INVITATION FOR BID

2023-RFx-031

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER WITH ASSOCIATED GRADING, ELECTRICAL, AND STORMWATER IMPROVEMENTS

City of Lebanon

City Hall 51 N. Park Street

Lebanon, NH 03766

RELEASE DATE: January 31, 2024

DEADLINE FOR QUESTIONS: March 4, 2024

RESPONSE DEADLINE: March 13, 2024, 4:00 pm

RESPONSES MUST BE SUBMITTED ELECTRONICALLY TO:

https://LebanonNH.gov/Bids

City of Lebanon

INVITATION FOR BID

Extend Taxiway 'A' & Relocate Localizer with Associated Grading, Electrical, and Stormwater Improvements

Attachments:

A - RFB Agreement Lebanon (Example)

B - RFB Bid Bond Lebanon (Example)

C - RFB Performance Bond Lebanon (Example)

D - RFP Payment Bond Lebanon (Example)

E - Lebanon General Conditions

F - Div_01_General_Provisions

G - Div_02_Special_Provisions

H - Div_02_Special_Provisions_Attachment II-A_Reports_and_Figures

I - Div_02_Special_Provisions_Attachment II-B_Federal_Contract_Provisions

J - Div_02_Special_Provisions_Attachment II-C_Construction_Safety_and_Phasing_Plan

K - Div_03_Technical_Specifications

L - LEB Vol I Drawings

M - LEB Vol II Drawings (FAA)

1. Introduction

The City of Lebanon reserves the right to reject any and all Bids and to waive any irregularity in Bidding. The successful Bidder will be required to furnish the necessary Bonds and Insurance Certificates. The City will award this project based on the City's discretion and may or may not include any or all bid alternatives. All work included in this bid is dependent upon the bid amounts and available funding. Actual quantities are subject to change and will be based upon actual field measurements taken during construction.

1.1. Summary

As a city grows, so does its aviation needs! The Lebanon Municipal Airport is improving safety on the airfield with multiple phased construction projects which will ultimately provide a full length parallel taxiway for the Airport's primary Runway.

This first construction project comprises a base bid to construct a 1,435ft-long extension of Taxiway 'A' to the south, a first added alternate to grade & seed the proposed localizer critical area measuring approximately 596,650 sf, and a second added alternate to relocate the Instrument Landing System Localizer Antenna Array and Distance Measuring Equipment (DME). This project includes heavy civil work (earthwork & paving), electrical, and stormwater elements. The stormwater work will be of particular interest to bidders, as the design includes diversion swales, sand filters, and other important drainage elements to mitigate our impact to the surrounding wetlands.

The City of Lebanon is looking for contractors who are excited to work on building important infrastructure in our local community, who understand the complexities of airfield operations and the care it takes to work near wetlands, and who know the safety requirements of working on an active airfield.

1.2. Contact Information

Project Contact:
Carl Gross
Airport Manager
5 Airpark Road
West Lebanon, NH 03784
Email: carl.gross@lebanonnh.gov
Phone: (603) 289-8878

Procurement Contact:
Leslie Merrithew
Project Manager - Stantec
40 Water St, 3rd Floor
Boston, MA 02109
Email: leslie.merrithew@stantec.com
Phone: (617) 314-1655

Department:
Airport

Department Head:
Carl Gross
Airport Manager

1.3. Timeline

It is expected that execution of this contract will be on or about October 11, 2024, and is dependent on receipt of FAA and State funding grants. The anticipated date of Notice to Proceed for Construction is on or about May 1, 2025.

All contractors shall account for a 2025 construction schedule in their bids.

Release Project Date	January 31, 2024
Pre-Proposal Meeting (Non-Mandatory)	February 8, 2024, 10:00am Agenda MS Teams Meeting Join on your computer, mobile app or room device by copying and pasting the link below: https://teams.microsoft.com/l/meetup-join/19%3ameeting_MzYxY2Q5YzYtMGNlOC00YWIxLWE1NDgtMmZiMjMyOTgyOTI4%40thread.v2/0?context=%7b%22Tid%22%3a%22413c6f2c-219a-4692-97d3-f2b4d80281e7%22%2c%22Oid%22%3a%22cf66b5a8-b672-489c-89b7-5601a690e700%22%7d Meeting ID: 290 657 217 846 Passcode: ZfihKd Or join by phone: 1 (833) 266-3861 (Toll-free) Phone Conference ID: 221 318 079#
Question Submission Deadline	March 4, 2024, 4:00pm
Question Response Deadline	March 5, 2024, 4:00pm

Proposal Submission Deadline	March 13, 2024, 4:00pm
Bid Opening	March 13, 2024, 4:00pm
Notice of Award	On or about March 29, 2024
Grant Approvals (FAA & NHDOT)	On or about September 20, 2024
Contract Execution	On or about October 11, 2024
Notice to Proceed	May 1, 2025
Substantial Completion	October 16, 2025
Final Completion and Acceptance	November 21, 2025

2. Instructions

2.1. Guidelines

All Bids must be submitted through the City of Lebanon eProcurement Portal located at LebanonNH.gov/Bids. The "Bid Proposal" should give a unit price in figures for each item which will yield a total price for each item and must be entered by a company representative authorized to commit the company.

It is the policy of the CITY that Contracts be awarded only to responsible CONTRACTORS. In order to qualify as responsible, a prospective CONTRACTOR must meet the following standards as they relate to this request:

- Have the adequate financial resources for performance, or have the ability to obtain such resources, as required during performance;
- Have the necessary experience, organization, technical and professional qualifications, skills, equipment, and facilities;
- Be able to comply with the proposed or required time of completion or performance schedule;
- Have a satisfactory record of performance and documented successful completion of similar projects.

2.2. Contract Documents and Definitions

The Contract Documents that will form the Contract are as defined in the General Conditions. Bidders must examine each of the Contract Documents, visit the location of the work, and inform themselves of the difficulties attending the execution of the work prior to the submission of their Proposals. The successful Contractor shall give attention to the definitions included in the Contract Documents.

2.3. Bid Bond

All bids must be submitted with a Bid Bond in the amount of 5% of the Bid Price executed between the Bidder and a Surety Company.

2.4. Performance Bond

The successful Bidder shall execute a Performance Bond in the amount of 100 percent of the Bid Price within 5 business days of the NOTICE of AWARD. Performance Bond shall be executed by the Bidder, Owner, and a Surety Company.

RSA 447:16 details the bond requirements for municipal projects over $125,000.

2.5. Payment Bond

The successful bidder shall provide a Payment Bond in accordance with the provisions of RSA 447:16, executed between the Bidder, Owner, and a Surety Company within 5 business days of the NOTICE of AWARD.

RSA 447:16 details the bond requirements for municipal projects over $125,000.

2.6. Title VI of the Civil Rights Act

The City of Lebanon, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that any contract entered into pursuant to this advertisement, disadvantaged business enterprises will be afforded full and fair opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, or national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability in consideration for an award.

2.7. Notice Of Requirement For Affirmative Action To Ensure Equal Employment Opportunity

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables

Goals for minority participation for each trade: **4.0%**

Goals for female participation in each trade: 6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor;

employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is ***West Lebanon, Grafton County New Hampshire*****.**

2.8. Disadvantaged Business Enterprise

Bid Information Submitted as a matter of **responsiveness**:
The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR § 26.53.

As a condition of responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

A. The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;

B. A description of the work that each DBE firm will perform;

C. The dollar amount of the participation of each DBE firm listed under (1);

D. Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal

E. Written confirmation from each listed DBE firm that it is participating in the contract in the kind and amount of work provided in the prime contractor's commitment; and

F. If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26. The documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.

Bid Information submitted as a matter of **responsibility**:

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR § 26.53.

As a condition of responsibility, every Bidder or Offeror must submit the following information on the forms provided herein within five days after bid opening.

A. The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;

B. A description of the work that each DBE firm will perform;

C. The dollar amount of the participation of each DBE firm listed under (1);

D. Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal;

E. Written confirmation from each listed DBE firm that it is participating in the contract in the kind and amount of work provided in the prime contractor's commitment; and

F. If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26. The documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.

2.9. Federal Fair Labor Standards

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, et seq, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.

The *Contractor* has full responsibility to monitor compliance to the referenced statute or regulation. The *Contractor* must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

2.10. Trade Restriction Certification

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –

1) is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);

2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and

3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC § 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR § 30.17, no contract shall be awarded to an Offeror or subcontractor:

1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR; or

2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list; or

3) who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

2.11. Other Federal Contract Provisions Incorporated in this Solicitation

By submission of an offer, the Offeror certifies that their bids comply with the following Federal contract provisions:

- Buy American Preferences
- Civil Rights - Title VI Assurances
- Davis Bacon Requirements
- Debarment and Suspension
- Lobbying Federal Employees
- Recovered Materials

3. Scope of Work

The Lebanon Municipal Airport is searching for qualified bidders for a heavy civil project which includes earthwork, paving, electrical, and stormwater elements on the airfield.

The proposed project includes but is not necessarily limited to:

BASE BID:

- Reconstruction of Taxiway A (360 LF x 50 FT);
- Construction to Extend Taxiway A (1,435 LF x 35 FT);
- Removal of Existing Taxiway A2 (235 LF x 65 FT);
- Construction of Proposed Taxiway A2 (235 LF x 50 FT);
- Earthwork; Aggregate Subbase/Base; Bituminous Paving; Pavement Markings; Topsoil and Seeding;
- Drainage Improvements including New Pipes, Structures, Sand Filters, Swales, and a Detention Pond;
- Electrical Improvements including New LED Taxiway Edge Lighting; New LED Airfield Guidance Signs; New Cabling, Conduit, Light Base Cans, Duct Banks and Handholes; and incidentals.

ADD ALT#1:

- Grading of Proposed Localizer Critical Area (596,650 SF), including Earthwork, Topsoil and Seeding;
- Grading of Proposed Gravel Access Road (1,125 LF x 12 FT) and Gravel pad.
- Drainage Improvements including New Pipes, Swales, and a Detention Pond;

ADD ALT#2 (Refer to the Volume II Drawings):

- Dismantling & Relocation of Existing Localizer Antenna Array;
- Dismantling & Relocation of Distance Measuring Equipment (DME);
- Removal of Existing Localizer Shelter Building;
- Disposal of Existing Localizer Shelter, Antenna, and DME Foundations
- Installation of New Localizer Shelter, Antenna, and DME Foundations;

- Installation of new pre-fabricated Localizer Shelter Building (Supplied by FAA);
- Electrical Improvements including New Cabling, Conduits

3.1. Project Drawings

Refer to #Attachments for Vol I and Vol II drawings detailing the scope of work for this project.

Vol I drawings contain information on the base bid and added alternate #01 for civil, stormwater, electrical, and phasing plans typical to an earthwork and aviation project.

Vol II drawings focus completely on added alternate #02 for the relocation of the FAA ILS Localizer Antenna, DME, and Shelter Building.

3.2. Project Specifications

Refer to #Attachments for technical specifications detailing the scope of work for this project. These specifications relate to the base bid, and both added alternates.

3.3. City of Lebanon General Conditions & FAA General Provisions

Refer to #Attachments for the general contract conditions and provisions for both the City of Lebanon and the FAA which will be incorporated into the contract for this project. These provisions relate to the base bid, and both added alternates.

3.4. Special Provisions

Refer to #Attachments for the special provisions which further detail requirements and specific work required under this contract. These provisions relate to the base bid, and both added alternates.

4. Terms and Conditions

4.1. Limitations, Omissions, Discrepancies, Addenda and Revisions

This Request for Bids does not commit the CITY to award a contract, to pay any costs incurred in the preparation of a response to this request, or to procure or contract for services or supplies. The CITY reserves the right to accept or reject any or all Bids received as a result of this request, or to cancel in part or in its entirety this Request for Bids, if in the best interest of the CITY to do so. The quantities that will be awarded would depend on final bid pricing and budget limitations.

Should a Bidder find discrepancies in or omissions from the Contract Documents or is in doubt as to their meaning, the Bidder should at once notify the Owner. In general, no answer will be given to the prospective Bidders in reply to an oral question if the question involves the equality or use of products or methods other than those specifically designated or described on the Drawings or in the Specifications. All information given to Bidders by means other than set forth in the Contract Documents is given informally and shall not be used as the basis of a claim against the Owner.

Omissions, discrepancies, and questions must be submitted via the eProcurement Questions portal by the designated date and time on the timeline. If a question involves the equality or use of products or methods not specifically designated or described on the Drawings or in the Specifications, it must be accompanied by Drawings, Specification, or other data in sufficient detail to enable the Owner to determine the equality or suitability of the product or method. In general, the Owner will neither approve nor disapprove particular products prior to the opening of the bids; such products will generally be considered only when offered by the Contractor for incorporation into the work after the award and signing of the Contract.

The Owner will prepare Addenda to address all pertinent questions received and answers shall be provided by the designated date and time on the timeline. Addenda will be sent to each Bidder/Follower who has downloaded the Contract Documents.

4.2. Bid Date Postponement

The Owner reserves the right to postpone the date for presentation and opening of Proposals and will give email notice of such postponement to each prospective Bidder/Follower.

4.3. Pricing Discrepancies

In the event of discrepancies between the price totals quoted in the Bids and the unit price figures, the unit price figures shall control. The price is to include the furnishing of all material, plant, equipment, tools, labor, and other facilities required for the completion of the work except as may be otherwise expressly provided in the Contract Documents. The Contractor shall prepare their prices for the Bids based on the equipment named in the Specifications. After the award of the Contract, if the Contractor desires to use equipment or methods other than those specified or shown in these documents, the Contractor shall submit data to prove equality, submit reason for change, submit the amount of credit (if any) to the Contract Price, provide Owner documentation for any changes required to arrive at a decision as to the suitability of the substitution.

4.4. Insurance

The Contractor shall, at its sole expense, obtain and maintain the following types of insurance, with an insurance company licensed to do business in the State of New Hampshire with a financial rating of A- or better in “Best’s Insurance Guide”, and for the following minimum amounts:

Type of Insurance Limits

A. Workers’ Compensation Per New Hampshire Statute

B. Employer’s Liability Insurance $1,000,000

C. Comprehensive General Liability* $1,000,000 per occurrence / $2,000,000 in the aggregate / $1,000,000 Project Aggregate

Comprehensive General Liability Insurance shall include coverage for all claims of personal injury, bodily injury, sickness, disease, or death (including coverage for acts of Consultant’s officials and employees), and broad form property damage (including loss of use resulting therefrom) and for completed operations.

D. Comprehensive Automobile Liability*

Bodily Injury $1,000,000 per occurrence/

Property Damage $2,000,000 in the aggregate

E. *Comprehensive Liability $5,000,000 in the aggregate

Umbrella Coverage in the amount of $5,000,000

Prior to the start of Work, the Consultant shall provide Certificates of Insurance to the City showing policy coverage of all of the above types of insurance with the coverage and limits as indicated above and, thereafter, on an annual basis for the duration of this Agreement and also at the termination of the Agreement, as evidence that policies providing the required coverage, conditions and limits are in full force and effect for the required period of time. Such Certificates shall identify this Agreement and contain provisions that coverage will not be cancelled or materially altered until at least thirty (30) days prior written notice has been given to the City. The City, to include its officers, agents, and employees, shall be named as an additional insured on all insurance required under this Agreement except for Professional Liability and Workers' Compensation.

4.5. Installation Floater

Not used.

4.6. Payment Schedule

Invoices are due and payable monthly by the third Friday of the following month. Invoices are to be for the actual dollar value of the services provided. Unless otherwise stated, payment will be net thirty (30) days after the receipt of a correct invoice for reasonable work allocable to the contract or after date of acceptance of work that meets contract requirements.

4.7. Arbitration

Any controversy arising out of or relating to this Contract or the breach hereof shall be settled by arbitration. The parties shall select an arbitrator. The arbitrator shall adopt appropriate arbitration rules similar to the American Arbitration Association or any other arbitration procedure. The place of arbitration shall be in Lebanon, New Hampshire. The arbitration hearing shall be held within thirty (30) days after the notice of arbitration is delivered by one party to the other party. In the event the parties are unable to agree on an arbitrator, application can be made to the Grafton County Superior Court under RSA Chapter 542. The arbitrator shall have the power to determine the interpretation of any provision of the Contract contained herein.

4.8. Termination of contract by the City for Cause

In the event the CONTRACTOR shall fail to perform as required under this Contract, the CITY shall then give notice to the CONTRACTOR in writing describing the default, the action to cure the default and the time within which the default is to be cured. If the CONTRACTOR does not cure the default within the time prescribed by the CITY, then the CITY shall have the right to terminate this Contract by giving written notice to the CONTRACTOR of the termination and specifying the effective date. In the event of the termination, all finished or unfinished documents, data, programs and reports prepared by the CONTRACTOR shall, at the option of the CITY, become its property. If the contract is terminated by the CITY, the CONTRACTOR will be paid an amount which bears the same ratio to the total compensation as the services covered by the Contract, less payments previously made and less payments made by the CITY to another contractor to complete the Contract

4.9. Termination of contract by the City for Convenience

The CITY may terminate the Contract at any time by giving written notice to the CONTRACTOR of such termination and specifying the effective date thereof, at least fifteen (15) days before the effective date of such termination. In that event, all finished or unfinished documents and materials, at the option of the CITY become its property. If the Contract is terminated by the CITY as provided herein, the CONTRACTOR will be paid an amount which bears the same ratio to the total compensation as the services covered by the Contract, less payments previously made by the CITY.

4.10. Indemnification

To the fullest extent permitted by law, the CONTRACTOR shall indemnify and hold harmless the CITY and its agents or employees, from any kind or character, either direct or indirect, at law or in equity, including but not limited to attorney's fees, arising out of or resulting from the performance of this Contract, regardless of negligence. None of the foregoing provisions shall deprive the CITY of any action, right or remedy otherwise available to it under law. In the event that the CONTRACTOR is requested but refuses to honor the indemnity obligations hereunder, then the CONTRACTOR shall, in addition to all other obligations, pay to the CITY the cost of bringing any action at law or in equity, including but not limited to attorney's fees, to enforce this indemnity

4.11. Contract

The Contract between the City of Lebanon and the CONTRACTOR shall consist of (1) the Request for Bids (RFB) and any amendments thereto, and (2) the CONTRACTOR's bid submitted in response to the RFB. In

the event of a conflict in language between the two documents referenced above, the provisions and requirements set forth and referenced in the request for bids shall govern. However, the City of Lebanon reserves the right to clarify any contractual relationship in writing with the concurrence of the CONTRACTOR, and such written clarification shall govern in case of conflict with the applicable requirements stated in the RFB or the CONTRACTOR'S bid. In all other matters not affected by the written clarification, if any, the request for bid shall govern. The CONTRACTOR is cautioned that their bid shall be subject to acceptance without further clarification.

4.12. Bid Acceptance

The Owner reserves the right to reject any or all Bids for any reason, or to accept any Bid which it deems to be in its best interest. Any Bid which is incomplete, obscure, or irregular may be rejected; any Bid having erasures or corrections in the price sheet may be rejected; any Bid which omits a bid on any one or more required items may be rejected; and any Bid accompanied by an insufficient or irregular certified check or Bid Bond may be rejected. The use of unbalanced bids is prohibited.

The project description is for illustrative purposes only and does not commit the City of Lebanon to perform the work described or to limit work performed under the terms, conditions, and specifications contained in this document to only those projects described below. The City reserves the right to change project scopes prior to the issuance of Purchase Orders against this Contract. It is the proposer's responsibility to review and confirm estimated quantities.

If the Bidder submits a Proposal before the deadline time for submission, the Bidder may withdraw its submission and modify the original Proposal for submission and re-submit prior to the deadline time. No verbal, telephone, or elelectronic communication methods will be considered.

4.13. Protest Solicitations and Awards

Right to Protest. Any actual or prospective bidder who is allegedly aggrieved in connection with the solicitation or pending award of a contract may protest to the City Manager.

Notice. A notice of protest must be submitted no later than 5:00 p.m., on the fifth full business day after posting of the award recommendation. The protest must be in writing and must identify the protesting party and the project number and title and shall include a factual summary of the basis of the protest.

The formal written protest shall; identify the protesting party and the solicitation involved; include a clear statement of the grounds on which the protest is based; refer to the statutes, laws, ordinances or other legal authorities which the protesting party deems applicable to such grounds; and specifically request the relief to which the protesting party deems itself entitled by application of such authorities to such grounds.

A formal written protest is considered filed with the City when it is received by the City Manager's Office. Accordingly, a protest is not timely filed unless it is received within the times specified above. Failure to file a formal written protest within the time period specified shall result in relinquishment of all rights of protest by the vendor and abrogation of any further bid protest proceedings.

These procedures shall be the sole remedy for challenging an award of bid. Bidders are prohibited from attempts to influence, persuade or promote through any other channels or means.

The time limits in which protests must be filed as specified herein may be altered by specific provisions in the RFx.

Authority to Resolve. The City Manager shall attempt to resolve the protest in a fair and equitable manner and shall render a written decision to the protestant.

Stay of procurement during protests. In the event of a timely protest, the City Manager shall not proceed further with the solicitation or with the pending award of the contract until a determination that the award of the contract without delay is necessary to protect substantial interests of the City.

4.14. Bidder's Qualifications

It is the purpose of the Owner not to award this Contract to any Bidder who does not furnish evidence satisfactory to the Owner that the Bidder has the ability, skill, integrity, and experience in this class of work and has sufficient capital and plant to enable the successful and complete execution of this contract within the specified time.

In determining the skill, ability, and integrity of the responsible and eligible Bidders the following elements will be considered: Whether the Bidder has (a) previously defaulted on, failed to perform properly, or failed to complete on time contracts of similar nature; (b) habitually and without just cause neglected payment for material or to employees; (c) a permanent place of business; (d) adequate plant and equipment to do the Work properly; (f) a suitable financial status to meet the obligations incident to the Work; (g) appropriate technical experience; (h) labor force that can work in harmony with all other elements of labor employed; (i) sufficient bonding capacity; and, (j) adequate superintendence.

4.15. Low Bidder and Acceptance of Proposal (Notice of Award)

Except where the City of Lebanon has exercised its right to reject any or all Bids, the Contract will be awarded to the lowest responsible and qualified Bidder.

Within fourteen (14) days after opening the Proposals, the City will prepare a Notice of Award signed by an authorized City representative. This Notice of Award shall bind the successful Bidder to execute the Contract approval.

Notice of Award and formal acceptance of the Bid will be made in writing to the successful Bidder. The Notice of Award will be signed by an authorized City representative.

The rights and obligations provided for in the Contract shall become effective and binding upon the Parties only with its formal execution by the City.

4.16. Execution of Contract & Failure Damages

Any Bidder whose Bid shall be accepted will be required to execute the Contract within fourteen (14) days after the City of Lebanon receives approval by the State of New Hampshire's Governor & Council for this project's funding. Failure or neglect to execute the Contract shall constitute a breach of the agreement affected by the acceptance of the Bid.

The damages to the City of Lebanon for such a breach shall include loss from the interference with this construction program and other items. The amount of the certified check or Bid Bond accompanying the Bid of such Bidder will be retained by the Owner as liquidated damages for such breach. In the event any

Bidder whose Bid shall be accepted shall fail or refuse to execute the Contract hereinbefore provided, the Owner may, at their option, determine that such Bidder has abandoned the Contract and thereupon the Bid and the acceptance thereof shall be null and void and the Owner will be entitled to liquidated damages as above provided.

4.17. Specifications Format

The Specifications are to be in full compliance with the current edition of FAA AC 150/5370-10H Standard Specifications for Construction of Airports. Where an item is not covered by the standard FAA specification, it shall be in full compliance with the current edition of NHDOT Highway Standards.

4.18. Manufacturer's Experience

Wherever it may be written that an equipment manufacturer must have a specified period of experience with their product, equipment that does not meet the specified experience period may be considered if the equipment supplier or manufacturer is willing to provide a bond or cash deposit for the duration of the specified time period which will guarantee replacement of the equipment in the event of failure.

4.19. Safety and Health

This project is subject to all of the Safety and Health Regulations (29 CRF Part 1926 and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974. Contractors are urged to become familiar with the requirements of these regulations.

4.20. U.S.D.O.T. Compliance

The Contractor shall be in compliance with the U.S. Department of Transportation's Federal Motor Carrier Safety Regulations, Parts 49CFR382, and 49CFR383. The Contractor shall maintain compliance with these regulations from the date of the contact award to project completion.

4.21. FAA General Provisions

See the #Attachments section for Division I FAA General Provisions which provide additional terms and conditions that the contractor will be subject to and must consider within their bid.

4.22. Special Provisions

See the #Attachments section for Division II Special Provisions which detail additional terms and conditions that the contractor will be subject to and must consider within their bid.

4.23. City of Lebanon General Provisions

See the #Attachments section for the Lebanon General Provisions which detail additional terms and conditions that the contractor will be subject to and must consider within their bid.

5. Vendor Questionnaire

5.1. Bidder Information *

Please Provide:

• Name of Bidder:

• Authorized Representative's Name:

• Authorized Representative's Title:

• When Incorporated

• Where Incorporated

• Corporate Main Office Address:

*Response required

5.2. How many years have you been engaged in the contracting business under your present firm name? *

*Response required

5.3. Contracts on Hand *

Contracts on hand: (Attach a list showing the Project Title, Project Location, Gross amount of each contract, and the approximate anticipated dates of completion.)

*Response required

5.4. General character of work performed by your company. *

*Response required

5.5. If you have ever failed to complete work awarded to you, please explain when and why:*

Explain a failure to complete work or state: "Our firm has never failed to complete any work awarded"

*Response required

5.6. If you have ever defaulted on a contract, please provide where and when:*

Provide details of contract default or state: "Our firm has never defaulted on a contract"

*Response required

5.7. List the more important projects recently done by your company, stating approximate cost for each, the month and year completed, primary owner List the more important projects recently done by your company, stating approximate cost for each, the month and year completed, primary owners contact / telephone number. s contact / telephone number. *

*Response required

5.8. List your major equipment AVAILABLE FOR THIS CONTRACT*

*Response required

5.9. Experience in construction work similar in importance to this project. *

Please provide details of your experience.

*Response required

5.10. Bid Proposal Affirmation*

In compliance with your Advertisement for Bids, BIDDER hereby proposes to perform all WORK for the 2024 Project in strict accordance with the CONTRACT DOCUMENTS, within the time set forth therein, and at the prices stated below.

By submission of this BID, each BIDDER certifies, and in the case of a joint BID each party thereto certifies as to their own organization, that this BID has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this BID with any other BIDDER or with any competitor.

BIDDER hereby agrees to commence WORK under this contract on or before a date to be specified in the NOTICE TO PROCEED and fully complete before the date specified in this document. BIDDER further agrees to pay as liquidated damages, the sum of $500.00 for each consecutive calendar day thereafter.

BIDDER agrees to perform all WORK described in the CONTRACT DOCUMENTS per the lump sum and/or unit prices entered in the Pricing List.

☐ Please confirm

*Response required

5.11. I hereby certify that I am the Authorized Representative of the company, and further certify under penalty of perjury that the above statements are true*

☐ Please confirm

*Response required

5.12. Bid Bond *

Each Bid shall be accompanied by a Bid Bond, or a certified Cashier's Check, in the amount of 5% of the total bid price, payable to the City of Lebanon, as a guarantee that the bidder, if their bid is accepted, will promptly execute the Agreement. The bidder shall guarantee the total bid price for a period of 60 days from the date of the bid opening.

Please scan and upload a copy of your bid bond below.

If providing a cashier's check for Surety, please mail or drop it off in person at the location listed below. Please be aware that Surety must be received in the office no later than the Project Submission Date.

City of Lebanon

Airport

5 Airpark Road

West Lebanon, NH 03784

Please have the Bidder Name, Project Title (Extend Taxiway 'A' & Relocate Localizer with Associated Grading, Electrical, and Stormwater Improvements), and Project ID Number (2023-RFx-031) listed clearly on the outside of the envelope.

*Response required

5.13. Certification of Compliance with FAA Buy American Preference - Construction Projects*

Bidders must download the document below, complete it, and upload it under Section 15.

- 08_II-B_Federal_Contract_Pr...

*Response required

5.14. Certification Regarding Tax Delinquency and Felony Convictions*

Bidders must download the document below, complete it, and upload it under Section 15.

- 08_II-B_Federal_Contract_Pr...

*Response required

5.15. Document Uploads*

Please upload all signed or required documentation here, including the Certification of Compliance with the FAA Buy American Preferences and the Certification Regarding Tax Delinquency.

*Response required

6. Pricing Proposal

BASE BID

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
BASE BID						
2	C-105.01	Mobilization	1	LS		
3	C-105.02	Resident Project Representative (RPR) Field Office	7	MONTHS		
4	C-100.01	Contractor Quality Control Program (CQCP)	1	LS		
5	C-102.01	Installation and Removal of Sediment Barrier	3,645	LF		
6	C-102.02	Installation and Removal of Straw Bales	1,194	LF		
7	C-102.03	Installation of Erosion Control Blanket	9,800	SY		
8	C-102.04	Installation and Removal of Drain Inlet Protection	10	EA		
9	C-102.05	Installation and Removal of Temporary Stabilized Construction Exits	3	EA		
10	C-102.06	Temporary Seeding and Mulching	374.2	1000 SF		
11	C-102.07	Installation of Stone Check Dams	4	EA		
12	C-102.08	Installation and Removal of Temporary Sediment Trap (≤3,600 CF Storage)	4	EA		
13	C-102.09	Installation and Removal of Temporary Sediment Trap (>3,600 CF Storage)	4	EA		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
14	P-101.01	Pavement Removal	6,389	SY		
15	P-101.02	Pavement Key Milling	608	SF		
16	P-101.03	Removal of Drainage Pipe	1,495	LF		
17	P-101.04	Removal of Drainage Structure	6	EA		
18	P-152.01	Unclassified Excavation	33,000	CY		
19	P-152.02	Rock Excavation	50	CY		
20	P-153.01	Controlled Low-Strength Material (CLSM)	200	CY		
21	P-154.01	Subbase Course	9,937	CY		
22	P-154.02	Seperation Geotextile	17,552	SY		
23	P-209.01	Crushed Aggregate Base Course	2,080	CY		
24	P-401.01	Asphalt Surface Course	2,864	TON		
25	P-600.01	Riprap Class I (d50=6”)	50	SY		
26	P-600.02	Riprap Class III (d50=12”)	800	SY		
27	P-600.03	Riprap Class V (d50=18”)	300	SY		
28	P-603.01	Emulsified Asphalt Tack Coat	1,200	GAL		
29	P-605.01	Joint Sawing and Sealing	400	LF		
30	P-620.01	Removal of Markings	330	SF		
31	P-620.02	Surface Preparation prior to First (Initial) application of Markings	2,420	SF		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
32	P-620.03	Surface Preparation Prior to Second (Permanent) Application of Markings	6,930	SF		
33	P-620.04	First (Initial) Application of Markings	6,285	SF		
34	P-620.05	Second (Permanent) Application of Markings	2,186	SF		
35	P-620.06	Reflective Media, Type III, for Second (Permanent) Application of Markings	2,101	SF		
36	P-620.07	Reflective Media, Type I, Gradation A, Second (Permanent) Application fo Markings	84	SF		
37	F-162.01	Chain-Link Fence	16	LF		
38	F-162.02	Temporary Construction Access Gates	2	EA		
39	D-701-5.1	15-inch Class V RCP Pipe	0	LF		
40	D-701-5.2	18-inch Class V RCP Pipe	0	LF		
41	D-701-5.3	21-inch Class V RCP Pipe	1,183	LF		
42	D-701-5.4	24-inch Class V RCP Pipe	0	LF		
43	D-701-5.5	30-inch Class V RCP Pipe	537	LF		
44	D-701-5.6	48-inch Class V RCP Pipe	1,196	LF		
45	D-701-5.7	54-inch Class V RCP Pipe	189	LF		
46	D-701-5.8	6-inch HDPE Pipe	28	LF		
47	D-701-5.9	8-inch HDPE Pipe	378	LF		
48	D-701-5.10	12-inch HPDE Pipe	0	LF		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
49	D-701-5.11	15-inch HDPE Pipe	92	LF		
50	D-701-5.12	24-inch HDPE Pipe	94	LF		
51	D-701-5.13	24-inch HDPE Pipe	0	LF		
52	D-705.01	Removal of Underdrain Pipe and Cleanouts	1,231	LF		
53	D-705.02	6-inch Underdrain Pipe	4,185	LF		
54	D-705.03	Underdrain Cleanout	25	EA		
55	D-705.04	Existing Underdrain Structure Adjustment	4	EA		
56	D-705.05	2” Schedule 40 PVC Lighting System Drain Pipe	500	LF		
57	D-705.06	2” Schedule 80 PVC Lighting System Drain Pipe	250	LF		
58	D-751-5.1	Manholes, 5-Foot Dia.	5	EA		
59	D-751-5.2	Manholes, 6-Foot Dia	2	EA		
60	D-751-5.3	Manholes, 8-Foot Dia.	1	EA		
61	D-751-5.4	Catch Basins, 4-Foot Dia.	6	EA		
62	D-751-5.5	Catch Basins, 6-Foot Dia.	3	EA		
63	D-751-5.6	Catch Basins, 7-Foot Dia.	1	EA		
64	D-751-5.7	Catch Basins, 8-Foot Dia.	1	EA		
65	D-751-6.0	Existing Drainage Structure Adjustment	2	EA		
66	D-751-7.0	Replacement of Frame and Grate	3	EA		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
67	D-751-9.0	Outlet Control Structures 6-Foot Diameter	1	EA		
68	D-771.01	Surface Sand Filter	2,500	SY		
69	T-901.01	Seeding	440	1000 SF		
70	T-905.01	Topsoil	5,121	CY		
71	T-908.01	Mulching	44,444	SY		
72	L-108-5.1	Removal of Cable from Conduit or Duct Bank	3,000	LF		
73	L-108-5.2	Removal of Direct-Buried Cable	120	LF		
74	L-108-5.3	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit	7,100	LF		
75	L-108-5.4	No. 6 AWG, 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit	240	LF		
76	L-108-5.5	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above the Duct Bank or Conduit, Including Connections/Terminations	6,000	LF		
77	L-108-5.6	Temporary No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Conduit	1,200	LF		
78	L-110-5.1	Removal of Electrical Duct Bank	280	LF		
79	L-110-5.2	Removal of Non-Encased Electrical Conduit	2,400	LF		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
80	L-110-5.3	Direct Buried 2" Schedule 40 PVC Elecrtical Conduit	5,500	LF		
81	L-110-5.4	Direct Buried 2" Schedule 80 PVC Elecrtical Conduit	120	LF		
82	L-110-5.5	Concrete Encased Sch. 40 PVC Electrical Duct Bank, 2-Way by 4”	280	LF		
83	L-115-5.1	Removal of Electrical Junction Structure	9	EA		
84	L-115-5.2	L-868 Electrical Junction Structure	2	EA		
85	L-115-5.3	Precast Electrical Handhole, 3' x 3'	6	EA		
86	L-125-5.1	Removal of Existing Elevated Taxiway Edge Light	41	EA		
87	L-125-5.2	Removal of Existing Runway Edge Light	2	EA		
88	L-125-5.3	Removal of Existing Illuminated Airfield Sign	6	EA		
89	L-125-5.4	L-862 Base Mounted Runway Edge Light	1	EA		
90	L-125-5.5	L-861T(L) LED Base Mounted Taxiway Edge Light	69	EA		
91	L-125-5.6	L-861T(L) LED Stake Mounted Taxiway Edge Light	2	EA		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
92	L-125-5.7	Convert Existing L-861T Elevated Taxiway Edge Light with New LED Fixture on Existing Base Can	7	EA		
93	L-125-5.8	L-858(L) LED Size 1, Class 2 Illuminated Airfield Guidance Sign	8	EA		
94	L-125-5.9	Airfield Lighting Spare Parts	1	ALLOWANCE		
TOTAL						

ADDED ALTERNATE #1

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
ADDED ALTERNATE #1						
96	C-102.01	Installation and Removal of Sediment Barrier	3,403	LF		
97	C-102.02	Installation and Removal of Straw Bales	897.6	LF		
98	C-102.03	Installation of Erosion Control Blanket	4,400	SY		
99	C-102.04	Installation and Removal of Drain Inlet Protection	5	EA		
100	C-102.05	Installation and Removal of Temporary Stabilized Construction Exits	1	EA		
101	C-102.06	Temporary Seeding and Mulching	645.7	1000 SF		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
102	P-101.03	Removal of Drainage Pipe	105	LF		
103	P-152.01	Unclassified Excavation	55,000	CY		
104	P-152.02	Rock Excavation	20	CY		
105	P-209.01	Crushed Aggregate Base Course	645	CY		
106	D-701-5.10	12-inch HPDE Pipe	110	LF		
107	D-751-8.0	Outlet Control Structures 4-Foot Diameter	1	EA		
108	T-901.01	Seeding	607	1000 SF		
109	T-905.01	Topsoil	7,418	CY		
110	T-908.01	Mulching	67,444	SY		
TOTAL						

ADDED ALTERNATE #2

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
ADDED ALTERNATE #2						
112	Vol 2 Item 1	Remove & Dispose Localizer Shelter Building & Miscellaneous Items not being relocated, as shown on Volume II drawings	1	LS		

Line Item	Item	Description	Quantity	Unit of Measure	Unit Cost	Total
113	Vol 2 Item 2	Relocation of Existing Localizer Antenna & DME equipment and all other items shown on Volume II drawings	1	LS		
114	Vol 2 Item 3	Installation of Localizer, DME Structures, New Shelter Building & Equipment including all cabling, structures, foundations, bollards and work shown on Volume II drawings.	1	LS		
TOTAL						

General Conditions Index

General Conditions

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50. [Reserved]
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53. [Reserved]
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60. Permits
61. Control of Pollution
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GENERAL CONDITIONS

1. Contracts and Contract Documents. The plans, information for bidders, bids, advertisement for bids, bid payment and performance bonds, Agreements, change orders, notice to proceed, specifications and addenda, hereinafter enumerated in the Agreement, shall form part of this Contract and the provisions thereof shall be as binding upon the parties hereto as if they were herein fully set forth. The table of contents, titles, headings, running headlines and marginal notes contained herein and in said documents are solely to facilitate reference to various provisions of the Contract Documents and in no way affect, limit or cast light on the interpretation of the provisions to which they refer.

2. Definitions.

2.1 "Addenda" means written or graphic instruments issued prior to the execution of the Agreement which modify or interpret the Contract Documents, drawings and specifications, by additions, deletions, clarifications or corrections. Such written or graphic instruments will be issued no less than five days before the bid opening.

2.2 "Bid" means the offer or proposal of the bidder submitted on the prescribed form setting forth the prices for the work to be performed.

2.3 "Bidder" means any person, firm or corporation submitting a bid for the work.

2.4 "Bonds" means bid, performance, and payment bonds and other instruments of security, furnished by the Contractor and his surety in accordance with the Contract Documents.

2.5 "Change order" means a written order to the Contractor authorizing an addition, deletion or revision in the work within the general scope of the Contract Documents, or authorizing an adjustment in the Contract Price or Contract Time.

2.6 "Contract Documents" means the Contract, including any advertisement for bids, information for bidders, bid, bid bond, Agreement, payment bond, performance bond, notice of award, notice to proceed, change orders, drawings, specifications and addenda.

2.7 "Contract Price" means the total monies payable to the Contractor under the terms and conditions of the Contract Documents.

2.8 "Contract Time" means the number of calendar days stated in the Contract Documents for the completion of the Work.

2.9 "Contractor" means the person, firm or corporation with whom the Owner has executed the Agreement.

2.10 "Division" means the state of New Hampshire Department of Environmental Services, Water Division.

2.11 "Drawings" mean the part of the Contract Documents which show the characteristics and scope of the work to be performed and which have been prepared or approved by the Engineer

2.12 “Engineer” means the person, firm or corporation named as such in the contract documents.

2.13 “Field order” means a written order effecting a change in the work not relating to an adjustment in the contract price or an extension of the contract time and issued by the Engineer to the Contractor during construction.

2.14 “Notice of Award” means the written notice of the acceptance of the Bid from the Owner to the successful Bidder.

2.15 “Notice to Proceed” means the written communication issued by the Owner to the Contractor authorizing him to proceed with the Work and establishing the date of commencement of the Work.

2.16 “Owner” means a public or quasi-public body or authority, corporation, association, partnership, or individual for whom the work is to be performed.

2.17 “Plans” means the contract drawings or exact reproductions thereof which show the scope, character, dimensions and details of the work and which have been prepared or approved by the Engineer.

2.18 “Project” means the undertaking to be performed as provided in the Contract Documents.

2.19 “Resident Project Representative” means the authorized representative of the Owner who is assigned to the Project site or any part thereof.

2.20 “Shop Drawings” means all drawings, diagrams, illustrations, brochures, schedules and other data which are prepared by the Contractor, a Subcontractor, manufacturer, supplier or distributor, which illustrates how specific portions of the Work shall be fabricated or installed.

2.21 “Special conditions” means revisions or additions to these general conditions, Supplemental General Conditions or specifications applicable to an individual project.

2.22 “Specifications” means a part of the contract documents consisting of written descriptions of a technical nature of materials, equipment, construction systems, standards and workmanship.

2.23 “Subcontractor” means an individual, firm or corporation having a direct contract with the Contractor or with any other Subcontractor for the performance of a part of the Work at the site.

2.24 “Supplemental General Conditions” means modifications to these general conditions required by a Federal agency for participation in the PROJECT and approved by the agency in writing prior to inclusion in the CONTRACT DOCUMENTS, or such documents that may be imposed by applicable State laws.

2.25 “Supplier” means any person or organization who supplies materials or equipment for the Work, including that fabricated to a special design, but who does not perform labor at the site.

2.26 “Work” means all labor necessary to produce the construction required by the contract documents, and all materials and equipment incorporated or to be incorporated in the project.

2.27 “Written Notice” means any notice to any party of the Agreement relative to any part of this Agreement in writing and considered delivered and the service thereof completed, when posted by certified or registered mail to the said party at his last given address, or delivered in person to said party or his authorized representative on the Work.

3. Additional Instructions and Detail Drawings. The Contractor may be furnished additional instructions and detail drawings as necessary to carry out the work included in the contract. The additional drawings and instructions thus supplied to the Contractor will coordinate with the contract documents and will be so prepared that they can be reasonably interpreted as part thereof.

4. Shop or setting drawings shall be in accordance with the following:

4.1 The Contractor shall furnish 6 copies of the manufacturer's shop drawings, specific design data as required in the detailed specifications, and technical literature covering all equipment and fabricated materials which he proposes to furnish under this contract in sufficient detail to indicate full compliance with the specifications. Shop drawings shall indicate the method of installing, the exact layout dimensions of the equipment or materials, including the location, size and details of valves, pipe connections, etc.

4.2 No equipment or materials shall be shipped until the manufacturer's shop drawings and specifications or other identifying data, assuring compliance with these specifications, are approved by the Engineer.

4.3 The Contractor shall check and verify all field measurements and shall be responsible for the prompt submission of all shop and working drawings so that there shall be no delay in the work.

4.4 Regardless of corrections made in or approval given to such drawings by the Engineer, the Contractor will nevertheless be responsible for the accuracy of such drawings and for their conformity to the plans and specifications. The Contractor shall notify the Engineer in writing of any deviations at the time he furnishes such drawings. He shall remain responsible for the accuracy of the drawings showing the deviations but not for the acceptance of the deviations from the original design shown in the plans and specification. Approval by the Engineer and the Owner of any deviation in material, workmanship or equipment proposed subsequent to approval of the shop drawings or design data, shall be requested in writing by the Contractor.

4.5 When submitted for the Engineer's review, Shop Drawings shall bear the Contractor's certification that he has reviewed, checked and approved the Shop Drawings and that they are in conformance with the requirements of the Contract Documents.

5. Materials, services, facilities and workmanship shall be furnished as follows:

5.1 Except as otherwise specifically stated in the contract documents, the Contractor shall provide and pay for all materials, labor, tools, equipment, water, light, power, transportation,

superintendence, temporary construction of every nature, and all other services and facilities of every nature whatsoever necessary to execute, complete, and deliver the work within the specified time.

5.2 Unless otherwise specifically provided for in the specifications, all workmanship, equipment, materials and articles incorporated in the work shall be new and the best grade of the respective kinds for the purpose.

5.3 The Contractor shall furnish to the Engineer for approval the manufacturer's detailed specifications for all machinery, mechanical and other special equipment, which he contemplates installing together with full information as to type, performance characteristics, and all other pertinent information as required.

5.4 Materials which are specified by reference to the number or symbol of a specific standard, such as an ASTM standard, a federal specification or other similar standard, shall comply with requirements in the latest revision thereof and any amendment or supplement thereto in effect on the date of the advertisement for bids, except as limited to type, class or grade, or modified in such reference. The standards referred to shall have full force and effect as though printed therein.

5.5 For equipment or for materials, when requested by the Engineer, the Contractor shall submit certificates of compliance from the manufacturer, certifying that the equipment or the materials comply with the requirements of the specifications or the standards.

5.6 Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned as directed by the manufacturer.

5.7 Materials, supplies, and equipment shall be in accordance with samples submitted by the Contractor and approved by the Engineer.

6. Contractor's Title to Materials. No material, supplies, or equipment to be installed or furnished under this contract shall be purchased subject to any chattel mortgage or under a conditional sale, lease purchase or other agreement by which an interest therein or in any part thereof is retained by the seller or supplier. The Contractor shall warrant good title to all materials, supplies, and equipment installed or incorporated in the work and upon completion of all work, shall deliver the same together with all improvements and appurtenances constructed or placed thereon by him to the Owner free from any claims, liens, or charges. Neither the Contractor nor any person, firm or corporation furnishing any material or labor for any work covered by this contract shall have any right to a lien upon any improvement or appurtenance thereon. Nothing contained in this paragraph, however, shall defeat or impair the right of persons furnishing materials or labor to recover under any bond given by the Contractor for their protection or any rights under any law permitting such persons to look to funds due the Contractor in the hands of the Owner. The provisions of this paragraph shall be inserted in all subcontracts and material contracts and notice of its provisions shall be given to all persons furnishing materials for the work when formal contract is entered into for such materials.

7. Inspection and testing of materials shall be as follows:

7.1 All materials and equipment used in the construction of the project shall be subject to

inspection and testing by a third party testing agency as directed by the Engineer in accordance with accepted standards at any and all times during manufacture or during the project construction and at any or all places where such manufacture is carried on.

7.2 The Contractor shall furnish promptly upon request by the third party testing agency, all materials required to be tested. All tests made by the Engineer shall be performed in such manner and ahead of scheduled installation, as not to delay the work of the Contractor. When required, testing of concrete, masonry, soils, pipe and pipe materials will be made in accordance with provisions in the specifications.

7.3 Material required to be tested which is delivered to the job site shall not be incorporated into the work until the tests have been completed and approval or acceptance given in writing by the Engineer.

7.4 Each sample submitted by the Contractor for testing shall carry an identification label containing such information as is requested by the third party testing agency. It shall also include a statement that the samples are representative of the remaining materials to be used on the project.

7.5 Approval of any materials shall be general only and shall not constitute a waiver of the Owner's right to demand full compliance with the contract requirements.

7.6 The Engineer may, at his own discretion, undertake the inspection of materials at the source. In the event plant inspection is undertaken, the following conditions shall be met:

a. The Engineer shall have the cooperation and assistance of the Contractor and the producer with whom he has contracted for materials.
b. The Engineer shall have full entry at all reasonable times to such areas as may concern the manufacture or production of the materials being furnished.
c. Adequate safety measures shall be provided and maintained at all times.

7.7 Except as otherwise specifically stated in the contract, the costs of sampling and testing will be paid for by the Contractor:

a. The Contractor shall furnish the third Party testing Agency, without extra cost, all samples required for testing purposes. All sampling and testing including the number and selection of samples shall be determined by the Engineer for his own information and use.
b. When testing of materials is specified in the appropriate section of the specifications, the cost of the same shall be charged to the Contractor. However, costs of equipment performance tests shall be borne by the Contractor, as detailed in the appropriate section of the specifications.
c. When the Contractor proposes a material, article or component as equal to the ones specified, reasonable tests may, or may not, be required by the Engineer. If the Engineer requires tests of a proposed equal item, the Contractor will be required to assume all costs of such testing.
d. Any material, article or component which fails to pass tests required by the Engineer or by the specifications, will be rejected and shall be removed from the project site. However, if, upon request of the Contractor, retesting or further tests are permitted by the Engineer, the Contractor shall assume all costs related to such retesting or further tests.

e. Neither the Owner nor the Engineer will in any way be charged for the manufacturer's costs in supplying certificates of compliance.

7.8 If the Contract Documents, laws, ordinances, rules, regulations or orders of any public authority having jurisdiction require any Work to specifically be inspected, tested or approved by someone other than the Contractor, the Contractor will give the Engineer timely notice of readiness. The Contractor will then furnish the Engineer with the required certificates of inspection, testing or approval.

7.9 Inspections, tests, or approvals by the engineer or others shall not relieve the Contractor from obligations to perform the Work in accordance with the requirements of the Contract Documents.

8. “Or equal” clause, substitutions, and Contractor's options.

8.1 If a specified or equal item is not available to meet the construction schedule, the Contractor may propose a substitute item of less than equal performance and quality. If this substitute is acceptable to the Engineer, any difference in purchase cost or costs incidental to the installation of such item will be negotiated between the parties to the contract.

8.2 Neither equal nor substitute items shall be installed without written approval of the Engineer.

8.3 The Contractor shall warrant that if substitutes are approved, no major changes in the function or general design of the Project will result.

9. Patents. Patent information is as follows:

9.1 The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liability of any nature or kind, including cost and expenses for, or on account of, any patented or unpatented invention, process, article, or appliance manufactured or used in the performance of the contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.

9.2 If the Contractor uses any design, device or materials in the construction methods for the project covered by patents or copyrights, he shall provide for such use by suitable agreement with the owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, that, without exception, the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract, and shall indemnify the Owner for any cost, expense or damage which it may be obliged to pay by reason of such infringement at any time during the construction of the work or after completion of the work.

10. Surveys. Surveys of land, property and construction shall be as follows:

10.1 The Owner will provide all land surveys and will establish and locate all property lines

relating to the project.

10.2 For structures, the Engineer will establish and stake out one or more base lines as needed and will establish bench marks in and around the project site for the use of the Contractor and for the Engineer's own reference in checking the work in progress. For structures such as pipelines, the Engineer will establish the location of the pipe, manholes and other appurtenances, and will establish bench marks along the route of the pipeline at intervals for the using of the Contractor and for his own reference in checking the pipe and manhole inverts and other elevations throughout the project. The Contractor shall utilize the lines and bench marks established by the Engineer to set up whatever specific detail controls he may need for establishing location, elevation lines and grades of all structures. All this work is subject to checking, approval, and continuous surveillance by the Engineer to avoid error. The Contractor shall provide the Engineer with a qualified man or men to assist in this checking as needed and on request of the Engineer.

10.3 Except as described elsewhere in the specifications, for construction other than pipelines and appurtenances in roadways and cross country, the Contractor shall be responsible for the location and setting lines and grades. Base lines and benchmarks for setting of the lines and grades for the above shall be provided by the Engineer.

10.4 Protection of stakes. The Contractor shall protect and preserve all of the established baseline stakes, bench marks, or other controls placed by the Engineer. Any of these items destroyed or lost through fault of the Contractor will be replaced by the Engineer at the Contractor's expense.

11. Contractor's Obligations. Contractor's obligation is as follows: The Contractor shall and in good workmanlike manner, do and perform all work and furnish and pay for all supplies and materials, machinery, equipment, facilities and means, except as herein otherwise expressly specified, necessary or proper to perform and complete all the work required by this contract, within the time stated in the proposal in accordance with the plans and drawings covered by this contract, and any and all supplemental plans and drawings, in accordance with the directions of the Engineer as given from time to time during the progress of the work, whether or not he considers the direction in accordance with the terms of the contract. He shall furnish, erect, maintain and remove such construction plant and such temporary works as may be required. The Contractor shall observe, comply with, and be subject to all terms, conditions, requirements, and limitations of the contract documents, and shall do, carry on and complete the entire work to the satisfaction of the Engineer and Owner. Contractor shall carry on the work and adhere to the progress schedule during all disputes, disagreements or unresolved claims with the Owner. No work shall be delayed or postponed pending the resolution of any disputes, disagreements, or claims except as the Owner and Contractor may otherwise agree in writing.

12. Weather Conditions. In the event of temporary suspension of work, or during inclement weather, or whenever the Engineer shall direct, the Contractor and his Subcontractors shall protect their work and materials against damage or injury from the weather. If, in the opinion of the Engineer, any work or material shall have been damaged or injured by reason of failure on the part of the Contractor or any of his Subcontractors to so protect his work, such materials shall be removed and replaced at the expense of the Contractor.

13. Protection of work and property shall be provided as follows:

13.1 The Contractor shall at all times safely guard the Owner's property from injury or loss in connection with this contract. He shall at all times safely guard and protect his own work, and that of adjacent property, from damage. The Contractor shall replace or make good any such damage, loss or injury unless caused directly by errors contained in the contract, or by the Owner, or his authorized representatives. The Contractor will notify owners of adjacent utilities when prosecution of the Work may affect them.

13.2 The Contractor shall take all necessary precautions for the safety of employees on the work site, and shall comply with all applicable provisions of federal, state and municipal safety laws and building codes to prevent accidents or injury to persons on, about or adjacent to the premises where the work is being performed. He shall erect and properly maintain at all times, as required by the conditions and progress of the work, all necessary safeguards for the protection of the workmen and the public and shall post danger signs warning against the hazards created by such features of construction as protruding nails, hoists, well holes, elevator hatchways, scaffolding, window openings, stairways, trenches and other excavations, and falling materials, and he shall designate a responsible member of his organization on the work, whose duty shall be the prevention of accidents. The name and position of any person so designated shall be reported to the Engineer by the Contractor. The person so designated shall be available by phone during nonworking hours.

13.3 In case of emergency which threatens loss or injury of property, and/or safety of life, the Contractor is allowed to act, without previous instructions from the Engineer. He shall notify the Engineer immediately thereafter. Any claim for compensation by the Contractor due to such extra work shall be promptly submitted in writing to the Engineer for approval.

13.4 When the Contractor has not taken action but has notified the Engineer of an emergency threatening injury to persons or damage to the work or any adjoining property, he shall act as instructed or authorized by the Engineer.

13.5 The intention is not to relieve the Contractor from acting, but to provide for consultations between Engineer and Contractor in an emergency which permits time for such consultations.

13.6 The amount of reimbursement claimed by the Contractor on account of any emergency action shall be determined in the manner provided in Article 17 (extra work and change orders) of the general conditions.

14. Inspection of work for conformance with plans and specifications.

14.1 For purposes of inspection and for any other purpose, the Owner, the Engineer, and agents and employees of the Division or of any funding agency may enter upon the work and the premises used by the Contractor, and the Contractor shall provide safe and proper facilities therefore. The Engineer shall be furnished with every facility for ascertaining that the work is in accordance with the requirements and intention of this contract, even to the extent of uncovering or taking down portions of finished work.

14.2 During construction and on its completion, all work shall conform to the location, lines, levels and grades indicated on the drawings or established on the site by the Engineer and shall be built in a workmanlike manner, in accordance with the drawings and specifications and the

supplementary directions given from time to time by the Engineer. In no case shall any work which exceeds the requirements of the drawings and specifications be paid for as extra work unless ordered in writing by the Engineer.

14.3 Unauthorized work and work not conforming to plans and specifications shall be handled as follows:

a. Work considered by the Engineer to be outside of or different from the plans and specifications and done without instruction by the Engineer, or in wrong location, or done without proper lines or levels, may be ordered by the Engineer to be uncovered or dismantled.

b. Work done in the absence of the Engineer or his agent may be ordered by the Engineer to be uncovered or dismantled.

c. Should the work thus exposed or examined prove satisfactory, the uncovering or dismantling and the replacement of material and rebuilding of the work shall be considered as "Extra Work" to be processed in accordance with article 17.

d. Should the work thus exposed or examined prove to be unsatisfactory the uncovering or dismantling and the replacement of material and rebuilding of the work shall be at the expense of the Contractor.

15. Reports, records and data shall be furnished as follows: The Contractor shall submit to the Owner such schedule of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as are required by the Contract Documents or as the Owner, Division or any funding agency may request concerning work performed or to be performed under this contract.

16. Superintendence by Contractor shall be furnished as follows: At the site of the work, the Contractor shall employ a competent construction superintendent or foreman who shall have full authority to act for the Contractor. The superintendent or foreman shall have been designated in writing by the Contractor as the Contractor's representative at the site. It is understood that such representative shall be acceptable to the Engineer and shall be the one who can be continued in that capacity for the particular job involved unless he ceases to be on the Contractor's payroll.
Such representative shall be present on the site at all times as required to perform adequate supervision and coordination of the Work.

17. Extra work and change-orders shall be processed as follows:

17.1 The Engineer may at any time by written order and without notice to the sureties require the performance of such extra work or changes in the work as may be found necessary. The amount of compensation to be paid to the Contractor for any extra work so ordered shall be made in accordance with one or more of the following methods in the order of precedence listed below:

a. A price based on unit prices previously approved; or

b. A lump sum price agreed upon between the parties and stipulated in the order for the extra work;

c. A price determined by adding 15 percent to the "reasonable cost" of the extra work performed, such "reasonable cost" to be determined by the Engineer in accordance with the following paragraph.

17.2 The Engineer shall include the reasonable cost to the Contractor of all materials used, of all labor, both common and skilled, of foreman, trucks, and the fair-market rental rate for all machinery and equipment for the period employed directly on the work. The reasonable cost for extra work shall include the cost to the Contractor of any additional insurance that may be required covering public liability for injury to persons and property, the cost of workmen's compensation insurance, federal social security, and any other costs based on payrolls, and required by law. The cost of extra work shall not include any cost or rental of small tools, buildings, or any portion of the time of the Contractor, his project supervisor or his superintendent, as assessed upon the amount of extra work, these items being considered covered by the 15 percent added to the reasonable cost. The reasonable cost for extra work shall also include the premium cost, if any, for additional bonds and insurance required because of the changes in the work.

17.3 In the case of extra work which is done by Subcontractors under the specific contract, or otherwise if so approved by the Engineer, the 15 percent added to the reasonable cost of the work will be allowed only to the Subcontractor. On such work an additional percentage of the reasonable cost (before addition of the 15 percent) will be paid to the Contractor for his work in directing the operations of the Subcontractor, for administrative supervision, and for any overhead costs. Such percentage shall be in accordance with the following schedule: reasonable cost up to and including $50,000—10 percent; next $50,000 to and including $100,000—7½ percent; greater than $100,000—5 percent.

17.4 The Engineer may authorize minor changes or alterations in the work not involving extra cost and not inconsistent with the overall intent of the contract documents. These shall be accomplished by a written field order. However, if the Contractor believes that any minor change or alteration authorized by the Engineer entitles him to an increase in the contract price, he may make a claim therefor as provided in article 21.

18. Time for Completion and Liquidated Damages. The following paragraphs address time for completion and liquidated damages:

18.1 It is hereby understood and mutually agreed, by and between the Contractor and the Owner, that the date of beginning and the time for completion as specified in the contract of the work to be done hereunder are Essential Conditions of this contract; and it is further mutually understood and agreed that the work embraced in this contract shall be commenced on a date to be specified in the "Notice to Proceed."

18.2 The Contractor agrees that said work shall be pursued regularly, diligently and continuously at such rate of progress as will insure full completion thereof within the time specified. It is expressly understood and agreed, by and between the Contractor and the Owner, that the time for the completion of the work described herein is a reasonable time, taking into consideration the average climatic range and usual industrial conditions prevailing in this locality.

18.3 If the Contractor shall neglect, fail or refuse to complete the work within the time herein specified, or any proper extension thereof granted by the Owner, then the Contractor does hereby agree, as a part consideration for the awarding of this contract, to pay to the Owner the amount specified in the contract, not as a penalty but as liquidated damages for such breach of

contract as hereinafter set forth, for each and every calendar day that the Contractor shall be in default after the time stipulated in the contract for completing the work.

18.4 The liquidated damages amount is fixed and agreed upon by and between the Contractor and the Owner because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Owner would in such event sustain. Said amount is agreed to be the amount of damages which the Owner would sustain and said amount shall be deducted from time to time by the owner from current periodical payments.

18.5 It is further agreed that "time is of the essence" of each and every portion of this contract and of the specifications wherein a definite and certain length of time is fixed for the performance of any act whatsoever; and where under the contract an additional time is allowed for the completion of any work, the new time limit fixed by such extension shall "be of the essence". Provided, that the Contractor shall not be charged with liquidated damages or any excess cost when the Owner determines that the Contractor is without fault and the Contractor's reasons for the time extension are acceptable to the Owner; provided, further, that the Contractor shall not be charged with liquidated damages or any excess cost when the delay in the completion of the work is due to:

a. A preference, priority or allocation order duly issued by the government;
b. An unforeseeable cause beyond the control and without the fault or negligence of the Contractor, including, but not restricted to, acts of God, or of the public enemy, acts of the Owner, acts of another Contractor in the performance of a contract with the Owner, fires, floods, epidemics, quarantine restrictions, strikes, freight embargoes, and severe weather;
c. Any delays of Subcontractors or suppliers occasioned by any of the causes specified in subsections (a) and (b) of this article:

18.6 The Contractor shall promptly notify the Owner in writing of the causes of the delay. The Owner shall ascertain the facts and extent of the delay and notify the Contractor within a reasonable time of his decision in the matter.

19. Defective work shall be processed as follows:

19.1 The Contractor shall promptly remove from the premises all materials and work condemned by the Engineer as failing to meet contract requirements, whether incorporated in the work or not, and the Contractor shall promptly replace and re-execute his own work in accordance with the contract and without expense to the Owner and shall bear the expense of making good all work of other Contractors which was destroyed or damaged by such removal or replacement.

19.2 All removal and replacement work shall be done at the Contractor's expense. If the Contractor does not take action to remove such condemned work and materials within 10 days after receipt of written notice, the Owner may remove them and store the material at the expense of the Contractor. If the Contractor does not pay the expense of such removal and storage within 10 days time thereafter, the Owner may, upon 10 days written notice, sell such materials at auction or at private sale and shall pay to the Contractor any net proceeds thereof, after deducting all the costs and expenses that should have been borne by the Contractor.

20. Differing Site Conditions. Claims for Differing Site Conditions shall be processed as follows:

20.1 The Contractor shall promptly and before such conditions are disturbed, notify the Engineer in writing of:

a. Subsurface or latent physical conditions at the site differing materially from those indicated in this contract; or,

b. Unknown physical conditions at the site, differing materially from those ordinarily encountered and generally recognized as inherent in the type of work provided for in this contract.

20.2 The Engineer shall promptly investigate the conditions. If he finds that conditions differ materially and will cause an increase or decrease in the Contractor's cost or the time required to perform any part of the work under this contract whether or not changed as a result of such conditions, the Engineer shall make an equitable adjustment and modify the contract in writing.

20.3 No claim of the Contractor under this clause shall be allowed unless the Contractor has given proper notice as required in paragraph 20.1 of this clause.

20.4 No claim by the Contractor for an equitable adjustment shall be allowed if asserted after final payment under this contract.

21. Claims for extra cost shall be processed as follows:

21.1 No claim for extra work or cost shall be allowed unless the same was done pursuant to a written order by the Engineer, approved by the Owner and the claim presented for payment with the first estimate after the changed or extra work is done. When work is performed under the terms of article 17, the Contractor shall furnish satisfactory bills, payrolls and vouchers covering all items of cost when requested by the Owner and shall allow the Owner access to accounts relating thereto.

21.2 If the Contractor claims that any instructions by drawings or similar documents issued after the date of the contract involve extra cost under the contract, he shall give the Engineer written notice after the receipt of such instruction and before proceeding to execute the work, except in an emergency which threatens life or property, then the procedure shall be as provided for under article 17, “Extra Work & Change Orders.” No claim shall be valid unless so made.

22. Right of the Owner to terminate contract:

22.1 In the event that any of the provisions of this contract are violated by the Contractor, or by any of his Subcontractors, the Owner may serve written notice upon the Contractor and the surety of its intention to terminate the contract, and unless within 10 days after the serving of such notice upon the Contractor, such violation or delay shall cease and satisfactory arrangement for correction be made, the contract shall, upon the expiration of said 10 days cease and terminate. In the event of any such termination, the Owner shall immediately serve notice thereof upon the surety and the Contractor and the surety shall have the right to take over and perform the contract; provided, however, that if the surety does not commence performance thereof within 10 days from the date of the mailing to such surety of notice of termination, the Owner may take over the work and prosecute the same to completion by contract or by force account for the account and at the expense of the Contractor and the Contractor and his surety shall be liable

to the Owner for any excess cost occasioned the Owner thereby, and in such event the Owner may take possession of and utilize in completing the work, such materials, appliances, and plant as may be on the site of the work and necessary therefore.

22.2 If the Contractor should be adjudged bankrupt, or if he should make a general assignment for the benefit of his creditors, or if a receiver should be appointed on account of his insolvency, or if he should refuse or should fail, except in cases for which extensions of time are provided, to supply enough skilled workmen or materials, or if he should fail to make payments to Subcontractors or for material or labor, so as to affect the progress of the work, or be guilty of a violation of the contract, then the Owner, upon the written notice of the Engineer that sufficient cause exists to justify such action may, without prejudice to any other right or remedy and after giving the Contractor and his surety 7 days' written notice, terminate the employment of the Contractor and take possession of the premises and of all materials, tools, equipment and other facilities installed on the work and paid for by the Owner, and finish the work by whatever method he may deem expedient. In the case of termination of this contract before completion from any cause whatever, the Contractor, if notified to do so by the Owner, shall promptly remove any part or all of his equipment and supplies at the expense of the Contractor. If such expense exceeds such unpaid balance, the Contractor shall pay the difference to the Owner. The expense incurred by the Owner as herein provided, and the damage incurred through the Contractor's default, shall be approved by the Engineer.

22.3 Where the contract has been terminated by the Owner, said termination shall not affect or terminate any of the rights of the Owner as against the Contractor or his surety then existing or which may thereafter accrue because of such default. Any retention or payment of monies by the Owner due the Contractor under the terms of the contract, shall not release the Contractor or hissurety from liability for his default.

22.4 After ten (10) days from delivery of a Written Notice to the Contractor and the Engineer, The Owner may, without cause and without prejudice to any other remedy, elect to abandon the Project and terminate the Contract. In such case the Contractor shall be paid for all Work executed and any expense sustained plus reasonable profit.

22.5 If through no act or fault of the Contractor, the Work is suspended for a period of more than ninety (90) days by the Owner or under an order of court or other public authority, or the Engineer fails to act on any request for payment within thirty (30) days after it is submitted, or the Owner fails to pay the Contractor substantially the sum approved by the Engineer or awarded by arbitrators within thirty (30) days of its approval and presentation, then the Contractor may, after ten (10) days from delivery of a Written Notice to the Owner and the Engineer terminate the Contract and recover from the Owner payment for all Work executed and all expenses sustained. In addition and in lieu of terminating the Contract, if the Engineer has failed to act on a request
for payment or if the Owner has failed to make any payment as aforesaid, the Contractor may upon ten (10) days written notice to the Owner and the Engineer stop the Work until paid all amounts then due, in which event and upon resumption of the Work Change Orders shall be issued for adjusting the Contract Price or Extending the Contract Time or both to compensate for the costs and delays attributable to the stoppage of the Work.

22.6 If the performance of all or any portion of the Work is suspended, delayed, or interrupted as a result of failure of the Owner or Engineer to act within the time specified in the Contract

Documents, or if no time is specified, within a reasonable time, an adjustment in the Contract Price or an extension of the Contract Time, or both, shall be made by Change Order to compensate the Contractor for the costs and delays necessarily caused by the failure of the Owner or Engineer.

23. Construction schedule and periodic estimates shall provide for the following:

23.1 Before starting the work or upon request by the Engineer during its progress, the Contractor shall submit to the Engineer a work plan showing construction methods and the various steps he intends to take in completing the work.

23.2 Before payment is made, the Contractor shall prepare and submit to the Engineer:

a. A written schedule fixing the dates for submission of drawings; and
b. A written schedule fixing the respective dates for the start and completion of segments of the work. Each such schedule shall be subject to review and change during the progress of the work.
c. Respective dates for submission of Shop Drawings and for the beginning of manufacture, the testing, and the installation of materials, supplies, and equipment.

24. Payment to Contractor. Payments to the Contractor shall be made as follows:

24.1 Final payment. The Owner will make a final payment to the Contractor on the basis of an estimate of the total amount of work done to the time of final completion and its value as prepared by the Contractor and approved by the Engineer.

24.2 Retainage by Owner. The Owner will retain a portion of the payment, in accordance with the following procedures:

d. Upon Final completion (as defined in article 25), the amount of retainage will be 5% of the total Contract Price plus an additional retainage based on the Engineer's estimate of the fair value of the punch list items and the cost of completing and/or correcting such items of work, with specified amounts for each incomplete or defective item of work. As these items are completed or corrected, they shall be paid for out of the retainage until the entire project is declared completed (See article 25). The final 5% retainage shall be held during the one year warranty period and released only after the project has been accepted by the Owner.

24.4 All material and work for which payment has been made shall thereupon become the sole property of the Owner. This provision shall not be construed as relieving the Contractor from the sole responsibility for the care and protection of materials and work upon which payment has been made or for the restoration of any damaged work, nor as a waiver of the right of the Owner to require compliance with all of the terms of the contract.

24.5 Owner's right to withhold payment and make application. The Contractor agrees that he will indemnify and save the Owner or the Owner's agents harmless from all claims growing out of the lawful demands of Subcontractors, laborers, workmen, mechanics, materialmen, and furnishers of machinery and parts, equipment, power, tools and all supplies, including

commissary, incurred in the furtherance of the performance of this contract. Prior to payment, the Contractor shall furnish satisfactory evidence that all claims of the nature hereinabove designated have been paid, discharged, or waived. If the Contractor fails to do so, then the Owner may, upon written notice to the Contractor either pay unpaid bills of which the Owner has written notice directly, or withhold from the Contractor's unpaid compensation a sum of money to pay any and all such lawful claims until satisfactory evidence is furnished that all liabilities
have been fully discharged.
Payment to the Contractor shall then be resumed in accordance with the terms of this contract but in no event shall the above provisions be construed to impose any obligations upon the Owner to either the Contractor or his surety or any third party. In paying any unpaid bills of the Contractor, the Owner shall be deemed the agent of the Contractor, and any payment so made by the Owner shall be considered as payment made under contract by the Owner to the Contractor and the Owner shall not be liable to the Contractor for any such payments made in good faith.

24.6 If the Owner fails to make payment forty-five (45) days after approval by the Engineer, in addition to other remedies available to the Contractor, there shall be added to each such payment interest at an annual rate of 2% commencing on the first day after said payment is due and continuing until the payment is received by the Contractor.

25. Acceptance and Final Payment. Acceptance and payment provisions shall be as follows:

25.1 Final completion shall be that point at which all work has been completed and all defective work has been corrected. The general guarantee period shall begin upon certification by the Engineer of final completion.

25.1 At the end of the general guarantee period for the entire contract which has been certified finally completed, the Owner, through the Engineer, shall make a guarantee inspection of all or portions of the work. When it is found that the work is satisfactory and that no work has become defective under the terms of the contract, the Owner will accept the entire project and make final payment, including the reimbursement of monies retained pursuant to the guarantee period.

25.3 If the guarantee inspection discloses any work as being unsatisfactory, the Engineer will give the Contractor the necessary instructions for correction of such work, and the Contractor shall immediately execute such instructions. Upon correction of the work, another inspection will be made which shall constitute the guarantee inspection, provided the work has been satisfactorily completed.

25.4 Before issuance of final payment, the Contractor shall certify in writing to the Engineer that all payrolls, material bills, and other indebtedness connected with the work have been paid or otherwise satisfied; except that in case of disputed indebtedness or liens, if the contract does not include a payment bond, the Contractor may submit in lieu of certification of payment a surety bond in the amount of the disputed indebtedness or liens, guaranteeing payment of all such disputed amounts, including all related costs and interest in connection with said disputed indebtedness or liens which the Owner may be compelled to pay upon adjudication.

25.5 If upon completion, full completion is delayed through no fault of the Contractor, and the

Engineer so certifies, the Owner may, upon certificate of the Engineer, and without termination of the contract, make payment of the balance due for that portion of the work fully completed and accepted. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

25.6 The acceptance by the Contractor of final payment shall release the Owner from all claims and all liability to the Contractor for all things relating to this work and for every act and neglect of the Owner and others relating to or arising out of this work. No payment, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligations of the performance and payment bond under this contract.

26. Payments by Contractor. The Contractor shall pay the costs:

26.1 For all transportation and utility services not later than the 20th day of the calendar month following that in which services are rendered;

26.2 For all materials, tools, and other expendable equipment to the extent of 90 percent of the cost thereof, not later than the 20th day of the calendar month following that in which such materials, tools and equipment are delivered at the site of the work and the balance of the cost thereof not later than the 30th day following the completion of that part of the work in or on which such materials, tools and equipment are incorporated or used; and

26.3 To each of his Subcontractors, not later than the 5th day following each payment to the Contractor, the respective amounts allowed the Contractor on account of the work performed by the Subcontractors to the extent of each Subcontractor's interest therein.

27. Insurance. The Contractor and any Subcontractor shall obtain all the insurance required under this article and such insurance shall be approved by the Owner.

27.1 The Contractor and all Subcontractors shall procure and shall maintain during the life of this contract workmen's compensation insurance as required by applicable state law. The Contractor shall provide and shall cause each Subcontractor to provide adequate employer's liability insurance.
Limits of Liability: $100,000 each accident;
$500,000 disease - policy limit;
$100,000 disease - each employee.

27.2 The Contractor shall procure and shall maintain during the life of this contract Commercial General liability insurance to include contractual liability, explosion, collapse and underground coverages.
Limits of liability: $1,000,000 each occurance bodily injury and property damage;
$2,000,000 general aggregate - include per project aggregate endorsement;
$2,000,000 products/completed operations aggregate.
If blasting or demolition or both is required by the contract, the Contractor or Subcontractor shall obtain the respective coverage and shall furnish the Engineer a certificate of insurance evidencing the required coverages prior to commencement of any operations involving blasting or demolition or both.

27.3 The Contractor shall procure and shall maintain during the life of this contract comprehensive automobile liability insurance to include all motor vehicles including owned, hired, borrowed and non-owned vehicles.
Limits of liability: $1,000,000 combined single limit for bodily injury and property damage.

27.4 The Contractor shall either:

a. Require each of his Subcontractors to procure and to maintain during the life of his subcontract commercial general liability insurance and comprehensive automobile liability insurance of the type and in the amounts specified in articles 27.2 and 27.3; or

b. Insure the activities of his Subcontractors in his policy.

27.5 The required insurance shall provide adequate protection for the Contractor and his Subcontractors, respectively, against damage claims which may arise from work under this contract, whether such work be by the insured or by anyone employed by him and also against any of the special hazards which may be encountered in the performance of this contract.

27.6 The Contractor shall furnish the Owner with certificates showing the type, amount, class of operations covered, effective dates and dates of expiration of policies. Such insurance shall not be canceled or materially altered, except after 10 days written notice has been received by the Owner.

27.7 For builder's risk insurance (fire and extended coverage) and until the work is completed and accepted by the Owner, the Contractor is required to maintain builder's risk type insurance on a 100 percent completed value basis on the insurable portion of the work for the benefit of the Owner, the Contractor, and Subcontractors as their interests may appear.

27.8 The Contractor shall take out and furnish to the Owner and maintain during the life of this contract, complete Owner's protective liability insurance.
Limits of Liability: $1,000,000 each occurance;
$2,000,000 aggregate.

28. Contract Security. The Contractor shall within five (5) days after the receipt of the Notice of Award furnish the Owner with a performance bond and a payment bond in penal sums equal to the amount of the contract price conditioned upon the performance by the Contractor of all undertakings, covenants, terms, conditions and agreements of the Contract Documents, and upon the prompt payment by the Contractor to all persons supplying labor and materials in the prosecution of the Work provided by the contract Documents. Such Bonds shall be executed by the Contractor and a corporate bonding company licensed to transact business in the state in which the Work is to be performed and named on the current list of "Surety Companies Acceptable on Federal Bonds" as published in the Treasury Department Circular Number 570. The expense of these Bonds shall be borne by the Contractor.

29. Additional or Substitute Bond. If at any time a surety on any such Bond is declared as bankrupt or loses its right to do business in the state in which the Work is to be performed, or is removed from the list of Surety Companies accepted on Federal Bonds, the Contractor shall within ten (10) days after notice from the Owner to do so, substitute an acceptable bond (or bonds) in such form and sum and signed by such other surety or sureties as may be satisfactory to the

Owner. The premiums on such bond shall be paid by the Contractor. No further payments shall be deemed due nor shall be made until the new surety or sureties shall have furnished such an acceptable bond to the Owner.

30. Assignments. The Contractor shall not assign the whole or any part of this contract or any monies due or to become due hereunder without written consent of the Owner. In case the Contractor assigns all or any part of any monies due or to become due under this contract, the instrument of assignment shall contain a clause substantially to the effect that it is agreed that the right of the assignee in and to any monies due or to become due to the Contractor shall be subject to prior claims of all persons, firms and corporations for services rendered or materials supplied for the performance of the work called for in this contract.

31. Mutual Responsibility of Contractor. If, through acts of neglect on the part of the Contractor, any other Contractor or any Subcontractor shall suffer loss or damage on the work site, the Contractor agrees to settle with such other Contractor or Subcontractor by agreement or arbitration if such other Contractor or Subcontractors will so settle. If such other Contractor or Subcontractors shall assert any claim against the Owner on account of any damage alleged to have been sustained, the Owner shall notify the Contractor, who shall indemnify and save harmless the Owner against any such claim.

32. Subcontracting. When subcontracting, the Contractor:

32.1 May utilize the services of specialty Subcontractors on those parts of the work which, under usual contracting practices, are performed by specialty Subcontractors.

32.2 Shall be as fully responsible to the Owner for the acts and omissions of his Subcontractors, and of persons either directly or indirectly employed by them, as he is for the acts and omissions of persons directly employed by him.

32.3 Shall cause appropriate provisions to be inserted in all subcontracts relative to the work to bind Subcontractors to the Contractor by the terms of the contract documents insofar as applicable to the work of Subcontractors and to give the Contractor the same power as regards terminating any subcontract that the Owner may exercise over the Contractor under any provision of the contract documents.

32.4 Shall not create any contractual relation between any Subcontractor and the Owner.

32.5 Shall not award Work to Subcontractor(s), in excess of fifty percent (50%) of the Contract Price, without prior written approval of the Owner.

33. Authority of the Engineer and His Representatives. In performing his duties, the Engineer or his representative shall:

33.1 Have the authority to suspend the work in whole or in part for such periods as he may deem necessary due to the failure of the Contractor to carry out provisions of the Contract or for failure of the Contractor to suspend work in weather conditions considered by the Engineer to be unsuitable for the prosecution of the work. The Engineer shall give all orders and directions under this contract, relative to the execution of the work. The Engineer shall determine the amount, quality, acceptability, and fitness of the several kinds of work and

materials which are to be paid for under this contract and shall decide all questions which may arise in relation to the
work. The Engineer's estimates and decisions shall be final and conclusive, except as otherwise provided. In case any question shall arise between the parties hereto relative to said contract or specifications, the determination or decision of the Engineer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected to any extent by such question. The Engineer shall decide the meaning and intent of any portion of the specifications and of any plans or drawings where the same may be found unclear. Any differences or conflicts in regard to their work which may arise between the Contractor under this contract and other Contractors performing work for the Owner shall be adjusted and determined by the Engineer.

a. The purpose of the above article is not in any way to relieve the Contractor of his responsibilities for the safety of workmen or general public in the execution of the work. Attention is drawn to Article 13 of these Conditions which refers to the safety obligations of the Contractor.
b. The Engineer, acting on behalf of the Owner, has the authority to enforce corrective action for work not in accordance with the specifications.
c. In addition, the Engineer, acting on behalf of the Owner, is to ensure that the work is in accordance with the Contract documents. He is not held responsible, however, for the methods of construction, sequences, schedules and procedures in the execution of the work. The Engineer does have the opportunity under 33.1 to reject the method of construction, work plan schedule, procedures, as he thinks appropriate.

33.2 Appoint assistants and representatives as he desires, and they shall be granted full access to the work under the contract. They have the authority to give directions pertaining to the work, to approve or reject materials, to suspend any work that is being improperly performed, to make measurements of quantities, to keep records of costs, and otherwise represent the Engineer in all matters except as provided below. The Contractor may, however, appeal from their decision to the Engineer himself, but any work done pending its resolution is at the Contractor's own risk. Except as permitted and instructed by the Engineer, the assistants and representatives are not
authorized to revoke, alter, enlarge, relax, or release any requirements of these specifications,nor to issue instructions contrary to the plans and specifications. They are not authorized to act as superintendents or foremen for the Contractor, or to interfere with the management of the work by the Contractor. Any advice which the assistants or representatives of the Engineer may givethe Contractor shall not be construed as binding the Engineer or the Owner in any way, nor as releasing the Contractor from the fulfillment of the terms of the contract. All transactions between the Contractor and the representatives of the Engineer which are liable to protest or where payments are involved shall be made in writing.

34. Stated Allowances. The Contractor shall include in his proposal for costs of materials not shown in his bid under “cash allowances” or “allowed materials,” any cash allowances stated in the supplemental general conditions or other contract documents. The Contractor shall purchase the “allowed materials” as directed by the Owner on the basis of the lowest and best bid of at least 3 competitive bids. If the actual price for purchasing the “allowed materials” is more or less than the “cash allowance,” the contract price shall be adjusted accordingly. The adjustment in contract price shall be made on the basis of the purchase price without additional charges for overhead, profit, insurance or any other incidental expenses. The cost of installation

of the "allowed materials" shall be included in the applicable sections of the contract specifications covering this work.

35. Use of Premises, Removal of Debris, Sanitary Conditions. In the use of premises or removal of debris, the Contractor expressly undertakes at his own expense: to take every precaution against injuries to persons or damage to property; to maintain sanitary conditions; to store his apparatus, materials, supplies and equipment in such orderly fashion at the site of the work as will not interfere with the progress of his work or the work of any other Contractors; to place upon the work or any part thereof only such loads as are consistent with the safety of that portion of the work; to clean up frequently all refuse, rubbish, scrap materials and debris caused by his operations, to the end that at all times the site of the work shall present an orderly and workmanlike appearance; before final payment to remove all surplus material, falsework, temporary structures, including foundations thereof, plant of any description and debris of every nature resulting from his operations, and to put the site in an orderly condition; to effect all cutting, fitting or patching of his work required to make the same conform to the plans and specifications and, except with the consent of the Engineer, not to cut or otherwise alter the work of any other Contractor; to provide and maintain in a sanitary condition such toilet accommodations for the use of his employees as may be necessary to comply with the requirements of the state and local boards of health, or of other bodies or authorities having jurisdiction.

36. Quantities of Estimate. Wherever the estimated quantities of work to be done and materials to be furnished under this contract are shown in any of the documents including the proposal, they are given for use in comparing bids and the right is specifically reserved except as herein otherwise specifically limited, to increase or decrease them as may be deemed reasonably necessary by the Owner to complete the work contemplated by this contract, and such increase or decrease shall in no way invalidate this contract, nor shall any such increase or decrease give cause for claims or
liability for damages. An increase or decrease in quantities for subsurface materials (e.g. ledge, unsuitable backfill), which overrun or underrun by 50% or more of the bid quantity may be the basis for a contract price adjustment, at the rate of a negotiated adjusted unit rate. Negotiated unit price rates shall be equitable and shall take into account, but not be limited to the following factors; bid unit rate, distribution of rates and bid balance, and the scope of work as effected by the changed quantities. Claims for extra work resulting from changed quantities shall be processed under article 21.

37. Lands and rights-of-way acquisition and usage shall be as follows:

37.1 Prior to issuing the Notice to Proceed, the Owner shall legally obtain all lands and rights-of-way necessary for carrying out and completing the work to be performed under this contract.

37.2 The Contractor shall not (except after written consent from the Owner) enter or occupy with men, tools, materials, or equipment, any land outside the rights-of-way or property of the Owner. A copy of the written consent shall be given to the Engineer.

37.3 The Owner shall provide to the Contractor information which delineates and describes The lands owned and the rights-of-way acquired.

37.4 The Contractor shall provide at its own expense and without liability to the Owner any additional land and access thereto that the Contractor may desire for temporary construction facilities, or for storage of materials.

38. General Guaranty. With reference to warranties, neither the final certificate of payment nor any provision in the contract documents, nor partial or entire occupancy of the premises by the Owner, shall constitute an acceptance of work not done in accordance with the contract documents or relieve the Contractor of liability in respect to any express warranties or responsibility for faulty materials or workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work resulting therefrom, which appear within the warranty period one year or longer if required by the contract, from the certified date of completion of the work. The Owner will give notice of observed defects within two working days of their discovery.

39. Errors and Inconsistencies in Contract Documents. With reference to errors and inconsistency in contract documents, any provisions in any of the contract documents which may be in conflict with the paragraphs in these general conditions shall be subject to the following order of precedence for interpretation:

39.1 Drawings will govern technical specifications.

39.2 General conditions will govern drawings and technical specifications.

39.3 Supplemental general conditions will govern general conditions, drawings and technical specifications.

39.4 Special conditions will govern supplemental general conditions, general conditions, drawings and technical specifications.

39.5 The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. In the event the Contractor discovers such an error or omission, he shall notify the Engineer. The Engineer will then make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications.

39.6 Figure dimensions on Drawings shall govern over general drawings.

40. Notice and service thereof. Any notice to the Contractor from the Owner relative to any part of this contract will be in writing and will be considered delivered and the service completed, when said notice is mailed, by certified registered mail, to the Contractor at his last given address, or delivered in person to the Contractor or his authorized representative on the work.

41. Required Provisions Deemed Inserted. Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein, and if through mistake or otherwise anysuch provision is not inserted or is not correctly inserted (example; miswording, etc.), then upon the application of either party the contract shall forthwith be physically amended to make such insertion or correction.

42. Protection of Lives and Health. The work under this contract is subject to the safety and health

regulations (CRF 29, part 1926, and all subsequent amendments) as promulgated by the U.S. Department of Labor on June 24, 1974. Contractors are urged to become familiar with the requirements of these regulations.

43. OSHA Construction Safety Program.

43.1 Pursuant to NHRSA 277:5-a, the Contractor shall provide an Occupational Health and Safety Administration (OSHA) 10-hour construction safety program for its on-site employees. All employees are required to complete the program prior to beginning work. The training program shall utilize an OSHA-approved curriculum. Graduates shall receive a card from OSHA certifying the successful completion of the training program.

43.2 Any employee required to complete the OSHA 10-hour construction safety program, and who cannot within 15 days provide documentation of completion of such program, shall be subject to removal from the job site.

43.3 The following individuals are exempt from the requirements of the 10-hour construction safety program: law enforcement officers involved with traffic control or jobsite security; flagging personnel who have completed the training required by the Department of Transportation; all relevant federal, state and municipal government employees and inspectors; and all individuals who are not considered to be on the site of work under the federal Davis-Bacon Act, including, but not limited to, construction and non-construction delivery personnel and non-trade personnel.

43.4 Should unforeseen environmental conditions be encountered, or potentially contaminated soils uncovered during excavation within the limits of the project, the contractor shall have on-staff individuals trained in accordance with 40 CFR 1910.120 who can mobilize to the affected area and work with the Engineer (or other authorized environmental professional) during contaminated soil excavation and delineation.

43.5 The contractor responsible for clearing trees shall have personnel on site that are trained in, and shall compete their work in accordance with 29 CFR 1910.269 for work around electrical lines.

44. Equal Employment Opportunity. Under equal employment opportunity requirements and during the performance of this contract the Contractor agrees to the following:

44.1 The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, or sex. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during employment, without regard to their race, creed, color, national origin, or sex. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

44.2 The Contractor will in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for

employment, without regard to race, creed, color, national origin, or sex.

44.3 The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided advising the labor union or worker's representative of the Contractor's commitment under section 202 of executive order no. 11246 of September 24, 1965, and 11375 of October, 13, 1967, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

44.4 The Contractor will comply with all provisions of executive orders no. 11246 and 11375.

44.5 The Contractor will furnish all information and reports required by executive orders no. 11246 and 11375.

44.6 In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any of such rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part by the Owner or the Department of Labor and the Contractor may be declared ineligible for further government contracts or federally-assisted construction, however, that in the event the Contractor becomes involved in, or is threatened with, litigation with a Subcontractor or vendor as a result of such direction by the Department of Labor, the Contractor may request the United States to enter into such litigation to protect theinterests of the United States.

44.7 A breach of this article may be grounds for termination of this contract and for debarment as provided in 29 CFR 5.6.

45. Interest of Federal, State or Local Officials. No federal, state or local official shall be admitted to any share or part of this contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this contract if made with a corporation for its general benefit.

46. Other Prohibited Interests. No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, Engineering, inspection, construction or material supply contract or any subcontract in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part hereof. No officer, employee, architect, attorney, Engineer or inspector of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall become directly or indirectly interested personally in this contract or in any part thereof, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

47. Use and Occupancy Prior to Acceptance. Use and occupancy of a portion or unit of the project, upon completion of that portion or unit, and before completion of the project, shall be a condition of this contract with the following provisions:

47.1 The Owner will make his request for use or occupancy to the Contractor in writing.

47.2 There must be no significant interference with the Contractor's work or performance of duties under the contract.

47.3 The Engineer, upon request of the Owner and agreement by the Contractor, will make an inspection of the complete part of the work to confirm its status of completion.

47.4 Consent of the surety and endorsement of the insurance carrier must be obtained prior to use and/or occupancy by the Owner. Also, prior to occupancy, the Owner will secure the required insurance coverage on the building.

47.5 The Owner will have the right to exclude the Contractor from the subject portion of the project after the date of occupancy but will allow the Contractor reasonable access to complete or correct items.

47.6 The warranty period shall begin upon final completion.

48. Suspension of Work. The Owner may, at any time and without cause, suspend the work or any portion thereof for a period of not more than 90 days by notice in writing to the Contractor and the Engineer. The Owner shall fix the date on which work shall be resumed. The Contractor will be allowed an increase in the contract price or an extension of the contract time, or both, directly attributable to any suspension if he makes a claim therefor as provided in articles 17 and 21.

49. [Reserved]

50. [Reserved]

51. [Reserved]

52. A project Sign is not required for this project

53. [Reserved]

54. Public convenience and traffic control requirements:

54.1 The Contractor shall at all times so conduct his work as to assure minimal obstruction to traffic. The safety and convenience of the general public and the residents along the work site route and the protection of property shall be provided for by the Contractor. The Contractor shall be responsible for timely notification to local residents before causing any interruptions of their access.

54.2 Fire hydrants and water holes for fire protection on or adjacent to the work site shall be kept accessible to fire apparatus at all times, and no obstructions shall be placed within 10 feet of any such facility. No footways, gutters, drain inlets, or portions of highways adjoining the work site shall be obstructed. In the event that all or part of a roadway is officially closed to traffic during construction, the Contractor shall provide and maintain safe and adequate traffic accessibility, satisfactory to the Engineer, for residences and businesses along and adjacent to the roadway so closed.

54.3 When the maintenance of traffic is considered by the Engineer to be minimal, the contract may not show this work as a pay item. In such cases, the Contractor shall bear all expense of maintaining traffic over the sections of road undergoing improvement and of constructing and maintaining such approaches, crossings, intersections, and other features as may be necessary, without direct reimbursement.

55. Pre-Construction Conference. The Contractor shall not commence work until a pre-construction conference has been held at which representatives of the Contractor, Engineer, and Owner are present. The pre-construction conference shall be scheduled by the Engineer.

56. Maintenance during construction:

56.1 The Contractor shall maintain the work during construction and until it is accepted by the Owner. This maintenance shall be continuous and effective work prosecuted day by day, with adequate equipment and forces, to the end that roads or structures are kept in satisfactory condition at all times.

56.2 All cost of maintenance during construction and before the work is accepted by the Owner shall be included in the unit prices bid on the various pay items and the Contractor shall not be paid an additional amount for such maintenance.

56.3 If the Contractor, at any time, fails to comply with the provisions above, the Engineer may direct the Contractor to do so. If the Contractor fails to remedy unsatisfactory maintenance within the time specified by the Engineer, the Engineer may immediately cause the project to be maintained and the entire cost of this maintenance will be deducted from money to become due the Contractor on this contract.

57. Cooperation with utilities.

57.1 The Owner will notify all utility companies, all pipe line owners, or other parties affected, and have all necessary adjustments of the public or private utility fixtures, pipe lines, and other appurtenances within or adjacent to the limits of construction made as soon as practicable.

57.2 Water lines, gas lines, wire lines, service connections, water and gas meter boxes, water and gas valve boxes, light standards, cableways, signals, and all other utility appurtenances within the limits of the proposed construction which are to be relocated or adjusted are to be moved by the owners of such utilities at their expense, except as may otherwise be provided for in the special conditions or as noted on the plans.

57.3 It is understood and agreed that the Contractor has considered in his bid all of the permanent and temporary utility appurtenances in their present or relocated positions as shown on the plans and as evident on the site, and that no additional compensation will be allowed for any delays, inconvenience, damage sustained by him due to any interference from such utility appurtenances or the operation of moving them.

57.4 The Contractor shall cooperate with the Owners of any underground or overhead utility lines in their removal and rearrangement operations in order that these operations may progress in a reasonable manner, that duplication of rearrangements may be reduced to a minimum, and

that services rendered by those parties will be minimal.

57.5 In the event of interruption to a water or utility service as a result of accidental breakage or as a result of being exposed or unsupported, the Contractor shall promptly notify the proper authority and shall cooperate with said authority in the restoration of services. If water service is interrupted, repair work shall be continuous until the service is restored. No work shall be undertaken around fire hydrants until provisions for continued service have been approved by the local fire authority. If any utility service is interrupted for more than 4 hours, the Contractor shall make provisions for temporary service at his own expense until service is resumed.

58. Work performed at night and on Sundays and holidays shall comply with the following:

58.1 No work will be permitted at night or on Sundays or holidays except as approved in writing by the Engineer, and provided such work is not in violation of a local ordinance. When working at night, the Contractor shall provide flood lighting sufficient to insure the same qualityof workmanship and the same conditions regarding safety as would be achieved in daylight.

58.2 Whenever Memorial Day or Fourth-of-July is observed on a Friday or a Monday and during the weekend of Labor Day, the Contractor may be required to suspend work for the 3 calendar days. Prior to the close of work, the work site shall be placed in a condition acceptable to the Engineer for the comfort and safety of the traveling public. An arrangement shall be made for responsible personnel acceptable to the Engineer to maintain the project in the above conditions.

59. Laws to be observed. With reference to laws that shall be observed:

59.1 The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations, and all orders and decrees of tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work. He shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the state and its representatives against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by himself or his employees.

59.2 Indemnification

The Contractor will indemnify and hold harmless the Owner and the Engineer and their agents and employees from and against all claims, damages, losses, and expenses including attorney's fees arising out of or resulting from the performance of the Work, provided that any such claims, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property including the loss of use resulting therefrom; and is caused in whole or in part by any negligent or willful act or emission of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable.

In any and all claims against the Owner or the Engineer, or any of their agents of employees, by any employees of the Contractor, and Subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by disability benefit or other employee benefit acts.

The obligation of the Contractor under this paragraph shall not extend to the liability of the Engineer, his agents or employees arising out of the preparation or approval of maps, Drawings, opinions, reports, surveys, Change Orders, designs or Specifications.

60. Permits to be obtained by the Contractor shall be in accordance with the following:

60.1 Permits and licenses of a temporary nature necessary for the prosecution of the work shall be obtained and paid for by the Contractor. Permits, licenses and easements for permanent structures or permanent changes in existing facilities will be secured and paid for by the Owner. Permits may include:

a. New Hampshire Department of Transportation Highway Trench Permits.
b. RSA 485-A:17 and 483-A N.H. DES Wetlands Bureau Dredge and Fill Permit.
c. RSA 485-A:17 - N.H. DES Site Specific Permit (Water Quality)
d. RSA 149-M:10 N.H. DES Solid Waste Management Bureau - disposal of construction debris and/or demolition waste.
e. N.H. Department of Environmental Services Air Resources Division (burning permits).
f. Other permits, as required by State and Local laws and ordinances.
g. Notice of intent for coverage under EPA's General NPDES Permit for construction dewatering activities.

61. Control of Pollution Due to Construction shall comply with the following:

61.1 During construction, the Contractor shall take precautions sufficient to avoid the leaching or runoff of polluting substances such as silt, clay, fuels, oils, bitumens, calcium chloride and any other polluting materials which are unsightly or which may be harmful to humans, fish, or other life, into groundwaters and surface waters of the State.

61.2 In waters used for public water supply or used for trout, salmon, or other game or forage fish spawning or nursery, control measures must be adequate to assure that turbidity in the receiving water will be increased not more than 10 standard turbidity units (s.t.u.) in the absence of other more restrictive locally-established limitations, unless otherwise permitted by the Division. In no case shall the classification for the surface water be violated.

61.3 In water used for other purposes, the turbidity must not exceed 25 s.t.u. unless otherwise permitted by the Division.

62. Use of Explosives.

62.1 When the use of explosives is necessary for the prosecution of the Work, exercise the utmost care not to endanger life or property. The Contractor shall be responsible for any and all damage resulting from the use of explosives.

62.2 Store all explosives in a secure manner, in compliance with all State and local laws and ordinances, and legally mark all such storage places. Storage shall be limited to such quantity as may be needed for the work underway.

62.3 Designate as a "Blasting Area" all sites where electric blasting caps are located and

where explosive charges are being placed. Mark all blasting areas with signs as required by law. Place signs as required by law from each end of the blasting area and leave in place while the above conditions prevail. Immediately remove signs after blasting operations or the storage of caps is over.

62.4 Notify each property Owner and public utility company having structures in proximity to the site of the work sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property. Such notice shall not relieve the Contractor of any of his responsibility for damage resulting from his blasting operation. Warn all persons within the danger zone of blasting operations and do not perform blasting work until the area is cleared.
Provide sufficient flagmen outside the danger zone to stop all approaching traffic and pedestrians. Provide watchmen during the loading period and until charges have been exploded. Place adequate protective covering over all charges before being exploded.

63. Arbitration by Mutual Agreement

63.1 All claims, disputes, and other matters in question arising out of, or relating to, the Contract Documents or the breach thereof, except for claims which have been waived by making an acceptance of final payment as provided in Section 25, may be decided by arbitration if the parties mutually agree. Any agreement to arbitrate shall be specifically enforceable under the prevailing arbitration law. The award rendered by the arbitrators shall be final, and judgment may be entered upon it in any court having jurisdiction thereof.

63.2 Notice of the request for arbitration shall be filed in writing with the other party to the Contract Documents and a copy shall be filed with the Engineer. Request for arbitration shall in no event be made on any claim, dispute, or other matter in question which would be barred by the applicable statute of limitations.

63.3 The Contractor will carry on the Work and maintain the progress schedule during any arbitration proceedings, unless other wise mutually agreed in writing.

64. Taxes. The Contractor will pay all sales, consumer, use, and other similar taxes required by the laws of the place where the Work is performed.

65 Separate Contracts

65.1 The Owner reserves the right to let other contracts in connection with this Project. The Contractor shall afford other Contractors reasonable opportunity for the introduction and storage of their materials and the execution of their Work, and shall properly connect and coordinate the Work with theirs. If the proper execution or results of any part of the Contractor's Work depends upon the Work of any other Contractor, the Contractor shall inspect and promptly report to the Engineer any defects in such Work that render it unsuitable for such proper execution and results.

65.2 The Owner may perform additional Work related to the Project or the Owner may let other contracts containing provisions similar to these. The Contractor will afford the other Contractors who are parties to such Contracts (or the Owner, if the Owner is performing the additional Work) reasonable opportunity for the introduction and storage of materials and

equipment and the execution of the Work, and shall properly connect and coordinate the Work with theirs.

65.3 If the performance of the additional Work by other Contractors or the Owner is not noted in the Contract Documents prior to the execution of the Contract, written notice shall thereof be given to the Contractor prior to starting such additional Work. If the Contractor believes that the performance of such additional Work by the Owner or others involves it in additional expense or entitles it to an extension of the Contract Time, the Contractor may make a claim thereof as provided in Sections 17 and 18.

AGREEMENT

THIS AGREEMENT, made this _____ day of _____, 202X by and between The City of Lebanon, NH, hereinafter called "OWNER" and _____doing business as (an individual,) or (a partnership,) or (a corporation) hereinafter called "CONTRACTOR".

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned:

1. The CONTRACTOR will commence and complete the _____ , hereafter called the PROJECT, as shown in the Notice to Proceed and as specified herein.
2. The CONTRACTOR will furnish all of the material, supplies, tools, equipment, labor and other services necessary for the construction and completion of the PROJECT described herein.
3. The CONTRACTOR will commence the work required by the CONTRACT DOCUMENTS within 5 (five) calendar days after the date of the NOTICE TO PROCEED and will complete the same within _____ Days, unless the period for completion is extended otherwise by the CONTRACT DOCUMENTS. The CONTRACTOR agrees to pay as liquidated damages the sum of $500.00 for each consecutive calendar day thereafter as provided in Section 18 of the GENERAL CONDITIONS.
4. The CONTRACTOR agrees to perform all of the WORK described in the CONTRACT DOCUMENTS and comply with the terms therein for the sum of $_____ or as shown in the BID schedule.
5. The term "CONTRACT DOCUMENTS" means all documents contained in the _____ dated _____ and the following addenda:
   - No._____ dated _____, 202X.
   - No._____ dated _____, 202X.
   - No._____ dated _____, 202X.
   - No._____ dated _____, 202X.
   - No._____ dated _____, 202X.
   - No._____ dated _____, 202X.
6. The OWNER will pay to the CONTRACTOR in the manner and at such times as set forth in the Contract Documents in such amounts as required by the CONTRACT DOCUMENTS.
7. This Agreement shall be binding upon all parties hereto and their respective heirs, executors, administrators, successors, and assigns.
8. Compliance with City Code 185 Welcoming Lebanon; Consultants who/that enter into contractual agreements are considered “agents” of the City as defined in City Code 185. As such Consultants agree to comply with the appliable provisions of this code. Violations of the provisions of this code by the Consultant or its employees may result in cancellation of this agreement at no

cost or financial obligation of the City. Additionally, the Consultant is subject to debarment of future contractual arrangements with the City.

IN WITNESS WHEREOF, the parties hereto have executed, or caused to be executed by their duly authorized officials, this Agreement in five (5) copies, each of which shall be deemed an original on the date first above written.

OWNER:

FOR THE CITY OF LEBANON

By _____
Name

Title _____

CONTRACTOR:

_____

By _____

Name _____

Address _____

_____

BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we, the undersigned _____ as Principal, and

_____

as Surety, are hereby held and firmly bound unto The City of Lebanon, NH as OWNER in the penal sumof_____for the payment of which, well and truly to be made, we hereby jointly and severally bind ourselves, successors and assigns.

Signed, this_____day of_____, 202X.

The Condition of the above obligation is such that whereas the Principal has submitted to the City of Lebanon a certain BID attached hereto and hereby made a part hereof to enter into a contract in writing,for the **LEBANON 202X** _____ **Project**.

NOW, THEREFORE,

(a) If said BID shall be rejected, or

(b) If said BID shall be accepted and the Principal shall execute and deliver a contract in the Form of Contract attachment hereto (properly completed in accordance with said BID) and shall furnish a BOND for faithful performance of said contract, and for the payment of all persons performing labor furnishing materials in connection therewith, and shall in all other respects perform the agreement created by the acceptance of said BID, then this obligation shall be void, otherwise the same shall remain in force and effect; it being expressly understood and agreed that the liability of the Surety forany and all claims hereunder shall, in no event, exceed the penal amount of this obligation as herein stated.

The Surety, for value received, hereby stipulates and agrees that the obligations of said Surety and its BOND shall be in no way impaired or affected by any extension of the time within which the OWNERmay accept such BID; and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal and the Surety have hereunto set their hands and seals, and suchof them as are corporations have caused their corporate seals to be hereto affixed and these presents to besigned by their proper officers, the day and year first set forth above.

_____ (L.S.)

Principal

_____

Surety

By:_____

IMPORTANT - Surety companies executing BONDS must appear on the Treasury Department's most current list (Circular 570) and be authorized to transact business in the state where the project is located.

Lebanon Municipal Airport
Extend Taxiway 'A' & Relocate Localizer

DIV I -
GENERAL PROVISIONS

Issued For Bid

Date

January 31, 2024

Prepared for:

Lebanon Municipal Airport
5 Airpark Road
West Lebanon, NH 03784

Prepared by:
Stantec Consulting Services Inc.

Stantec

Division I General Contract Provisions

Section 10 Definition of Terms

When the following terms are used in these specifications, in the contract, or in any documents or other instruments pertaining to construction where these specifications govern, the intent and meaning shall be defined as follows:

Paragraph Number	Term	Definition
10-01	**AASHTO**	The American Association of State Highway and Transportation Officials.
10-02	**Access Road**	The right-of-way, the roadway and all improvements constructed thereon connecting the airport to a public roadway.
10-03	**Advertisement**	A public announcement, as required by local law, inviting bids for work to be performed and materials to be furnished.
10-04	**Airport**	Airport means an area of land or water which is used or intended to be used for the landing and takeoff of aircraft; an appurtenant area used or intended to be used for airport buildings or other airport facilities or rights of way; airport buildings and facilities located in any of these areas, and a heliport.
10-05	**Airport Improvement Program (AIP)**	A grant-in-aid program, administered by the Federal Aviation Administration (FAA).
10-06	**Air Operations Area (AOA)**	The term air operations area (AOA) shall mean any area of the airport used or intended to be used for the landing, takeoff, or surface maneuvering of aircraft. An air operation area shall include such paved or unpaved areas that are used or intended to be used for the unobstructed movement of aircraft in addition to its associated runway, taxiway, or apron.
10-07	**Apron**	Area where aircraft are parked, unloaded or loaded, fueled and/or serviced.
10-08	**ASTM International (ASTM)**	Formerly known as the American Society for Testing and Materials (ASTM).

Paragraph Number	Term	Definition
10-09	**Award**	The Owner's notice to the successful bidder of the acceptance of the submitted bid.
10-10	**Bidder**	Any individual, partnership, firm, or corporation, acting directly or through a duly authorized representative, who submits a proposal for the work contemplated.
10-11	**Building Area**	An area on the airport to be used, considered, or intended to be used for airport buildings or other airport facilities or rights-of-way together with all airport buildings and facilities located thereon.
10-12	**Calendar Day**	Every day shown on the calendar.
10-13	**Certificate of Analysis (COA)**	The COA is the manufacturer's Certificate of Compliance (COC) including all applicable test results required by the specifications.
10-14	**Certificate of Compliance (COC)**	The manufacturer's certification stating that materials or assemblies furnished fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer's authorized representative.
10-15	**Change Order**	A written order to the Contractor covering changes in the plans, specifications, or proposal quantities and establishing the basis of payment and contract time adjustment, if any, for work within the scope of the contract and necessary to complete the project.
10-16	**Contract**	A written agreement between the Owner and the Contractor that establishes the obligations of the parties including but not limited to performance of work, furnishing of labor, equipment and materials and the basis of payment. The awarded contract includes but may not be limited to: Advertisement, Contract form, Proposal, Performance bond, payment bond, General provisions, certifications and representations, Technical Specifications, Plans, Supplemental Provisions, standards incorporated by reference and issued addenda.
10-17	**Contract Item (Pay Item)**	A specific unit of work for which a price is provided in the contract.

Paragraph Number	Term	Definition
10-18	**Contract Time**	The number of calendar days or working days, stated in the proposal, allowed for completion of the contract, including authorized time extensions. If a calendar date of completion is stated in the proposal, in lieu of a number of calendar or working days, the contract shall be completed by that date.
10-19	**Contractor**	The individual, partnership, firm, or corporation primarily liable for the acceptable performance of the work contracted and for the payment of all legal debts pertaining to the work who acts directly or through lawful agents or employees to complete the contract work.
10-20	**Contractors Quality Control (QC) Facilities**	The Contractor's QC facilities in accordance with the Contractor Quality Control Program (CQCP).
10-21	**Contractor Quality Control Program (CQCP)**	Details the methods and procedures that will be taken to assure that all materials and completed construction required by the contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors.
10-22	**Control Strip**	A demonstration by the Contractor that the materials, equipment, and construction processes results in a product meeting the requirements of the specification.
10-23	**Construction Safety and Phasing Plan (CSPP)**	The overall plan for safety and phasing of a construction project developed by the airport operator, or developed by the airport operator's consultant and approved by the airport operator. It is included in the invitation for bids and becomes part of the project specifications.
10-24	**Drainage System**	The system of pipes, ditches, and structures by which surface or subsurface waters are collected and conducted from the airport area.
10-25	**Engineer**	The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for engineering, inspection, and/or observation of the contract work and acting directly or through an authorized representative.
10-26	**Equipment**	All machinery, together with the necessary supplies for upkeep and maintenance; and all tools and apparatus

Paragraph Number	Term	Definition
		necessary for the proper construction and acceptable completion of the work.
10-27	**Extra Work**	An item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, but which is found by the Owner's Engineer or Resident Project Representative (RPR) to be necessary to complete the work within the intended scope of the contract as previously modified.
10-28	**FAA**	The Federal Aviation Administration. When used to designate a person, FAA shall mean the Administrator or their duly authorized representative.
10-29	**Federal Specifications**	The federal specifications and standards, commercial item descriptions, and supplements, amendments, and indices prepared and issued by the General Services Administration.
10-30	**Force Account**	**a.** Contract Force Account - A method of payment that addresses extra work performed by the Contractor on a time and material basis. **b.** Owner Force Account - Work performed for the project by the Owner's employees.
10-31	**Intention of Terms**	Whenever, in these specifications or on the plans, the words "directed," "required," "permitted," "ordered," "designated," "prescribed," or words of like import are used, it shall be understood that the direction, requirement, permission, order, designation, or prescription of the Engineer and/or Resident Project Representative (RPR) is intended; and similarly, the words "approved," "acceptable," "satisfactory," or words of like import, shall mean approved by, or acceptable to, or satisfactory to the Engineer and/or RPR, subject in each case to the final determination of the Owner. Any reference to a specific requirement of a numbered paragraph of the contract specifications or a cited standard shall be interpreted to include all general requirements of the entire section, specification item, or cited standard that may be pertinent to such specific reference.
10-32	**Lighting**	A system of fixtures providing or controlling the light sources used on or near the airport or within the airport buildings. The field lighting includes all luminous signals,

Paragraph Number	Term	Definition
		markers, floodlights, and illuminating devices used on or near the airport or to aid in the operation of aircraft landing at, taking off from, or taxiing on the airport surface.
10-33	**Major and Minor Contract Items**	A major contract item shall be any item that is listed in the proposal, the total cost of which is equal to or greater than 20% of the total amount of the award contract. All other items shall be considered minor contract items.
10-34	**Materials**	Any substance specified for use in the construction of the contract work.
10-35	**Modification of Standards (MOS)**	Any deviation from standard specifications applicable to material and construction methods in accordance with FAA Order 5300.1.
10-36	**Notice to Proceed (NTP)**	A written notice to the Contractor to begin the actual contract work on a previously agreed to date. If applicable, the Notice to Proceed shall state the date on which the contract time begins.
10-37	**Owner**	The term "Owner" shall mean the party of the first part or the contracting agency signatory to the contract. Where the term "Owner" is capitalized in this document, it shall mean airport Sponsor only. The Owner for this project is the **City of Lebanon**
10-38	Passenger Facility Charge (PFC)	Per 14 Code of Federal Regulations (CFR) Part 158 and 49 United States Code (USC) § 40117, a PFC is a charge imposed by a public agency on passengers enplaned at a commercial service airport it controls.
10-39	**Pavement Structure**	The combined surface course, base course(s), and subbase course(s), if any, considered as a single unit.
10-40	**Payment bond**	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will pay in full all bills and accounts for materials and labor used in the construction of the work.
10-41	**Performance bond**	The approved form of security furnished by the Contractor and their own surety as a guaranty that the Contractor will complete the work in accordance with the terms of the contract.

Paragraph Number	Term	Definition
10-42	**Plans**	The official drawings or exact reproductions which show the location, character, dimensions and details of the airport and the work to be done and which are to be considered as a part of the contract, supplementary to the specifications. Plans may also be referred to as 'contract drawings.'
10-43	**Project**	The agreed scope of work for accomplishing specific airport development with respect to a particular airport.
10-44	**Proposal**	The written offer of the bidder (when submitted on the approved proposal form) to perform the contemplated work and furnish the necessary materials in accordance with the provisions of the plans and specifications.
10-45	**Proposal guaranty**	The security furnished with a proposal to guarantee that the bidder will enter into a contract if their own proposal is accepted by the Owner.
10-46	**Quality Assurance (QA)**	Owner's responsibility to assure that construction work completed complies with specifications for payment.
10-47	**Quality Control (QC)**	Contractor's responsibility to control material(s) and construction processes to complete construction in accordance with project specifications.
10-48	**Quality Assurance (QA) Inspector**	An authorized representative of the Engineer and/or Resident Project Representative (RPR) assigned to make all necessary inspections, observations, tests, and/or observation of tests of the work performed or being performed, or of the materials furnished or being furnished by the Contractor.
10-49	**Quality Assurance (QA) Laboratory**	The official quality assurance testing laboratories of the Owner or such other laboratories as may be designated by the Engineer or RPR. May also be referred to as Engineer's, Owner's, or QA Laboratory.
10-50	**Resident Project Representative (RPR)**	The individual, partnership, firm, or corporation duly authorized by the Owner to be responsible for all necessary inspections, observations, tests, and/or observations of tests of the contract work performed or being performed, or of the materials furnished or being furnished by the Contractor, and acting directly or through an authorized representative.

Paragraph Number	Term	Definition
10-51	**Runway**	The area on the airport prepared for the landing and takeoff of aircraft.
10-52	**Runway Safety Area (RSA)**	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft. See the construction safety and phasing plan (CSPP) for limits of the RSA.
10-53	**Safety Plan Compliance Document (SPCD)**	Details how the Contractor will comply with the CSPP.
10-54	**Specifications**	A part of the contract containing the written directions and requirements for completing the contract work. Standards for specifying materials or testing which are cited in the contract specifications by reference shall have the same force and effect as if included in the contract physically.
10-55	**Sponsor**	A Sponsor is defined in 49 USC § 47102(24) as a public agency that submits to the FAA for an AIP grant; or a private Owner of a public-use airport that submits to the FAA an application for an AIP grant for the airport.
10-56	**Structures**	Airport facilities such as bridges; culverts; catch basins, inlets, retaining walls, cribbing; storm and sanitary sewer lines; water lines; underdrains; electrical ducts, manholes, handholes, lighting fixtures and bases; transformers; navigational aids; buildings; vaults; and, other manmade features of the airport that may be encountered in the work and not otherwise classified herein.
10-57	**Subgrade**	The soil that forms the pavement foundation.
10-58	**Superintendent**	The Contractor's executive representative who is present on the work during progress, authorized to receive and fulfill instructions from the RPR, and who shall supervise and direct the construction.
10-59	**Supplemental Agreement**	A written agreement between the Contractor and the Owner that establishes the basis of payment and contract time adjustment, if any, for the work affected by the supplemental agreement. A supplemental agreement is required if: (1) in scope work would increase or decrease the total amount of the awarded contract by more than 25%: (2) in scope work would increase or decrease the total of any major contract item by more than 25%; (3)

Paragraph Number	Term	Definition
		work that is not within the scope of the originally awarded contract; or (4) adding or deleting of a major contract item.
10-60	**Surety**	The corporation, partnership, or individual, other than the Contractor, executing payment or performance bonds that are furnished to the Owner by the Contractor.
10-61	**Taxilane**	A taxiway designed for low speed movement of aircraft between aircraft parking areas and terminal areas.
10-62	**Taxiway**	The portion of the air operations area of an airport that has been designated by competent airport authority for movement of aircraft to and from the airport's runways, aircraft parking areas, and terminal areas.
10-63	**Taxiway/Taxilane Safety Area (TSA)**	A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an aircraft. See the construction safety and phasing plan (CSPP) for limits of the TSA.
10-64	**Work**	The furnishing of all labor, materials, tools, equipment, and incidentals necessary or convenient to the Contractor's performance of all duties and obligations imposed by the contract, plans, and specifications.
10-65	**Working day**	A working day shall be any day other than a legal holiday, Saturday, or Sunday on which the normal working forces of the Contractor may proceed with regular work for at least six (6) hours toward completion of the contract. When work is suspended for causes beyond the Contractor's control, it will not be counted as a working day. Saturdays, Sundays and holidays on which the Contractor's forces engage in regular work will be considered as working days.
10-66	**Beneficial Occupancy**	The acceptance, by the Owner, of a completed, or partially completed portion of a project for the purpose of allowing use of that portion of the project by the Owner for any period of time prior to final acceptance. By turning over a portion of the project for the Owner's beneficial occupancy, the contractor inherently agrees that no additional contract time or compensation shall be made under the contract resulting directly or indirectly from such use by the Owner. Beneficial occupancy shall not be construed to imply acceptance of any item of the contract for payment purposes, nor shall it have any relationship

Paragraph Number	Term	Definition
		with substantial completion or final acceptance of any work performed under the contract.
10-67	**Final Acceptance**	The determination by the Owner that all work has been completed as required under the contract for payment purposes. This shall include all pay items, change orders, final inspection "punch list" items, incidental requirements, and all other subsidiary obligations of the contractor needed for compliance with all contract terms and associated specified or implied legal requirements.
10-68	**Substantial Completion**	The point in time at which contract requirements have been completed, except for work having a contract price of less than one percent of the then adjusted total contract price, or substantially all of the work has been completed and opened to public use except for minor incomplete or unsatisfactory work items that do not materially impair the usefulness of the work required by the contract. Normally, substantial completion shall be required prior to scheduling the final inspection. Further, substantial completion does not constitute or imply final acceptance of any pay item of the contract for payment purposes. Refer to Article III of the Contract Agreement.

END OF SECTION 10

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Section 20 Proposal Requirements and Conditions

20-01 Advertisement (Notice to Bidders). Project advertisement documents are found on the City of Lebanon eProcurement Portal located at LebanonNH.gov/Bids.

20-02 Qualification of bidders. Each bidder shall submit evidence of competency and evidence of financial responsibility to perform the work to the Owner at the time of bid opening.

Evidence of competency, unless otherwise specified, shall consist of statements covering the bidder's past experience on similar work, and a list of equipment and a list of key personnel that would be available for the work.

Each bidder shall furnish the Owner satisfactory evidence of their financial responsibility. Evidence of financial responsibility, unless otherwise specified, shall consist of a confidential statement or report of the bidder's financial resources and liabilities as of the last calendar year or the bidder's last fiscal year. Such statements or reports shall be certified by a public accountant. At the time of submitting such financial statements or reports, the bidder shall further certify whether their financial responsibility is approximately the same as stated or reported by the public accountant. If the bidder's financial responsibility has changed, the bidder shall qualify the public accountant's statement or report to reflect the bidder's true financial condition at the time such qualified statement or report is submitted to the Owner.

Unless otherwise specified, a bidder may submit evidence that they are prequalified with the State Highway Division and are on the current "bidder's list" of the state in which the proposed work is located. Evidence of State Highway Division prequalification may be submitted as evidence of financial responsibility in lieu of the certified statements or reports specified above.

20-03 Contents of proposal forms. The Owner's proposal forms state the location and description of the proposed construction; the place, date, and time of opening of the proposals; and the estimated quantities of the various items of work to be performed and materials to be furnished for which unit bid prices are asked. The proposal form states the time in which the work must be completed, and the amount of the proposal guaranty that must accompany the proposal. The Owner will accept only those Proposals properly executed on physical forms or electronic forms provided by the Owner. Bidder actions that may cause the Owner to deem a proposal irregular are given in paragraph 20-09 *Irregular proposals*.

Mobilization is limited to **10** percent of the total project cost.

A prebid conference is required on this project to discuss as a minimum, the following items: material requirements; submittals; Quality Control/Quality Assurance requirements; the construction safety and phasing plan including airport access and staging areas; and unique airfield paving construction requirements. **Prebid conference will be held virtually on MS Teams (link provided on City's Procurement website) on Thursday, February 8th, 2024 at 10a local time.**

20-04 Issuance of proposal forms. The Owner reserves the right to refuse to issue a proposal form to a prospective bidder if the bidder is in default for any of the following reasons:

a. Failure to comply with any prequalification regulations of the Owner, if such regulations are cited, or otherwise included, in the proposal as a requirement for bidding.

b. Failure to pay, or satisfactorily settle, all bills due for labor and materials on former contracts in force with the Owner at the time the Owner issues the proposal to a prospective bidder.

c. Documented record of Contractor default under previous contracts with the Owner.

d. Documented record of unsatisfactory work on previous contracts with the Owner.

20-05 Interpretation of estimated proposal quantities. An estimate of quantities of work to be done and materials to be furnished under these specifications is given in the proposal. It is the result of careful calculations and is believed to be correct. It is given only as a basis for comparison of proposals and the award of the contract. The Owner does not expressly, or by implication, agree that the actual quantities involved will correspond exactly therewith; nor shall the bidder plead misunderstanding or deception because of such estimates of quantities, or of the character, location, or other conditions pertaining to the work. Payment to the Contractor will be made only for the actual quantities of work performed or materials furnished in accordance with the plans and specifications. It is understood that the quantities may be increased or decreased as provided in the Section 40, paragraph 40-02, Alteration of Work and Quantities*,* without in any way invalidating the unit bid prices.

20-06 Examination of plans, specifications, and site. The bidder is expected to carefully examine the site of the proposed work, the proposal, plans, specifications, and contract forms. Bidders shall satisfy themselves to the character, quality, and quantities of work to be performed, materials to be furnished, and to the requirements of the proposed contract. The submission of a proposal shall be prima facie evidence that the bidder has made such examination and is satisfied to the conditions to be encountered in performing the work and the requirements of the proposed contract, plans, and specifications.

Boring logs and other records of subsurface investigations and tests are available for inspection of bidders. It is understood and agreed that such subsurface information, whether included in the plans, specifications, or otherwise made available to the bidder, was obtained and is intended for the Owner's design and estimating purposes only. Such information has been made available for the convenience of all bidders. It is further understood and agreed that each bidder is solely responsible for all assumptions, deductions, or conclusions which the bidder may make or obtain from their own examination of the boring logs and other records of subsurface investigations and tests that are furnished by the Owner.

20-07 Preparation of proposal. The bidder shall submit their proposal on the forms furnished by the Owner. All blank spaces in the proposal forms, unless explicitly stated otherwise, must be correctly filled in where indicated for each and every item for which a quantity is given. The bidder shall state the price (written in ink or typed) both in words and numerals which they propose for each pay item furnished in the proposal. In case of conflict between words and numerals, the words, unless obviously incorrect, shall govern.

The bidder shall correctly sign the proposal in ink. If the proposal is made by an individual, their name and post office address must be shown. If made by a partnership, the name and post office address of each member of the partnership must be shown. If made by a corporation, the person signing the proposal shall give the name of the state where the corporation was chartered and the name, titles, and business address of the president, secretary, and the treasurer. Anyone signing a proposal as an agent shall file evidence of their authority to do so and that the signature is binding upon the firm or corporation.

20-08 Responsive and responsible bidder. A responsive bid conforms to all significant terms and conditions contained in the Owner's invitation for bid. It is the Owner's responsibility to decide if the exceptions taken by a bidder to the solicitation are material or not and the extent of deviation it is willing to accept.

A responsible bidder has the ability to perform successfully under the terms and conditions of a proposed procurement, as defined in 2 CFR § 200.318(h). This includes such matters as Contractor integrity, compliance with public policy, record of past performance, and financial and technical resources.

20-09 Irregular proposals. Proposals shall be considered irregular for the following reasons:

a. If the proposal is on a form other than that furnished by the Owner, or if the Owner's form is altered, or if any part of the proposal form is detached.

b. If there are unauthorized additions, conditional or alternate pay items, or irregularities of any kind that make the proposal incomplete, indefinite, or otherwise ambiguous.

c. If the proposal does not contain a unit price for each pay item listed in the proposal, except in the case of authorized alternate pay items, for which the bidder is not required to furnish a unit price.

d. If the proposal contains unit prices that are obviously unbalanced.

e. If the proposal is not accompanied by the proposal guaranty specified by the Owner.

f. If the applicable Disadvantaged Business Enterprise information is incomplete.

The Owner reserves the right to reject any irregular proposal and the right to waive technicalities if such waiver is in the best interest of the Owner and conforms to local laws and ordinances pertaining to the letting of construction contracts.

20-10 Bid guarantee. Each separate proposal shall be accompanied by a bid bond, certified check, or other specified acceptable collateral, in the amount specified in the proposal form. Such bond, check, or collateral, shall be made payable to the Owner.

20-11 Delivery of proposal. See the Instructions to Bidders section of the online procurement platform for proposal submission instructions. No proposal will be considered unless received per the instructions and requirements of the bid. Proposals will not be accepted after the bid opening time.

20-12 Withdrawal or revision of proposals. A bidder may withdraw or revise (by withdrawal of one proposal and submission of another) a proposal provided that the bidder's request for withdrawal is received by the Owner **by email** before the time specified for opening bids. Revised proposals must be received at the place specified in the advertisement before the time specified for opening all bids.

20-13 Public opening of proposals. Proposals shall be opened, and read, publicly at the time and place specified in the advertisement. Bidders, their authorized agents, and other interested persons are invited to attend. Proposals that have been withdrawn (by written or telegraphic request) or received after the time specified for opening bids shall be returned to the bidder unopened.

20-14 Disqualification of bidders. A bidder shall be considered disqualified for any of the following reasons:

a. Submitting more than one proposal from the same partnership, firm, or corporation under the same or different name.

b. Evidence of collusion among bidders. Bidders participating in such collusion shall be disqualified as bidders for any future work of the Owner until any such participating bidder has been reinstated by the Owner as a qualified bidder.

c. If the bidder is considered to be in "default" for any reason specified in paragraph 20-04, *Issuance of Proposal Forms,* of this section.

20-15 Discrepancies and Omissions. A Bidder who discovers discrepancies or omissions with the project bid documents shall immediately notify the Owner's Engineer of the matter. A bidder that has

doubt as to the true meaning of a project requirement may submit to the Owner's Engineer a written request for interpretation no later than **seven (7)** days prior to bid opening.

Any interpretation of the project bid documents by the Owner's Engineer will be by written addendum issued by the Owner. The Owner will not consider any instructions, clarifications or interpretations of the bidding documents in any manner other than written addendum.

END OF SECTION 20

Section 30 Award and Execution of Contract

30-01 Consideration of proposals. After the proposals are publicly opened and read, they will be compared on the basis of the summation of the products obtained by multiplying the estimated quantities shown in the proposal by the unit bid prices. If a bidder's proposal contains a discrepancy between unit bid prices written in words and unit bid prices written in numbers, the unit bid price written in words shall govern.

Until the award of a contract is made, the Owner reserves the right to reject a bidder's proposal for any of the following reasons:

a. If the proposal is irregular as specified in Section 20, paragraph 20-09, *Irregular Proposals*.

b. If the bidder is disqualified for any of the reasons specified Section 20, paragraph 20-14, *Disqualification of Bidders*.

In addition, until the award of a contract is made, the Owner reserves the right to reject any or all proposals, waive technicalities, if such waiver is in the best interest of the Owner and is in conformance with applicable state and local laws or regulations pertaining to the letting of construction contracts; advertise for new proposals; or proceed with the work otherwise. All such actions shall promote the Owner's best interests.

30-02 Award of contract. The award of a contract, if it is to be awarded, shall be made within **thirty (30)** calendar days of the date specified for publicly opening proposals, unless otherwise specified herein.

If the Owner elects to proceed with an award of contract, the Owner will make award to the responsible bidder whose bid, conforming with all the material terms and conditions of the bid documents, is the lowest in price.

30-03 Cancellation of award. The Owner reserves the right to cancel the award without liability to the bidder, except return of proposal guaranty, at any time before a contract has been fully executed by all parties and is approved by the Owner in accordance with paragraph 30-07 *Approval of Contract*.

30-04 Return of proposal guaranty. All proposal guaranties, except those of the two lowest bidders, will be returned immediately after the Owner has made a comparison of bids as specified in the paragraph 30-01, *Consideration of Proposals.* Proposal guaranties of the two lowest bidders will be retained by the Owner until such time as an award is made, at which time, the unsuccessful bidder's proposal guaranty will be returned. The successful bidder's proposal guaranty will be returned as soon as the Owner receives the contract bonds as specified in paragraph 30-05, *Requirements of Contract Bonds.*

30-05 Requirements of contract bonds. At the time of the execution of the contract, the successful bidder shall furnish the Owner a surety bond or bonds that have been fully executed by the bidder and the surety guaranteeing the performance of the work and the payment of all legal debts that may be incurred by reason of the Contractor's performance of the work. The surety and the form of the bond or bonds shall be acceptable to the Owner. Unless otherwise specified in this subsection, the surety bond or bonds shall be in a sum equal to the full amount of the contract.

30-06 Execution of contract. The successful bidder shall sign (execute) the necessary agreements for entering into the contract and return the signed contract to the Owner, along with the fully executed surety

bond or bonds specified in paragraph 30-05, *Requirements of Contract Bonds,* of this section, within **15** calendar days from the date mailed or otherwise delivered to the successful bidder.

30-07 Approval of contract. Upon receipt of the contract and contract bond or bonds that have been executed by the successful bidder, the Owner shall complete the execution of the contract in accordance with local laws or ordinances, and return the fully executed contract to the Contractor. Delivery of the fully executed contract to the Contractor shall constitute the Owner's approval to be bound by the successful bidder's proposal and the terms of the contract.

30-08 Failure to execute contract. Failure of the successful bidder to execute the contract and furnish an acceptable surety bond or bonds within the period specified in paragraph 30-06, *Execution of Contract,* of this section shall be just cause for cancellation of the award and forfeiture of the proposal guaranty, not as a penalty, but as liquidated damages to the Owner.

END OF SECTION 30

Section 40 Scope of Work

40-01 Intent of contract. The intent of the contract is to provide for construction and completion, in every detail, of the work described. It is further intended that the Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work in accordance with the plans, specifications, and terms of the contract.

40-02 Alteration of work and quantities. The Owner reserves the right to make such changes in quantities and work as may be necessary or desirable to complete, in a satisfactory manner, the original intended work. Unless otherwise specified in the Contract, the Owner's Engineer or RPR shall be and is hereby authorized to make, in writing, such in-scope alterations in the work and variation of quantities as may be necessary to complete the work, provided such action does not represent a significant change in the character of the work.

For purpose of this section, a significant change in character of work means: any change that is outside the current contract scope of work; any change (increase or decrease) in the total contract cost by more than 25%; or any change in the total cost of a major contract item by more than 25%.

Work alterations and quantity variances that do not meet the definition of significant change in character of work shall not invalidate the contract nor release the surety. Contractor agrees to accept payment for such work alterations and quantity variances in accordance with Section 90, paragraph 90-03, *Compensation for Altered Quantities*.

Should the value of altered work or quantity variance meet the criteria for significant change in character of work, such altered work and quantity variance shall be covered by a supplemental agreement. Supplemental agreements shall also require consent of the Contractor's surety and separate performance and payment bonds. If the Owner and the Contractor are unable to agree on a unit adjustment for any contract item that requires a supplemental agreement, the Owner reserves the right to terminate the contract with respect to the item and make other arrangements for its completion.

40-03 Omitted items. The Owner, the Owner's Engineer or the RPR may provide written notice to the Contractor to omit from the work any contract item that does not meet the definition of major contract item. Major contract items may be omitted by a supplemental agreement. Such omission of contract items shall not invalidate any other contract provision or requirement.

Should a contract item be omitted or otherwise ordered to be non-performed, the Contractor shall be paid for all work performed toward completion of such item prior to the date of the order to omit such item. Payment for work performed shall be in accordance with Section 90, paragraph 90-04, *Payment for Omitted Items*.

40-04 Extra work. Should acceptable completion of the contract require the Contractor to perform an item of work not provided for in the awarded contract as previously modified by change order or supplemental agreement, Owner may issue a Change Order to cover the necessary extra work. Change orders for extra work shall contain agreed unit prices for performing the change order work in accordance with the requirements specified in the order, and shall contain any adjustment to the contract time that, in the RPR's opinion, is necessary for completion of the extra work.

When determined by the RPR to be in the Owner's best interest, the RPR may order the Contractor to proceed with extra work as provided in Section 90, paragraph 90-05, *Payment for Extra Work*. Extra work that is necessary for acceptable completion of the project, but is not within the general scope of the work covered by the original contract shall be covered by a supplemental agreement as defined in Section 10, paragraph 10-59, *Supplemental Agreement*.

If extra work is essential to maintaining the project critical path, RPR may order the Contractor to commence the extra work under a Time and Material contract method. Once sufficient detail is available to establish the level of effort necessary for the extra work, the Owner shall initiate a change order or supplemental agreement to cover the extra work.

Any claim for payment of extra work that is not covered by written agreement (change order or supplemental agreement) shall be rejected by the Owner.

40-05 Maintenance of traffic. It is the explicit intention of the contract that the safety of aircraft, as well as the Contractor's equipment and personnel, is the most important consideration. The Contractor shall maintain traffic in the manner detailed in the Construction Safety and Phasing Plan (CSPP).

a. It is understood and agreed that the Contractor shall provide for the free and unobstructed movement of aircraft in the air operations areas (AOAs) of the airport with respect to their own operations and the operations of all subcontractors as specified in Section 80, paragraph 80-04, *Limitation of Operations*. It is further understood and agreed that the Contractor shall provide for the uninterrupted operation of visual and electronic signals (including power supplies thereto) used in the guidance of aircraft while operating to, from, and upon the airport as specified in Section 70, paragraph 70-15, *Contractor's Responsibility for Utility Service and Facilities of Others*.

b. With respect to their own operations and the operations of all subcontractors, the Contractor shall provide marking, lighting, and other acceptable means of identifying personnel, equipment, vehicles, storage areas, and any work area or condition that may be hazardous to the operation of aircraft, fire-rescue equipment, or maintenance vehicles at the airport in accordance with the construction safety and phasing plan (CSPP) and the safety plan compliance document (SPCD).

c. When the contract requires the maintenance of an existing road, street, or highway during the Contractor's performance of work that is otherwise provided for in the contract, plans, and specifications, the Contractor shall keep the road, street, or highway open to all traffic and shall provide maintenance as may be required to accommodate traffic. The Contractor, at their expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel. The Contractor shall furnish, erect, and maintain barricades, warning signs, flag person, and other traffic control devices in reasonable conformity with the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/), unless otherwise specified. The Contractor shall also construct and maintain in a safe condition any temporary connections necessary for ingress to and egress from abutting property or intersecting roads, streets or highways. Unless otherwise specified herein, the Contractor will not be required to furnish snow removal for such existing road, street, or highway.

40-06 Removal of existing structures. All existing structures encountered within the established lines, grades, or grading sections shall be removed by the Contractor, unless such existing structures are otherwise specified to be relocated, adjusted up or down, salvaged, abandoned in place, reused in the work or to remain in place. The cost of removing such existing structures shall not be measured or paid for directly, but shall be included in the various contract items.

Should the Contractor encounter an existing structure (above or below ground) in the work for which the disposition is not indicated on the plans, the Resident Project Representative (RPR) shall be notified prior

to disturbing such structure. The disposition of existing structures so encountered shall be immediately determined by the RPR in accordance with the provisions of the contract.

Except as provided in Section 40, paragraph 40-07, *Rights in and Use of Materials Found in the Work*, it is intended that all existing materials or structures that may be encountered (within the lines, grades, or grading sections established for completion of the work) shall be used in the work as otherwise provided for in the contract and shall remain the property of the Owner when so used in the work.

40-07 Rights in and use of materials found in the work. Should the Contractor encounter any material such as (but not restricted to) sand, stone, gravel, slag, or concrete slabs within the established lines, grades, or grading sections, the use of which is intended by the terms of the contract to be embankment, the Contractor may at their own option either:

a. Use such material in another contract item, providing such use is approved by the RPR and is in conformance with the contract specifications applicable to such use; or,

b. Remove such material from the site, upon written approval of the RPR; or

c. Use such material for the Contractor's own temporary construction on site; or,

d. Use such material as intended by the terms of the contract.

Should the Contractor wish to exercise option a., b., or c., the Contractor shall request the RPR's approval in advance of such use.

Should the RPR approve the Contractor's request to exercise option a., b., or c., the Contractor shall be paid for the excavation or removal of such material at the applicable contract price. The Contractor shall replace, at their expense, such removed or excavated material with an agreed equal volume of material that is acceptable for use in constructing embankment, backfills, or otherwise to the extent that such replacement material is needed to complete the contract work. The Contractor shall not be charged for use of such material used in the work or removed from the site.

Should the RPR approve the Contractor's exercise of option a., the Contractor shall be paid, at the applicable contract price, for furnishing and installing such material in accordance with requirements of the contract item in which the material is used.

It is understood and agreed that the Contractor shall make no claim for delays by reason of their own exercise of option a., b., or c.

The Contractor shall not excavate, remove, or otherwise disturb any material, structure, or part of a structure which is located outside the lines, grades, or grading sections established for the work, except where such excavation or removal is provided for in the contract, plans, or specifications.

40-08 Final cleanup. Upon completion of the work and before acceptance and final payment will be made, the Contractor shall remove from the site all machinery, equipment, surplus and discarded materials, rubbish, temporary structures, and stumps or portions of trees. The Contractor shall cut all brush and woods within the limits indicated and shall leave the site in a neat and presentable condition. Material cleared from the site and deposited on adjacent property will not be considered as having been disposed of satisfactorily, unless the Contractor has obtained the written permission of the property Owner.

END OF SECTION 40

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Section 50 Control of Work

50-01 Authority of the Resident Project Representative (RPR). The RPR has final authority regarding the interpretation of project specification requirements. The RPR shall determine acceptability of the quality of materials furnished, method of performance of work performed, and the manner and rate of performance of the work. The RPR does not have the authority to accept work that does not conform to specification requirements.

50-02 Conformity with plans and specifications. All work and all materials furnished shall be in reasonably close conformity with the lines, grades, grading sections, cross-sections, dimensions, material requirements, and testing requirements that are specified (including specified tolerances) in the contract, plans, or specifications.

If the RPR finds the materials furnished, work performed, or the finished product not within reasonably close conformity with the plans and specifications, but that the portion of the work affected will, in their opinion, result in a finished product having a level of safety, economy, durability, and workmanship acceptable to the Owner, the RPR will advise the Owner of their determination that the affected work be accepted and remain in place. The RPR will document the determination and recommend to the Owner a basis of acceptance that will provide for an adjustment in the contract price for the affected portion of the work. Changes in the contract price must be covered by contract change order or supplemental agreement as applicable.

If the RPR finds the materials furnished, work performed, or the finished product are not in reasonably close conformity with the plans and specifications and have resulted in an unacceptable finished product, the affected work or materials shall be removed and replaced or otherwise corrected by and at the expense of the Contractor in accordance with the RPR's written orders.

The term "reasonably close conformity" shall not be construed as waiving the Contractor's responsibility to complete the work in accordance with the contract, plans, and specifications. The term shall not be construed as waiving the RPR's responsibility to insist on strict compliance with the requirements of the contract, plans, and specifications during the Contractor's execution of the work, when, in the RPR's opinion, such compliance is essential to provide an acceptable finished portion of the work.

The term "reasonably close conformity" is also intended to provide the RPR with the authority, after consultation with the Sponsor and FAA, to use sound engineering judgment in their determinations to accept work that is not in strict conformity, but will provide a finished product equal to or better than that required by the requirements of the contract, plans and specifications.

The RPR will not be responsible for the Contractor's means, methods, techniques, sequences, or procedures of construction or the safety precautions incident thereto.

50-03 Coordination of contract, plans, and specifications. The contract, plans, specifications, and all referenced standards cited are essential parts of the contract requirements. If electronic files are provided and used on the project and there is a conflict between the electronic files and hard copy plans, the hard copy plans shall govern. A requirement occurring in one is as binding as though occurring in all. They are intended to be complementary and to describe and provide for a complete work. In case of discrepancy, calculated dimensions will govern over scaled dimensions; contract technical specifications shall govern over contract general provisions, plans, cited standards for materials or testing, and cited

advisory circulars (ACs); contract general provisions shall govern over plans, cited standards for materials or testing, and cited ACs; plans shall govern over cited standards for materials or testing and cited ACs. If any paragraphs contained in the Special Provisions conflict with General Provisions or Technical Specifications, the Special Provisions shall govern.

From time to time, discrepancies within cited testing standards occur due to the timing of the change, edits, and/or replacement of the standards. If the Contractor discovers any apparent discrepancy within standard test methods, the Contractor shall immediately ask the RPR for an interpretation and decision, and such decision shall be final.

The Contractor shall not take advantage of any apparent error or omission on the plans or specifications. In the event the Contractor discovers any apparent error or discrepancy, Contractor shall immediately notify the Owner or the designated representative in writing requesting their written interpretation and decision.

50-04 List of Special Provisions. Refer to Division II Special Provisions.

50-05 Cooperation of Contractor. The Contractor shall be supplied with an electronic PDF of the plans and specifications. The Contractor shall have available on the construction site at all times one hardcopy each of the plans and specifications. Additional hard copies of plans and specifications may be obtained by the Contractor for the cost of reproduction.

The Contractor shall give constant attention to the work to facilitate the progress thereof, and shall cooperate with the RPR and their inspectors and with other Contractors in every way possible. The Contractor shall have a competent superintendent on the work at all times who is fully authorized as their agent on the work. The superintendent shall be capable of reading and thoroughly understanding the plans and specifications and shall receive and fulfill instructions from the RPR or their authorized representative.

50-06 Cooperation between Contractors. The Owner reserves the right to contract for and perform other or additional work on or near the work covered by this contract.

When separate contracts are let within the limits of any one project, each Contractor shall conduct the work not to interfere with or hinder the progress of completion of the work being performed by other Contractors. Contractors working on the same project shall cooperate with each other as directed.

Each Contractor involved shall assume all liability, financial or otherwise, in connection with their own contract and shall protect and hold harmless the Owner from any and all damages or claims that may arise because of inconvenience, delays, or loss experienced because of the presence and operations of other Contractors working within the limits of the same project.

The Contractor shall arrange their work and shall place and dispose of the materials being used to not interfere with the operations of the other Contractors within the limits of the same project. The Contractor shall join their work with that of the others in an acceptable manner and shall perform it in proper sequence to that of the others.

50-07 Construction layout and stakes. The Engineer/RPR shall establish necessary horizontal and vertical control. The establishment of Survey Control and/or reestablishment of survey control shall be by a State Licensed Land Surveyor. Contractor is responsible for preserving integrity of horizontal and vertical controls established by Engineer/RPR. In case of negligence on the part of the Contractor or their employees, resulting in the destruction of any horizontal and vertical control, the resulting costs will be deducted as a liquidated damage against the Contractor.

Prior to the start of construction, the Contractor will check all control points for horizontal and vertical accuracy and certify in writing to the RPR that the Contractor concurs with survey control established for

the project. All lines, grades and measurements from control points necessary for the proper execution and control of the work on this project will be provided to the RPR. The Contractor is responsible to establish all layout required for the construction of the project.

Copies of survey notes will be provided to the RPR for each area of construction and for each placement of material as specified to allow the RPR to make periodic checks for conformance with plan grades, alignments and grade tolerances required by the applicable material specifications. Surveys will be provided to the RPR prior to commencing work items that cover or disturb the survey staking. Survey(s) and notes shall be provided in the following format(s): **Electronic format TIN Surfaces and topographic information shall be provided in 2021 AutoCAD Civil 3D .dwg file type. All associated point files to be provided in .csv or .xlsx format with a point code legend included. Electronic PDFs to be provided of all data pickup and survey notes.**

Laser, GPS, String line, or other automatic control shall be checked with temporary control as necessary. In the case of error, on the part of the Contractor, their surveyor, employees or subcontractors, resulting in established grades, alignment or grade tolerances that do not concur with those specified or shown on the plans, the Contractor is solely responsible for correction, removal, replacement and all associated costs at no additional cost to the Owner.

Property monuments, benchmarks, control points and stakes disturbed by the Contractor or suspected of having been disturbed by the Contractor shall be checked and/or reset by the Contractor as directed by the Engineer without additional cost to the Owner. This shall include Primary and Secondary Airport Control Station monuments (PACS / SACS) that are located on the airfield. The Contractor shall take all necessary precautions to protect the PACS / SACS from disturbance. If they are disturbed by the Contractors operations, the monuments shall be re-set in accordance with Advisory Circular AC 150/5300-16A at the Contractor's expense. All checking / re-setting shall be accomplished by a professional surveyor licensed per State Requirements.

No direct payment will be made, unless otherwise specified in contract documents, for this labor, materials, or other expenses. The cost shall be included in the price of the bid for the various items of the Contract.

50-08 Authority and duties of Quality Assurance (QA) inspectors. QA inspectors shall be authorized to inspect all work done and all material furnished. Such QA inspection may extend to all or any part of the work and to the preparation, fabrication, or manufacture of the materials to be used. QA inspectors are not authorized to revoke, alter, or waive any provision of the contract. QA inspectors are not authorized to issue instructions contrary to the plans and specifications or to act as foreman for the Contractor.

QA Inspectors are authorized to notify the Contractor or their representatives of any failure of the work or materials to conform to the requirements of the contract, plans, or specifications and to reject such nonconforming materials in question until such issues can be referred to the RPR for a decision.

50-09 Inspection of the work. All materials and each part or detail of the work shall be subject to inspection. The RPR shall be allowed access to all parts of the work and shall be furnished with such information and assistance by the Contractor as is required to make a complete and detailed inspection.

If the RPR requests it, the Contractor, at any time before acceptance of the work, shall remove or uncover such portions of the finished work as may be directed. After examination, the Contractor shall restore said portions of the work to the standard required by the specifications. Should the work thus exposed or examined prove acceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be paid for as extra work; but should the work so exposed or examined prove unacceptable, the uncovering, or removing, and the replacing of the covering or making good of the parts removed will be at the Contractor's expense.

Provide advance written notice to the RPR of work the Contractor plans to perform each week and each day. Any work done or materials used without written notice and allowing opportunity for inspection by the RPR may be ordered removed and replaced at the Contractor's expense.

Should the contract work include relocation, adjustment, or any other modification to existing facilities, not the property of the (contract) Owner, authorized representatives of the Owners of such facilities shall have the right to inspect such work. Such inspection shall in no sense make any facility owner a party to the contract, and shall in no way interfere with the rights of the parties to this contract.

50-10 Removal of unacceptable and unauthorized work. All work that does not conform to the requirements of the contract, plans, and specifications will be considered unacceptable, unless otherwise determined acceptable by the RPR as provided in paragraph 50-02, *Conformity with Plans and Specifications*.

Unacceptable work, whether the result of poor workmanship, use of defective materials, damage through carelessness, or any other cause found to exist prior to the final acceptance of the work, shall be removed immediately and replaced in an acceptable manner in accordance with the provisions of Section 70, paragraph 70-14, *Contractor's Responsibility for Work*.

No removal work made under provision of this paragraph shall be done without lines and grades having been established by the RPR. Work done contrary to the instructions of the RPR, work done beyond the lines shown on the plans or as established by the RPR, except as herein specified, or any extra work done without authority, will be considered as unauthorized and will not be paid for under the provisions of the contract. Work so done may be ordered removed or replaced at the Contractor's expense.

Upon failure on the part of the Contractor to comply with any order of the RPR made under the provisions of this subsection, the RPR will have authority to cause unacceptable work to be remedied or removed and replaced; and unauthorized work to be removed and recover the resulting costs as a liquidated damage against the Contractor.

50-11 Load restrictions. The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the work. A special permit will not relieve the Contractor of liability for damage that may result from the moving of material or equipment.

The operation of equipment of such weight or so loaded as to cause damage to structures or to any other type of construction will not be permitted. Hauling of materials over the base course or surface course under construction shall be limited as directed. No loads will be permitted on a concrete pavement, base, or structure before the expiration of the curing period. The Contractor, at their own expense, shall be responsible for the repair to equal or better than preconstruction conditions of any damage caused by the Contractor's equipment and personnel.

50-12 Maintenance during construction. The Contractor shall maintain the work during construction and until the work is accepted. Maintenance shall constitute continuous and effective work prosecuted day by day, with adequate equipment and forces so that the work is maintained in satisfactory condition at all times.

In the case of a contract for the placing of a course upon a course or subgrade previously constructed, the Contractor shall maintain the previous course or subgrade during all construction operations.

All costs of maintenance work during construction and before the project is accepted shall be included in the unit prices bid on the various contract items, and the Contractor will not be paid an additional amount for such work.

50-13 Failure to maintain the work. Should the Contractor at any time fail to maintain the work as provided in paragraph 50-12, *Maintenance during Construction*, the RPR shall immediately notify the

Contractor of such noncompliance. Such notification shall specify a reasonable time within which the Contractor shall be required to remedy such unsatisfactory maintenance condition. The time specified will give due consideration to the exigency that exists.

Should the Contractor fail to respond to the RPR's notification, the Owner may suspend any work necessary for the Owner to correct such unsatisfactory maintenance condition, depending on the exigency that exists. Any maintenance cost incurred by the Owner, shall be recovered as a liquidated damage against the Contractor.

50-14 Partial acceptance. If at any time during the execution of the project the Contractor substantially completes a usable unit or portion of the work, the occupancy of which will benefit the Owner, the Contractor may request the RPR to make final inspection of that unit. If the RPR finds upon inspection that the unit has been satisfactorily completed in compliance with the contract, the RPR may accept it as being complete, and the Contractor may be relieved of further responsibility for that unit. Such partial acceptance and beneficial occupancy by the Owner shall not void or alter any provision of the contract.

50-15 Final acceptance. Upon due notice from the Contractor of presumptive completion of the entire project, the RPR and Owner will make an inspection. If all construction provided for and contemplated by the contract is found to be complete in accordance with the contract, plans, and specifications, such inspection shall constitute the final inspection. The RPR shall notify the Contractor in writing of final acceptance as of the date of the final inspection.

If, however, the inspection discloses any work, in whole or in part, as being unsatisfactory, the RPR will notify the Contractor and the Contractor shall correct the unsatisfactory work. Upon correction of the work, another inspection will be made which shall constitute the final inspection, provided the work has been satisfactorily completed. In such event, the RPR will make the final acceptance and notify the Contractor in writing of this acceptance as of the date of final inspection.

50-16 Claims for adjustment and disputes. If for any reason the Contractor deems that additional compensation is due for work or materials not clearly provided for in the contract, plans, or specifications or previously authorized as extra work, the Contractor shall notify the RPR in writing of their intention to claim such additional compensation before the Contractor begins the work on which the Contractor bases the claim. If such notification is not given or the RPR is not afforded proper opportunity by the Contractor for keeping strict account of actual cost as required, then the Contractor hereby agrees to waive any claim for such additional compensation. Such notice by the Contractor and the fact that the RPR has kept account of the cost of the work shall not in any way be construed as proving or substantiating the validity of the claim. When the work on which the claim for additional compensation is based has been completed, the Contractor shall, within 10 calendar days, submit a written claim to the RPR who will present it to the Owner for consideration in accordance with local laws or ordinances.

Nothing in this subsection shall be construed as a waiver of the Contractor's right to dispute final payment based on differences in measurements or computations.

END OF SECTION 50

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Section 60 Control of Materials

60-01 Source of supply and quality requirements. The materials used in the work shall conform to the requirements of the contract, plans, and specifications. Unless otherwise specified, such materials that are manufactured or processed shall be new (as compared to used or reprocessed).

In order to expedite the inspection and testing of materials, the Contractor shall furnish documentation to the RPR as to the origin, composition, and manufacture of all materials to be used in the work. Documentation shall be furnished promptly after execution of the contract but, in all cases, prior to delivery of such materials.

At the RPR's option, materials may be approved at the source of supply before delivery. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources.

The Contractor shall furnish airport lighting equipment that meets the requirements of the specifications; and is listed in AC 150/5345-53, *Airport Lighting Equipment Certification Program* and *Addendum*, that is in effect on the date of advertisement.

60-02 Samples, tests, and cited specifications. All materials used in the work shall be inspected, tested, and approved by the RPR before incorporation in the work unless otherwise designated. Any work in which untested materials are used without approval or written permission of the RPR shall be performed at the Contractor's risk. Materials found to be unacceptable and unauthorized will not be paid for and, if directed by the RPR, shall be removed at the Contractor's expense.

Unless otherwise designated, quality assurance tests will be made by and at the expense of the Owner in accordance with the cited standard methods of ASTM, American Association of State Highway and Transportation Officials (AASHTO), federal specifications, Commercial Item Descriptions, and all other cited methods, which are current on the date of advertisement for bids.

The testing organizations performing on-site quality assurance field tests shall have copies of all referenced standards on the construction site for use by all technicians and other personnel. Unless otherwise designated, samples for quality assurance will be taken by a qualified representative of the RPR. All materials being used are subject to inspection, test, or rejection at any time prior to or during incorporation into the work. Copies of all tests will be furnished to the Contractor's representative at their request after review and approval of the RPR.

A copy of all Contractor QC test data shall be provided to the RPR daily, along with printed reports, in an approved format, on a weekly basis. After completion of the project, and prior to final payment, the Contractor shall submit a final report to the RPR showing all test data reports, plus an analysis of all results showing ranges, averages, and corrective action taken on all failing tests.

The Contractor shall employ a Quality Control (QC) testing organization to perform all Contractor required QC tests in accordance with Item C-100 Contractor Quality Control Program (CQCP).

60-03 Certification of compliance/analysis (COC/COA). The RPR may permit the use, prior to sampling and testing, of certain materials or assemblies when accompanied by manufacturer's COC stating that such materials or assemblies fully comply with the requirements of the contract. The certificate shall be signed by the manufacturer. Each lot of such materials or assemblies delivered to the

work must be accompanied by a certificate of compliance in which the lot is clearly identified. The COA is the manufacturer's COC and includes all applicable test results.

Materials or assemblies used on the basis of certificates of compliance may be sampled and tested at any time and if found not to be in conformity with contract requirements will be subject to rejection whether in place or not.

The form and distribution of certificates of compliance shall be as approved by the RPR.

When a material or assembly is specified by "brand name or equal" and the Contractor elects to furnish the specified "or equal," the Contractor shall be required to furnish the manufacturer's certificate of compliance for each lot of such material or assembly delivered to the work. Such certificate of compliance shall clearly identify each lot delivered and shall certify as to:

a. Conformance to the specified performance, testing, quality or dimensional requirements; and,

b. Suitability of the material or assembly for the use intended in the contract work.

The RPR shall be the sole judge as to whether the proposed "or equal" is suitable for use in the work.

The RPR reserves the right to refuse permission for use of materials or assemblies on the basis of certificates of compliance.

60-04 Plant inspection. The RPR or their authorized representative may inspect, at its source, any specified material or assembly to be used in the work. Manufacturing plants may be inspected from time to time for the purpose of determining compliance with specified manufacturing methods or materials to be used in the work and to obtain samples required for acceptance of the material or assembly.

Should the RPR conduct plant inspections, the following conditions shall exist:

a. The RPR shall have the cooperation and assistance of the Contractor and the producer with whom the Contractor has contracted for materials.

b. The RPR shall have full entry at all reasonable times to such parts of the plant that concern the manufacture or production of the materials being furnished.

c. If required by the RPR, the Contractor shall arrange for adequate office or working space that may be reasonably needed for conducting plant inspections. Place office or working space in a convenient location with respect to the plant.

It is understood and agreed that the Owner shall have the right to retest any material that has been tested and approved at the source of supply after it has been delivered to the site. The RPR shall have the right to reject only material which, when retested, does not meet the requirements of the contract, plans, or specifications.

60-05 Engineer/ Resident Project Representative (RPR) field office. The Contractor shall provide dedicated space for the use of the engineer, RPR, and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity. Refer to C-105 for additional requirements.

60-06 Storage of materials. Materials shall be stored to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, may again be inspected prior to their use in the work. Stored materials shall be located to facilitate their prompt inspection. The Contractor shall coordinate the storage of all materials with the RPR. Materials to be stored on airport property shall not create an obstruction to air navigation nor shall they interfere with the free and unobstructed movement of aircraft. Unless otherwise shown on the plans and/or CSPP, the storage of

materials and the location of the Contractor's plant and parked equipment or vehicles shall be as directed by the RPR. Private property shall not be used for storage purposes without written permission of the Owner or lessee of such property. The Contractor shall make all arrangements and bear all expenses for the storage of materials on private property. Upon request, the Contractor shall furnish the RPR a copy of the property Owner's permission.

All storage sites on private or airport property shall be restored to their original condition by the Contractor at their expense, except as otherwise agreed to (in writing) by the Owner or lessee of the property.

60-07 Unacceptable materials. Any material or assembly that does not conform to the requirements of the contract, plans, or specifications shall be considered unacceptable and shall be rejected. The Contractor shall remove any rejected material or assembly from the site of the work, unless otherwise instructed by the RPR.

Rejected material or assembly, the defects of which have been corrected by the Contractor, shall not be returned to the site of the work until such time as the RPR has approved its use in the work.

60-08 Owner furnished materials. The Contractor shall furnish all materials required to complete the work, except those specified, if any, to be furnished by the Owner. Owner-furnished materials shall be made available to the Contractor at the location specified.

All costs of handling, transportation from the specified location to the site of work, storage, and installing Owner-furnished materials shall be included in the unit price bid for the contract item in which such Owner-furnished material is used.

After any Owner-furnished material has been delivered to the location specified, the Contractor shall be responsible for any demurrage, damage, loss, or other deficiencies that may occur during the Contractor's handling, storage, or use of such Owner-furnished material. The Owner will deduct from any monies due or to become due the Contractor any cost incurred by the Owner in making good such loss due to the Contractor's handling, storage, or use of Owner-furnished materials.

END OF SECTION 60

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Section 70 Legal Regulations and Responsibility to Public

70-01 Laws to be observed. The Contractor shall keep fully informed of all federal and state laws, all local laws, ordinances, and regulations and all orders and decrees of bodies or tribunals having any jurisdiction or authority, which in any manner affect those engaged or employed on the work, or which in any way affect the conduct of the work. The Contractor shall at all times observe and comply with all such laws, ordinances, regulations, orders, and decrees; and shall protect and indemnify the Owner and all their officers, agents, or servants against any claim or liability arising from or based on the violation of any such law, ordinance, regulation, order, or decree, whether by the Contractor or the Contractor's employees.

70-02 Permits, licenses, and taxes. The Contractor shall procure all permits and licenses, pay all charges, fees, and taxes, and give all notices necessary and incidental to the due and lawful execution of the work.

70-03 Patented devices, materials, and processes. If the Contractor is required or desires to use any design, device, material, or process covered by letters of patent or copyright, the Contractor shall provide for such use by suitable legal agreement with the Patentee or Owner. The Contractor and the surety shall indemnify and hold harmless the Owner, any third party, or political subdivision from any and all claims for infringement by reason of the use of any such patented design, device, material or process, or any trademark or copyright, and shall indemnify the Owner for any costs, expenses, and damages which it may be obliged to pay by reason of an infringement, at any time during the execution or after the completion of the work.

70-04 Restoration of surfaces disturbed by others. The Owner reserves the right to authorize the construction, reconstruction, or maintenance of any public or private utility service, FAA or National Oceanic and Atmospheric Administration (NOAA) facility, or a utility service of another government agency at any time during the progress of the work. To the extent that such construction, reconstruction, or maintenance has been coordinated with the Owner, such authorized work (by others) must be shown on the plans and is indicated as follows: No other utility work is proposed at this time.

Facility or Utility	**Contact**	**Phone #**
Lebanon Municipal Airport	Carl Gross	603-298-8878
FAA SSC	Eddie Cyr	802-238-5846
Liberty Utilities	Erin Guzman	603-306-8223

Except as listed above, the Contractor shall not permit any individual, firm, or corporation to excavate or otherwise disturb such utility services or facilities located within the limits of the work without the written permission of the RPR.

Should the Owner of public or private utility service, FAA, or NOAA facility, or a utility service of another government agency be authorized to construct, reconstruct, or maintain such utility service or facility during the progress of the work, the Contractor shall cooperate with such Owners by arranging and performing the work in this contract to facilitate such construction, reconstruction or maintenance by others whether or not such work by others is listed above. When ordered as extra work by the RPR, the Contractor shall make all necessary repairs to the work which are due to such authorized work by others, unless otherwise provided for in the contract, plans, or specifications. It is understood and agreed that the

Contractor shall not be entitled to make any claim for damages due to such authorized work by others or for any delay to the work resulting from such authorized work.

70-05 Federal Participation. The United States Government has agreed to reimburse the Owner for some portion of the contract costs. The contract work is subject to the inspection and approval of duly authorized representatives of the FAA Administrator. No requirement of this contract shall be construed as making the United States a party to the contract nor will any such requirement interfere, in any way, with the rights of either party to the contract.

70-06 Sanitary, health, and safety provisions. The Contractor's worksite and facilities shall comply with applicable federal, state, and local requirements for health, safety and sanitary provisions.

70-07 Public convenience and safety. The Contractor shall control their operations and those of their subcontractors and all suppliers, to assure the least inconvenience to the traveling public. Under all circumstances, safety shall be the most important consideration.

The Contractor shall maintain the free and unobstructed movement of aircraft and vehicular traffic with respect to their own operations and those of their own subcontractors and all suppliers in accordance with Section 40, paragraph 40-05, *Maintenance of Traffic,* and shall limit such operations for the convenience and safety of the traveling public as specified in Section 80, paragraph 80-04, *Limitation of Operations*.

The Contractor shall remove or control debris and rubbish resulting from its work operations at frequent intervals, and upon the order of the RPR. If the RPR determines the existence of Contractor debris in the work site represents a hazard to airport operations and the Contractor is unable to respond in a prompt and reasonable manner, the RPR reserves the right to assign the task of debris removal to a third party and recover the resulting costs as a liquidated damage against the Contractor.

70-08 Construction Safety and Phasing Plan (CSPP). The Contractor shall complete the work in accordance with the approved Construction Safety and Phasing Plan (CSPP) developed in accordance with AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP is on sheet(s) G100 and G200 series of the project plans.

70-09 Use of explosives. The use of explosives is not permitted on this project.

70-10 Protection and restoration of property and landscape. The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer/RPR has witnessed or otherwise referenced their location and shall not move them until directed.

The Contractor shall be responsible for all damage or injury to property of any character, during the execution of the work, resulting from any act, omission, neglect, or misconduct in manner or method of executing the work, or at any time due to defective work or materials, and said responsibility shall not be released until the project has been completed and accepted.

When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or in consequence of the non-execution thereof by the Contractor, the Contractor shall restore, at their expense, such property to a condition similar or equal to that existing before such damage or injury was done, by repairing, or otherwise restoring as may be directed, or the Contractor shall make good such damage or injury in an acceptable manner.

70-11 Responsibility for damage claims. The Contractor shall indemnify and hold harmless the Engineer/RPR and the Owner and their officers, agents, and employees from all suits, actions, or claims, of any character, brought because of any injuries or damage received or sustained by any person, persons, or property on account of the operations of the Contractor; or on account of or in consequence of any

neglect in safeguarding the work; or through use of unacceptable materials in constructing the work; or because of any act or omission, neglect, or misconduct of said Contractor; or because of any claims or amounts recovered from any infringements of patent, trademark, or copyright; or from any claims or amounts arising or recovered under the "Workmen's Compensation Act," or any other law, ordinance, order, or decree. Money due the Contractor under and by virtue of their own contract considered necessary by the Owner for such purpose may be retained for the use of the Owner or, in case no money is due, their own surety may be held until such suits, actions, or claims for injuries or damages shall have been settled and suitable evidence to that effect furnished to the Owner, except that money due the Contractor will not be withheld when the Contractor produces satisfactory evidence that he or she is adequately protected by public liability and property damage insurance.

70-12 Third party beneficiary clause. It is specifically agreed between the parties executing the contract that it is not intended by any of the provisions of any part of the contract to create for the public or any member thereof, a third-party beneficiary or to authorize anyone not a party to the contract to maintain a suit for personal injuries or property damage pursuant to the terms or provisions of the contract.

70-13 Opening sections of the work to traffic. If it is necessary for the Contractor to complete portions of the contract work for the beneficial occupancy of the Owner prior to completion of the entire contract, such "phasing" of the work must be specified below and indicated on the approved Construction Safety and Phasing Plan (CSPP) and the project plans. When so specified, the Contractor shall complete such portions of the work on or before the date specified or as otherwise specified.

Upon completion of any portion of work listed above, such portion shall be accepted by the Owner in accordance with Section 50, paragraph 50-14, *Partial Acceptance*.

No portion of the work may be opened by the Contractor until directed by the Owner in writing. Should it become necessary to open a portion of the work to traffic on a temporary or intermittent basis, such openings shall be made when, in the opinion of the RPR, such portion of the work is in an acceptable condition to support the intended traffic. Temporary or intermittent openings are considered to be inherent in the work and shall not constitute either acceptance of the portion of the work so opened or a waiver of any provision of the contract. Any damage to the portion of the work so opened that is not attributable to traffic which is permitted by the Owner shall be repaired by the Contractor at their expense.

The Contractor shall make their own estimate of the inherent difficulties involved in completing the work under the conditions herein described and shall not claim any added compensation by reason of delay or increased cost due to opening a portion of the contract work.

The Contractor must conform to safety standards contained AC 150/5370-2 and the approved CSPP.

Contractor shall refer to the plans, specifications, and the approved CSPP to identify barricade requirements, temporary and/or permanent markings, airfield lighting, guidance signs and other safety requirements prior to opening up sections of work to traffic.

70-14 Contractor's responsibility for work. Until the RPR's final written acceptance of the entire completed work, excepting only those portions of the work accepted in accordance with Section 50, paragraph 50-14, *Partial Acceptance*, the Contractor shall have the charge and care thereof and shall take every precaution against injury or damage to any part due to the action of the elements or from any other cause, whether arising from the execution or from the non-execution of the work. The Contractor shall rebuild, repair, restore, and make good all injuries or damages to any portion of the work occasioned by any of the above causes before final acceptance and shall bear the expense thereof except damage to the work due to unforeseeable causes beyond the control of and without the fault or negligence of the Contractor, including but not restricted to acts of God such as earthquake, tidal wave, tornado, hurricane or other cataclysmic phenomenon of nature, or acts of the public enemy or of government authorities.

If the work is suspended for any cause whatever, the Contractor shall be responsible for the work and shall take such precautions necessary to prevent damage to the work. The Contractor shall provide for normal drainage and shall erect necessary temporary structures, signs, or other facilities at their own expense. During such period of suspension of work, the Contractor shall properly and continuously maintain in an acceptable growing condition all living material in newly established planting, seeding, and sodding furnished under the contract, and shall take adequate precautions to protect new tree growth and other important vegetative growth against injury.

70-15 Contractor's responsibility for utility service and facilities of others. As provided in paragraph 70-04, *Restoration of Surfaces Disturbed by Others*, the Contractor shall cooperate with the owner of any public or private utility service, FAA or NOAA, or a utility service of another government agency that may be authorized by the Owner to construct, reconstruct or maintain such utility services or facilities during the progress of the work. In addition, the Contractor shall control their operations to prevent the unscheduled interruption of such utility services and facilities.

To the extent that such public or private utility services, FAA, or NOAA facilities, or utility services of another governmental agency are known to exist within the limits of the contract work, the approximate locations have been indicated on the plans and/or in the contract documents.

Contacts for such work are provided in Section 70-04.

It is understood and agreed that the Owner does not guarantee the accuracy or the completeness of the location information relating to existing utility services, facilities, or structures that may be shown on the plans or encountered in the work. Any inaccuracy or omission in such information shall not relieve the Contractor of the responsibility to protect such existing features from damage or unscheduled interruption of service.

It is further understood and agreed that the Contractor shall, upon execution of the contract, notify the Owners of all utility services or other facilities of their plan of operations. Such notification shall be in writing addressed to "The Person to Contact" as provided in this paragraph and paragraph 70-04, *Restoration of Surfaces Disturbed By Others*. A copy of each notification shall be given to the RPR.

In addition to the general written notification provided, it shall be the responsibility of the Contractor to keep such individual Owners advised of changes in their plan of operations that would affect such Owners.

Prior to beginning the work in the general vicinity of an existing utility service or facility, the Contractor shall again notify each such Owner of their plan of operation. If, in the Contractor's opinion, the Owner's assistance is needed to locate the utility service or facility or the presence of a representative of the Owner is desirable to observe the work, such advice should be included in the notification. Such notification shall be given by the most expeditious means to reach the utility owner's "Person to Contact" no later than two normal business days prior to the Contractor's commencement of operations in such general vicinity. The Contractor shall furnish a written summary of the notification to the RPR.

The Contractor's failure to give the two days' notice shall be cause for the Owner to suspend the Contractor's operations in the general vicinity of a utility service or facility.

Where the outside limits of an underground utility service have been located and staked on the ground, the Contractor shall be required to use hand excavation methods within 3 feet (1 m) of such outside limits at such points as may be required to ensure protection from damage due to the Contractor's operations.

Should the Contractor damage or interrupt the operation of a utility service or facility by accident or otherwise, the Contractor shall immediately notify the proper authority and the RPR and shall take all reasonable measures to prevent further damage or interruption of service. The Contractor, in such events,

shall cooperate with the utility service or facility owner and the RPR continuously until such damage has been repaired and service restored to the satisfaction of the utility or facility owner.

The Contractor shall bear all costs of damage and restoration of service to any utility service or facility due to their operations whether due to negligence or accident. The Owner reserves the right to deduct such costs from any monies due or which may become due the Contractor, or their own surety.

70-15.1 FAA facilities and cable runs. The Contractor is hereby advised that the construction limits of the project include existing facilities and buried cable runs that are owned, operated and maintained by the FAA. The Contractor, during the execution of the project work, shall comply with the following:

a. The Contractor shall permit FAA maintenance personnel the right of access to the project work site for purposes of inspecting and maintaining all existing FAA owned facilities.

b. The Contractor shall provide notice to the FAA Air Traffic Organization (ATO)/Technical Operations/System Support Center (SSC) Point-of-Contact through the airport manager a minimum of seven (7) calendar days prior to commencement of construction activities in order to permit sufficient time to locate and mark existing buried cables and to schedule any required facility outages.

c. If execution of the project work requires a facility outage, the Contractor shall contact the FAA Point-of-Contact a minimum of 72 hours prior to the time of the required outage.

d. Any damage to FAA cables, access roads, or FAA facilities during construction caused by the Contractor's equipment or personnel whether by negligence or accident will require the Contractor to repair or replace the damaged cables, access road, or FAA facilities to FAA requirements. The Contractor shall not bear the cost to repair damage to underground facilities or utilities improperly located by the FAA.

e. If the project work requires the cutting or splicing of FAA owned cables, the FAA Point-of-Contact shall be contacted a minimum of 72 hours prior to the time the cable work commences. The FAA reserves the right to have a FAA representative on site to observe the splicing of the cables as a condition of acceptance. All cable splices are to be accomplished in accordance with FAA specifications and require approval by the FAA Point-of-Contact as a condition of acceptance by the Owner. The Contractor is hereby advised that FAA restricts the location of where splices may be installed. If a cable splice is required in a location that is not permitted by FAA, the Contractor shall furnish and install a sufficient length of new cable that eliminates the need for any splice.

70-16 Furnishing rights-of-way. The Owner will be responsible for furnishing all rights-of-way upon which the work is to be constructed in advance of the Contractor's operations.

70-17 Personal liability of public officials. In carrying out any of the contract provisions or in exercising any power or authority granted by this contract, there shall be no liability upon the Engineer, RPR, their authorized representatives, or any officials of the Owner either personally or as an official of the Owner. It is understood that in such matters they act solely as agents and representatives of the Owner.

70-18 No waiver of legal rights. Upon completion of the work, the Owner will expeditiously make final inspection and notify the Contractor of final acceptance. Such final acceptance, however, shall not preclude or stop the Owner from correcting any measurement, estimate, or certificate made before or after completion of the work, nor shall the Owner be precluded or stopped from recovering from the Contractor or their surety, or both, such overpayment as may be sustained, or by failure on the part of the Contractor to fulfill their obligations under the contract. A waiver on the part of the Owner of any breach of any part of the contract shall not be held to be a waiver of any other or subsequent breach.

The Contractor, without prejudice to the terms of the contract, shall be liable to the Owner for latent defects, fraud, or such gross mistakes as may amount to fraud, or as regards the Owner's rights under any warranty or guaranty.

70-19 Environmental protection. The Contractor shall comply with all federal, state, and local laws and regulations controlling pollution of the environment. The Contractor shall take necessary precautions to prevent pollution of streams, lakes, ponds, and reservoirs with fuels, oils, asphalts, chemicals, or other harmful materials and to prevent pollution of the atmosphere from particulate and gaseous matter.

70-20 Archaeological and historical findings. Unless otherwise specified in this subsection, the Contractor is advised that the site of the work is not within any property, district, or site, and does not contain any building, structure, or object listed in the current National Register of Historic Places published by the United States Department of Interior.

Should the Contractor encounter, during their operations, any building, part of a building, structure, or object that is incongruous with its surroundings, the Contractor shall immediately cease operations in that location and notify the RPR. The RPR will immediately investigate the Contractor's finding and the Owner will direct the Contractor to either resume operations or to suspend operations as directed.

Should the Owner order suspension of the Contractor's operations in order to protect an archaeological or historical finding, or order the Contractor to perform extra work, such shall be covered by an appropriate contract change order or supplemental agreement as provided in Section 40, paragraph 40-04, *Extra Work,* and Section 90, paragraph 90-05, *Payment for Extra Work*. If appropriate, the contract change order or supplemental agreement shall include an extension of contract time in accordance with Section 80, paragraph 80-07, *Determination and Extension of Contract Time*.

70-21 Insurance Requirements. Minimum insurance coverage requirements are outlined in the City of Lebanon's Terms and Conditions.

END OF SECTION 70

Section 80 Execution and Progress

80-01 Subletting of contract. The Owner will not recognize any subcontractor on the work. The Contractor shall at all times when work is in progress be represented either in person, by a qualified superintendent, or by other designated, qualified representative who is duly authorized to receive and execute orders of the Resident Project Representative (RPR).

The Contractor shall perform, with his organization, an amount of work equal to at least **25** percent of the total contract cost.

Should the Contractor elect to assign their contract, said assignment shall be concurred in by the surety, shall be presented for the consideration and approval of the Owner, and shall be consummated only on the written approval of the Owner.

The Contractor shall provide copies of all subcontracts to the RPR 14 days prior to being utilized on the project. As a minimum, the information shall include the following:

- Subcontractor's legal company name.
- Subcontractor's legal company address, including County name.
- Principal contact person's name, telephone and fax number.
- Complete narrative description, and dollar value of the work to be performed by the subcontractor.
- Copies of required insurance certificates in accordance with the specifications.
- Minority/ non-minority status.

80-02 Notice to proceed (NTP). The Owners notice to proceed will state the date on which contract time commences. The Contractor is expected to commence project operations within **10** days of the NTP date. The Contractor shall notify the RPR at least **24** hours in advance of the time contract operations begins. The Contractor shall not commence any actual operations prior to the date on which the notice to proceed is issued by the Owner.

80-03 Execution and progress. Unless otherwise specified, the Contractor shall submit their coordinated construction schedule showing all work activities for the RPR's review and acceptance at least **10 days** prior to the start of work. The Contractor's progress schedule, once accepted by the RPR, will represent the Contractor's baseline plan to accomplish the project in accordance with the terms and conditions of the Contract. The RPR will compare actual Contractor progress against the baseline schedule to determine that status of the Contractor's performance. The Contractor shall provide sufficient materials, equipment, and labor to guarantee the completion of the project in accordance with the plans and specifications within the time set forth in the proposal.

If the Contractor falls significantly behind the submitted schedule, the Contractor shall, upon the RPR's request, submit a revised schedule for completion of the work within the contract time and modify their operations to provide such additional materials, equipment, and labor necessary to meet the revised schedule. Should the execution of the work be discontinued for any reason, the Contractor shall notify the RPR at least **24 hours** in advance of resuming operations.

The Contractor shall not commence any actual construction prior to the date on which the NTP is issued by the Owner.

The project schedule shall be prepared as a network diagram in Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), or other format, or as otherwise specified. It shall include information on the sequence of work activities, milestone dates, and activity duration. The schedule shall show all work items identified in the project proposal for each work area and shall include the project start date and end date.

The Contractor shall maintain the work schedule and provide an update and analysis of the progress schedule on a **twice** monthly basis, or as otherwise specified in the contract. Submission of the work schedule shall not relieve the Contractor of overall responsibility for scheduling, sequencing, and coordinating all work to comply with the requirements of the contract.

80-04 Limitation of operations. The Contractor shall control their operations and the operations of their subcontractors and all suppliers to provide for the free and unobstructed movement of aircraft in the air operations areas (AOA) of the airport.

When the work requires the Contractor to conduct their operations within an AOA of the airport, the work shall be coordinated with airport operations (through the RPR) at least **48 hours** prior to commencement of such work. The Contractor shall not close an AOA until so authorized by the RPR and until the necessary temporary marking, signage and associated lighting is in place as provided in Section 70, paragraph 70-08, *Construction Safety and Phasing Plan (CSPP)*.

When the contract work requires the Contractor to work within an AOA of the airport on an intermittent basis (intermittent opening and closing of the AOA), the Contractor shall maintain constant communications as specified; immediately obey all instructions to vacate the AOA; and immediately obey all instructions to resume work in such AOA. Failure to maintain the specified communications or to obey instructions shall be cause for suspension of the Contractor's operations in the AOA until satisfactory conditions are provided. The areas of the AOA identified in the Construction Safety Phasing Plan (CSPP) and as listed below, cannot be closed to operating aircraft to permit the Contractor's operations on a continuous basis and will therefore be closed to aircraft operations intermittently as follows:

Runway 7-25 shall remain open at all times during the construction project.

Runway 18-36 shall remain open at all times except for the runway closure period identified in the CSPP.

Refer to the CSPP and the phasing plan drawings for additional AOA closures.

The Contractor shall be required to conform to safety standards contained in AC 150/5370-2, Operational Safety on Airports During Construction and the approved CSPP.

80-04.1 Operational safety on airport during construction. All Contractors' operations shall be conducted in accordance with the approved project Construction Safety and Phasing Plan (CSPP) and the Safety Plan Compliance Document (SPCD) and the provisions set forth within the current version of AC 150/5370-2, Operational Safety on Airports During Construction. The CSPP included within the contract documents conveys minimum requirements for operational safety on the airport during construction activities. The Contractor shall prepare and submit a SPCD that details how it proposes to comply with the requirements presented within the CSPP.

The Contractor shall implement all necessary safety plan measures prior to commencement of any work activity. The Contractor shall conduct routine checks to assure compliance with the safety plan measures.

The Contractor is responsible to the Owner for the conduct of all subcontractors it employs on the project. The Contractor shall assure that all subcontractors are made aware of the requirements of the CSPP and SPCD and that they implement and maintain all necessary measures.

No deviation or modifications may be made to the approved CSPP and SPCD unless approved in writing by the Owner. The necessary coordination actions to review Contractor proposed modifications to an approved CSPP or approved SPCD can require a significant amount of time.

80-05 Character of workers, methods, and equipment. The Contractor shall, at all times, employ sufficient labor and equipment for prosecuting the work to full completion in the manner and time required by the contract, plans, and specifications.

All workers shall have sufficient skill and experience to perform properly the work assigned to them. Workers engaged in special work or skilled work shall have sufficient experience in such work and in the operation of the equipment required to perform the work satisfactorily.

Any person employed by the Contractor or by any subcontractor who violates any operational regulations or operational safety requirements and, in the opinion of the RPR, does not perform his work in a proper and skillful manner or is intemperate or disorderly shall, at the written request of the RPR, be removed immediately by the Contractor or subcontractor employing such person, and shall not be employed again in any portion of the work without approval of the RPR.

Should the Contractor fail to remove such person or persons, or fail to furnish suitable and sufficient personnel for the proper execution of the work, the RPR may suspend the work by written notice until compliance with such orders.

All equipment that is proposed to be used on the work shall be of sufficient size and in such mechanical condition as to meet requirements of the work and to produce a satisfactory quality of work. Equipment used on any portion of the work shall not cause injury to previously completed work, adjacent property, or existing airport facilities due to its use.

When the methods and equipment to be used by the Contractor in accomplishing the work are not prescribed in the contract, the Contractor is free to use any methods or equipment that will accomplish the work in conformity with the requirements of the contract, plans, and specifications.

When the contract specifies the use of certain methods and equipment, such methods and equipment shall be used unless otherwise authorized by the RPR. If the Contractor desires to use a method or type of equipment other than specified in the contract, the Contractor may request authority from the RPR to do so. The request shall be in writing and shall include a full description of the methods and equipment proposed and of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor will be fully responsible for producing work in conformity with contract requirements. If, after trial use of the substituted methods or equipment, the RPR determines that the work produced does not meet contract requirements, the Contractor shall discontinue the use of the substitute method or equipment and shall complete the remaining work with the specified methods and equipment. The Contractor shall remove any deficient work and replace it with work of specified quality, or take such other corrective action as the RPR may direct. No change will be made in basis of payment for the contract items involved nor in contract time as a result of authorizing a change in methods or equipment under this paragraph.

80-06 Temporary suspension of the work. The Owner shall have the authority to suspend the work wholly, or in part, for such period or periods the Owner may deem necessary, due to unsuitable weather, or other conditions considered unfavorable for the execution of the work, or for such time necessary due

to the failure on the part of the Contractor to carry out orders given or perform any or all provisions of the contract.

In the event that the Contractor is ordered by the Owner, in writing, to suspend work for some unforeseen cause not otherwise provided for in the contract and over which the Contractor has no control, the Contractor may be reimbursed for actual money expended on the work during the period of shutdown. No allowance will be made for anticipated profits. The period of shutdown shall be computed from the effective date of the written order to suspend work to the effective date of the written order to resume the work. Claims for such compensation shall be filed with the RPR within the time period stated in the RPR's order to resume work. The Contractor shall submit with their own claim information substantiating the amount shown on the claim. The RPR will forward the Contractor's claim to the Owner for consideration in accordance with local laws or ordinances. No provision of this article shall be construed as entitling the Contractor to compensation for delays due to inclement weather or for any other delay provided for in the contract, plans, or specifications.

If it becomes necessary to suspend work for an indefinite period, the Contractor shall store all materials in such manner that they will not become an obstruction nor become damaged in any way. The Contractor shall take every precaution to prevent damage or deterioration of the work performed and provide for normal drainage of the work. The Contractor shall erect temporary structures where necessary to provide for traffic on, to, or from the airport.

80-07 Determination and extension of contract time. The **number of calendar days** shall be stated in the proposal and contract and shall be known as the Contract Time.

If the contract time requires extension for reasons beyond the Contractor's control, it shall be adjusted as follows:

80-07.1 Contract time based on calendar days. Contract Time based on calendar days shall consist of the number of calendar days stated in the contract counting from the effective date of the Notice to Proceed and including all Saturdays, Sundays, holidays, and non-work days. All calendar days elapsing between the effective dates of the Owner's orders to suspend and resume all work, due to causes not the fault of the Contractor, shall be excluded.

At the time of final payment, the contract time shall be increased in the same proportion as the cost of the actually completed quantities bears to the cost of the originally estimated quantities in the proposal. Such increase in the contract time shall not consider either cost of work or the extension of contract time that has been covered by a change order or supplemental agreement. Charges against the contract time will cease as of the date of final acceptance.

80-08 Failure to complete on time. For each calendar day or working day, as specified in the contract, that any work remains uncompleted after the contract time (including all extensions and adjustments as provided in paragraph 80-07, *Determination and Extension of Contract Time*) the sum specified in the contract and proposal as liquidated damages (LD) will be deducted from any money due or to become due the Contractor or their own surety. Such deducted sums shall not be deducted as a penalty but shall be considered as liquidation of a reasonable portion of damages including but not limited to additional engineering services that will be incurred by the Owner should the Contractor fail to complete the work in the time provided in their contract.

Schedule	Liquidated Damages Cost	Allowed Construction Time
All Phases	$2,500 / calendar day	168 Days Maximum Construction Time

The maximum construction time allowed for Schedules **1 through 5 and including A1 and A2** will be the sum of the time allowed for individual schedules but not more than **168** calendar days. Permitting the Contractor to continue and finish the work or any part of it after the time fixed for its completion, or after the date to which the time for completion may have been extended, will in no way operate as a wavier on the part of the Owner of any of its rights under the contract.

80-09 Default and termination of contract. The Contractor shall be considered in default of their contract and such default will be considered as cause for the Owner to terminate the contract for any of the following reasons, if the Contractor:

a. Fails to begin the work under the contract within the time specified in the Notice to Proceed, or

b. Fails to perform the work or fails to provide sufficient workers, equipment and/or materials to assure completion of work in accordance with the terms of the contract, or

c. Performs the work unsuitably or neglects or refuses to remove materials or to perform anew such work as may be rejected as unacceptable and unsuitable, or

d. Discontinues the execution of the work, or

e. Fails to resume work which has been discontinued within a reasonable time after notice to do so, or

f. Becomes insolvent or is declared bankrupt, or commits any act of bankruptcy or insolvency, or

g. Allows any final judgment to stand against the Contractor unsatisfied for a period of 10 days, or

h. Makes an assignment for the benefit of creditors, or

i. For any other cause whatsoever, fails to carry on the work in an acceptable manner.

Should the Owner consider the Contractor in default of the contract for any reason above, the Owner shall immediately give written notice to the Contractor and the Contractor's surety as to the reasons for considering the Contractor in default and the Owner's intentions to terminate the contract.

If the Contractor or surety, within a period of 10 days after such notice, does not proceed in accordance therewith, then the Owner will, upon written notification from the RPR of the facts of such delay, neglect, or default and the Contractor's failure to comply with such notice, have full power and authority without violating the contract, to take the execution of the work out of the hands of the Contractor. The Owner may appropriate or use any or all materials and equipment that have been mobilized for use in the work and are acceptable and may enter into an agreement for the completion of said contract according to the terms and provisions thereof, or use such other methods as in the opinion of the RPR will be required for the completion of said contract in an acceptable manner.

All costs and charges incurred by the Owner, together with the cost of completing the work under contract, will be deducted from any monies due or which may become due the Contractor. If such expense exceeds the sum which would have been payable under the contract, then the Contractor and the surety shall be liable and shall pay to the Owner the amount of such excess.

80-10 Termination for national emergencies. The Owner shall terminate the contract or portion thereof by written notice when the Contractor is prevented from proceeding with the construction contract as a direct result of an Executive Order of the President with respect to the execution of war or in the interest of national defense.

When the contract, or any portion thereof, is terminated before completion of all items of work in the contract, payment will be made for the actual number of units or items of work completed at the contract price or as mutually agreed for items of work partially completed or not started. No claims or loss of anticipated profits shall be considered.

Reimbursement for organization of the work, and other overhead expenses, (when not otherwise included in the contract) and moving equipment and materials to and from the job will be considered, the intent being that an equitable settlement will be made with the Contractor.

Acceptable materials, obtained or ordered by the Contractor for the work and that are not incorporated in the work shall, at the option of the Contractor, be purchased from the Contractor at actual cost as shown by receipted bills and actual cost records at such points of delivery as may be designated by the RPR.

Termination of the contract or a portion thereof shall neither relieve the Contractor of their responsibilities for the completed work nor shall it relieve their surety of its obligation for and concerning any just claim arising out of the work performed.

80-11 Work area, storage area and sequence of operations. The Contractor shall obtain approval from the RPR prior to beginning any work in all areas of the airport. No operating runway, taxiway, or air operations area (AOA) shall be crossed, entered, or obstructed while it is operational. The Contractor shall plan and coordinate work in accordance with the approved CSPP and SPCD.

END OF SECTION 80

Section 90 Measurement and Payment

90-01 Measurement of quantities. All work completed under the contract will be measured by the RPR, or their authorized representatives, using **United States Customary Units of Measurement**.

The method of measurement and computations to be used in determination of quantities of material furnished and of work performed under the contract will be those methods generally recognized as conforming to good engineering practice.

Unless otherwise specified, longitudinal measurements for area computations will be made horizontally, and no deductions will be made for individual fixtures (or leave-outs) having an area of 9 square feet (0.8 square meters) or less. Unless otherwise specified, transverse measurements for area computations will be the neat dimensions shown on the plans or ordered in writing by the RPR.

Unless otherwise specified, all contract items which are measured by the linear foot such as electrical ducts, conduits, pipe culverts, underdrains, and similar items shall be measured parallel to the base or foundation upon which such items are placed.

The term “lump sum” when used as an item of payment will mean complete payment for the work described in the contract. When a complete structure or structural unit (in effect, “lump sum” work) is specified as the unit of measurement, the unit will be construed to include all necessary fittings and accessories.

When requested by the Contractor and approved by the RPR in writing, material specified to be measured by the cubic yard (cubic meter) may be weighed, and such weights will be converted to cubic yards (cubic meters) for payment purposes. Factors for conversion from weight measurement to volume measurement will be determined by the RPR and shall be agreed to by the Contractor before such method of measurement of pay quantities is used.

Measurement and Payment Terms

Term	Description
Excavation and Embankment Volume	In computing volumes of excavation, the average end area method will be used unless otherwise specified.
Measurement and Proportion by Weight	The term “ton” will mean the short ton consisting of 2,000 pounds (907 km) avoirdupois. All materials that are measured or proportioned by weights shall be weighed on accurate, independently certified scales by competent, qualified personnel at locations designated by the RPR. If material is shipped by rail, the car weight may be accepted provided that only the actual weight of material is paid for. However, car weights will not be acceptable for material to be passed through mixing plants. Trucks used to haul material being paid for by weight shall be weighed empty daily at such times as the RPR directs, and each truck shall bear a plainly legible identification mark.

Term	Description
Measurement by Volume	Materials to be measured by volume in the hauling vehicle shall be hauled in approved vehicles and measured therein at the point of delivery. Vehicles for this purpose may be of any size or type acceptable for the materials hauled, provided that the body is of such shape that the actual contents may be readily and accurately determined. All vehicles shall be loaded to at least their water level capacity, and all loads shall be leveled when the vehicles arrive at the point of delivery.
Asphalt Material	Asphalt materials will be measured by the gallon (liter) or ton (kg). When measured by volume, such volumes will be measured at 60°F (16°C) or will be corrected to the volume at 60°F (16°C) using ASTM D1250 for asphalts. Net certified scale weights or weights based on certified volumes in the case of rail shipments will be used as a basis of measurement, subject to correction when asphalt material has been lost from the car or the distributor, wasted, or otherwise not incorporated in the work. When asphalt materials are shipped by truck or transport, net certified weights by volume, subject to correction for loss or foaming, will be used for computing quantities.
Cement	Cement will be measured by the ton (kg) or hundredweight (km).
Structure	Structures will be measured according to neat lines shown on the plans or as altered to fit field conditions.
Timber	Timber will be measured by the thousand feet board measure (MFBM) actually incorporated in the structure. Measurement will be based on nominal widths and thicknesses and the extreme length of each piece.
Plates and Sheets	The thickness of plates and galvanized sheet used in the manufacture of corrugated metal pipe, metal plate pipe culverts and arches, and metal cribbing will be specified and measured in decimal fraction of inch.
Miscellaneous Items	When standard manufactured items are specified such as fence, wire, plates, rolled shapes, pipe conduit, etc., and these items are identified by gauge, unit weight, section dimensions, etc., such identification will be considered to be nominal weights or dimensions. Unless more stringently controlled by tolerances in cited specifications, manufacturing tolerances established by the industries involved will be accepted.
Scales	Scales must be tested for accuracy and serviced before use. Scales for weighing materials which are required to be proportioned or measured and paid for by weight shall be furnished, erected, and maintained by the Contractor, or be certified permanently installed commercial scales. Platform scales shall be installed and maintained with the platform level and rigid bulkheads at each end. Scales shall be accurate within 0.5% of the correct weight throughout the range of use. The Contractor shall have the scales checked under the observation of the RPR before beginning work and at such other times as requested. The intervals

Term	Description
	shall be uniform in spacing throughout the graduated or marked length of the beam or dial and shall not exceed 0.1% of the nominal rated capacity of the scale, but not less than one pound (454 grams). The use of spring balances will not be permitted. In the event inspection reveals the scales have been "overweighing" (indicating more than correct weight) they will be immediately adjusted. All materials received subsequent to the last previous correct weighting-accuracy test will be reduced by the percentage of error in excess of 0.5%. In the event inspection reveals the scales have been under-weighing (indicating less than correct weight), they shall be immediately adjusted. No additional payment to the Contractor will be allowed for materials previously weighed and recorded. Beams, dials, platforms, and other scale equipment shall be so arranged that the operator and the RPR can safely and conveniently view them. Scale installations shall have available ten standard 50-pound (2.3 km) weights for testing the weighing equipment or suitable weights and devices for other approved equipment. All costs in connection with furnishing, installing, certifying, testing, and maintaining scales; for furnishing check weights and scale house; and for all other items specified in this subsection, for the weighing of materials for proportioning or payment, shall be included in the unit contract prices for the various items of the project.
Rental Equipment	Rental of equipment will be measured by time in hours of actual working time and necessary traveling time of the equipment within the limits of the work. Special equipment ordered in connection with extra work will be measured as agreed in the change order or supplemental agreement authorizing such work as provided in paragraph 90-05 *Payment for Extra Work*.
Pay Quantities	When the estimated quantities for a specific portion of the work are designated as the pay quantities in the contract, they shall be the final quantities for which payment for such specific portion of the work will be made, unless the dimensions of said portions of the work shown on the plans are revised by the RPR. If revised dimensions result in an increase or decrease in the quantities of such work, the final quantities for payment will be revised in the amount represented by the authorized changes in the dimensions.

90-02 Scope of payment. The Contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the execution thereof, subject to the provisions of Section 70, paragraph 70-18, *No Waiver of Legal Rights*.

When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material

will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

90-03 Compensation for altered quantities. When the accepted quantities of work vary from the quantities in the proposal, the Contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, except as provided for in Section 40, paragraph 40-02, *Alteration of Work and Quantities,* will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the Contractor which results directly from such alterations or indirectly from their own unbalanced allocation of overhead and profit among the contract items, or from any other cause.

90-04 Payment for omitted items. As specified in Section 40, paragraph 40-03, *Omitted Items,* the RPR shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the Owner.

Should the RPR omit or order nonperformance of a contract item or portion of such item from the work, the Contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the RPR's order to omit or non-perform such contract item.

Acceptable materials ordered by the Contractor or delivered on the work prior to the date of the RPR's order will be paid for at the actual cost to the Contractor and shall thereupon become the property of the Owner.

In addition to the reimbursement hereinbefore provided, the Contractor shall be reimbursed for all actual costs incurred for the purpose of performing the omitted contract item prior to the date of the RPR's order. Such additional costs incurred by the Contractor must be directly related to the deleted contract item and shall be supported by certified statements by the Contractor as to the nature the amount of such costs.

90-05 Payment for extra work. Extra work, performed in accordance with Section 40, paragraph 40-04, *Extra Work*, will be paid for at the contract prices or agreed prices specified in the change order or supplemental agreement authorizing the extra work.

90-06 Partial payments. Partial payments will be made to the Contractor at least once each month as the work progresses. Said payments will be based upon estimates, prepared by the RPR, of the value of the work performed and materials complete and in place, in accordance with the contract, plans, and specifications. Such partial payments may also include the delivered actual cost of those materials stockpiled and stored in accordance with paragraph 90-07, *Payment for Materials on Hand*. No partial payment will be made when the amount due to the Contractor since the last estimate amounts to less than five hundred dollars.

a. From the total of the amount determined to be payable on a partial payment, **five (5)** percent of such total amount will be deducted and retained by the Owner for protection of the Owner's interests. Unless otherwise instructed by the Owner, the amount retained by the Owner will be in effect until the final payment is made except as follows:

(1) Contractor may request release of retainage on work that has been partially accepted by the Owner in accordance with Section 50-14. Contractor must provide a certified invoice to the RPR that supports the value of retainage held by the Owner for partially accepted work.

(2) In lieu of retainage, the Contractor may exercise at its option the establishment of an escrow account per paragraph 90-08.

b. The Contractor is required to pay all subcontractors for satisfactory performance of their contracts no later than 30 days after the Contractor has received a partial payment. Contractor must provide the Owner evidence of prompt and full payment of retainage held by the prime Contractor to the subcontractor within 30 days after the subcontractor's work is satisfactorily completed. A subcontractor's work is satisfactorily completed when all the tasks called for in the subcontract have been accomplished and documented as required by the Owner. When the Owner has made an incremental acceptance of a portion of a prime contract, the work of a subcontractor covered by that acceptance is deemed to be satisfactorily completed.

c. When at least 95% of the work has been completed to the satisfaction of the RPR, the RPR shall, at the Owner's discretion and with the consent of the surety, prepare estimates of both the contract value and the cost of the remaining work to be done. The Owner may retain an amount not less than twice the contract value or estimated cost, whichever is greater, of the work remaining to be done. The remainder, less all previous payments and deductions, will then be certified for payment to the Contractor.

It is understood and agreed that the Contractor shall not be entitled to demand or receive partial payment based on quantities of work in excess of those provided in the proposal or covered by approved change orders or supplemental agreements, except when such excess quantities have been determined by the RPR to be a part of the final quantity for the item of work in question.

No partial payment shall bind the Owner to the acceptance of any materials or work in place as to quality or quantity. All partial payments are subject to correction at the time of final payment as provided in paragraph 90-09, *Acceptance and Final Payment*.

The Contractor shall deliver to the Owner a complete release of all claims for labor and material arising out of this contract before the final payment is made. If any subcontractor or supplier fails to furnish such a release in full, the Contractor may furnish a bond or other collateral satisfactory to the Owner to indemnify the Owner against any potential lien or other such claim. The bond or collateral shall include all costs, expenses, and attorney fees the Owner may be compelled to pay in discharging any such lien or claim.

90-07 Payment for materials on hand. Partial payments may be made to the extent of the delivered cost of materials to be incorporated in the work, provided that such materials meet the requirements of the contract, plans, and specifications and are delivered to acceptable sites on the airport property or at other sites in the vicinity that are acceptable to the Owner. Such delivered costs of stored or stockpiled materials may be included in the next partial payment after the following conditions are met:

a. The material has been stored or stockpiled in a manner acceptable to the RPR at or on an approved site.

b. The Contractor has furnished the RPR with acceptable evidence of the quantity and quality of such stored or stockpiled materials.

c. The Contractor has furnished the RPR with satisfactory evidence that the material and transportation costs have been paid.

d. The Contractor has furnished the Owner legal title (free of liens or encumbrances of any kind) to the material stored or stockpiled.

e. The Contractor has furnished the Owner evidence that the material stored or stockpiled is insured against loss by damage to or disappearance of such materials at any time prior to use in the work.

It is understood and agreed that the transfer of title and the Owner's payment for such stored or stockpiled materials shall in no way relieve the Contractor of their responsibility for furnishing and placing such materials in accordance with the requirements of the contract, plans, and specifications.

In no case will the amount of partial payments for materials on hand exceed the contract price for such materials or the contract price for the contract item in which the material is intended to be used.

No partial payment will be made for stored or stockpiled living or perishable plant materials.

The Contractor shall bear all costs associated with the partial payment of stored or stockpiled materials in accordance with the provisions of this paragraph.

90-08 Payment of withheld funds. At the Contractor's option, if an Owner withholds retainage in accordance with the methods described in paragraph 90-06 *Partial Payments*, the Contractor may request that the Owner deposit the retainage into an escrow account. The Owner's deposit of retainage into an escrow account is subject to the following conditions:

a. The Contractor shall bear all expenses of establishing and maintaining an escrow account and escrow agreement acceptable to the Owner.

b. The Contractor shall deposit to and maintain in such escrow only those securities or bank certificates of deposit as are acceptable to the Owner and having a value not less than the retainage that would otherwise be withheld from partial payment.

c. The Contractor shall enter into an escrow agreement satisfactory to the Owner.

d. The Contractor shall obtain the written consent of the surety to such agreement.

90-09 Acceptance and final payment. When the contract work has been accepted in accordance with the requirements of Section 50, paragraph 50-15, *Final Acceptance*, the RPR will prepare the final estimate of the items of work actually performed. The Contractor shall approve the RPR's final estimate or advise the RPR of the Contractor's objections to the final estimate which are based on disputes in measurements or computations of the final quantities to be paid under the contract as amended by change order or supplemental agreement. The Contractor and the RPR shall resolve all disputes (if any) in the measurement and computation of final quantities to be paid within 30 calendar days of the Contractor's receipt of the RPR's final estimate. If, after such 30-day period, a dispute still exists, the Contractor may approve the RPR's estimate under protest of the quantities in dispute, and such disputed quantities shall be considered by the Owner as a claim in accordance with Section 50, paragraph 50-16, *Claims for Adjustment and Disputes*.

After the Contractor has approved, or approved under protest, the RPR's final estimate, and after the RPR's receipt of the project closeout documentation required in paragraph 90-11, *Contractor Final Project Documentation*, final payment will be processed based on the entire sum, or the undisputed sum in case of approval under protest, determined to be due the Contractor less all previous payments and all amounts to be deducted under the provisions of the contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment.

If the Contractor has filed a claim for additional compensation under the provisions of Section 50, paragraph 50-16, *Claims for Adjustments and Disputes,* or under the provisions of this paragraph, such claims will be considered by the Owner in accordance with local laws or ordinances. Upon final adjudication of such claims, any additional payment determined to be due the Contractor will be paid pursuant to a supplemental final estimate.

90-10 Construction warranty.

a. In addition to any other warranties in this contract, the Contractor warrants that work performed under this contract conforms to the contract requirements and is free of any defect in equipment, material, workmanship, or design furnished, or performed by the Contractor or any subcontractor or supplier at any tier.

b. This warranty shall continue for a period of one year from the date of final acceptance of the work, except as noted. If the Owner takes possession of any part of the work before final acceptance, this warranty shall continue for a period of one year from the date the Owner takes possession. However, this will not relieve the Contractor from corrective items required by the final acceptance of the project work. Light Emitting Diode emitting diode (LED) light fixtures with the exception of obstruction lighting, must be warranted by the manufacturer for a minimum of four (4) years after date of installation inclusive of all electronics.

c. The Contractor shall remedy at the Contractor's expense any failure to conform, or any defect. In addition, the Contractor shall remedy at the Contractor's expense any damage to Owner real or personal property, when that damage is the result of the Contractor's failure to conform to contract requirements; or any defect of equipment, material, workmanship, or design furnished by the Contractor.

d. The Contractor shall restore any work damaged in fulfilling the terms and conditions of this clause. The Contractor's warranty with respect to work repaired or replaced will run for one year from the date of repair or replacement.

e. The Owner will notify the Contractor, in writing, within **seven (7)** days after the discovery of any failure, defect, or damage.

f. If the Contractor fails to remedy any failure, defect, or damage within **14** days after receipt of notice, the Owner shall have the right to replace, repair, or otherwise remedy the failure, defect, or damage at the Contractor's expense.

g. With respect to all warranties, express or implied, from subcontractors, manufacturers, or suppliers for work performed and materials furnished under this contract, the Contractor shall: (1) Obtain all warranties that would be given in normal commercial practice; (2) Require all warranties to be executed, in writing, for the benefit of the Owner, as directed by the Owner, and (3) Enforce all warranties for the benefit of the Owner.

h. This warranty shall not limit the Owner's rights with respect to latent defects, gross mistakes, or fraud.

90-11 Contractor Final Project Documentation. Approval of final payment to the Contractor is contingent upon completion and submittal of the items listed below. The final payment will not be approved until the RPR approves the Contractor's final submittal. The Contractor shall:

a. Provide two (2) copies of all manufacturers warranties specified for materials, equipment, and installations.

b. Provide weekly payroll records (not previously received) from the general Contractor and all subcontractors.

c. Complete final cleanup in accordance with Section 40, paragraph 40-08, *Final Cleanup*.

d. Complete all punch list items identified during the Final Inspection.

e. Provide complete release of all claims for labor and material arising out of the Contract.

f. Provide a certified statement signed by the subcontractors, indicating actual amounts paid to the Disadvantaged Business Enterprise (DBE) subcontractors and/or suppliers associated with the project.

g. When applicable per state requirements, return copies of sales tax completion forms.

h. Manufacturer's certifications for all items incorporated in the work.

i. All required record drawings, as-built drawings or as-constructed drawings.

j. Project Operation and Maintenance (O&M) Manual(s).

k. Security for Construction Warranty.

l. Equipment commissioning documentation submitted, if required.

m. Provide aerial photographs as described in Division II Special Provisions

END OF SECTION 90

Lebanon Municipal Airport
Extend Taxiway 'A' & Relocate Localizer

DIV II -
SPECIAL PROVISIONS

Issued For Bid

Date

January 31, 2024

Prepared for:

Lebanon Municipal Airport
5 Airpark Road
West Lebanon, NH 03784

Prepared by:
Stantec Consulting Services Inc.

DIVISION II SPECIAL PROVISIONS

1 Commencement and Completion of Work:

1.1 It is expected that execution of this contract between the City of Lebanon and the Contractor, will be on or about **October, 2024** and is dependent on receipt of FAA and State funding grants. The anticipated date of Notice to Proceed for Construction is on or about **May 1, 2025**.

1.2 The scheduled construction period is **One Hundred Sixty Eight (168)** calendar days for substantial completion of the work. It is anticipated that, if necessary, a stop work order shall be issued if all work cannot be completed prior to winter conditions. Refer to Contract Plans and Division I, Article 80-08 for additional information.

1.3 All contractors shall account for a **2025 construction schedule** in their bids. Requests for additional funds due to escalation shall not be entertained.

2 Description and Location of Work:

2.1 The work is located at the Lebanon Municipal Airport in Lebanon, New Hampshire.

2.2 The work includes but is not necessarily limited to:

BASE BID:

- Reconstruction of Taxiway A (360 LF x 50 FT);
- Construction to extend Taxiway A (1,435 LF x 35 FT);
- Removal of Existing Taxiway A2 (235 LF x 65 FT);
- Construction of Proposed Taxiway A2 (235 LF x 50 FT);
- Earthwork; Aggregate Subbase/Base; Bituminous Paving; Pavement Markings; Topsoil and Seeding;
- Drainage Improvements including New Pipes, Structures, Sand Filters, Ditches, and a Detention Pond;
- Electrical Improvements including New LED Taxiway Edge Lighting; New LED Airfield Guidance Signs; New Cabling, Conduit, Light Base Cans, Duct Banks and Handholes; and incidentals.

ADD ALT#1:

- Grading of Proposed Localizer Critical Area (596,650 SF), including Earthwork, Topsoil and Seeding;
- Grading of Proposed Gravel Access Road (1,125 LF x 12 FT) and Gravel pad.
- Drainage Improvements including New Pipes, Swales, and a Detention Pond;

ADD ALT#2:

- Dismantling & Relocation of Existing Localizer Antenna Array;
- Dismantling & Relocation of Distance Measuring Equipment (DME);
- Removal of Existing Localizer Shelter Building;
- Disposal of Existing Localizer Shelter, Antenna, and DME Foundations
- Installation of New Localizer Shelter, Antenna, and DME Foundations;
- Installation of new pre-fabricated Localizer Shelter Building (Supplied by FAA);
- Electrical Improvements including New Cabling, Conduits and connections.

3 Drawings:

3.1 The Contract Drawings are as follows:

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SHEET NO.	**DWG. NO.**	**SHEET TITLE**
1	T001	TITLE SHEET
2	G001	GENERAL SITE PLAN
3	G002	GENERAL NOTES
4	G100	OVERALL PHASING AND SAFETY PLAN
5	G101	PHASING AND SAFETY PLAN NOTES AND DETAILS
6	G201	PHASING AND SAFETY PLAN - 1
7	G202	PHASING AND SAFETY PLAN - 2
8	G203	PHASING AND SAFETY PLAN - 3
9	G204	PHASING AND SAFETY PLAN - 4
10	G205	PHASING AND SAFETY PLAN - 5
11	G206	PHASING AND SAFETY PLAN - 6
12	G207	PHASING AND SAFETY PLAN - 7
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16	V104	EXISTING CONDITIONS PLAN - 4
17	V105	EXISTING CONDITIONS PLAN - 5
18	C101	LAYOUT & ALIGNMENT PLAN - 1
19	C102	LAYOUT & ALIGNMENT PLAN - 2
20	C103	LAYOUT & ALIGNMENT PLAN - 3
21	C104	LAYOUT & ALIGNMENT PLAN - 4
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23	C201	PROFILES - 1

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25	C203	PROFILES - 3
26	C301	GRADING PLAN - 1
27	C302	GRADING PLAN - 2
28	C303	GRADING PLAN - 3
29	C304	GRADING PLAN - 4
30	C305	GRADING PLAN - 5
31	C401	SPOT GRADE PLAN - 1
32	C402	SPOT GRADE PLAN - 2
33	C411	TYPICAL SECTIONS - 1
34	C412	TYPICAL SECTIONS - 2
35	C413	TYPICAL SECTIONS - 3
36	C501	DRAINAGE & EROSION CONTROL PLAN - 1
37	C502	DRAINAGE & EROSION CONTROL PLAN - 2
38	C503	DRAINAGE & EROSION CONTROL PLAN - 3
39	C504	DRAINAGE & EROSION CONTROL PLAN - 4
40	C505	DRAINAGE & EROSION CONTROL PLAN - 5
41	C506	DRAINAGE & EROSION CONTROL PLAN - 6
42	C511	DRAINAGE PIPE & STRUCTURE SCHEDULE - 1
43	C512	DRAINAGE PIPE & STRUCTURE SCHEDULE - 2
44	C601	DRAINAGE & EROISION NOTES & DETAILS - 1
45	C602	DRAINAGE & EROISION NOTES & DETAILS - 2
46	C603	DRAINAGE & EROISION NOTES & DETAILS - 3
47	C604	DRAINAGE & EROISION NOTES & DETAILS - 4
48	C605	DRAINAGE & EROSION NOTES & DETAILS - 5
49	C611	CIVIL & MISCELLANEOUS DETAILS
50	C701	MARKING PLAN - 1
51	C702	MARKING PLAN - 2
52	C711	MARKING DETAILS
53	E001	ELECTRICAL LEGEND & GENERAL NOTES
54	E101	LIGHTING AND SIGNAGE PLAN - 1
55	E102	LIGHTING AND SIGNAGE PLAN - 2
56	E103	LIGHTING AND SIGNAGE PLAN - 3
57	E201	TEMPORARY LIGHTING PLAN
58	E501	LIGHTING & SIGNAGE DETAILS - 1
59	E502	LIGHTING & SIGNAGE DETAILS - 2
60	E503	LIGHTING & SIGNAGE DETAILS - 3
61	E601	FIXTURE AND SIGNAGE SCHEDULE
62	X101	CROSS SECTIONS - 1

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65	X104	CROSS SECTIONS - 4
66	X105	CROSS SECTIONS - 5
67	X106	CROSS SECTIONS - 6
68	X107	CROSS SECTIONS - 7
69	X108	CROSS SECTIONS - 8
70	X109	CROSS SECTIONS - 9
71	X110	CROSS SECTIONS - 10
72	X111	CROSS SECTIONS - 11
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75	X114	CROSS SECTIONS - 14
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3	G003	AIRPORT LAYOUT
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6	C003	LOC SITE PLAN
7	C004	METER SITE PLAN
8	C005	MISCELLANEOUS DETAILS
9	C006	LOCALIZER GROUND CHECK POINTS
10	Q001	SHELTER EXTERIOR DETAILS
11	Q002	SHELTER INTERIOR DETAILS
12	Q003	LOC ANTENNA DETAILS
13	Q004	DME ANTENNA DETAILS
14	S001	SHELTER FOUNDATION DESIGN
15	S002	LOC FOUNDATION DESIGN
16	E001	POWER WIRING DIAGRAM
17	E002	DME WIRING DIAGRAM
18	E003	LOC WIRING DIAGRAM

4 Reports & Figures

4.1 Utility investigations and attempted bedrock mapping were completed in the summer of 2022 with ground radar penetration technology by RSI. The information has been included in the existing conditions drawings, and the original figures produced by RSI are included in **ATTACHMENT II-A for informational purposes only**, to give an indication of the locations of utilities and potential underground utilities within the project limits. The Contractor is responsible for familiarizing themselves with these figures and the results section of RSI's report prior to undertaking the work.

4.2 Geotechnical subsurface investigations were completed in the summer of 2022 by SW Cole. The Geotechnical report has been included in **ATTACHMENT II-A**. The Contractor is responsible for familiarizing themselves with this report and the geotechnical recommendations relative to earthwork, drainage, and pavement associated with the proposed construction.

4.3 The information provided in this section is based on information obtained during the time of each respective field investigation and should not be considered fully comprehensive. The Contractor shall take whatever necessary action required to supplement this information prior to commencement of work.

5 Required Federal Contract Provisions:

5.1 This project will be federally funded under the Federal Aviation Administration's (FAA's) Airport Improvement Program (AIP) grant.

5.2 Federal laws and regulations required the inclusion of the following specific clauses and contract provisions in this project:

- 5.2.1 Access to Records and Reports
- 5.2.2 Affirmative Action Requirement
- 5.2.3 Breach of Contract
- 5.2.4 Buy American Preferences
- 5.2.5 Civil Rights – General
- 5.2.6 Civil Rights - Title VI Assurances
- 5.2.7 Clean Air/Water Pollution Control
- 5.2.8 Contract Work Hours and Safety Standards
- 5.2.9 Copeland Anti-Kickback
- 5.2.10 Davis Bacon Requirements
- 5.2.11 Debarment and Suspension
- 5.2.12 Disadvantaged Business Enterprise
- 5.2.13 Distracted Driving
- 5.2.14 Domestic Preferences for Procurements
- 5.2.15 Equal Employment Opportunity
- 5.2.16 Federal Fair Labor Standards Act
- 5.2.17 Foreign Trade Restriction
- 5.2.18 Lobbying Federal Employees

5.2.19 Occupational Safety and Health Act

5.2.20 Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment

5.2.21 Prohibition of Segregated Facilities

5.2.22 Recovered Materials

5.2.23 Tax Delinquency and Felony Conviction

5.2.24 Termination of Contract

5.2.25 Veteran's Preference

5.3 These clauses and contract provisions are incorporated in this contract and can be found in **ATTACHMENT II-B**.

5.4 The Contractor (including all Subcontractors) is required to insert these contract provisions in each lower tier contract (e.g., subcontract or sub-agreement).

5.5 The Contractor (including all Subcontractors) is required to incorporate the requirements of these contract provisions by reference for work done under any purchase orders, rental agreements, and other agreements for supplies or services

5.6 The Contractor shall be responsible for compliance with these contract provisions by any Subcontractor, lower-tier Subcontractor, or service provider.

6 Environmental, Permits & Stormwater Pollution Prevention

6.1 The following Department of Environmental Services (DES) permit applications have been submitted to NH DES:

6.1.1 Alteration of Terrain Permit

6.1.2 Standard Dredge & Fill Wetlands Permit

6.2 The permit approvals are expected prior to April 2024.

6.3 The approvals will result in an Order of Conditions specific to this project and may require additional environmental controls over and above what is shown in the bid documents.

6.4 Work will not commence until this Order has been received from NH DES. The onus is on the contractor to review the information and fully meet the requirements of these conditions. It is not anticipated that these orders will require additional provisions (site / environmental) over and above what is already detailed in the bid documents.

6.5 Should there be additional work required by the Order of Conditions, the Owner will negotiate with the Contractor to value the additional work and apply that to the contract price per the general provisions paragraphs 40-04 Extra Work and 90-05 Payment for Extra Work.

6.6 A Notice of Intent (NOI) to the U.S. Environmental Protection Agency (EPA) for coverage under the CGP for Stormwater Discharge from Construction will be filed **by the Contractor** at least 14 days prior to the start of construction. The RPR will work with the Contractor to prepare the required documents.

6.7 In accordance with the National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities (CGP), the Contractor shall be considered an "operator" of the construction project (see section 1.1.1.b. of the CGP).

6.8 The Contractor shall be responsible for adhering to project specific Stormwater Pollution Prevention Plan (SWPPP) which will be prepared by the RPR as part of the NOI. The SWPPP is based on the Erosion & Sediment Control plans and specifications included in these bid documents.

6.9 The Contractor shall adhere to the Best Management Practices (BMPs) to be implemented during construction. BMPs are designed to minimize potential contamination of stormwater as a result of contact with soil stockpiles, materials, equipment, and vehicles.

6.10 Once a phase has begun, the Contractor shall work diligently to complete all required work until all disturbed areas within the phase have been stabilized in accordance with the erosion control notes on the drawings. Contractor shall minimize areas of disturbance that have not been fully stabilized where possible. Every effort shall be made to limit non-stabilized disturbed areas to less than 5 acres as much as practicable.

6.11 An Environmental Monitor (EM) shall be employed by the engineer and conduct inspections of the project site on behalf of the owner for the duration of construction. The Contractor shall as an incidental component of the construction contract, allow unfettered access to the work areas and assist the EM as needed to complete its inspections. When deficiencies are identified by the EM, the Contractor under direction of the RPR shall address the deficient items immediately as needed to ensure the erosion and sediment control plan for the project is functioning adequately. This may include implementation of additional erosion and sediment control measures at locations directed by the EM and RPR.

6.12 No separate measurement or payment will be made to the Contractor for adherence to the Stormwater Pollution Prevention Plan. These efforts and responsibilities are considered incidental to the project.

7 Provision of Utilities for Construction

7.1 The Contractor shall provide or arrange for, at their own expense, water, heat, and electricity for construction purposes, sanitary facilities for workmen, telephone, and other facilities and services as found necessary for their own operations.

7.2 Separate individual internet service shall be provided and maintained in the RPR's Field Office at the Contractor's expense.

7.3 It is the Contractor's responsibility to verify if the public water system (i.e. hydrants) may be used for construction purposes and shall provide backflow devices and meters inspected and approved for use by local utility authorities. The Contractor shall coordinate with the local Water utility authority and pay for any and all charges that the local authority requires. If hydrants are not available for use, the Contractor shall be prepared to provide water truck(s) as required at no additional cost.

7.4 Electricity for the Contractor's work site will be the responsibility of the Contractor. If portable power units are used for work during the hours of darkness, they shall be suitably muffled and shielded from residential areas. Furnishing such units shall be the responsibilities of the Contractor and will be considered a subsidiary obligation of the Contractor.

7.5 Buildings for the sanitary necessities of all persons employed on the work, beginning with the first worker at the site, shall be provided and maintained by the Contractor:

7.5.1 At approved locations near the work;

7.5.2 On the basis of not less than 1 unit for each 15 persons;

7.5.3 In a clean, sanitary condition at all times;

7.5.4 Of an approved chemical type, or water closets, if permitted;

7.5.5 Adequately screened to be inaccessible to flies.

8 RPR's Field Office

8.1 The Contractor shall provide or arrange for, at their own expense, a Field Office for the RPR.

8.2 See Technical Specification Item C-105 in Division III for detailed requirements of the RPR's Field Office.

9 Disturbances

9.1 The committing of nuisances on the land of the Owner and adjacent properties shall be rigorously prohibited and adequate steps taken to prevent it. Any employee found violating this provision shall be discharged and not employed again on work under this Contract.

10 Construction Work Phasing

10.1 The intent of construction work phasing is to minimize runway and taxiway closure periods, and overall facility disruption time at the Airport. As such, limitations on performance periods are prescribed for the construction contract as described herein and as indicated on the project drawings. Construction work phasing requirements are subject to revision by the RPR as necessary to meet operational needs of the Owner and airport users

10.2 Construction phasing requirements shall apply to all specified and implied work activities requiring any of the Contractor's forces, involving workers, materials, vehicles, and equipment which are required toward the successful performance of contract obligations. Specific work phasing guidance, as it relates to safety on the airfield, is provided in the Construction Safety and Phasing Plan (CSPP) included in **ATTACHMENT II-C**. The CSPP, as approved by the FAA, including any revisions thereto, shall be implemented by the Contractor for the duration of the project at no additional expense to the Owner.

10.3 Scheduling of work activities within phasing guidelines are the responsibility of the Contractor and a condition of the contract. Work schedules shall be updated as necessary by the Contractor, and at a minimum of twice every month.

10.4 The Contractor shall submit the initial, tentative schedule of construction activities at the pre-construction conference. This schedule will be formally reviewed between the Contractor, RPR, and Owner at construction progress meetings, normally held on a weekly basis or as often as deemed necessary by the RPR.

10.5 Safety requirements are included as an integral part of project phasing. The Contractor shall carefully consider airport operation- and construction-related safety requirements and shall coordinate closely with the Owner and RPR when preparing and revising construction activity schedules within the project phasing guidelines. Additional and specific safety information is provided elsewhere in the Special and General Provisions, on the construction drawings, and within the referenced publications.

10.6 The Contractor shall note well that Runways 7-25 and 18-36 and access to the existing taxiways and aircraft parking apron will remain active with aircraft operations during portions of the construction period. This must be communicated and emphasized to all Contractor (and Subcontractor) personnel performing work under the contract before they are allowed to enter the jobsite.

10.7 Project phasing provides for the partial temporary closure of portions of the airport and are intended to minimize the number of construction mobilizations required, which require temporary safety measures, markings, and lighting to keep portions of the airfield active while construction work is on-going. Phasing drawings have been included within the construction documents that provide a general sequencing of the work, and specific requirements that the Contractor must follow. It is up to the Contractor to provide a detailed phasing plan that complies with the requirements stated herein.

10.8 No separate payment will be made for the establishment of the runway closure markers, construction signs, barricades, and incidentals necessary to implement the construction safety and phasing plan. The cost of all requirements shall be included in and considered incidental to the other pay items listed in the contract documents.

11 Beneficial Occupancy

11.1 Acceptance for beneficial occupancy shall be made when work required for each contract item has been completed sufficiently in the opinion of the Engineer to allow safe operation by airport users.

11.2 The Contractor shall not be allowed to conduct work or operate within work areas which have been turned over for beneficial occupancy without specific approval by the RPR.

11.3 Beneficial occupancy shall not constitute final acceptance for payment purposes and shall have no relationship with substantial completion which shall only apply to the entire contract as a whole or to completion of specified work phases or sub-phases.

12 Underground Utilities

12.1 The Contractor shall refer to the Drawings and these Specifications covering the utilities and include in their bid all work required in connection with them.

12.2 The utility lines and other underground structures shown on the Contract Drawings have been compiled from record plans and other investigations, but the accuracy of the locations shown and the completeness of information is not guaranteed.

12.3 The Contractor shall check and verify the location of all existing utilities both underground and overhead before proceeding to begin the work or to order materials. A utility locating service shall be hired by the Contractor to verify the location and depth of existing utilities if DIGSAFE is not able to verify all utilities shown within areas of excavation on the plans. A site plan of the existing Contractor-verified existing utilities shall be submitted by the Contractor prior to starting any excavation. No separate payment will be made for any utility locating required, including the work of the utility locating service and existing utility site plan submittal.

12.4 Excavation shall be in accordance with P-152 Excavation, Subgrade, and Embankment, and all other statutes, ordinances, rules and regulations of any city, state or Federal Agency that may be applicable. Any damage to the existing utilities caused by negligence on the part of the Contractor, and any other costs arising out of said excavation or by reason thereof, shall be the Contractor's sole responsibility.

12.5 Approximate locations of known underground utility lines, where known, are shown on the contract drawings. Should any phase of the work require excavating under existing utilities or otherwise endanger their support, the Contractor shall furnish and install at their own expense such temporary supports as may be required to prevent damage to or interruption of the utility or utilities involved. Extreme care shall be used in working in areas where buried cable is known to exist. The Contractor shall have on the site, at all times, proper equipment for locating buried cable and such cable shall be located by hand-dug test pits before power equipment is permitted to work in the area.

12.6 Should any other underground utility lines be encountered, the RPR may make a field check and direct such additional procedure as may be necessary to maintain or eliminate the interfering utility.

12.7 Contractor shall hand dig or vacuum excavate within 3 feet of any known utility. No separate payment will be made for hand digging or vacuum excavation.

12.8 Contractor shall refer to the General Provisions paragraph 70-15 for additional responsibilities and expectations for work around utilities and facilities of others.

13 Maintenance of the Construction Site and Haul Roads

13.1 The Contractor shall keep the construction site free of foreign object debris (FOD) that could be blown onto the runways, taxiways, aprons, and other areas of the airport operations.

13.2 The Contractor is responsible for constructing and maintaining all haul routes required for the duration of the project. The Contractor shall be responsible for ensuring the haul routes are adequately constructed to the width and strength needed for all construction operations. No separate payment shall be made for haul routes and temporary access routes.

13.3 All airport pavements, haul roads, access roads, and city/town roads used to access the airport shall be kept clear and clean at all times. Unpaved haul roads shall be maintained by blading and filling as directed/approved by the RPR. All rocks, mud, and other debris carried onto the airport pavement by the Contractor's equipment must be reported to the RPR or the Airport Manager. The Airport Manager will then close the affected area to air traffic and the Contractor will immediately sweep the area to the satisfaction of the Airport Manager.

13.4 Dust shall be controlled at all times. The Contractor shall maintain, at the construction site, the equipment for the application of water to control dust within the construction site and on haul roads. The equipment shall be equipped with a shutoff control valve that can be operated from the cab by the operator. The Contractor shall apply water for dust control as necessary to prevent dust from the construction site and/or haul roads from being a hazard to aircraft and from being a nuisance to the public and as directed by the Engineer.

13.5 FOD shall be controlled at all times. The Contractor shall maintain at the job site at all times while the construction under this contract is in progress, a self-propelled, self-contained vacuum sweeper with a broom and dust control and a minimum hopper capacity of four (4) cubic yards. The sweeper shall operate as necessary to keep active aircraft pavements, access roads and the work areas clean. At the close of each day's work, all active aircraft pavements and airport paved roads used or dirtied by the Contractor shall again be swept. Pavement sweepings shall be disposed of legally offsite. No separate payment shall be made for disposal of pavement sweepings and shall be considered incidental to the various items of work.

13.6 The Contractor shall also be responsible for supplying any other equipment as may be necessary to clean all areas that are contaminated a result of their operations to the complete satisfaction the Engineer and the Airport Manager.

13.7 Trucks loaded in the construction area shall have loads trimmed and covered as necessary to assure that no particles, stones, or debris will fall off.

13.8 No separate payment will be made for maintaining the construction site free of FOD and dust.

13.9 No separate payment will be made for construction, repair, sweeping, and maintenance of haul roads, access roads, and city/town roads, and all costs thereof shall be included in the contract prices for the various items of work in the Proposal.

13.10 No separate payment will be made for repair, sweeping, and maintenance of airport pavements, and all costs thereof shall be included in the contract prices for the various items of work in the Proposal.

13.11 All haul routes shall be maintained and repaired at the end of the project to match existing conditions to the satisfaction of the RPR. Contractor to take videos of all haul routes and their existing conditions prior to disturbance and submit these videos to the RPR prior to undertaking any work.

13.12 All haul routes repairs shall be completed in accordance with the access road repair typical section(s) provided in the plans. The type and limits of repair shall be determined by the RPR with approval from the Airport Manager. No access roads shall be repaired without specific approval in writing from the Airport Manager. No separate payment will be made for access road repairs included in these Special Provisions.

13.13 Any damage to existing pavements as a result of negligence on the part of the contractor for failure to properly protect the road and/or aircraft pavements shall be repaired at no additional cost to the owner.

14 Storage Area and Equipment Yard

14.1 The areas for the location of storing materials and for servicing, repairing, and parking construction equipment are located as shown on the Contract Drawings. All materials to be used in the work shall be stored in these areas. The Contractor's attention is alerted to the fact that a limited amount of area is available within the designated areas and that exact limits are subject to the approval of the RPR.

14.2 Any area occupied by the Contractor shall be maintained in a clean and orderly condition satisfactory to the RPR. Contractor shall be required to eliminate weeds and other unwanted vegetative growth within the storage areas, as directed by the RPR. Particular attention shall be given to the elimination of combustible rubbish or debris in the areas, and none shall be left exposed overnight or at other periods of time the work is shut down.

14.3 No separate payment will be made for the establishment of the Contractor's storage area and equipment yard or for any costs in connection with its maintenance or restoration. This work is considered a subsidiary obligation of the Contractor and shall be included in the contract prices for the various items.

15 Airport Security Badges

15.1 The Contractor shall be required to obtain a minimum of four airport security badges specific to the Lebanon Municipal Airport to perform work in the Air Operations Area (AOA). The badged employee(s) must escort workers through any secure aprons, and zones of the terminal, and remain with the workers until exiting the secure area. The badged escort can be a worker. All security badges must be completed prior to the start of construction. Badge applications can be obtained via the office of the Airport Operations Manager and must be applied for in person.

15.2 Badge applications cost approximately $40.00, and the application requires a background check and two original forms of IDs to be provided in person, as well as attendance and completion of a training course provided by the Lebanon Municipal Airport. Contractors are suggested to start the badging process as soon as possible. All efforts associated with badging and applicable application costs shall be considered incidental to the project cost. Contractors are responsible for confirming actual costs of security badge application.

16 Airport Operation and Safety Requirements.

16.1 Normal airport operations will be conducted on the airfield during portions of the project and the work shall be carried on in such a manner so as not to interfere with the necessary operation of the airport. The Contractor shall take all precautions necessary to ensure the safety of operating aircraft as well as their own equipment and personnel. The Contractor shall follow all safety and phasing requirements shown in the plans and in the Construction Safety & Phasing Plan Report included within these Special Provisions in **ATTACHMENT II-C**.

16.2 In addition, the Contractor shall follow FAA Advisory Circular (AC) 150/5370-2, "Operational Safety on Airports During Construction", latest version, with respect to safety requirements for this project as well as any other requirements set forth by the Owner.

16.3 **The Contractor shall submit a Safety and Phasing Compliance Document (SPCD) 30 days prior to beginning work.** The Safety and Phasing Compliance Document shall describe how the Contractor will comply with the requirements of the Safety & Phasing Plan, Notes and Details, as well as the safety and operational requirements of these Special Provisions.

16.4 The Safety and Phasing Compliance Document shall include a certification statement by the Contractor that indicates they understand the operational safety requirements of the plans and specifications, and they assert that they will not deviate from the operational safety requirements of the plans and specifications unless otherwise approved by the Owner and the FAA.

16.5 The Contractor shall identify a safety officer who is responsible for Airport safety to monitor construction activities and to coordinate immediate response to correct any construction related activity that may adversely affect the operational safety of the Airport.

16.6 No construction operations shall be carried on within the taxiway object free area (TOFA) or within the runway safety area/runway obstacle free zone (RSA/OFZ) or within the limits of active runway approach zones unless prior approval has been obtained. The Contractor shall consult with the RPR if they're unsure of the active restricted areas.

16.7 For the purposes of this project, these are the critically defined areas:

- 16.7.1 Runway Safety Area (RSA): **75ft** measured perpendicular to any Runway centerline
- 16.7.2 Runway Object Free Zone (OFZ): **200ft** measured perpendicular to any Runway centerline
- 16.7.3 Runway Object Free Area (ROFA): **250ft** measured perpendicular to any Runway centerline
- 16.7.4 Taxiway Safety Area (TSA): **39.5ft** measured perpendicular to any Taxiway centerline
- 16.7.5 Taxiway Object Free Area (TOFA): **65.5ft** measured perpendicular to any Taxiway centerline
- 16.7.6 Within the Localizer Critical Area limits as shown on the plans
- 16.7.7 Within any Runway Approach Surface as shown on the current Airport Layout Plan
- 16.7.8 Within **25ft** of any aircraft parking apron

16.8 Before beginning any work on the project, the Contractor shall clearly mark out the limits of the operations areas on the surface of the ground by use of wooden stakes, warning tape barriers, temporary pavement markings or other means approved by the RPR.

16.9 When permission has been granted to work inside these limits, no equipment shall be left within the lines when not actually working. All equipment shall be located outside of the restriction area when not in use. All booms shall be lowered when the equipment is not in operation. No construction operations, including an open flame such as welding or burning, shall be carried on near any aircraft. Equipment is to be stored in the Contractor's staging areas during nights and weekends when no work is scheduled.

16.10 Each Contractors' motorized vehicle operating in the restricted area shall be equipped with an amber flashing light and a three (3) foot square flag consisting of international orange and white squares not less than one foot square displayed in full view above the vehicle. In addition, all Contractors' vehicles shall have the company identification and the vehicle call sign (escort vehicles) in 16" letters/numbers plainly visible on both sides of the vehicle to identify the vehicle.

16.11 The Contractor shall obey all instructions as to the operation and routes to be taken by equipment traveling on airport property. Any signs, lights, signals, markings, traffic control and other devices that may be required by the Owner shall be provided and maintained by the Contractor during the work, subject to the approval of the RPR.

16.12 Lighted channelizer cones and low-profile barricades shall be provided by the Contractor and must be maintained by the Contractor for the duration of the project. No aircraft pavement or navigation aid currently lighted shall be left unlighted overnight unless closed to all airport operations. The Contractor shall check all temporary lighting to assure its operating condition before leaving the job each day.

16.13 The Contractor shall coordinate their work with the RPR so that no less than 48 hours notice will be given before they start work in any area. No trenches or other excavation shall be left open within runway or taxiway safety areas when the runway/taxiway is to be released for aircraft at the end of the work shift. The use of steel plates is prohibited on the airfield.

17 Employees and Vehicle Traffic Control by the Contractor.

17.1 Access to the construction area will be as shown on the Contract Drawings. Contractor shall park only those work vehicles and equipment required for construction within the secured areas of the airport at the designated Contractor parking area.

17.2 Contractor employee personal cars will **not** be permitted within the secured areas of the airport. All vehicles destined to or from the work area shall be escorted by a Contractor's vehicle specifically assigned for the purpose. Workers shall be transported from the public parking lot at the Lebanon Municipal Airport to and from the work area by properly equipped Contractor's escort vehicles.

17.3 The Contractor, as a subsidiary obligation, shall provide adequate and safe transportation for their employees from outside the secured area of the airport to the work area. Any area inside the airfield security fence shall be considered the secure area. Employees and drivers of work vehicles shall be instructed as to proper access roads and shall be cautioned that unauthorized use of aircraft pavements or other areas outside the designated work area may lead to their arrest and subsequent payment of fines.

17.4 All orders, written or verbal, for material issued by the Contractor or their Subcontractors shall instruct the supplier of the procedures to be followed. Extra construction vehicles needed at the work site will require temporary escort permits as required by the Owner.

17.5 Contractor shall provide signs to properly direct their employees and delivery trucks to the project staging area. Contractor's employees and deliveries shall be properly escorted to their destination.

17.6 The Contractor shall submit to the RPR 30 days prior to starting work a written method of operations detailing the precautions they propose for the control of vehicle traffic including flag people, signs, escorts, and any other measures they propose. No work shall start until the operations plans are approved by the RPR and Owner. No contract time extensions or claims for extra costs will be allowed because of the Contractor's inability to get approval for their operations plan.

17.7 If any of the Contractor's employees violate the airport's security or driving rules and regulations, they may be banned from the airport secured areas for the duration of the project. If there are delays in the Contractor's work schedule because of this action, the Owner will not consider any time extensions or claims for extra costs. It is the Contractor's responsibility to provide qualified, responsible, and experienced personnel so that violations do not occur.

17.8 The contractor shall comply with all airport security requirements including obtaining security badges and attending airfield driver and security training offered by the Airport for operation of vehicles within the secured area of the airport and the AOA and maintaining a secure perimeter of the airport when accessing airfield vehicle gates.

18 Escorts, Flag Persons and Gate Guards

18.1 The Contractor shall ensure that all vehicles needing to enter the airfield for construction purposes are escorted by approved Contractor radio equipped escort vehicles to and from the work area. The Contractor shall always have on site at least one radio-equipped escort vehicle with qualified operator who shall monitor/operate the radio during all working hours. The Contractor shall have a minimum of two radio equipped escort vehicles with qualified operator who shall monitor/operate the radio when scheduled activities require construction equipment/activities to cross/access locations in the AOA (taxiways, aprons, runways or work within the runway obstacle free zone, runway approach surfaces or taxiway object free area). The contractor shall note that crossing of active runways are **strictly prohibited**. Airfield radio communications personnel shall not perform any other task during performance of this duty.

18.2 The escort vehicle will be parked in an appropriate location so that the operator can view the work. Radio control will be required whenever the Contractor is working in or adjacent to the aircraft operations areas. Radio control will be required whenever the Contractor's vehicle and equipment are operating on or crossing active runways, taxiways, and/or aircraft parking aprons.

18.3 The escort vehicles shall have a two-way radio on the appropriate GROUND/TOWER/ CTAF/UNICOM frequency and the radio shall be capable of reliable two-way communication with the GROUND/TOWER/CTAF/UNICOM from any location on the airport. The contractor shall monitor the GROUND/TOWER frequencies when the tower is open and the UNICOM frequency when the FAA Air Traffic Control Tower (ATCT) it is closed.

18.4 Escort vehicles shall be properly equipped with a rotating amber light on the roof and have the escort’s call sign with a minimum inscription height of 16” labeled on both sides of the vehicle. The escort vehicle drivers shall be trained to perform escort duties on the airfield and will be briefed on Airport safety, security, and radio protocol prior to the start of construction. The Contractor’s superintendent and foremen will also be required to attend this safety briefing at no additional cost.

18.5 The Contractor shall provide a gate guard to provide adequate security at airfield access gates to properly identify, regulate and direct all construction vehicles during all work hours of the project. The gate guard shall always remain at the gate when the gate is left in the open position.

18.6 Costs incurred by the Contractor for the above shall be considered incidental to the various project items of the Contract.

19 Radio Control and Signs

19.1 Radio control of construction operations is always required when the contractor is working on the Airfield and the Airport is open. The Contractor shall monitor air traffic always using an FAA radio when working within the Air Operations Area. The radios shall be two-way radios capable of handling FAA frequencies (118 MHZ – 135 MHZ) to monitor aircraft operations.

19.2 The Contractor shall furnish a minimum of three (3) FAA portable radios – ICOM model IC-A16, 200 channel, "tune-able", with battery, extra battery, battery charger, extended microphone, and earphone. A minimum of two (2) of these radios shall be used by the Contractor and one (1) shall be used by the Resident RPR to monitor aircraft operations.

19.3 The Contractor shall purchase and maintain all radios required as specified above. The Contractor shall operate these radios, at their expense, and at the completion of the work all radios shall remain the property of the Contractor. All costs associated with purchasing and maintaining these radios shall be considered incidental to the various project items.

20 Temporary Construction Barricades and Lights

20.1 The Contractor shall provide airport approved lighted low-profile interlocking barricades, lighted channelizer cones and orange safety fence at the locations as shown on the project drawings and maintained in place while the area is closed, after which they shall be removed promptly.

20.2 Low-profile barricades where shown as continuous runs shall be interlocked together. Lighted channelizer cones shall be spaced not more than 4 feet on center and/or as directed by the RPR, The Contractor shall use lighted channelizer cones and barricades to delineate the areas of work and closed airfield pavements according to project drawings.

20.3 The lighted low-profile barricades, lighted channelizer cones and orange safety fence shall be in accordance with the detail on the project drawings. The final placement and location of all barricades, channelizer cones and safety fence shall be subject to the approval of the RPR and Owner.

20.4 No separate payment will be made for providing, transporting, setting, maintaining, installing, and removing channelizer cones and barricades required by the RPR or Owner to satisfactorily designate an area as closed to aircraft operations all of which is considered a subsidiary obligation of the Contractor and shall be included in the contract prices for the various items.

20.5 All temporary barricades and lights shall remain the property of the Contractor.

21 As-Built Drawings

21.1 The Contractor shall maintain at the site, a set of Contract Plans on which to record the as-built conditions. These As-Built Drawings shall be updated on a daily basis, as the work progresses, showing what was actually constructed, the dimensions and grades of all Work, located horizontally and vertically to the nearest 0.1 of a foot, indicating thereon all exposed features uncovered during the work and all other construction work items completed under this Contract. The Contractor shall require the Subcontractors to participate daily in the As-Built Drawing updates, which shall show all work, as it was built or discovered, including the work of all Subcontractors. As-Built Drawings of hidden features shall be based upon measurements taken by the Contractor before covering them. These As-Built Drawings shall be kept current and available for review by the RPR and the Owner at all times.

21.2 Prior to final acceptance and payment by the Owner, the Contractor must submit to the RPR all of the Contractor-prepared As-Built Prints. Each As-Built Print must include a Contractor-signed certification statement that confirms the completeness and accuracy of as-built conditions.

22 Aerial Photographs

22.1 At the completion of the project, the Contractor shall provide one final overall aerial color photograph, showing all airport property boundaries. The final aerial photograph shall be taken vertically (no oblique angles) at a negative scale of approximately 1”=600’ to 1”=1250’ to cover the airport boundaries. Color negatives shall be scanned at 12 micron resolution or better, and an electronic version shall be provided to the RPR for approval. Once approved, the final photograph shall be enlarged to an even scale of 1”=400’. The Contractor shall provide four (4) framed 30” by 40” color enlargements, as well as all digital image files.

22.2 The Owner shall retain rights to all project photos, including negatives and electronic versions. The cost of furnishing the ground and aerial photographs will not be paid for as a separate item but shall be incidental to the various project items.

22.3 Aerial photographs shall be considered incidental to the contract. No separate or additional compensation shall be made to the contractor for any incidental items.

23 COVID-19

23.1 The Contractor is required to adhere to the current Local/State COVID19 guidelines. Any costs associated with COVID-19 Guidelines shall be borne by the Contractor.

24 Measurement and Payment for Special Provisions Requirements:

24.1 No separate measurement and payment will be made for the requirements listed in these Special Provisions and the cost of all requirements shall be included in and considered incidental to the other pay items listed in the contract documents.

END OF DIVISION II

ATTACHMENT II-A REPORTS & FIGURES

Radar Solutions International, Inc.™
Geophysics for People and the Environment

September 6th, 2022

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Ms. Alexandra Kavanagh, P.E.
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Via E-Mail: leslie.merrithew@stantec.com, Alexandra.Kavanagh@stantec.com
dom.zazzaro@stantec.com

Subject: FINAL REPORT
GPR and EMI for Utility Locating, Borehole Clearance, and Bedrock Detection Services for LEB RW 36 & TW A Extension Project
Lebanon, New Hampshire

Dear Leslie, Alexandra, and Domenic,

Radar Solutions International (RSI), Inc., a NH-Certified **WBE/DBE** firm based in Waltham, Massachusetts, is pleased to submit to STANTEC our report and figures summarizing RSI's interpretive results as part of utility locating and mapping of existing utilities at Lebanon Airport, Lebanon, NH. The additional goal of this project was to help determine bedrock depth south of the proposed Runway 36 expansion. Thank you for the opportunity to work with Stantec on this important project.

BACKGROUND

As part of the LEB RW 36 & TW A Extension project, existing utilities had to be identified and mapped. Additionally, soil foundation conditions south of Runway 36 where the expansion is to take place, were unknown. The secondary goal was to clear existing boreholes and geoprobes, and use GPR to map the depth to the top of bedrock. Figure 1 shows the locations of RSI's geophysical grids and locations where data were collected.

METHODS

Ground Penetrating Radar (GPR) was used to help locate existing utilities in and around Runway 36, and help determine depth to bedrock along and west and south of the existing runway. Electromagnetic Induction (EMI), which is the standard DIGSAFE tool, was also used to help mark out those utilities that emanated a 60Hz signal, or to which we could clamp a transmitter and induce a signal along conductive utilities. A third tool was used, a Geonics EM-61, which is a sophisticated metal detector that can detect metal as deep as 12 to 15 feet below grade, which was used to detect metal utilities to which RSI personnel could not clamp.

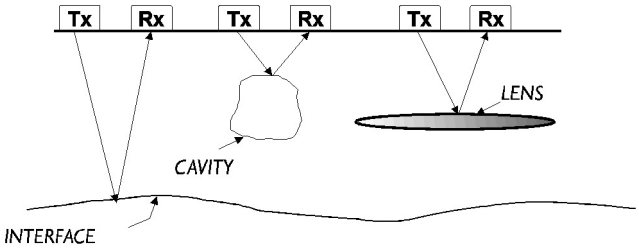
Ground Penetrating Radar (GPR)

GPR uses microwave and radiowave frequency EM waves to image the subsurface, creating a cross-section of reflections as a function of horizontal distance versus approximate depth everywhere the antenna is moved. The GPR method operates by transmitting low-powered radio and microwave energy into the ground using an ultra-wide band (UWB) transceiver antenna. The peak power of any GPR antenna is 20 to 100 times less the wattage of a cellular phone, and the energy is directed into the ground (and not at the operator) by means of shielding on the top side of the antenna. The GPR signal is then reflected back to the antenna by materials with contrasting electrical impedance, which is primarily determined by dielectric and conductivity properties of the material, its magnetic permeability, and its physical properties. The greater the contrast in the real dielectric permittivity (RDP) of two materials, the greater the reflection amplitude. Typically, high-amplitude reflections occur at lithologic or mineralogic changes, or where there is a sudden change in water content. Reflections can occur where there is also a sudden change in density, such as when a void or loosely packed soil is encountered, or when a large heterogeneity, such as a boulder, is encountered.

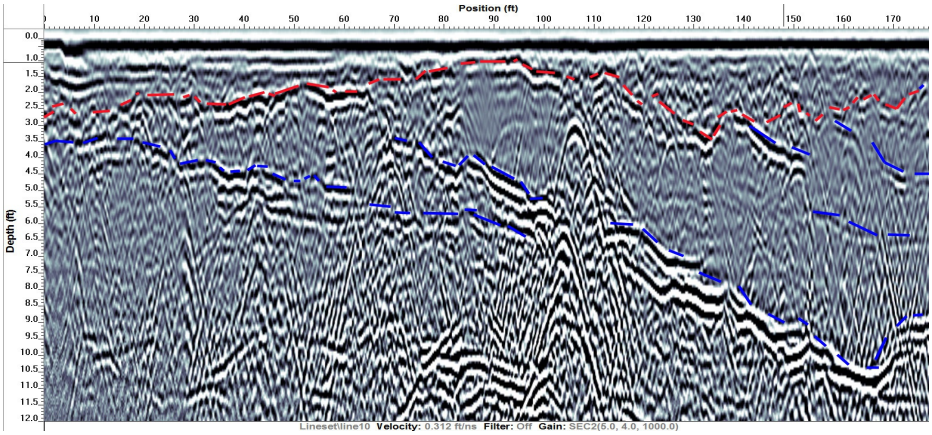
A material's dielectric properties are primarily determined by mineralogy, and water content. A soil with a high iron and/or magnesium content, or one that contains mineralogical clay or other platey minerals, will have a higher RPD value than a quartz-rich sand. Similarly, a soil that has a high porosity and is water saturated will have a higher RDP for the same unsaturated soil.

By mapping where these reflections occur, both as a function of horizontal distance and depth into the ground/fill below grade, we can infer the location and depth of utilities. For this survey RSI used a Sensors and Software Noggin with dual 250 MHz antennas. RSI selected this frequency as the goal was to identify utilities that potentially could be deep, given the thickness of the runway, as well as bedrock, the depth of which was unknown prior to the boring program.

Reflections observed on GPR records can be non-unique, meaning that a similar reflector can be caused by different objects. Strong reflections are typically produced from metal objects, which has an RDP of 1,000, the water-table, and clay layers. The schematic below shows the different ways reflections can occur. Objects, such as utilities, that have a discrete length and width typically produce hyperbolic reflections on GPR records. Till, a weathered bedrock, or a bouldery(or urban) fill, produce similar reflections on the radargram. Hence, some ground-truthing is recommended to correlate reflections with lithologies. Also below, are two GPR images showing similar reflection characteristics, but caused by different material types.

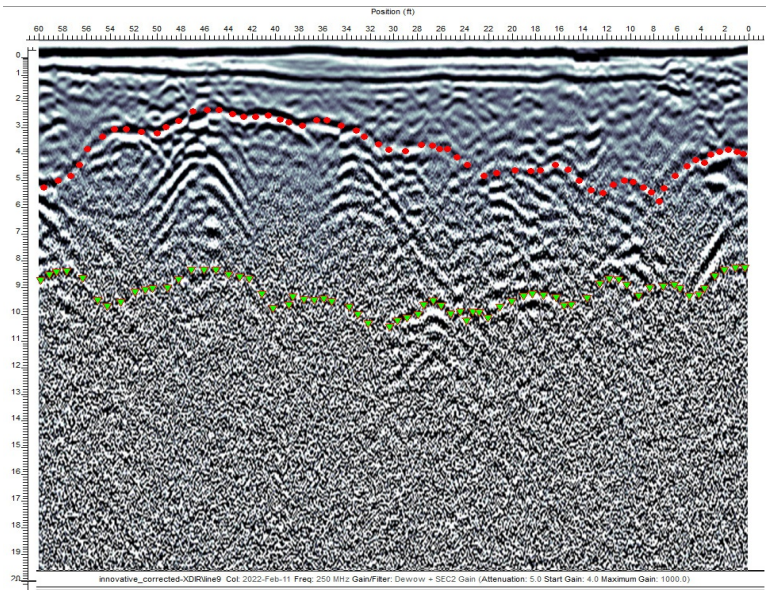


LEFT: Schematic showing that GPR reflections occur where there is a change in dielectric properties, such as at an interface of two materials or at an object.



ABOVE: GPR Record showing bedrock. The red dashed line denotes top of bedrock, while the blue shows reflections attributed to water-filled fractures. Hyperbolic reflectors are attributed to vertical fractures.

BELOW: GPR record of glacial till. Red dotted line shows interpreted top of till, while green triangles may represent reflections from top of bedrock, or internal reflections from boulders. Reflections from the top of till looks nearly identical to that from bedrock.



EM-61

Manufactured by Geonics, Inc., the EM-61 is a time-domain electromagnetic instrument, originally developed to find unexploded ordinances (UXOs), was used to compliment the GPR, to find buried metal utilities, RC structures, and other metal targets in the northernmost portion of the site. This sophisticated metal detector has a detection limit of up to 12 to 15 feet (3.5 meters) according to the manufacturer.

The EM-61 operates on the principle that the time-decay rate (i.e. transient pulse) of a signal induced in metal decays proportionally to the mass of the metal object. The EM-61 works by generating an EM signal of known frequency and voltage at the transmitter, located in the backpack configuration. In the presence of metal objects, an EM signal is induced when the transmitted signal is applied. When the transmitter is switched off, the induced field decays at a rate specific to the metal mass in which it is induced. The EM-61 top and bottom receiver coils measure the decay voltage at four discrete increments of time (each called a “time gate”) after the transmit pulse has been shut off. The amplitude of the voltage after the transmit pulse has been shut off is proportional to the size of the metal object: the larger the voltage (as measured in millivolts) at the time of the measurement, the larger the metal object. High voltages indicate metal objects. Negative voltages can also indicate both above-ground and buried metal. The larger targets have larger induced voltages at the later time-gates.

The EM-61 operates by pushing the instrumentation along survey lines spaced 2.5 feet apart. Data is collected on a time-basis, measuring 10 readings per second. A fiduciary marker, placed by the operator, is used to correlate the measurement to its position within the geophysical grid. A sub-meter accuracy GPS system can also be interfaced with the EM-61, thus eliminating the need and expense to construct a survey grid. The station spacing varies, depending upon the application.

Several different data sets are generated from the approximately 1.3 by 3 foot size receiver coils of the EM-61, with concurrent measurements made at top and bottom receiver coils and at the four different time-gates. Differential measurements, obtained from subtracting the bottom receiver coil measurements from the top, help determine whether the anomaly is caused by above or below ground sources. Output from the EM-61 is in millivolts (mVolts). Data collected from the EM-61's field computer is downloaded from the field computer and contoured, with buried metal being assigned such “hot” colors as red or magenta. The EM-61 works particularly well in finding shallow metal, foundations and footings, and other reinforced concrete structures. Please note that while the EM-61 instrumentation can theoretically operate within 5 feet of parked cars, the data will nevertheless be contaminated by above-ground sources. Also, the primary limitation of this technology is that deeper metal may be obscured by shallower metal. For this reason, EM-61 readings cannot be accurately obtained on reinforced concrete slabs.

Electromagnetic Induction (EMI)

RSI personnel used two sophisticated pipe and cable locators (EM induction tools) to trace out live, 60-cycle energy, which would indicate nearby electrical, telephone, or possibly other utilities with a 60-cycle tracer wire, and any other conductive utility to which the transmitter is clamped. One was a RadioDetection RD8200 and the other was a McGlaughlin VLOC3, both units representing technologies manufactured within the last year.

The EM induction tool can operate in 4 different modes: ***Receiver only mode***, detecting 60 cycle power (or harmonics thereof), ***Direct Contact/Clamp-on*** mode, where the transmitter hooks the positive lead directly to the pipe or cable while the negative lead is grounded, ***Direct-coupled/ Inductive mode***, where an inductive clamp is placed around the pipe or cable, and ***Remote Beacon mode***, where a transponding beacon is placed on a fiberglass rodder and threaded through non-conductive pipes and traced from the surface using a receiving antenna.

Mode #1 (***Receiver only mode***) only detects active electric lines. The disadvantage of this mode is that if the rebar mat is not grounded or the soil is conductive, false readings can occur, especially if the receiver's gains are turned up high. Also, if the electrical cable is located within a heavily reinforced concrete duct bank, it may be shielded, and hence, not detectable.

Mode #2 (***Direct Contact/Clamp-on***) the best method for directly tracing pipes, although, its success is contingent upon having a good ground and the pipe's outer surface being conductive enough to induce a signal down it. In some instances, such as gas transmission lines, pipe segments are isolated from each other with insulators so that self-potential (i.e. naturally-occurring energy from the earth's field) does not build up along the pipeline. Also, cast iron, especially when rusty, may not transmit a current well. Also, this mode cannot be used for PVC and plastic pipes, as they do not transmit current at all.

Mode #3 (*Direct-coupled/Inductive mode*) is another reliable way of inducing a current down a pipe. This, like Mode #2, relies on the pipe being conductive enough to induce a signal through it.

Mode #4 (*Remote Beacon mode*) cannot be used for iron, steel, and otherwise conductive pipes. It can only be used for non-conducting pipes, such as vitrified clay, asbestos concrete, PVC, plastic, and occasionally reinforced concrete. This method only works, however, if there is direct access to one end of the utility, and if it is located no more than 25 feet below grade.

Each entire area was first swept with the RadioDetection RD8000 or VLOC3 EMI Verifier to detect live electrical, and any utilities that may be carrying induced or passive current. When utilities were detected they were marked using the standard National Dig-Safe color scheme.

RESULTS

Interpreted Geophysical results are presented on the attached Figures. Figure 1 presents the area of investigation, and shows those utilities detected real-time using EMI, the location of which was surveyed-in using a sub-cm GPS. Figures 2A and 2B present interpreted GPR results from the visual inspection of the GPR data. Please note, no depth-slice imaging was conducted due to the time it would have taken to collect the necessary high-density of data. Figure 2A shows the actual locations of the hyperbolic reflectors, as well as their depths. Where point targets align, utilities have been inferred. Figure 2B summarizes utility location and depth. Figure 3 shows the locations of GPR lines obtained as part of the bedrock survey. Figure 4A presents a 2D contour map to the interpreted top of till, while Figure 4B presents the same map, but with the shallower layer overlain on top of it. Key results are noted below. All Figures are presented at a scale of 1" = 150 Feet.

- Electrical, drainage, water and sewer utility lines (Figure 1) were traced using a Radio Detection RD 8200. Any utility emitting a 60 Hz signal, such as what we observe from electrical utilities, analogue communication utilities, and any other utilities with a 60 Hz tracer wire, are marked as red, dashed lines on Figure 1. Please note, unless there was an existing manhole, or some other indication that the utility was otherwise, any utility emitting a 60 Hz signal was assumed to be from an electrical conduit. It should also be noted that while the EMI shows only one peak, there could be several closely spaced conduits bundled together, or within the same trench. The EMI would only detect the primary peak, either from the conduit drawing the most power, or from the complimentary interference pattern. Drainage lines are likely comprised of metal, as they were traceable by clamping on the EMI transmitter (Figure 1).

- Numerous utilities were inferred from the alignment of GPR hyperbolic reflectors from line to line (Figure 2a). Most utilities are within the grass area, trending parallel Runway 36, and tend to be greater than 3.5 feet below grade. There appear to be some utilities crossing the southernmost tip of Runway 36, but these are in excess of 7.5 feet beneath it. Also on Figure 2A, we observe disturbed reflectors attributed to excavations. The areas of disturbances align linearly from line to line. Utilities have been inferred where we observe trenches, even if the utility is too deep to be identified consistently upon visual inspection.

- The metal utility identified using EM-61 (not shown on any Figure), is coincident with an electrical utility line, identified both with EMI and GPR. The GPR indicates that his line is about 6.5 feet below grade (Figure 2a).

- Figure 2B summarizes all the depths identified with interpreted utilities. Likely, site lighting, which is about 2.5 feet below grade, trends around the peripheries and down

Runway 36, itself. The drainage line, located about 15 feet west of the site lighting and west of Runway 36, is about 8 feet below grade. It, also, parallels the runway.

- A small number of reflectors appear "flat" in cross-section. Figures 2A and 2B show these locations as an orange-filled polygon with a dark blue outline. These could represent buried concrete structures, but the flat reflectors could also be caused by the build-up of water within the fill, causing horizontal-like reverberations. They could also be caused by the GPR antenna moving parallel a utility.

- Figure 3 shows the locations of GPR traverses along, west of, and south of the existing Runway 36. Additional data were collected using a maximum depth range of 25 feet. GPR signal was noisy, due to the wetness of the soil/fill material, especially south of the runway. However, with filtering, RSI did notice several reflectors at 20+ feet below grade.

- Initially, the deepest reflector was interpreted to possibly represent bedrock. However, from the geotechnical boring survey, bedrock was not identified at any of the geoprobe or boring locations. Refusal occurred at several geoprobe locations, but based on split spoon samples logged at each boring location, refusal was probably at, or within a till. During the GPR visual inspection for bedrock, RSI personnel identified several reflectors, none of which were strong. However, from depth to till information, shown at boring locations in blue text on Figures 3, 4A, and 4B, the strongest and deepest reflector appears to be not from bedrock, but from till. Figure 4A presents a 2D contour map showing the interpreted depth to top of till, which was the deepest reflector on the radargram. RSI did observe two or more shallower reflectors; the most consistent one has been contoured up and is superimposed as black contour lines on top of the interpreted till layer, shown as color-filled contours on Figure 4B.

- The depths at which geoprobes encountered refusal, if at all, are shown as red text on Figures 3, 4A, and 4B. It would appear that refusal is at top of till, or within till. However, there are a few instances, where refusal is above the till layer. It is possible, in these instances, that refusal was on a boulder and/or on "urban fill".

- In general, the interpreted top of till is shallower in the north, and deepens to the south and east. Interpreted till is deepest at the southeast corner, where till is believed to be 20+ feet below grade (Figures 4A through 4B).

RECOMMENDATIONS

The nature of geophysics is interpretive, and reflections from GPR are non-unique. The purpose of the numerous boreholes was to identify depth to bedrock. However, as no bedrock was present in any of the cores, and as there is good to fair correlation with the top of till, identified on the GPR records, with depth to till, as recorded on boring logs, we believe no bedrock is present within the investigative depth of the GPR. Therefore, no additional borings

would need to be conducted to confirm GPR results. If STANTEC or its client wishes to identify bedrock depth, then RSI would recommend either a seismic refraction or gravity survey.

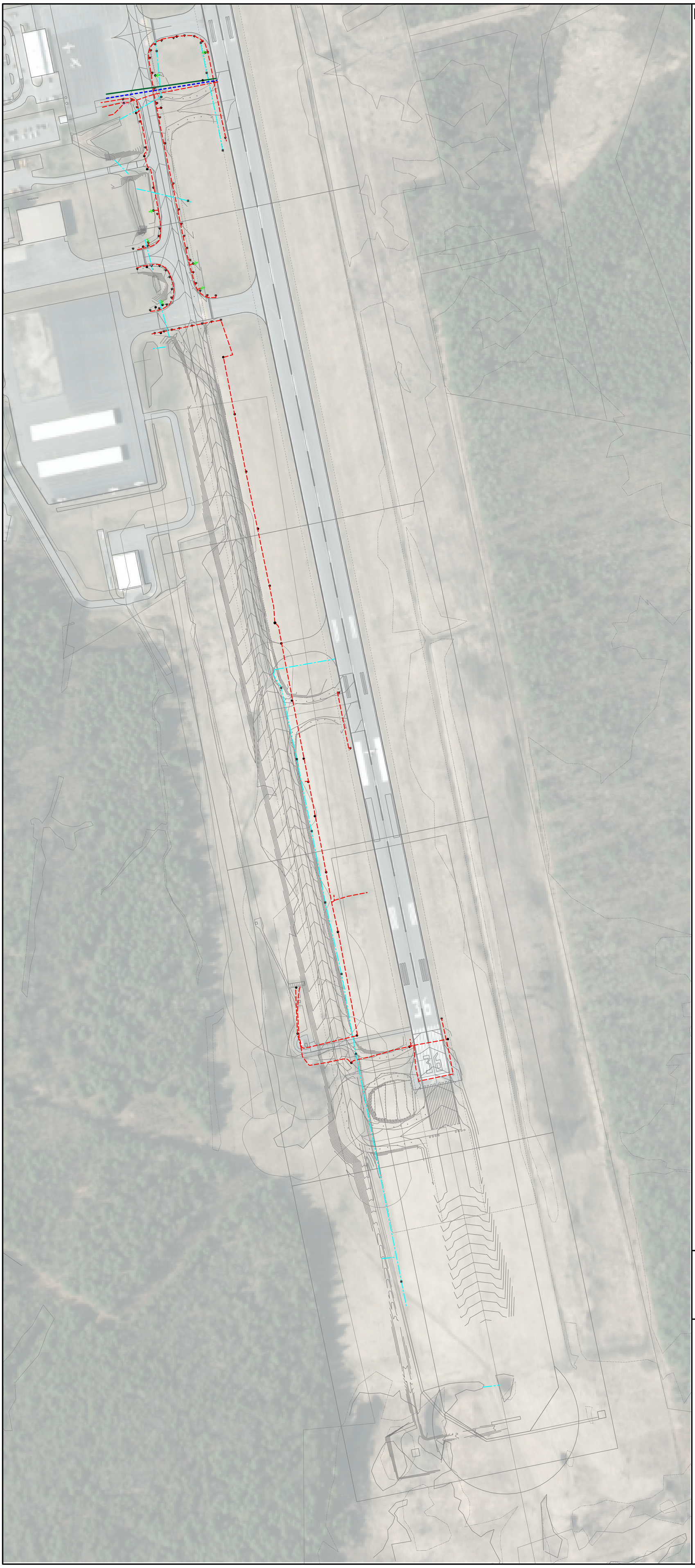
****

We appreciate the opportunity work on this project with STANTEC, and look forward to your comments and questions. In the meantime, please do not hesitate to call or email to arrange a Zoom meeting to further discuss these findings.

Sincerely,
RADAR SOLUTIONS INTERNATIONAL, Inc.

Doria L. Kutrubes

Doria Kutrubes. M.Sc., P.G.
President and Sr. Geophysical Associate



LEGEND

- Manhole
- Catch Basin
- Sign
- Runway Lights
- Vault

Utilities Detected by EMI:

- Electrical (60 Hz) Live
- Gas
- Telecommunication
- Drain
- Water
- Sewer

COORDINATE SYSTEM
NEW HAMPSHIRE
STATE PLANE NAD (83)
US SURVEY FEET

SCALE: 1 Inch = 150 Feet

150 0 150 Feet

FIGURE 1
AREA OF INVESTIGATION WITH EMI
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD
WEST LEBANON, NEW HAMPSHIRE

Prepared for
STANTEC
SEPTEMBER 2022

RSI Geophysics for People and the Environment
Radar Solutions International, Inc.™

LEGEND

- Manhole
- Catch Basin
- Sign
- Runway Lights
- Vault

Utilities Detected by EMI:

- Electrical (60 Hz) Live
- Gas
- Telecommunication
- Drain
- Water
- Sewer

Visual Inspection Legend

- Small GPR Reflector (possible diameter utility, metal scrap, large piece of rebar)
- Cluster of Flat GPR Reflectors (possible buried slab)
- Large, Weak GPR Reflector (possible cobble, RC or plastic pipe, boulder)
- Large, High-Amplitude GPR Reflector (possible utility, metal scrap, boulder); Depth (ft.) as indicated BELOW:
- Possible Utility as Interpreted from the Alignment of GPR reflectors from line to line
- Tentative Utility, inferred from the Alignment of GPR reflectors across two or three lines; may be attributed to random alignment of boulders, etc., in the fill.
- Excavated Areas

DEPTH (Feet)

- 0.0 to 0.5
- 0.5 to 1.0
- 1.0 to 1.5
- 1.5 to 2.0
- 2.0 to 2.5
- 2.5 to 3.0
- 3.0 to 3.5
- 3.5 to 4.0
- 4.0 to 5.0
- 5.0 to 6.0
- 6.0 to 7.0
- 7.0 to 8.0
- 8.0 to 9.0
- 9.0 to 10.0
- 10.0 to 11.0
- 11.0 to 12.0
- 12.0 to 13.0
- 13.0 to 14.0

COORDINATE SYSTEM
NEW HAMPSHIRE
STATE PLANE NAD (83)
US SURVEY FEET

SCALE: 1 Inch = 150 Feet
150 0 150 Feet

FIGURE 2a
VISUAL INSPECTION GPR DATA WITH EMI
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD
WEST LEBANON, NEW HAMPSHIRE

Prepared for
STANTEC
SEPTEMBER 2022

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LEGEND

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- 2.0 to 2.5
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- 3.5 to 4.0
- 4.0 to 5.0
- 5.0 to 6.0
- 6.0 to 7.0
- 7.0 to 8.0
- 8.0 to 9.0
- 9.0 to 10.0
- 10.0 to 11.0
- 11.0 to 12.0
- 12.0 to 13.0
- 13.0 to 14.0

COORDINATE SYSTEM
NEW HAMPSHIRE
STATE PLANE NAD (83)
US SURVEY FEET

SCALE: 1 Inch = 150 Feet
150 0 150 Feet

FIGURE 2b
VISUAL INSPECTION GPR DATA WITH EMI
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD
WEST LEBANON, NEW HAMPSHIRE

Prepared for
STANTEC
AUGUST 2022

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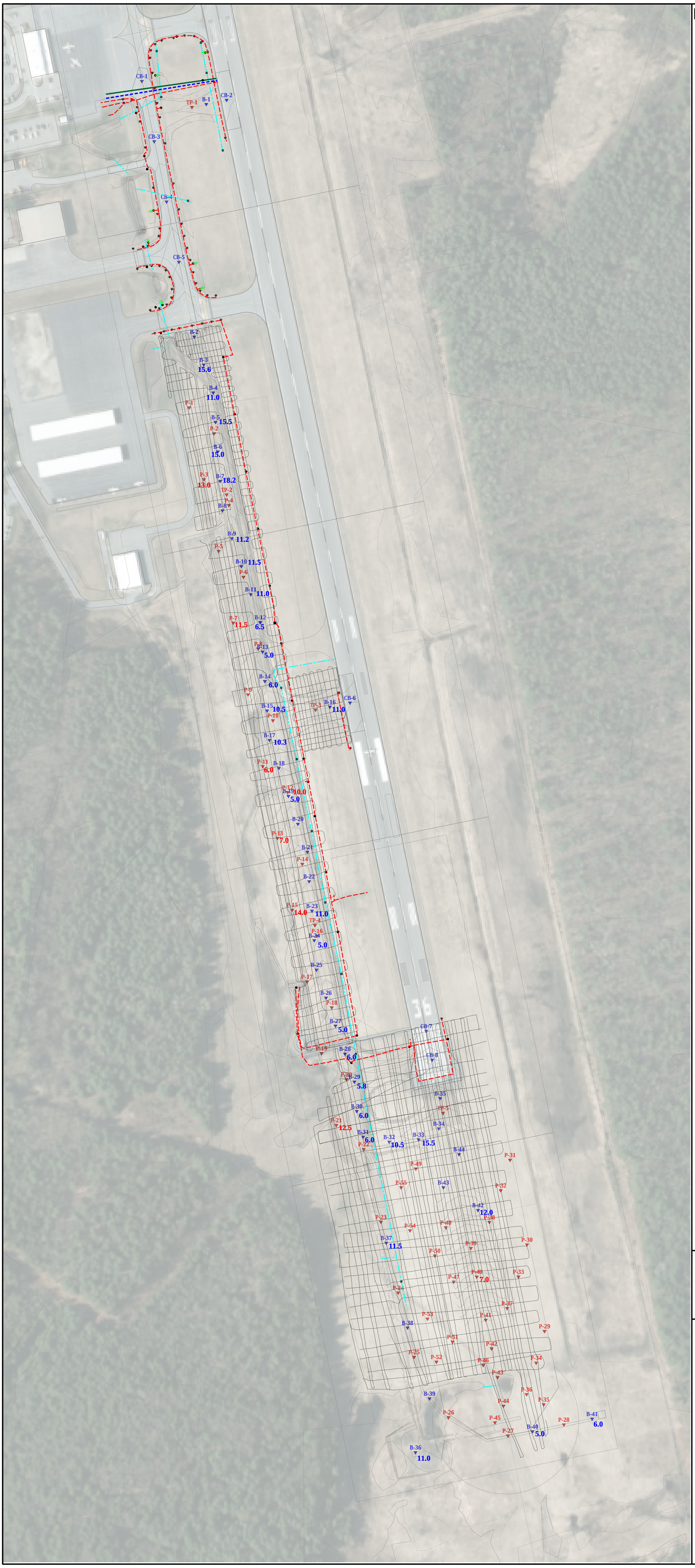

LEGEND

- Manhole
- Catch Basin
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Utilities Detected by EMI:

- Electrical (60 Hz) Live
- Gas
- Telecommunication
- Drain
- Water
- Sewer

P-3 ▼ 13.0 — Location of Geoprobe and Refusal, if any

B-2 ▼ 15.6 — Location of Geotechnical Boring and Top of Till, if Encountered and Noted in Logs

NOTE: NO BEDROCK WAS ENCOUNTERED IN ANY OF THE GEOTECHNICAL BORINGS

COORDINATE SYSTEM
NEW HAMPSHIRE
STATE PLANE NAD (83)
US SURVEY FEET

SCALE: 1 Inch = 150 Feet

150 0 150 Feet

FIGURE 3
GPR LINES OF COVERAGE FOR BEDROCK SURVEY
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD
WEST LEBANON, NEW HAMPSHIRE

Prepared for
STANTEC
SEPTEMBER 2022

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814200 814300 814400 814500 814600 814700 814800 814900 815000 815100 815200 815300 815400 815500 815600 815700 815800 815900 816000 816100 816200 816300 816400 816500

LEGEND

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- Catch Basin
- Sign
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- Vault

Utilities Detected by EMI:

- Electrical (60 Hz) Live
- Gas
- Telecommunication
- Drain
- Water
- Sewer

Depth to Top of Interpreted Till Layer (ft)

5.0 5.8 6.6 7.4 8.2 9.0 9.8 10.6 11.4 12.2 13.0 13.8 14.6 15.4 16.2 17.0 17.8 18.6 19.4 20.2 21.0 21.8

COORDINATE SYSTEM
NEW HAMPSHIRE
STATE PLANE NAD (83)
US SURVEY FEET

SCALE: 1 Inch = 150 Feet
150 0 150 Feet

FIGURE 4A
DEPTH TO TOP OF GPR REFLECTOR MOST LIKELY TO REPRESENT TILL
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD
WEST LEBANON, NEW HAMPSHIRE

Prepared for
STANTEC
SEPTEMBER 2022

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814200 814300 814400 814500 814600 814700 814800 814900 815000 815100 815200 815300 815400 815500 815600 815700 815800 815900 816000 816100 816200 816300 816400 816500

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Depth to Top of Interpreted Till Layer (ft)

5.0 6.0 7.0 8.0 9.0 10.0 11.0 12.0 13.0 14.0 15.0 16.0 17.0 18.0 19.0 20.0 21.0 22.0

COORDINATE SYSTEM
NEW HAMPSHIRE
STATE PLANE NAD (83)
US SURVEY FEET

SCALE: 1 Inch = 150 Feet
150 0 150 Feet

FIGURE 4B
DEPTH TO TOP OF GPR REFLECTOR MOST LIKELY TO REPRESENT TILL WITH DEPTH TO OVERLYING LAYER SHOWN
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD
WEST LEBANON, NEW HAMPSHIRE
Prepared for
STANTEC
SEPTEMBER 2022

RSI Geophysics for People and the Environment
Radar Solutions International, Inc.™

REPORT

21-1421 S

June 23, 2022

Explorations and Geotechnical Engineering Services

Runway 18-36 and Taxiway A Extension
Lebanon Municipal Airport
Lebanon, New Hampshire

Prepared For:
Stantec
Attention: Leslie Merrithew, P. Eng.
226 Causeway Street, 6th Floor
Boston, MA 02114

Prepared By:
S. W. Cole Engineering, Inc.
13 Delta Drive
Londonderry, New Hampshire
T: 603.716.2111

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21-1421 S

June 23, 2022

Stantec
Attention: Leslie Merrithew, P. Eng.
226 Causeway Street, 6th Floor
Boston, MA 02114

Subject: Explorations and Geotechnical Engineering Services
Runway 18-36 and Taxiway A Extension
Lebanon Municipal Airport
Lebanon, New Hampshire

Dear Leslie,

In accordance with our Proposal, dated October 22, 2021, we have performed subsurface explorations for the subject project. This report summarizes our findings and geotechnical recommendations and its contents are subject to the limitations set forth in Appendix A.

1.0 INTRODUCTION

1.1 Scope and Purpose

The purpose of our services was to obtain subsurface information at the site in order to develop geotechnical recommendations relative to earthwork, drainage, and pavement associated with the proposed construction. Our scope of services included forty-four test boring explorations, fifty-five test probe explorations, 8 pavement test borings, and 5 field CBR test pits soils and asphalt laboratory testing, a geotechnical analysis of the subsurface findings and preparation of this report.

1.2 Site and Proposed Construction

The site is located east of Airpark Road in Lebanon, New Hampshire at the Lebanon Municipal Airport. We understand the site is an active airport and the area of work takes place in the southeastern area of the airfield. The site consists of an existing Runway 18-36 (RW36), Taxiway A (TA), Taxiway stubs A1 and A2, grass area surrounding the

RW36 and TA with aircraft instrumentation, an engineered ditch west of RW36 and south of TA, and wetland southwest of the existing runway safety area. Existing grades relatively flat on the existing runway and taxiway. Existing grade in the grassed area generally slopes up from north to south from the end of the RW36 to the end of the runway safety area and up from the east and west-edge of RW36 south of the TA.

Based on the information provided, we understand the project includes the extension of the 36 end of the Runway 18-36 by 200 feet and an extension of the safety area by 700 feet. We understand Taxiway A, on the west side of the runway will be extended by about 3,000 feet in length and stub Taxiway A1 and A2 will be added to connect Runway 18-36 and Taxiway A. We understand the Localizer will be moved to the south of the safety area and include a gravel access road off the end of the proposed taxiway extension.

Proposed and existing site features are shown on the "Exploration Location Plan" attached in Appendix B.

2.0 EXPLORATION AND TESTING

2.1.1 Current Explorations

Forty-four test borings (B-1 through B-44), fifty-five test probes (P-1 through P-55), 8 pavement test borings (CB-1 through CB-8), and 5 CBR test pits (TP-1 through TP-5) were made at the site on April 18, 2022 through June 2, 2022 by S. W. Cole Explorations, LLC (S.W.COLE) and L&M Service Contractors (L&M). The exploration locations were selected and established in the field by S.W.COLE using a recreational grade GPS. The approximate exploration locations are shown on the "Exploration Location Plan" attached in Appendix B. Logs of the explorations and a key to the notes and symbols used on the logs are attached in Appendix C. The elevations shown on the logs were estimated based on topographic information shown on the "Exploration Location Plan".

2.1.2 Prior Explorations

Twenty-seven test pits (TP-1 through TP-27) and forty-three test boring (B-1 through B-43) were made at the site by New Hampshire Boring, Inc. (NHB) under subcontract to GZA GeoEnvironmetnal, Inc. (GZA) between December 10, 2008 through February 6, 2009. The findings of these prior explorations are described in a report prepared by

GZA, dated April 28, 2009. The findings are generally consistent with our recent findings.

2.2 Field Testing

The test borings, cased borings, and test probes were drilled using a combination of solid stem auger, hollow stem auger, asphalt core barrel and cased wash-boring techniques. The soils in the test borings were sampled at 2 to 5 foot intervals using a split spoon sampler and Standard Penetration Testing (SPT) methods. The soil in the test probes was not sampled. SPT blow count results are shown on the logs.

The California Bearing Ratio (CBR) test pits were dug using a John Deere 35G Excavator. The soil in the CBR test pits were sampled in bulk from a representative location to the elevation of where the CBR test was performed.

CBR tests were performed in TP-1 through TP-5 to assess the strength of the existing subgrade for the purpose of new pavement assessment by Stantec. These results are attached in Appendix D.

2.3 Laboratory Testing

Soil and asphalt samples obtained from the explorations were returned to our laboratory for further classification and testing. Moisture content test results are noted on the logs. The results of asphalt extraction, CBR, hydrometer analysis, and sieve analysis tests are attached in Appendix D.

3.0 SUBSURFACE CONDITIONS

3.1 Soil and Bedrock

In general the explorations encountered what we interpret as medium dense fill consisting of sand with varying amounts of silt, gravel, and clay overlying medium dense to very dense glacial till. Typically, the fill is similar in gradation to the native glacial till and deciphering the transition was difficult. The transition was evident where the sampling encountered buried relic topsoil below the fill and above the glacial till and these are the only locations where we denote “fill” on the boring logs.

Explorations B-1 through B-33 and TP-1 through TP-4 were made in the area of the proposed Taxiway A and Taxiway A stubs and encountered a soils profile generally consisting of several inches of topsoil overlying possible fill extending up to 18.2 feet consisting of sand with varying amounts of silt, gravel, and clay overlying glacial till until refusal or the bottom of exploration was reached. TP-1 encountered a 12-inch relic topsoil at approximately 5.5 feet.

Explorations B-34, B-35, and TP-5 were made in area of the proposed Runway 36 extension and encountered 3 inches of topsoil overlying possible fills extending to depths of at least 7.0 feet consisting of silty sand with varying amounts of fine gravel, clay, cobbles, boulders, and organics to at least 7.0 feet.

Test borings B-36 through B-41 were made in the area of the proposed Localizer Access Road and Localizer Shelter encountered a soil profile generally consisting of several inches of topsoil overlying an possible fill consisting of silty sand or sand and silt with varying amounts of gravel, clay, cobbles, and boulders to at least 5.0 feet. B-37 through B-39 encountered a 12 to 18-inch relic topsoil layer starting at about 5.5 to 11.5 feet.

Test borings B-42 through B-44 were made in the area of the proposed Runway 36 extension safety area and encountered a soil profile generally consisting of 5 to 6-inches of topsoil overlying possible fill extending up to at least 12.0 feet consisting of silty sand with varying amounts of gravel, clay, cobbles, and boulders overlying glacial till until the bottom of exploration was reached.

Core borings CB-1 and CB-3 through CB-5 were made in the existing Taxiway A area between A1 and A2 and CB-2 and CB-6 through CB-8 were made in the existing Runway 18-36 between A1 and the end of the runway. The core borings encountered about 4 inches of pavement and base and subbase soils characterized as silty gravelly sand extending to about 4 to 5 feet below the pavement. Traditional aggregate base and subbase containing low percentages of fines were not encountered.
Not all the strata were encountered at each exploration; refer to the attached logs for more detailed subsurface information.

Exploration depth obtained at the probes is attached in Appendix C.

3.2 Groundwater

The soils encountered at the test borings were moist to wet from the ground surface. Saturated soils were encountered at depths varying from 5 to 16 feet. Groundwater likely becomes perched on the relatively impervious silty clay and glacial till encountered at the test borings. Long term groundwater information is not available. It should be anticipated that groundwater levels will fluctuate, particularly in response to periods of snowmelt and precipitation, as well as changes in site use.

4.0 EVALUATION AND RECOMMENDATIONS

4.1 Frost Susceptibility

Based on the results of the laboratory testing and guidance provided in FAA Advisory Circular 150 / 5320-6F Table 2-2, we classified the frost susceptibility of the site soils as follows:

Material Type	USCS Soil Classification	Frost Group
Fills	SM, ML	FG-3, FG-4
Native Glacial Till	SM	FG-3

Frost penetration can be on the order of 5.0 feet in this area of the state. In the absence of excavation and replacement of frost susceptible soils to 5.0 feet in depth, or use of rigid insulation, some frost heaving and pavement distress must be anticipated. Design of pavement, base and subbase thickness are the responsibility of Stantec.

4.2 Excavation and Dewatering

Excavation work will generally encounter fills that have high percentages of silt and native soils that are heterogeneous mixtures of silt, sand, and ravel with low percentages of clay and occasional cobbles and boulders. Care must be exercised during construction to limit disturbance of the bearing soils. Earthwork and grading activities should occur during drier, non-freezing weather of Spring, Summer and Fall. Rubber tired construction equipment should not operate directly on the native silt and clays, when wet. Low ground pressure tracked equipment may be needed and temporary haul roads overlying geotextile fabric may be necessary. Final cuts to subgrade should be performed with a smooth-edged bucket to help reduce strength loss from soil disturbance.

Based on the subsurface findings, the majority of the explorations did not encounter refusal. Shallow refusal could be on cobble/boulder or on bedrock. If bedrock removal

is required, we recommend a licensed blasting contractor be engaged to provide bedrock removal. Pre-blast surveys should be completed on surrounding structures, water supply wells and infrastructure prior to commencing blasting activities.

Vibrations from construction should be controlled below threshold limits of 0.5 in/sec for structures, water supply wells and infrastructure within 500 feet of the project site. More restrictive vibration limits may be warranted in specific cases with sensitive equipment, historic structures or artifacts on-site or within close proximity.

Controlling the water levels to at least one foot below planned excavation depths will help stabilize subgrades during construction. The soils are generally slowly draining and typically sumping and pumping dewatering techniques should be adequate to control groundwater in excavations. Excavations must be properly shored or sloped in accordance with OSHA Regulations to prevent sloughing and caving of the sidewalls during construction. Care must be taken to preclude undermining adjacent structures, utilities and roadways. The design and planning of excavations, excavation support systems, and dewatering is the responsibility of the contractor.

4.3 Subsurface Drainage

The need for pavement subsurface drainage will depend on the finish elevations. Many borings encountered saturated soils as shallow as 5 feet. It is our opinion that where site cuts are made to attain finish grade, consideration should be given to use of drainage swales and toe drains at the base of upgradient cut slopes.

4.4 CBR Results

Five field CBR test were performed on in-situ soils at depths of about 4 to 5 feet below the ground surface. Additionally, we retried bulk samples at a depth of 5 feet and returned sample to our laboratory for laboratory CBR testing. Laboratory CBR testing was performed at samples set at 97 percent of their maximum dry density as determined by ASTM D-698. The CBR results are as follows:

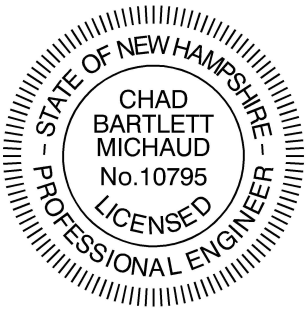
Explorations	Soil	Lab CBR Value at 0.1" Penetration (97% of Max. Density)	Field CBR Value at 0.1" Penetration (in-situ field density)
TP-1	Gravelly SAND and SILT, some Clay	6.4	12.7
TP-2	Gravelly Silty SAND, some Clay, Occasional Cobbles/Boulders	9.0	10.4
TP-3	Gravelly Silty SAND some Clay, Frequent Cobbles/Boulders	6.9	24.3*
TP-4	Gravelly Silty SAND, some Clay, Occasional Cobbles/Boulders	19.9	18.0
TP-5	Gravelly Silty SAND, some Clay, Occasional Cobbles/Boulders	14.3	40.7*
*Field value possibly impacted by presence of cobble/boulder			

5.0 CLOSURE

We trust this information meets your current needs. If you have any questions, please do not hesitate to contact us.

Sincerely,

S. W. Cole Engineering, Inc.



Chad B. Michaud, P.E.
Principal Geotechnical Engineer

BRW:cbm

APPENDIX A

Limitations

This report has been prepared for the exclusive use of Stantec for specific application to the proposed Runway 18-36 and Taxiway A Extension at Lebanon Municipal Airport in Lebanon, New Hampshire. S. W. Cole Engineering, Inc. (S.W.COLE) has endeavored to conduct our services in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

The soil profiles described in the report are intended to convey general trends in subsurface conditions. The boundaries between strata are approximate and are based upon interpretation of exploration data and samples.

The analyses performed during this investigation and recommendations presented in this report are based in part upon the data obtained from subsurface explorations made at the site. Variations in subsurface conditions may occur between explorations and may not become evident until construction. If variations in subsurface conditions become evident after submission of this report, it will be necessary to evaluate their nature and to review the recommendations of this report.

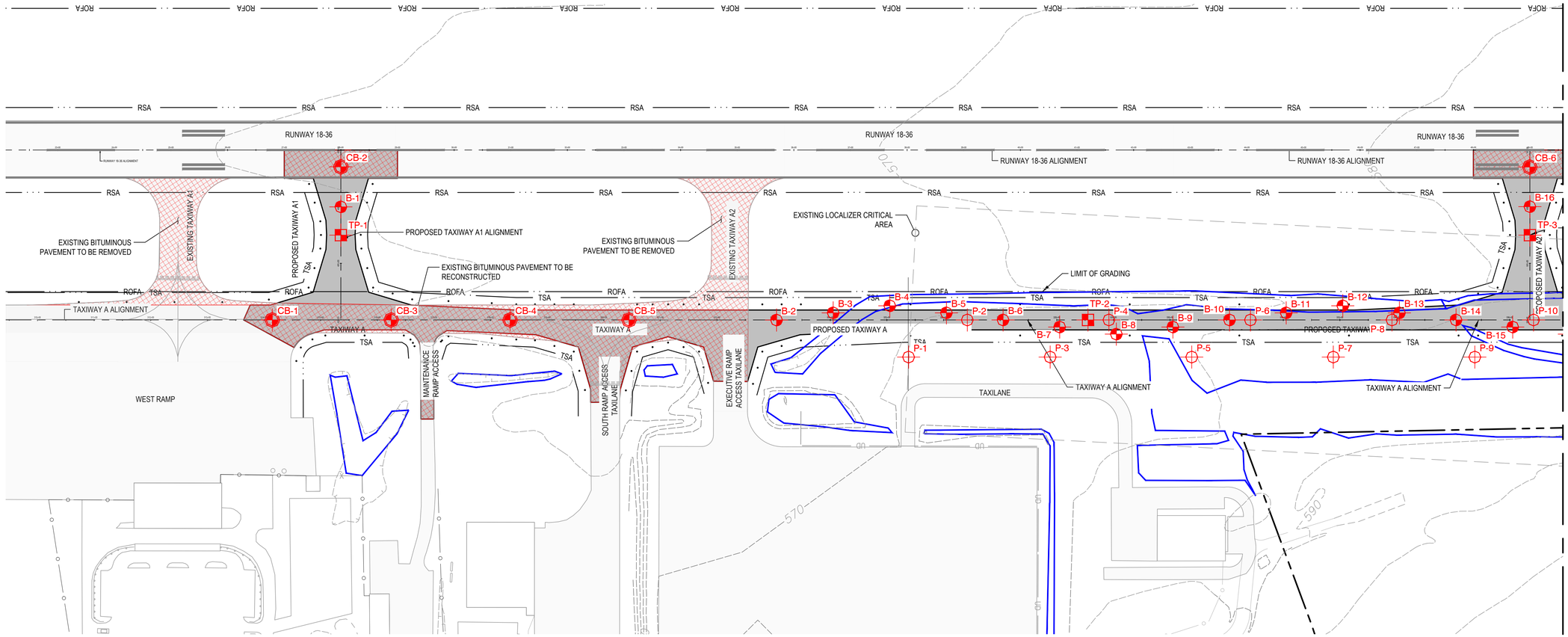
Observations have been made during exploration work to assess site groundwater levels. Fluctuations in water levels will occur due to variations in rainfall, temperature, and other factors.

S.W.COLE's scope of services has not included the investigation, detection, or prevention of any Biological Pollutants at the project site or in any existing or proposed structure at the site. The term "Biological Pollutants" includes, but is not limited to, molds, fungi, spores, bacteria, and viruses, and the byproducts of any such biological organisms.

Recommendations contained in this report are based substantially upon information provided by others regarding the proposed project. In the event that any changes are made in the design, nature, or location of the proposed project, S.W.COLE should review such changes as they relate to analyses associated with this report. Recommendations contained in this report shall not be considered valid unless the changes are reviewed by S.W.COLE.

APPENDIX B

Figures



LEGEND:

- APPROXIMATE BORING LOCATION
- APPROXIMATE CORE & BORING LOCATION
- APPROXIMATE TEST PIT LOCATION
- PROPOSED PROBE LOCATION

NOTES:

1. EXPLORATION LOCATION PLAN WAS PREPARED FROM A 1"=100' SCALE PLAN OF THE SITE ENTITLED "SUBSURFACE INVESTIGATIONS 7460 SKETCH," PREPARED BY STANTEC CONSULTING SERVICES INC. (STANTEC), DATED 03/03/2022.
2. THE EXPLORATION LOCATIONS WERE SELECTED BY STANTEC AND PROVIDED ON THE ABOVE REFERENCED PLAN AND SUBSEQUENTLY LOCATED IN THE FIELD BY S. W. COLE ENGINEERING, INC USING A RECREATIONAL GRADE GPS RECEIVER.
3. THIS PLAN SHOULD BE USED IN CONJUNCTION WITH THE ASSOCIATED S. W. COLE ENGINEERING, INC. GEOTECHNICAL REPORT.
4. THE PURPOSE OF THIS PLAN IS ONLY TO DEPICT THE LOCATION OF THE EXPLORATIONS IN RELATION TO THE EXISTING CONDITIONS AND PROPOSED CONSTRUCTION AND IS NOT TO BE USED FOR CONSTRUCTION.

0 100 200 Feet

S.W.COLE ENGINEERING, INC.

STANTEC

EXPLORATION LOCATION PLAN

RUNWAY 36 AND TAXIWAY EXTENSION
LEBANON MUNICIPAL AIRPORT
LEBANON, NEW HAMPSHIRE

Job No.:	21-1421	Scale:	1" = 100'
Date :	06/13/2022	Sheet:	1

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APPENDIX C

Exploration Logs and Key

TEST PROBE DATA		
Probe	Probe depth (ft)	Refusal Elevation (ft)
P-1	15	No Refusal
P-2	15	No Refusal
P-3	13	yes
P-4	15	No Refusal
P-5	15	No Refusal
P-6	15	No Refusal
P-7	11.5	yes
P-8	15	No Refusal
P-9	15	No Refusal
P-10	15	No Refusal
P-11	6	yes
P-12	10	yes
P-13	7	yes
P-14	15	No Refusal
P-15	14	yes
P-16	15	No Refusal
P-17	15	No Refusal
P-18	15	No Refusal
P-19	15	No Refusal
P-20	15	No Refusal
P-21	12.5	yes
P-22	15	No Refusal
P-23	15	No Refusal
P-24	15	No Refusal
P-25	15	No Refusal
P-26	15	No Refusal
P-27	15	No Refusal
P-28	15	No Refusal
P-29	15	No Refusal
P-30	15	No Refusal
P-31	15	No Refusal
P-32	15	No Refusal
P-33	15	No Refusal
P-34	15	No Refusal
P-35	15	No Refusal
P-36	15	No Refusal
P-37	15	No Refusal
P-38	15	No Refusal
P-39	15	No Refusal
P-40	7	yes
P-41	15	No Refusal
P-42	15	No Refusal
P-43	15	No Refusal
P-44	15	No Refusal

P-45	15	No Refusal	
P-46	15	No Refusal	
P-47	15	No Refusal	
P-48	15	No Refusal	first attempt 2.5' refusal
P-49	15	No Refusal	
P-50	15	No Refusal	
P-51	15	No Refusal	
P-52	15	No Refusal	
P-53	15	No Refusal	
P-54	15	No Refusal	
P-55	15	No Refusal	

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 1
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 5/2/2022
DATE FINISH: 5/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 17.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/20	2-3-4-10			5 inches of Topsoil		
										0.4 Medium dense, Gray Gravelly Silty SAND (FILL) (SM)		
			2D		2-4	24/17	9-8-16-20					
	5		3D		5-7	24/14	7-6-12-17			5.5 Loose to medium dense, Brown-gray silty SAND trace gravel with rootlets to 1.0 feet. (SM)		
	10		4D		10-12	24/23	11-12-16-20			11.0 Medium dense, Olive silty SAND some gravel (SM)		
	15		5D		15-17	24/12	6-7-6-5				▽	
										Bottom of Exploration at 17.0 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: B- 1

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 2
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/28/2022
DATE FINISH: 4/28/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Soil appears saturated below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/18	4-4-4-4			5 inches of Topsoil		
										0.4 Loose to medium dense, Brown SILT and fine SAND some clay (sm)		
			2D		2-4	24/22	9-11-17-17	ID 6385M				
										3.5 Medium dense, Brown gravelly silty SAND (SM)		
	5		3D		5-7	24/8	12-12-16-11					
	10		4D		10-12	24/12	6-5-5-4				▽	
										11.0 Loose to medium dense, Olive silty fine to medium SAND trace gravel (SM)		
	15		5D		15-17	24/11	9-12-12-7					
										15.9 Loose to medium dense, Olive-gray gravelly silty SAND (SM)		
										Bottom of Exploration at 17.0 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 3
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/28/2022
DATE FINISH: 4/28/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Soil appears saturated below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/17	3-5-5-4			6 inches of Topsoil		
										0.5 Loose to medium dense, Brown-gray fine to medium SAND and SILT some fine gravel (ML)		
			2D		2-4	24/19	9-11-10-5	ID 6386M w =4.9 %				
	5		3D		5-7	24/16	6-6-10-14					
	10		4D		10-12	24/13	7-7-8-7			9.9 Medium dense to dense, Gray silty SAND trace gravel (SM)	▽	
	15		5D		15-17	24/17	19-31-34-37			15.6 Very dense, Gray gravelly silty SAND (Glacial Till) (SM)		

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 4
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 16.4
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/14	2-4-6-5			6 inches of Topsoil		
										0.5 Loose to medium dense, Brown silty SAND trace gravel with rootlets to 1.5 feet. (SM)		
			2D		2-4	24/16	3-8-9-6					
	5		3D		5-7	24/3	7-7-12-15					
	10		4D		10-12	24/13	20-21-16-18					
										11.0 Medium dense to very dense, Olive-gray gravelly silty SAND (Glacial Till) (SM)		
	15		5D		15-16.4	17/10	15-49-55/5"				▽	

Bottom of Exploration at 16.4 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: B- 4

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 5
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 15.5 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/18	2-2-3-2			14 inches of Topsoil		
										1.2 Loose, Brown SILT and SAND with rootlets to 2.0 feet. (ML)		
			2D		2-4	24/24	4-8-8-8					
										3.0 Medium dense, Brown-olive silty SAND trace gravel (SM)		
	5		3D		5-7	24/16	10-12-9-9			5.0 Medium dense to very dense, Olive-gray gravelly silty SAND (SM)		
	10		4D		10-12	24/12	14-18-20-12					
	15		5D		15-15.5	6/5	51				▽	

Bottom of Exploration at 15.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 6
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 16.3
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/17	2-2-4-6			5 inches of Topsoil		
										0.4 Loose to medium dense, Brown silty SAND trace gravel with rootlets to 1.5 feet (SM)		
			2D		2-4	24/18	5-6-9-11					
	5		3D		5-7	24/15	9-11-10-9	ID 6387M w =4.8 %		5.0 Medium dense to dense, Brown-olive silty fine gravelly fine to medium SAND (SM)		
	10		4D		10-12	24/12	12-16-16-18					
	15		5D		15-16.3	16/14	12-29-50/4"			15.0 Very dense, Gray gravelly silty SAND (Glacial Till) (SM)	▽	

Bottom of Exploration at 16.3 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 7
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 19.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/18	3-4-5-5			0.3 3 inches of Topsoil Loose to medium dense, Brown-olive silty SAND trace gravel with rootlets to 2.0 feet. (SM)		
			2D		2-4	24/24	5-7-9-11					
	5		3D		5-7	24/24	10-10-14-10					
	10		4D		10-12	24/12	7-11-8-11			11.0 Medium dense to dense, Olive-gray silty SAND some gravel with 6 inch Brown SAND some silt some gravel layer at 17.5 feet. (SM)		
	15		5D		15-17	24/14	9-13-14-12				▽	
			6D		17-19	24/15	25-24-22-21			18.2 Dense, Gray gravelly silty SAND (Glacial Till) (SM)		
										Bottom of Exploration at 19.0 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 8
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Soil appears saturated below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/17	1-3-8-10			6 inches of Topsoil		
										0.5 Medium dense, Brown-olive silty fine to medium SAND some clay trace fine gravel with rootlets to 2.0 feet. (SM)		
			2D		2-4	24/20	10-9-10-7	ID 6388M				
	5		3D		5-7	24/23	8-9-14-14					
	10		4D		10-12	24/14	11-11-11-13				▽	
										10.8 Medium dense, Olive gravellly silty SAND (SM)		
	15		5D		15-17	24/9	5-8-17-16					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B- 9
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Soil appears saturated below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/17	2-3-2-5			0.3 4 inches of Topsoil Loose to medium dense, Brown silty SAND trace gravel (Reworked Till) (SM)		
			2D		2-4	24/24	7-8-8-13					
	5		3D		5-7	24/20	9-9-15-17					
	10		4D		10-12	24/15	9-9-11-13				▽	
										11.2 Medium dense to dense, Olive-gray gravelly silty SAND (Glacial Till) (SM)		
	15		5D		15-17	24/5	11-20-14-9					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: B- 9

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-10
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 17.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Soil appears saturated below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/10	2-5-9-5			6 inches of Topsoil		
										0.5 Medium dense to dense, Brown gravelly silty SAND (SM)		
			2D		2-4	24/0	15-16-16-21					
	5		3D		5-7	24/14	14-15-15-19					
								ID 6389M w =4.1 %		6.0 Medium dense to dense, Gray-olive silty fine gravelly fine to medium SAND with 6 inch Brown SAND some silt some gravel layer at 11.0 feet. (SM)		
	10		4D		10-12	24/12	23-16-18-16				▽	
										11.5 Dense, Olive-gray gravelly silty SAND (Glacial Till) (SM)		
	15		5D		15-17	24/14	10-15-24-23					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-11
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/27/2022
DATE FINISH: 4/27/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): Soil appears saturated from 0.0 to 3.0 and below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/19	2-3-5-10			6 inches of Topsoil		
										0.5 Loose to dense, Brown silty SAND some gravel (SM)		
			2D		2-4	24/13	14-21-29-26					
										3.5 Medium dense to dense, Gray gravelly silty SAND (SM)		
	5		3D		5-7	24/13	14-14-15-23					
										6.0 Dense to very dense, Olive silty SAND some gravel with probable nested cobbles and boulders from 7.0 to 8.5 feet. (SM)		
	10		4D		10-12	24/13	22-34-30-12					
										11.0 Dense to very dense, Gray gravelly silty SAND with 4 inch Gray SAND some gravel some silt layer at 16.5 feet. (Glacial Till) (SM)		
	15		5D		15-17	24/6	3-10-24-23					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-12
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 16.4 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 0 ft Soil appears saturated below 0.0 feet. (CHECK SAMPLES)
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth ▽	Remarks
			1D		0-2	24/17	3-3-4-6	ID 6390M		5 inches of Topsoil		
										0.4 Loose to dense, Olive fine gravelly silty SAND some clay with organics and rootlets to 2.0 feet. (SM)		
			2D		2-4	24/16	11-12-20-18					
	5		3D		5-7	24/15	14-9-12-39					
										6.5 Dense to very dense, Olive-gray gravelly silty SAND with probable nested cobbles and boulders from 10.5 to 12.5 feet. (Glacial Till) (SM)		
	10		4D		10-12	24/15	11-16-20-37					
	15		5D		15-16.4	17/12	27-35-50/5"					

Bottom of Exploration at 16.4 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-13
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 6.3 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Soil appears saturated from 0.0 to 2.0 feet.
GENERAL NOTES: Offset 5.0 feet west of stake and reached full depth on probe.

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/20	3-4-5-13			0.3 4 inches of Topsoil Loose, Olive-gray gravelly silty SAND (SM)		
			2D		2-4	24/20	10-22-25-21			2.0 Dense, Gray silty SAND trace gravel (SM)		
	5		3D		5-6.3	16/10	25-24-50/4"			5.0 Very dense, Gray gravelly silty SAND with nested cobble and boulders from 5.5 to 6.3 feet. (Glacial Till) (SM)		

Auger Refusal at 6.3 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-14
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 15.8
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/15	3-3-4-16			0.2 2 inches of Topsoil Loose to very dense, Brown-gray fine gravelly SAND and SILT (SM)		
			2D		2-3.8	21/14	16-12-17-50/3"	ID 6391M w =4.8 %				
	5		3D		5-7	24/12	37-26-27-21			6.0 Very dense, Gray gravelly silty SAND with probable nested cobbles and boulders 12.0 to 13.5 feet. (Glacial Till) (SM)		
	10		4D		10-12	24/17	15-26-27-24					
	15		5D		15-15.8	10/10	50-50/4"					

Bottom of Exploration at 15.8 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-15
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 16.3 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/16	2-6-5-3			0.3 4 inches of Topsoil Medium dense, Brown-olive Silty fine to medium SAND trace gravel with rootlets to 1.0 feet. (SM)		
			2D		2-4	24/21	5-8-11-15			3.5 Medium dense, Brown-olive silty SAND some gravel (SM)		
	5		3D		5-7	24/24	10-16-12-12					
	10		4D		10-12	24/19	16-18-17-25			10.5 Dense to very dense, Gray gravelly silty SAND with probable nested cobbles and boulders from 12.5 to 14.5 feet. (Glacial Till) (SM)		
	15		5S		15-16.3	16/13	42-46-50/4"				▽	

Bottom of Exploration at 16.3 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-16
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/29/2022
DATE FINISH: 4/29/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 17.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/22	2-4-7-9			0.3 4 inches of Topsoil Medium dense, SILT and fine to medium SAND trace gravel with rootlets to 1.0 feet. (ML)		
			2D		2-3.7	20/15	11-10-14-50/2"			3.0 Medium dense, Gray gravelly silty SAND with nested cobbles and boulders 3.5 to 4.5 feet. (SM)		
	5		3D		5-7	24/18	8-7-8-10			5.0 Medium dense to desne, Gray-brown silty SAND some gravel (SM)		
	10		4D		10-12	24/14	8-18-23-19			11.0 Dense to very dense, Gray gravelly silty SAND (Glacial Till) (SM)		
	15		5D		15-17	24/10	19-36-25-20					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-17
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 16.4 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/22	2-3-4-4			0.4 5 inches of Topsoil Loose to Dense, Brown-olive silty fine to medium SAND trace gravel with rootlets to 1.5 feet. (SM)		
			2D		2-4	24/24	5-4-5-5					
	5		3D		5-7	24/18	6-6-6-6					
	10		4D		10-12	24/20	18-24-31-27			10.3 Very dense, Olive-gray silty SAND some gravel (Glacial Till) (SM)		
	15		5D		15-16.4	17/11	13-35-50/5"				▽	

Bottom of Exploration at 16.4 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-18
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 9.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/22	5-6-3-4			0.3 3 inches of Topsoil Loose, Brown-olive silty SAND some gravel (SM)		
										1.5 Dense, Brown-olive silty fine gravelly fine to medium SAND some clay (SM)		
			2D		2-4	24/20	36-20-17-15					
	5		3D		5-7	24/24	14-16-16-21	ID 6392M				

Auger Refusal at 9.0 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-19
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/22	3-4-5-6			6 inches of Topsoil		
										0.5 Loose to medium dense, Brown-olive silty fine to medium SAND trace gravel with rootlets to 1.5 feet. (SM)		
			2D		2-4	24/24	7-10-9-15					
	5		3D		5-7	24/24	11-15-18-19			5.0 Dense to very dense, Olive-gray silty SAND some gravel (Glacial Till) (SM)		
	10		4D		10-12	24/19	14-21-21-22					
	15		5D		15-17	24/24	27-38-35-49					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-20
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/26/2022
DATE FINISH: 4/26/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 8.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/16	2-2-2-3			8 inches of Topsoil		
										0.7 Loose, Brown-olive silty fine to medium SAND trace gravel with rootlets to 2.0 feet. (SM)		
			2D		2-4	24/22	8-7-19-19			2.3 Medium dense to dense, Olive-gray gravelly silty SAND with nest cobbles and boulders from 5.5 to 6.0 feet. (SM)		
	5		3D		5-7	24/14	41-21-21-20					

Auger Refusal at 8.0 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-21
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/25/2022
DATE FINISH: 4/25/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 8.5 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/21	2-3-5-8			0.4 5 inches of Topsoil Loose to medium dense, Olive-gray silty SAND some gravel with rootlets to 1.0 feet. (SM)		
			2D		2-4	24/20	11-18-18-20			2.5 Dense, Olive-gray silty fine gravelly fine to medium SAND (SM)		
	5		3D		5-7	24/17	15-15-16-18	ID 6393M w =3.4 %				

Bottom of Exploration at 8.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-22
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/25/2022
DATE FINISH: 4/25/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 7.5
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/15	2-4-5-12			6 inches of Topsoil		
										0.5 Loose to medium dense, Brown gravelly silty SAND (SM)		
			2D		2-4	24/9	11-8-11-14					
										3.2 Medium dense to dense, Olive-gray silty SAND some gravel (SM)		
	5		3D		5-7	24/24	8-11-18-24					

Auger Refusal at 7.5 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-23
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/25/2022
DATE FINISH: 4/25/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/20	2-5-8-11	ID 6394M		7 inches of Topsoil		
										0.6 Medium dense, Brown-olive fine gravelly silty SAND some clay with rootlets and organics to 1.5 feet. (SM)		
			2D		2-4	24/18	5-8-9-10			2.5 Medium dense to dense, Olive-gray silty SAND some gravel (SM)		
	5		3D		5-7	24/24	8-9-9-10					
	10		4D		10-12	24/14	20-25-24-33			11.0 Dense to very dense, Gray gravelly silty SAND (Glacial Till) (SM)		
	15		5D		15-17	24/22	17-27-30-37					

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-24
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/25/2022
DATE FINISH: 4/25/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 12.5
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/9	7-22-19-18			6 inches of Topsoil		
										0.5 Medium dense to dense, Brown gravelly silty SAND (SM)		
			2D		2-4	24/17	26-11-12-19					
	5		3D		5-7	24/22	8-9-12-18			5.0 Medium dense to very dense, Gray silty SAND some gravel (Glacial Till) (SM)		
	10		4D		10-11.5	18/14	28-27-50					

Bottom of Exploration at 12.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-25
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/25/2022
DATE FINISH: 4/25/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 8.5 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/23	3-11-10-5			6 inches of Topsoil		
										0.5 Medium dense to very dense, Olive-gray fine to medium SAND and SILT some fine gravel (SM)		
			2D		2-4	24/21	8-20-15-9	ID 6395M w =4.9 %				
	5		3D		5-7	24/0	12-20-41-25					

Auger Refusal at 8.5 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-26
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/25/2022
DATE FINISH: 4/25/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 16.9
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/22	2-6-9-5			8 inches of Topsoil		
										0.7 Medium dense, Brown-olive silty SAND some gravel with rootlets to 1.0 feet. (SM)		
			2D		2-4	24/22	11-12-14-13			2.0 Medium dense to very dense, Olive-gray gravelly silty SAND with 4 inch Gray SAND some gravel some silt layer at 16.0 feet. (SM)		
	5		3D		5-7	24/21	7-10-15-19					
	10		4D		10-12	24/24	16-24-27-24					
	15		5D		15-16.9	23/19	17-26-42-50/5"					

Bottom of Exploration at 16.9 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-27
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/25/2022
DATE FINISH: 4/25/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 16.4
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/18	3-4-8-15			12 inches of Topsoil		
										1.0 Medium dense to very dense, Brown silty SAND trace fine gravel with a 4 inch olive gravelly SAND some silt layer at 3.0 feet. (SM)		
			2D		2-4	24/10	17-49-18-11					
	5		3D		5-7	24/24	12-17-22-35			5.0 Dense to very dense, Olive-gray gravelly silty SAND (Glacial Till) (SM)		
	10		4D		10-12	24/21	18-29-35-30					
	15		5D		15-16.4	17/15	27-43-50/5"					
										Bottom of Exploration at 16.4 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: B-27

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-28
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/22/2022
DATE FINISH: 4/22/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 15.4
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: N/A / 4 1/2 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 3 ft Soil appears saturated below 3.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/7	2-3-3-8			7 inches of Topsoil		
										0.6 Loose to medium dense, Gray-brown gravelly SAND and SILT (SM)		
			2D		2-4	24/8	13-13-13-38	ID 6396M w =4.8 %			▽	
	5		3D		5-7	24/24	8-7-11-18					
										6.0 Medium dense to very dense, Gray-brown gravelly silty SAND (Glacial Till) (SM)		
	10		4D		10-11.9	23/23	24-27-40-50/5"					
	15		5D		15-15.4	5/1	50/5"					

Bottom of Exploration at 15.4 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-29
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/22/2022
DATE FINISH: 4/22/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 15.8 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / 4 1/2 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Soil appears saturated below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/13	2-5-12-11			6 inches of Topsoil		
										0.5 Medium dense, Brown-gray fine gravelly silty SAND some clay with organics to 1.5 feet. (SM)		
			2D		2-4	24/7	8-11-11-10					
	5		3D		5-7	24/14	12-7-12-19					
										5.8 Dense to very dense, Gray gravelly silty SAND (Glacial Till) (SM)		
	10		4D		10-11.5	18/9	24-40-50				▽	
	15		5D		15-15.8	10/5	18-50/4"					
										Bottom of Exploration at 15.8 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-30
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/22/2022
DATE FINISH: 4/22/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 15.5 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / 4 1/2 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 5 ft Soil appears saturated below 5.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/17	2-2-4-7			8 inches of Topsoil		
										0.7 Loose to medium dense, Brown-olive fine gravelly silty SAND some clay with organics to 2.5 feet. (SM)		
			2D		2-4	24/20	8-6-5-5	ID 6397M				
	5		3D		5-7	24/24	4-6-8-8				▽	
										6.0 Medium dense to very dense, Olive-gray gravelly silty SAND (Glacial Till) (SM)		
	10		4D		10-12	24/15	16-28-34-30					
	15		5D		15-15.5	6/3	50/6"					

Bottom of Exploration at 15.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-31
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/22/2022
DATE FINISH: 4/22/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 14.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / 4 1/2 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): Free-water observed flowing from borehole as drilling was advanced past 5.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/12	2-2-3-3			6 inches of Topsoil		
										0.5 Loose, Olive silty fine to medium SAND trace gravel with organics and rootlets to 2.0 feet. (SM)		
			2D		2-4	24/12	5-4-4-6					
	5		3D		5-7	24/14	6-2-7-8					
										6.0 Medium dense, Gray gravelly silty SAND with 12 inch brown SAND some fine gravel trace silt layer at 10.0 feet. (Glaical Till) (SM)		
	10		4D		10-12	24/24	12-16-21-35					

Auger Refusal at 14.0 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING NO.: B-31

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-32
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/22/2022
DATE FINISH: 4/22/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 16.5
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: N/A / 4 1/2 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 5 ft Soil appears saturated below 5.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/20	2-4-10-13			10 inches of Topsoil		
										0.8 Medium dense, Brown-gray silty gravelly SAND (SM)		
			2D		2-4	24/21	14-11-11-11					
										3.0 Medium dense, Olive-gray fine to medium Sandy Clayey SILT trace fine gravel (FILL) (ML)		
	5		3D		5-7	24/23	6-6-5-5	ID 6398M			▽	
	10		4D		10-12	24/24	4-4-3-10			10.0 6 inch dark brown SILT and fine SAND with organics (Relic Topsoil) 10.5		
										Very dense, Gray silty SAND some gravel (Glacial Till) (SM)		
	15		5D		15-16.5	18/15	20-30-42					

Bottom of Exploration at 16.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-33
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/18/2022
DATE FINISH: 4/18/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/14	2-8-17-18			0.3 4 inches of Topsoil Loose to dense, Brown-gray silty SAND some fine gravel (SM)		
			2D		2-4	24/17	9-11-9-15					
	5		3D		5-7	24/12	14-10-21-20	ID 6399M w =4.4 %				
	10		4D		10-12	24/13	2-2-3-9			11.0 Medium dense, Gray Clayey fine Sandy SILT trace gravel (ML)		
	15		5D		15-17	24/19	8-12-34-42			15.5 Dense, Gray silty SAND some gravel (Glacial Till) (SM)	▽	

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-34
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/18/2022
DATE FINISH: 4/18/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 7.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES: First attempted encountered HSA refusal at 7.0 feet.

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/16	4-13-17-10			0.3 3 inches of Topsoil Dense to very dense, Brown-gray fine gravelly silty SAND some clay with nested cobbles and boulders from 3.0 to 4.0 feet. (SM)		
			2D		2-4	24/11	9-20-16-5	ID 6400M				
	5		3D		5-6.8	21/18	13-35-49-50/3"					

Auger Refusal at 7.0 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-35
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/18/2022
DATE FINISH: 4/18/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 17.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** 2 1/4 in / 5 5/8 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/20	8-16-20-20			0.3 3 inches of Topsoil Dense, Brown-gray silty SAND some fine gravel with rootlets to 1.0 feet. (SM)		
			2D		2-4	24/12	13-17-14-20	ID 6401M w =3.8 %				
	5		3D		5-7	24/19	13-17-27-34					
	10		4D		10-12	24/20	10-13-17-21					
	15		5D		15-17	24/24	7-13-18-22				▽	

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

CLIENT:	Stantec
PROJECT:	Runway 18-36 and Taxiway A Extension
LOCATION:	Lebanon Municipal Airport, Lebanon, NH

BORING NO.:	**B-36**
SHEET:	1 of 1
PROJECT NO.	21-1421
DATE START:	4/20/2022
DATE FINISH:	4/20/2022

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** **TOTAL DEPTH (FT):** 15.9 **LOGGED BY:** Bryce Walker

DRILLING CO.: S. W. Cole Explorations, LLC **DRILLER:** Ben Cross **DRILLING METHOD:** Solid Stem Auger

RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** N/A / 4 1/2 in **SAMPLER:** Standard Split-Spoon

HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:**

HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30

WATER LEVEL DEPTHS (ft): Soil appears saturated below 2.0 feet.

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:

Water Level
- ▽ At time of Drilling
- ▼ At Completion of Drilling
- ▼ After Drilling

D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear

Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot

WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector

S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/19	2-2-2-9			0.3 4 inches of Topsoil Very loose to medium dense, Gray silty SAND trace gravel with organics and rootlets to 2.0 feet. (SM)		
			2D		2-4	24/24	12-7-4-4			2.5 Medium dense to very dense, Olive silty fine to medium SAND some clay some fine gravel (SM)		
	5		3D		5-7	24/23	6-8-9-6	ID 6402M				
	10		4D		10-12	24/12	36-36-21-27			11.0 Very dense, Gray gravelly silty SAND (Glacial Till) (SM)		
	15		5D		15-15.9	11/7	34-50/5"			Bottom of Exploration at 15.9 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-37
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/21/2022
DATE FINISH: 4/21/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 12.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / 4 1/2 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 6.5 ft Soil appears saturated below 6.5 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/19	1-5-16-15			8 inches of Topsoil		
										0.7 Loose to medium dense, Gray-brown fine to medium SAND and SILT some gravel (FILL) (SM)		
	5		2D		5-7	24/10	12-7-6-3	ID 6403M w =12.2 %			▽	
	10		3D		10-12	24/24	3-4-4-16			10.0 18 inches of Relic Topsoil		
										11.5 Medium dense, Gray silty fine to medium SAND some gravel (Glacial Till) (SM)		
										Bottom of Exploration at 12.0 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-38
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/21/2022
DATE FINISH: 4/21/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 14.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: N/A / 4 1/2 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 5 ft Soil appears saturated below 5.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/11	6-3-5-21			0.3 3 inches of Topsoil Loose, Brown-gray silty SAND some gravel (FILL) (SM)		
			2D		2-4	24/12	6-2-3-2					
										3.9 Loose, Gray-orange silty fine gravelly fine to medium SAND some clay (FILL) (SM)	▽	
	5		3D		5-7	24/6	3-2-3-3	ID 6404M				
	10		4D		10-12	24/15	9-3-5-4					
										11.5 18 inches of Relic Topsoil		
			5D		12-14	24/14	13-10-9-7					
										13.0 Medium dense, Gray Silty fine to medium SAND trace gravel (SM)		

Bottom of Exploration at 14.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-39
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/21/2022
DATE FINISH: 4/21/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 12.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / 4 1/2 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 5 ft Soil appears saturated below 5.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/16	1-1-5-5	ID 6405M w =5.8 %		Loose to medium dense, Brown-olive fine to medium SAND and SILT trace gravel with organics and rootlets to 2.0 feet (FILL) (SM)		
			2D		2-3.8	22/7	5-7-12-50/4"					
										3.5 Medium dense, Brown-gray Silty fine to medium SAND some fine gravel (FILL) (SM)		
	5		3D		5-7	24/19	3-8-9-8				▽	
										5.5 12 inches of Relic Topsoil		
										6.5 Medium dense, Brown-gray silty gravelly SAND (SM)		
	10		4D		10-12	24/19	10-11-17-16					

Bottom of Exploration at 12.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-40
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/20/2022
DATE FINISH: 4/20/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 11.4 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / 4 1/2 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/22	2-2-3-2			6 inches of Topsoil		
										0.5 Loose to medium dense, Brown silty fine to medium SAND trace gravel with rootlets to 1.0 feet. (SM)		
			2D		2-4	24/20	9-8-11-16					
	5		3D		5-7	24/24	10-12-16-18	ID 6406M w =4.6 %		5.0 Medium dense to very dense, Brown-gray gravelly silty SAND (Glacial Till) (SM)		
	10		4D		10-11.4	17/14	26-26-50/5"					

Auger Refusal at 11.4 feet
(Probable Boulder)

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-41
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/20/2022
DATE FINISH: 4/20/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 16.5
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: N/A / 4 1/2 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 10 ft Soil appears saturated below 10.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/21	1-3-3-3			0.3 4 inches of Topsoil Loose, Brown-gray silty SAND with rootlets 1.0 to 1.0 feet (SM)		
			2D		2-4	24/14	4-6-21-12			Loose to medium dense, Gray silty SAND some gravel (SM)		
										3.5 Medium dense, Gray silty fine to medium SAND some clay trace fine gravel (SM)		
	5		3D		5-7	24/24	8-6-6-8	ID 6407M				
										6.0 Very dense, Olive-gray silty gravelly SAND (Glaical Till) (SM)		
	10		4D		10-12	24/24	13-20-34-31				▽	
	15		5D		15-16.5	18/15	15-40-35					

Bottom of Exploration at 16.5 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-42
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/19/2022
DATE FINISH: 4/19/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1D		0-2	24/19	5-12-17-12			5 inches of Topsoil		
										0.4 Medium dense to dense, Brown gravelly silty SAND some clay (SM)		
			2D		2-3.8	22/14	27-24-21-50/4"	ID 6408M				
	5		3D		5-7	24/12	12-17-18-21			5.0 Medium dense to dense, Olive-gray silty SAND trace gravel (SM)		
	10		4D		10-12	24/24	10-7-7-12					
										12.0 Dense, Gray silty SAND some gravel (Glacial Till) (SM)		
	15		5D		15-17	24/12	10-14-30-42				▽	

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-43
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/19/2022
DATE FINISH: 4/19/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 17.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:** Solid Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / 4 1/2 in | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-1.4	17/11	6-16-50/5"			6 inches of Topsoil		
										0.5 Dense, Brown-gray gravelly silty SAND with nested cobble and boulders from 1.5 to 2.5 feet (SM)		
	5		2D		5-7	24/22	12-15-17-15	ID 6409M		5.0 Dense, Brown-gray silty clayey fine to medium SAND trace fine gravel (SM)		
	10		3D		10-12	24/20	5-4-6-12			10.0 Loose to medium dense, Gray silty fine to medium SAND trace gravel (SM)		
	15		4D		15-17	24/24	6-8-11-11				▽	
										16.5 Medium dense, Gray-brown gravelly SAND some silt (SM)		
										Bottom of Exploration at 17.0 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: B-44
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/29/2022
DATE FINISH: 4/29/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 17.0
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD: Hollow Stem Auger
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: 2 1/4 in / 5 5/8 in
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): ▽ 15 ft Soil appears saturated below 15.0 feet.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1D		0-2	24/16	5-12-15-11			5 inches of Topsoil		
										0.4 Medium dense to very dense, Brown silty coarse gravelly SAND (SM)		
			2D		2-4	24/12	16-28-30-35	ID 6410M w =2.7 %				
	5		3D		5-7	24/20	19-24-18-18					
	10		4D		10-12	24/24	8-11-10-14			10.0 Medium dense, Brown silty SAND trace gravel (SM)		
	15		5D		15-17	24/17	4-5-7-14				▽	
										15.6 Medium dense, Brown-gray gravelly silty SAND (SM)		

Bottom of Exploration at 17.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: CB-1
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/28/2022
DATE FINISH: 4/28/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 6.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:**
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / N/A | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1C		0-					4 inches of Pavement		
			1B		0.3-			ID 6360M		0.3 Brown-gray fine gravelly silty SAND (Base and Subbase Material) (SM)		
			2B		2-			ID 6361M				
			1D		4-6	24/11	27-21-14-11					
	5									5.7 Dense, Brown silty fine to medium SAND trace fine gravel (SM)		
										Bottom of Exploration at 6.0 feet		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

CLIENT:	Stantec
PROJECT:	Runway 18-36 and Taxiway A Extension
LOCATION:	Lebanon Municipal Airport, Lebanon, NH

BORING NO.:	CB-2
SHEET:	1 of 1
PROJECT NO.	21-1421
DATE START:	5/2/2022
DATE FINISH:	5/2/2022

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** **TOTAL DEPTH (FT):** 6.0 **LOGGED BY:** Bryce Walker

DRILLING CO.: S. W. Cole Explorations, LLC **DRILLER:** Ben Cross **DRILLING METHOD:**

RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** N/A / N/A **SAMPLER:** Standard Split-Spoon

HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:**

HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30

WATER LEVEL DEPTHS (ft): No free-water observed.

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:

Water Level
- ▽ At time of Drilling
- ▼ At Completion of Drilling
- ▼ After Drilling

D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear

Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot

WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector

S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1C		0-					0.3 4.25 inches of Pavement		
			1B		0.3-			ID 6362M		0.8 Brown-gray fine gravelly SAND trace silt trace clay (Base Material) (SW)		
										Brown-gray silty fine gravelly silty SAND trace clay (Subbase Material) (SM)		
			2B		2-			ID 6363M				
			1D		4-6	24/17	15-21-24-20					
	5									4.6 Very dense, Brown-olive silty SAND some gravel (SM)		

Bottom of Exploration at 6.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: CB-3
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/28/2022
DATE FINISH: 4/28/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 6.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:**
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / N/A | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1C		0-					3.5 inches of Pavement		
			1B		0.3-			ID 6364M		0.3 Brown-gray silty fine gravelly fine to medium SAND (Base and Subbase Material) (SM)		
			2B		2-			ID 6365M				
			1D		4-6	24/17	21-31-34-19					
	5									5.0 Very dense, Brown-olive silty SAND some gravel (SM)		

Bottom of Exploration at 6.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING LOG

CLIENT:	Stantec
PROJECT:	Runway 18-36 and Taxiway A Extension
LOCATION:	Lebanon Municipal Airport, Lebanon, NH

BORING NO.:	CB-4
SHEET:	1 of 1
PROJECT NO.	21-1421
DATE START:	4/28/2022
DATE FINISH:	4/28/2022

Drilling Information

LOCATION: See Exploration Location Plan **ELEVATION (FT):** **TOTAL DEPTH (FT):** 6.0 **LOGGED BY:** Bryce Walker

DRILLING CO.: S. W. Cole Explorations, LLC **DRILLER:** Ben Cross **DRILLING METHOD:**

RIG TYPE: Track Mounted Mobile Drill B-53 **AUGER ID/OD:** N/A / N/A **SAMPLER:** Standard Split-Spoon

HAMMER TYPE: Automatic **HAMMER WEIGHT (lbs):** 140 **CASING ID/OD:** N/A /N/A **CORE BARREL:**

HAMMER EFFICIENCY FACTOR: **HAMMER DROP (inch):** 30

WATER LEVEL DEPTHS (ft): No free-water observed.

GENERAL NOTES:

KEY TO NOTES AND SYMBOLS: Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling

D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear

Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot

WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector

S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1C		0-					3.5 inches of Pavement		
			1B		0.3-			ID 6366M		0.3 Brown-gray silty fine gravelly SAND some clay (Base and Subbase Material) (SM)		
			2B		2-			ID 6367M				
			1D		4-6	24/19	12-8-17-23					
	5									4.5 Medium dense, Brown-olive silty SAND some gravel (SM)		

Bottom of Exploration at 6.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: CB-5
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 4/28/2022
DATE FINISH: 4/28/2022

Drilling Information

LOCATION: See Exploration Location Plan
ELEVATION (FT):
TOTAL DEPTH (FT): 4.7
LOGGED BY: Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC
DRILLER: Ben Cross
DRILLING METHOD:
RIG TYPE: Track Mounted Mobile Drill B-53
AUGER ID/OD: N/A / N/A
SAMPLER: Standard Split-Spoon
HAMMER TYPE: Automatic
HAMMER WEIGHT (lbs): 140
CASING ID/OD: N/A /N/A
CORE BARREL:
HAMMER EFFICIENCY FACTOR:
HAMMER DROP (inch): 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Drilling
▼ At Completion of Drilling
▼ After Drilling
D = Split Spoon Sample
U = Thin Walled Tube Sample
R = Rock Core Sample
V = Field Vane Shear
Pen. = Penetration Length
Rec. = Recovery Length
bpf = Blows per Foot
mpf = Minute per Foot
WOR = Weight of Rods
WOH = Weight of Hammer
RQD = Rock Quality Designation
PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.
q_u = Unconfined Compressive Strength, kips/sq.ft.
Ø = Friction Angle (Estimated)
N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_20 Depth	Remarks
			1C		0-					4.5 inches of Pavement		
			1B		0.4-					0.4 Brown-gray silty fine gravelly fine to medium SAND some clay (Base and Subbase Material) (SM)		
			2B		2-			ID 6369M				
			1D		4-4.7	8/8	37-50/2"			4.0 Very dense, Brown-olive silty SAND some gravel (SM)		
										Auger Refusal at 4.7 feet (Probable Boulder or Concrete)		

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

BORING LOG

S.W.COLE ENGINEERING, INC.

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: CB-6
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 5/2/2022
DATE FINISH: 5/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 6.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:**
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / N/A | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1C		0-					0.3 4.25 inches of Pavement		
			1B		0.3-			ID 6370M		0.8 Brown-gray SAND and fine GRAVEL some silt trace clay (Base Material) (SW)		
										Brown-gray silty fine gravelly SAND some clay (Subbase Material) (SM)		
			2B		2-			ID 6371M				
			1D		4-6	24/22	21-27-24-25					
	5									4.5 Very dense, Brown-olive silty SAND some gravel (SM)		

Bottom of Exploration at 6.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: CB-7
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 5/2/2022
DATE FINISH: 5/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 6.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:**
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / N/A | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1C		0-					0.3 4.0 inches of Pavement		
			1B		0.3-			ID 6372M		0.8 Brown-gray fine gravelly silty SAND some clay (Base Material) (SM)		
										Brown-gray silty fine gravelly SAND some clay (Subbase Material) (SM)		
			2B		2-							
			1D		4-6	24/19	16-31-65-70					
	5									5.0 Dense, Brown-olive silty SAND some gravel (SM)		

Bottom of Exploration at 6.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

S.W.COLE ENGINEERING, INC.

BORING LOG

CLIENT: Stantec
PROJECT: Runway 18-36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

BORING NO.: CB-8
SHEET: 1 of 1
PROJECT NO. 21-1421
DATE START: 5/2/2022
DATE FINISH: 5/2/2022

Drilling Information

LOCATION: See Exploration Location Plan | **ELEVATION (FT):** | **TOTAL DEPTH (FT):** 6.0 | **LOGGED BY:** Bryce Walker
DRILLING CO.: S. W. Cole Explorations, LLC | **DRILLER:** Ben Cross | **DRILLING METHOD:**
RIG TYPE: Track Mounted Mobile Drill B-53 | **AUGER ID/OD:** N/A / N/A | **SAMPLER:** Standard Split-Spoon
HAMMER TYPE: Automatic | **HAMMER WEIGHT (lbs):** 140 | **CASING ID/OD:** N/A /N/A | **CORE BARREL:**
HAMMER EFFICIENCY FACTOR: | **HAMMER DROP (inch):** 30
WATER LEVEL DEPTHS (ft): No free-water observed.
GENERAL NOTES:

KEY TO NOTES AND SYMBOLS:
Water Level: ▽ At time of Drilling; ▼ At Completion of Drilling; ▼ After Drilling
D = Split Spoon Sample; U = Thin Walled Tube Sample; R = Rock Core Sample; V = Field Vane Shear
Pen. = Penetration Length; Rec. = Recovery Length; bpf = Blows per Foot; mpf = Minute per Foot
WOR = Weight of Rods; WOH = Weight of Hammer; RQD = Rock Quality Designation; PID = Photoionization Detector
S_v = Field Vane Shear Strength, kips/sq.ft.; q_u = Unconfined Compressive Strength, kips/sq.ft.; Ø = Friction Angle (Estimated); N/A = Not Applicable

Elev. (ft)	Depth (ft)	Casing Pen. (bpf)	SAMPLE INFORMATION: Sample No.	Type	Depth (ft)	Pen./ Rec. (in)	Blow Count or RQD	Field / Lab Test Data	Graphic Log	Sample Description & Classification	H_2O Depth	Remarks
			1C		0-					4.25 inches of Pavement		
			1B		0.3-			ID 6374M		0.4 Brown-gray fine gravelly silty SAND some clay (Base Material) (SM) 0.8		
			2B		2-			ID 6375M		Brown-gray silty fine gravelly SAND some clay (Subbase Material) (SM)		
	5		1D		4-6	24/23	17-17-29-29			4.2 Dense, Brown-olive silty SAND some gravel (SM)		

Bottom of Exploration at 6.0 feet

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

BORING / WELL 21-1421.GPJ SWCE TEMPLATE.GDT 6/13/22

TEST PIT LOGS

CLIENT: Stantec
PROJECT: Runway 36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

PROJECT NO.: 21-1421
LOGGED BY: Leah Leite
CONTRACTOR: L&M Service Contractors
EQUIPMENT: Deere 35G Excavator

TEST PIT TP- 1

DATE: 6/1/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** **COMPLETION DEPTH (FT):** 6.8
WATER LEVEL ELEVATIONS (FT): No Free Water **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		6" of Grassed Topsoil					
		0.5 Gray Gravelly SAND and SILT, some Clay (FILL)					
5				1S		5-	
		5.5 Brown Relic Topsoil, with rootlets and organics					
		6.5 Gray Silty Gravelly SAND, trace Clay (Native)					
		Bottom of Exploration at 6.8 feet					

TEST PIT TP- 2

DATE: 6/2/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL ELEVATIONS (FT): Moist Soils at 7' **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		3" of Grassed Topsoil					
		0.3 Brown Gravelly Silty SAND, some Clay, with rootlets to 2.0 feet and occasional cobbles and boulders (Fill)					
5				1S		5-	
			▽ 7				
		Bottom of Exploration at 7.0 feet					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

CLIENT: Stantec
PROJECT: Runway 36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

PROJECT NO.: 21-1421
LOGGED BY: Leah Leite
CONTRACTOR: L&M Service Contractors
EQUIPMENT: Deere 35G Excavator

TEST PIT TP- 3

DATE: 6/1/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** _____ **COMPLETION DEPTH (FT):** 6.0
WATER LEVEL ELEVATIONS (FT): No Free Water **REMARKS:** _____

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		8" of Grassed Topsoil					
		0.7 Brown SILT and fine SAND, some Gravel with rootlets to 2' (Fill)					
		2.5 Gray Gravelly Silty SAND some Clay, with frequent cobbles and boulders (Fill)					
5				1S		5-	
		Bottom of Exploration at 6.0 feet					

TEST PIT TP- 4

DATE: 6/2/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** _____ **COMPLETION DEPTH (FT):** 7.0
WATER LEVEL ELEVATIONS (FT): No Free Water **REMARKS:** _____

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		4" of Grassed Topsoil					
		0.3 Brown Silty Gravelly SAND some Clay, with rootlets (Fill)					
		2.0 Brown-Gray Gravelly Silty SAND, some Clay, with occasional cobbles and boulders (Fill)					
5				1S		5-	
		6.3 Gray Silty fine SAND, some fine Gravel (Native)					
		Bottom of Exploration at 7.0 feet					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

TEST PIT LOGS

CLIENT: Stantec
PROJECT: Runway 36 and Taxiway A Extension
LOCATION: Lebanon Municipal Airport, Lebanon, NH

PROJECT NO.: 21-1421
LOGGED BY: Leah Leite
CONTRACTOR: L&M Service Contractors
EQUIPMENT: Deere 35G Excavator

TEST PIT TP- 5

DATE: 6/2/2022 **LOCATION:** See Exploration Location Plan **SURFACE ELEVATION (FT):** **COMPLETION DEPTH (FT):** 6.5
WATER LEVEL ELEVATIONS (FT): No Free Water **REMARKS:**

Depth (feet)	Graphic Log	Stratum Description	H_20 Depth	Sample No.	Type	Sample Depth (ft)	Field / Lab Test Data
		0.3 3" of Grassed Topsoil					
		Brown Gravelly Silty SAND, some Clay, with trace organics and occasional cobbles and boulders (Fill)					
5				1S		5-	
		Bottom of Exploration at 6.5 feet					

Stratification lines represent approximate boundary between soil types, transitions may be gradual. Water level readings have been made at times and under conditions stated. Fluctuations of groundwater may occur due to other factors than those present at the time measurements were made.

KEY TO NOTES AND SYMBOLS:
Water Level
▽ At time of Digging
▼ At Completion of Digging
▼ After Digging

q_p = Pocket Penetrometer Strength, kips/sq.ft.

KEY TO NOTES & SYMBOLS

Test Boring and Test Pit Explorations

Stratification lines represent the approximate boundary between soil types and the transition may be gradual.

Key to Symbols Used:

w	-	water content, percent (dry weight basis)
q_u	-	unconfined compressive strength, kips/sq. ft. - laboratory test
S_v	-	field vane shear strength, kips/sq. ft.
L_v	-	lab vane shear strength, kips/sq. ft.
q_p	-	unconfined compressive strength, kips/sq. ft. – pocket penetrometer test
O	-	organic content, percent (dry weight basis)
W_L	-	liquid limit - Atterberg test
W_P	-	plastic limit - Atterberg test
WOH	-	advance by weight of hammer
WOM	-	advance by weight of man
WOR	-	advance by weight of rods
HYD	-	advance by force of hydraulic piston on drill
RQD	-	Rock Quality Designator - an index of the quality of a rock mass.
γ_T	-	total soil weight
γ_B	-	buoyant soil weight

Description of Proportions:

Trace:	0 to 5%
Some:	5 to 12%
"Y"	12 to 35%
And	35+%
With	Undifferentiated

Description of Stratified Soils

Parting:	0 to 1/16" thickness
Seam:	1/16" to 1/2" thickness
Layer:	½" to 12" thickness
Varved:	Alternating seams or layers
Occasional:	one or less per foot of thickness
Frequent:	more than one per foot of thickness

REFUSAL: **Test Boring Explorations** - Refusal depth indicates that depth at which, in the drill foreman's opinion, sufficient resistance to the advance of the casing, auger, probe rod or sampler was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

REFUSAL: **Test Pit Explorations** - Refusal depth indicates that depth at which sufficient resistance to the advance of the backhoe bucket was encountered to render further advance impossible or impracticable by the procedures and equipment being used.

Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

APPENDIX D

Laboratory Test Results

S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

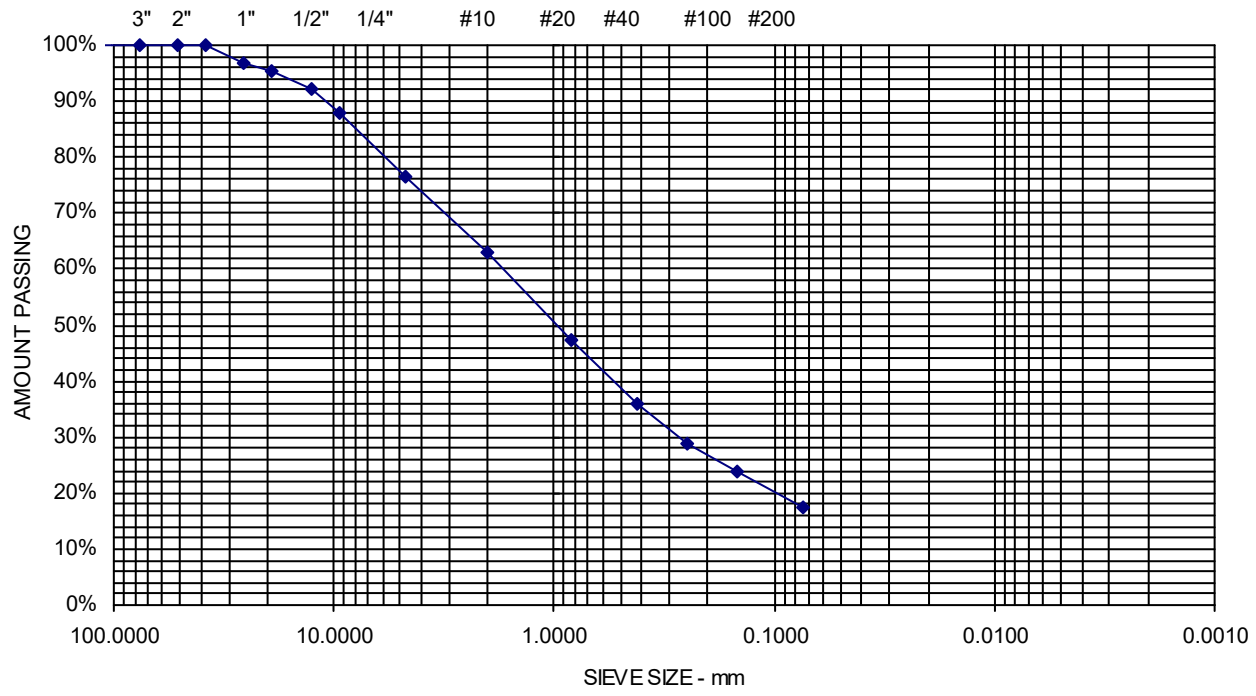
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **CB-1 BASE**

Project Number: 21-1421
Lab ID: 6360M
Date Received: 5/4/2022
Date Completed: 5/13/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**97**	
19.0 mm	**3/4"**	**95**	
12.5 mm	**1/2"**	**92**	
9.5 mm	**3/8"**	**88**	
4.75 mm	**No. 4**	**76**	23.6% Gravel
2.00 mm	**No. 10**	**63**	
850 um	**No. 20**	**48**	
425 um	**No. 40**	**36**	58.9% Sand
250 um	**No. 60**	**29**	
150 um	**No. 100**	**24**	
75 um	**No. 200**	**17.5**	17.5% Fines



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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

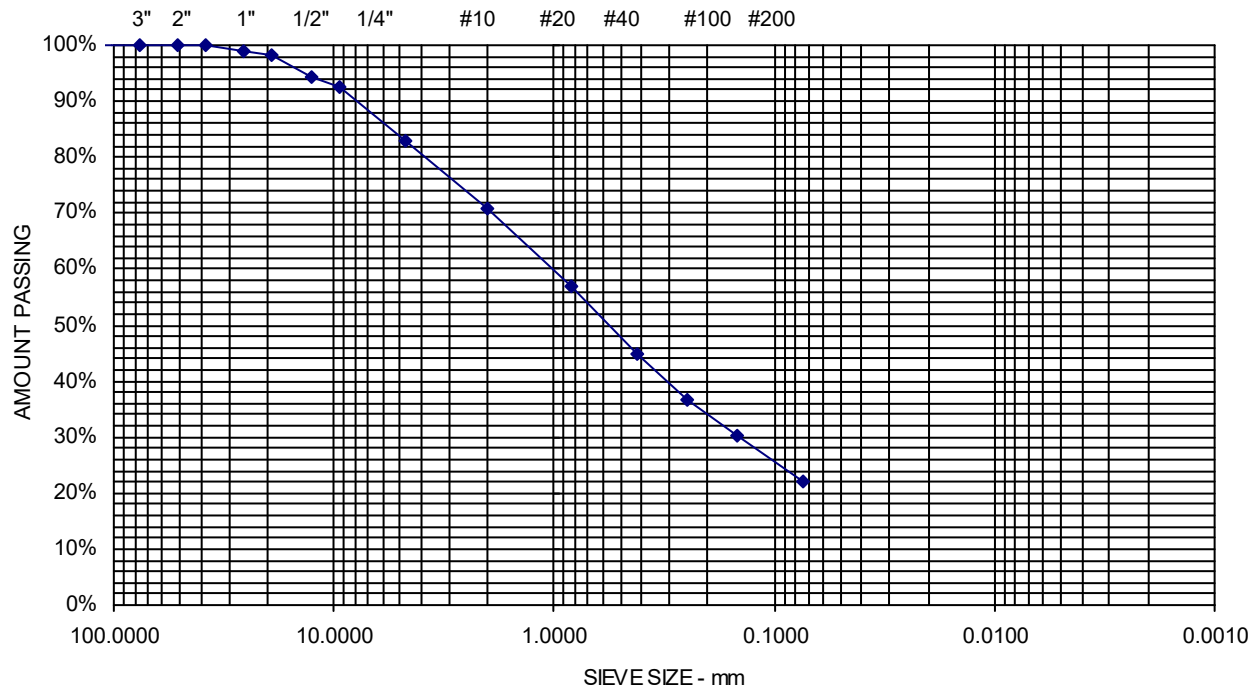
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **CB-1 SUBBASE**

Project Number: 21-1421
Lab ID: 6361M
Date Received: 5/4/2022
Date Completed: 5/13/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**99**	
19.0 mm	**3/4"**	**98**	
12.5 mm	**1/2"**	**94**	
9.5 mm	**3/8"**	**92**	
4.75 mm	**No. 4**	**83**	17% Gravel
2.00 mm	**No. 10**	**71**	
850 um	**No. 20**	**57**	
425 um	**No. 40**	**45**	61% Sand
250 um	**No. 60**	**37**	
150 um	**No. 100**	**30**	
75 um	**No. 200**	**22.0**	22% Fines



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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

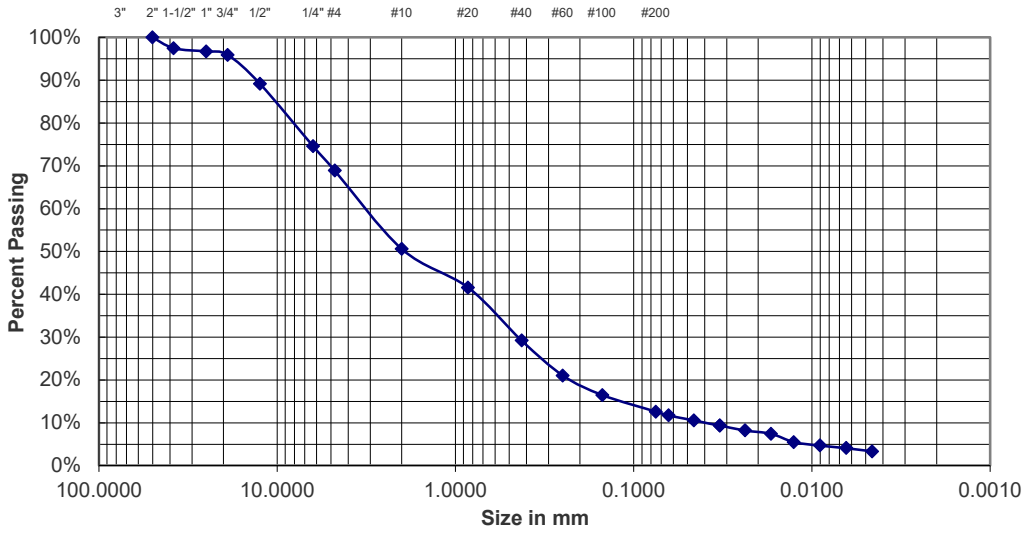
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6362M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/18/2022
Material Source:	CB-2, Base material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**97**	
1"	25	**97**	
¾"	19	**96**	
½"	12.5	**89**	
¼"	6.3	**75**	
No. 4	4.75	**69**	
No. 10	2	**51**	
No. 20	0.85	**42**	
No. 40	0.425	**29**	
No. 60	0.25	**21**	
No. 100	0.15	**16**	
No. 200	0.075	**12.6**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06374	**11.7**
0.04601	**10.5**
0.03293	**9.4**
0.03293	**9.4**
0.02374	**8.2**
0.01698	**7.4**
0.01263	**5.5**
0.00903	**4.7**
0.00643	**4.1**
0.00459	**3.3**
0.00328	**2.5**
0.00232	**2.5**
0.00134	**2.3**



Particle Distribution:				
	Gravel (3" - No. 4)	**31.1%**	Fines (0.074 -0.005)	**9.0%**
	Sand (No. 4 - No. 200)	**56.3%**	Clay (<0.005)	**3.6%**

Comments:

Reviewed By

13 Delta Drive, Unit 8, Londonderry, NH 03053 • P: (603) 716.2111 • F: (603) 716.2112 • E: infolondonderry@swcole.com

S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

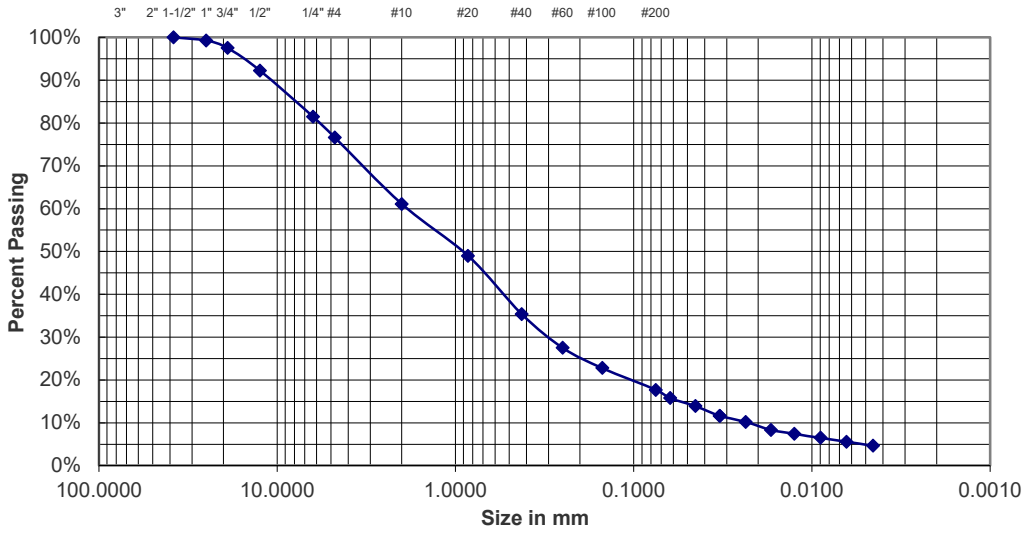
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6363M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/18/2022
Material Source:	CB-2, Subbase material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**99**	
¾"	19	**98**	
½"	12.5	**92**	
¼"	6.3	**81**	
No. 4	4.75	**77**	
No. 10	2	**61**	
No. 20	0.85	**49**	
No. 40	0.425	**35**	
No. 60	0.25	**27**	
No. 100	0.15	**23**	
No. 200	0.075	**17.7**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06237	**15.7**
0.04507	**13.9**
0.03293	**11.6**
0.03293	**11.6**
0.02356	**10.2**
0.01698	**8.3**
0.01254	**7.4**
0.00893	**6.5**
0.00638	**5.6**
0.00454	**4.6**
0.00325	**3.7**
0.00232	**3.5**
0.00134	**3.0**



Particle Distribution:				
	Gravel (3" - No. 4)	**23.4%**	Fines (0.074 -0.005)	**12.9%**
	Sand (No. 4 - No. 200)	**59.0%**	Clay (<0.005)	**4.8%**

Comments:

Reviewed By

13 Delta Drive, Unit 8, Londonderry, NH 03053 • P: (603) 716.2111 • F: (603) 716.2112 • E: infolondonderry@swcole.com

S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

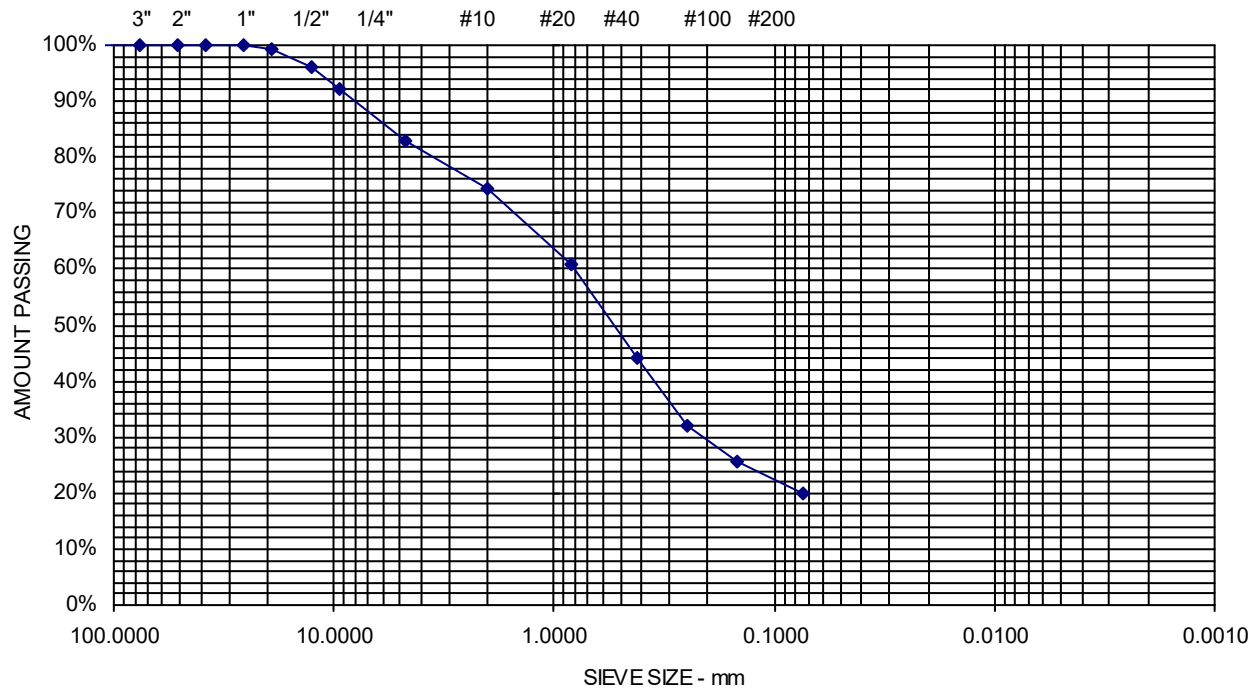
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **CB-3 BASE**

Project Number: 21-1421
Lab ID: 6364M
Date Received: 5/4/2022
Date Completed: 5/20/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**99**	
12.5 mm	**1/2"**	**96**	
9.5 mm	**3/8"**	**92**	
4.75 mm	**No. 4**	**83**	17.2% Gravel
2.00 mm	**No. 10**	**74**	
850 um	**No. 20**	**61**	
425 um	**No. 40**	**44**	63% Sand
250 um	**No. 60**	**32**	
150 um	**No. 100**	**26**	
75 um	**No. 200**	**19.8**	19.8% Fines



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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

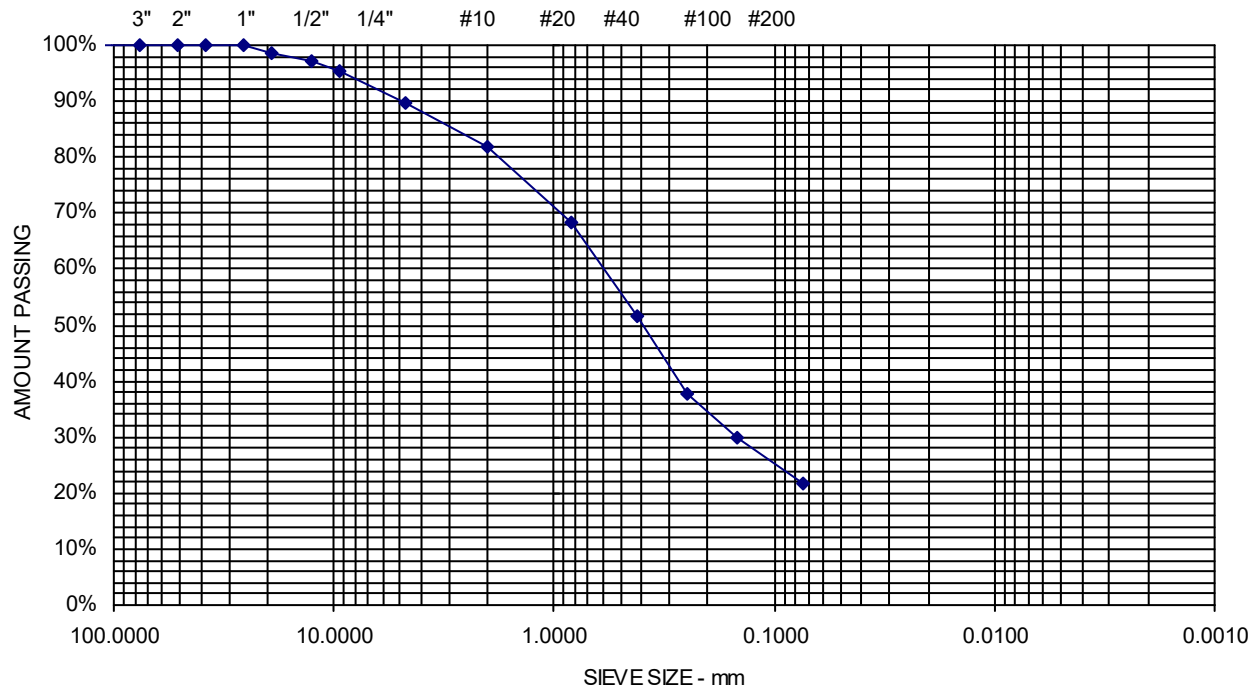
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **CB-3 SUBBASE**

Project Number: 21-1421
Lab ID: 6365M
Date Received: 5/4/2022
Date Completed: 5/20/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**99**	
12.5 mm	**1/2"**	**97**	
9.5 mm	**3/8"**	**96**	
4.75 mm	**No. 4**	**90**	10.2% Gravel
2.00 mm	**No. 10**	**82**	
850 um	**No. 20**	**68**	
425 um	**No. 40**	**51**	67.9% Sand
250 um	**No. 60**	**38**	
150 um	**No. 100**	**30**	
75 um	**No. 200**	**21.9**	21.9% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

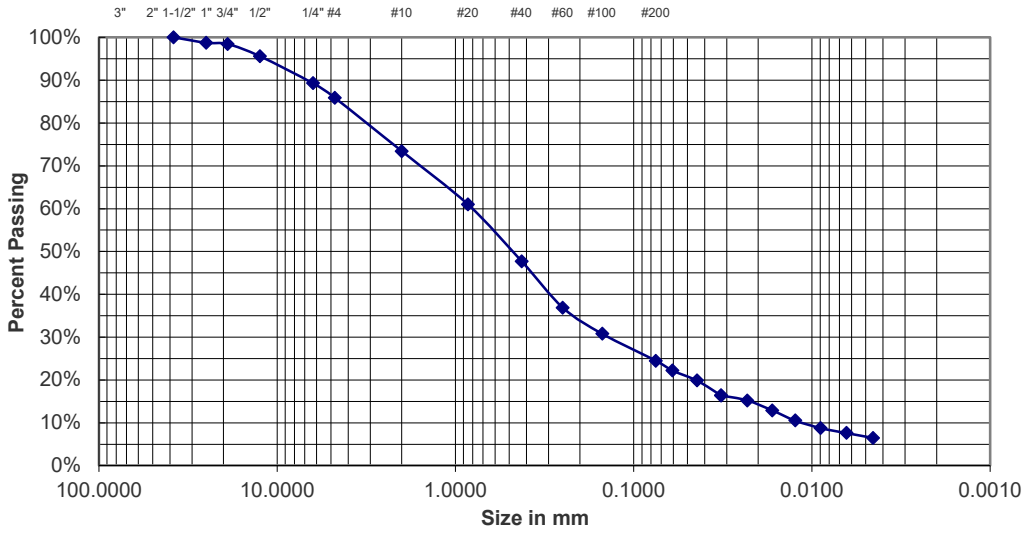
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6366M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/18/2022
Material Source:	CB-4, Base material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**99**	
¾"	19	**98**	
½"	12.5	**96**	
¼"	6.3	**89**	
No. 4	4.75	**86**	
No. 10	2	**73**	
No. 20	0.85	**61**	
No. 40	0.425	**48**	
No. 60	0.25	**37**	
No. 100	0.15	**31**	
No. 200	0.075	**24.5**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06069	**22.2**
0.04410	**19.9**
0.03227	**16.4**
0.03227	**16.4**
0.02301	**15.2**
0.01666	**12.9**
0.01240	**10.5**
0.00893	**8.8**
0.00638	**7.6**
0.00454	**6.4**
0.00325	**5.3**
0.00230	**5.0**
0.00133	**4.7**



Particle Distribution:

Gravel (3" - No. 4)	**14.1%**	Fines (0.074 -0.005)	**17.6%**
Sand (No. 4 - No. 200)	**61.4%**	Clay (<0.005)	**6.9%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

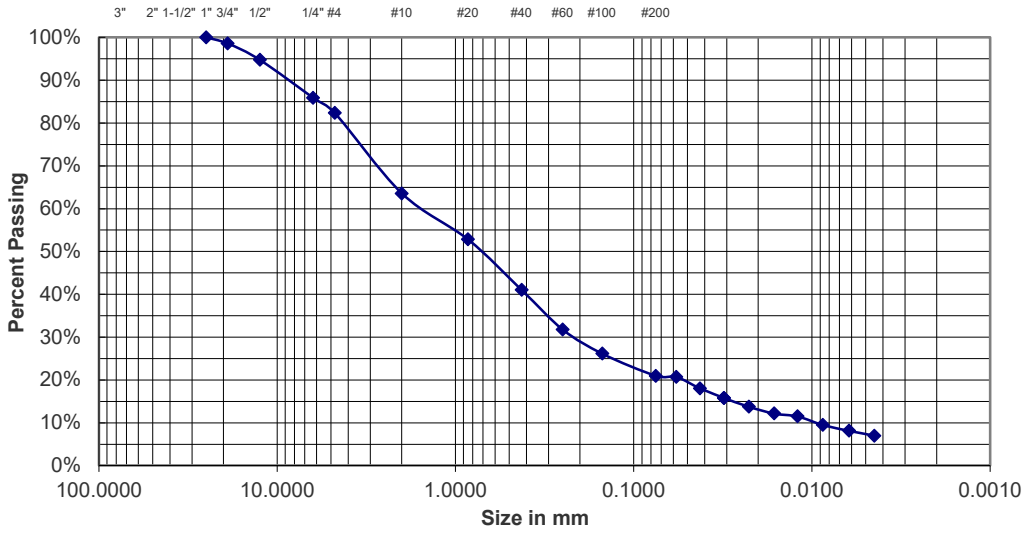
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6367M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/25/2022
Material Source:	CB-4, Subbase material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**99**	
½"	12.5	**95**	
¼"	6.3	**86**	
No. 4	4.75	**82**	
No. 10	2	**64**	
No. 20	0.85	**53**	
No. 40	0.425	**41**	
No. 60	0.25	**32**	
No. 100	0.15	**26**	
No. 200	0.075	**21.0**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05779	**20.7**
0.04251	**18.0**
0.03119	**15.8**
0.03119	**15.8**
0.02253	**13.7**
0.01627	**12.2**
0.01202	**11.5**
0.00867	**9.5**
0.00620	**8.1**
0.00447	**7.0**
0.00316	**6.3**
0.00226	**5.4**
0.00131	**5.0**



Particle Distribution:

Gravel (3" - No. 4)	**17.6%**	Fines (0.074 -0.005)	**13.5%**
Sand (No. 4 - No. 200)	**61.4%**	Clay (<0.005)	**7.5%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

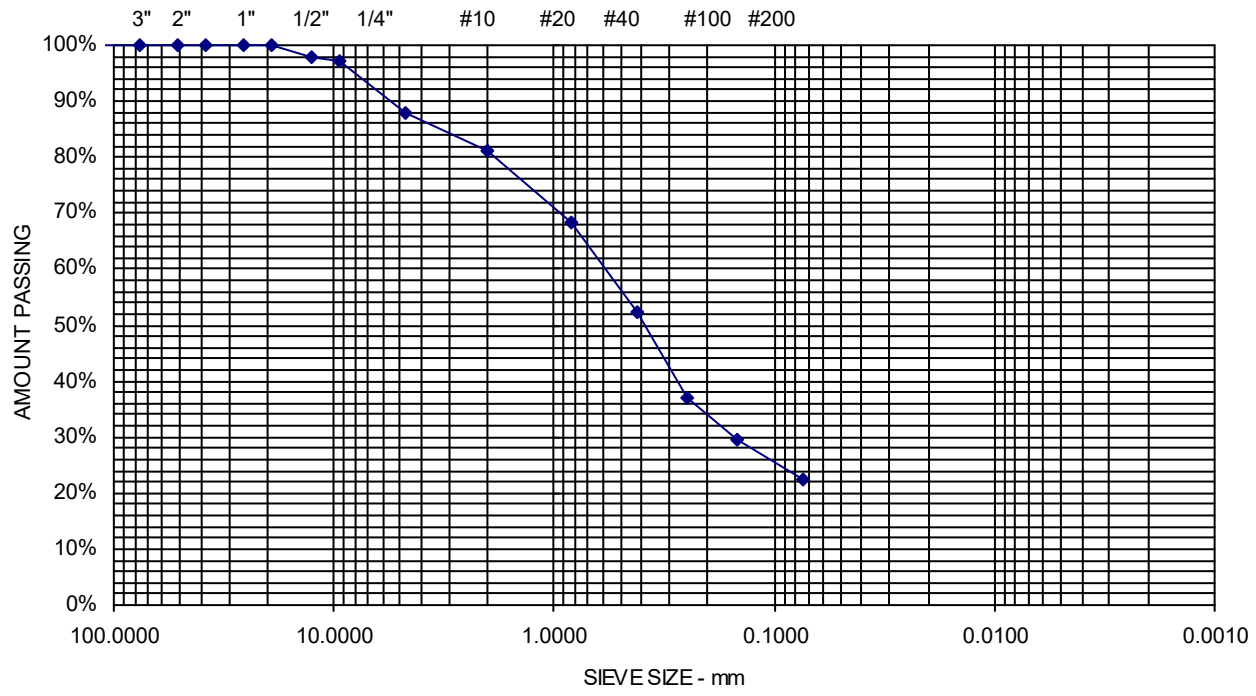
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **CB-5 SUBBASE**

Project Number: 21-1421
Lab ID: 6369M
Date Received: 5/4/2022
Date Completed: 5/25/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**98**	
9.5 mm	**3/8"**	**97**	
4.75 mm	**No. 4**	**88**	12.1% Gravel
2.00 mm	**No. 10**	**81**	
850 um	**No. 20**	**68**	
425 um	**No. 40**	**52**	65.4% Sand
250 um	**No. 60**	**37**	
150 um	**No. 100**	**30**	
75 um	**No. 200**	**22.5**	22.5% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

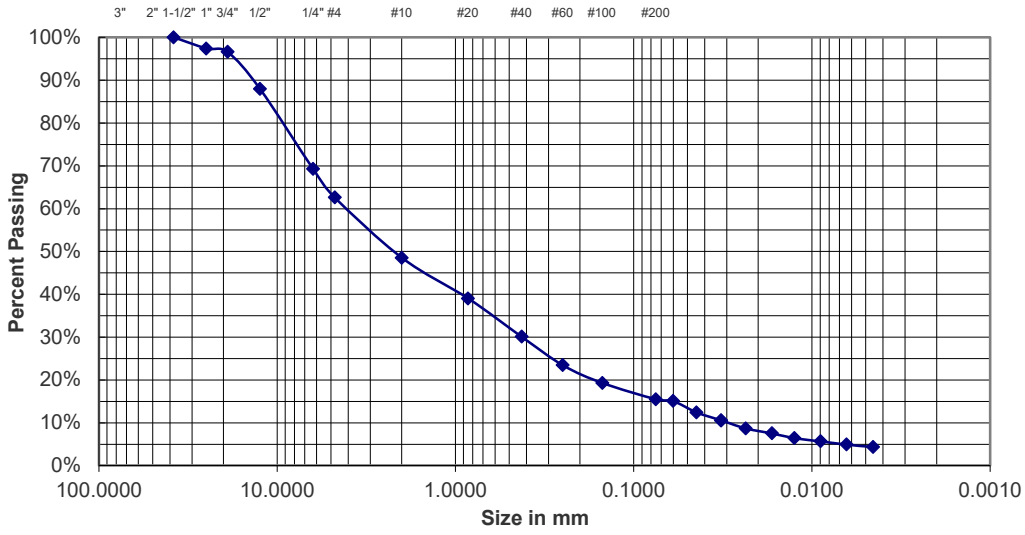
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6370M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/19/2022
Material Source:	CB-6, Base material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**97**	
¾"	19	**97**	
½"	12.5	**88**	
¼"	6.3	**69**	
No. 4	4.75	**63**	
No. 10	2	**49**	
No. 20	0.85	**39**	
No. 40	0.425	**30**	
No. 60	0.25	**23**	
No. 100	0.15	**19**	
No. 200	0.075	**15.5**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06012	**15.1**
0.04449	**12.4**
0.03227	**10.6**
0.03227	**10.6**
0.02356	**8.7**
0.01679	**7.5**
0.01254	**6.4**
0.00893	**5.7**
0.00638	**4.9**
0.00454	**4.3**
0.00321	**3.8**
0.00230	**3.4**
0.00133	**3.0**



Particle Distribution:

Gravel (3" - No. 4)	**37.4%**	Fines (0.074 -0.005)	**11.1%**
Sand (No. 4 - No. 200)	**47.1%**	Clay (<0.005)	**4.4%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

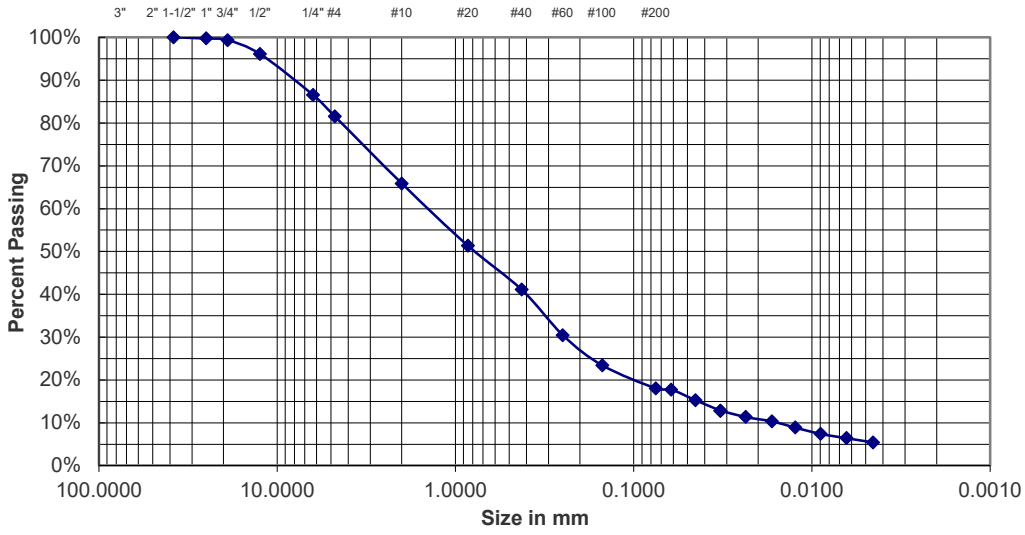
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6371M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/19/2022
Material Source:	CB-6, Subbase material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**99**	
½"	12.5	**96**	
¼"	6.3	**87**	
No. 4	4.75	**82**	
No. 10	2	**66**	
No. 20	0.85	**51**	
No. 40	0.425	**41**	
No. 60	0.25	**30**	
No. 100	0.15	**23**	
No. 200	0.075	**18.0**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06154	**17.7**
0.04507	**15.3**
0.03254	**12.8**
0.03254	**12.8**
0.02356	**11.3**
0.01679	**10.3**
0.01240	**8.9**
0.00893	**7.4**
0.00638	**6.4**
0.00454	**5.4**
0.00321	**4.9**
0.00230	**4.4**
0.00133	**3.9**



Particle Distribution:

Gravel (3" - No. 4)	**18.4%**	Fines (0.074 -0.005)	**12.1%**
Sand (No. 4 - No. 200)	**63.5%**	Clay (<0.005)	**5.9%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

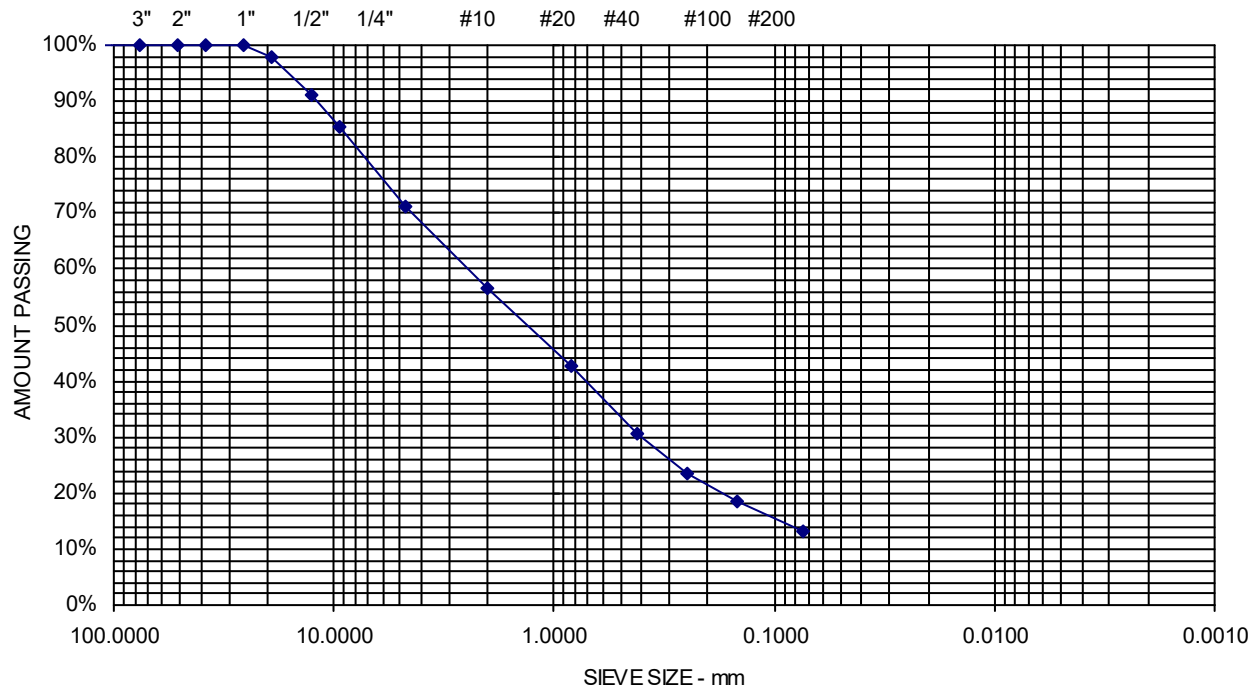
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **CB-7 BASE**

Project Number: 21-1421
Lab ID: 6372M
Date Received: 5/4/2022
Date Completed: 5/25/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**98**	
12.5 mm	**1/2"**	**91**	
9.5 mm	**3/8"**	**85**	
4.75 mm	**No. 4**	**71**	28.9% Gravel
2.00 mm	**No. 10**	**57**	
850 um	**No. 20**	**43**	
425 um	**No. 40**	**31**	57.9% Sand
250 um	**No. 60**	**23**	
150 um	**No. 100**	**18**	
75 um	**No. 200**	**13.2**	13.2% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

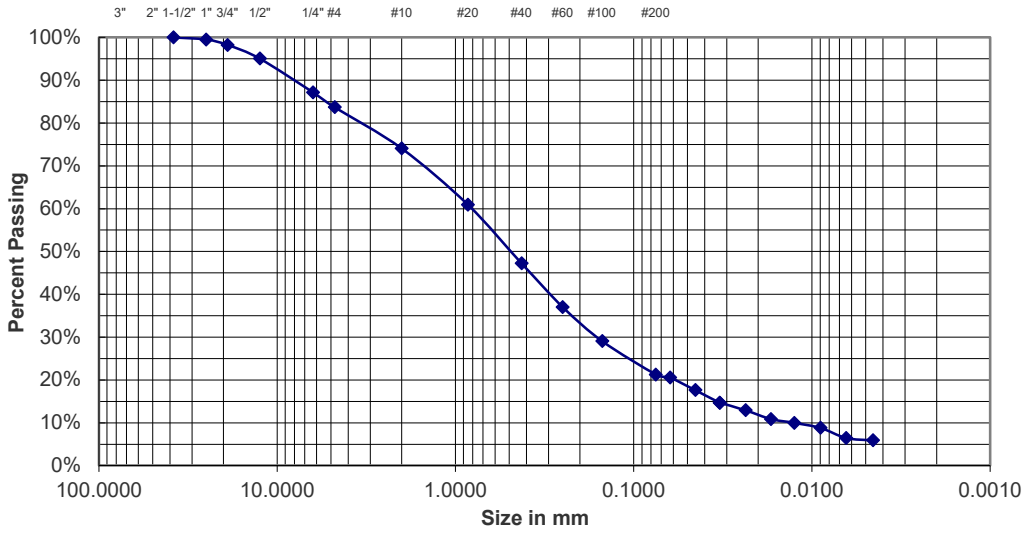
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6374M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/19/2022
Material Source:	CB-8, Base material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**99**	
¾"	19	**98**	
½"	12.5	**95**	
¼"	6.3	**87**	
No. 4	4.75	**84**	
No. 10	2	**74**	
No. 20	0.85	**61**	
No. 40	0.425	**47**	
No. 60	0.25	**37**	
No. 100	0.15	**29**	
No. 200	0.075	**21.2**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06237	**20.5**
0.04507	**17.6**
0.03293	**14.7**
0.03293	**14.7**
0.02356	**12.9**
0.01698	**10.9**
0.01254	**10.0**
0.00893	**8.8**
0.00643	**6.5**
0.00454	**5.9**
0.00325	**5.3**
0.00230	**4.7**
0.00134	**4.1**



Particle Distribution:

Gravel (3" - No. 4)	**16.3%**	Fines (0.074 -0.005)	**14.9%**
Sand (No. 4 - No. 200)	**62.4%**	Clay (<0.005)	**6.3%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

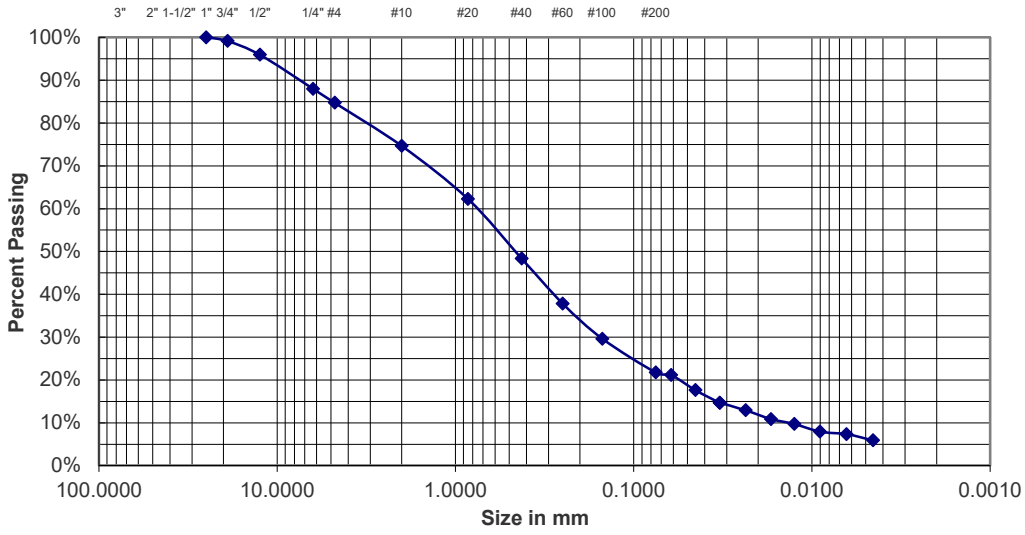
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6375M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Bulk sample	**Date Completed:**	5/19/2022
Material Source:	CB-8, Subbase material	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**99**	
½"	12.5	**96**	
¼"	6.3	**88**	
No. 4	4.75	**85**	
No. 10	2	**75**	
No. 20	0.85	**62**	
No. 40	0.425	**48**	
No. 60	0.25	**38**	
No. 100	0.15	**30**	
No. 200	0.075	**21.7**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06154	**21.1**
0.04507	**17.6**
0.03293	**14.7**
0.03293	**14.7**
0.02356	**12.9**
0.01698	**10.9**
0.01254	**9.7**
0.00903	**7.9**
0.00638	**7.3**
0.00454	**5.9**
0.00325	**5.3**
0.00230	**4.7**
0.00134	**4.4**



Particle Distribution:

Gravel (3" - No. 4)	**15.3%**	Fines (0.074 -0.005)	**15.4%**
Sand (No. 4 - No. 200)	**63.0%**	Clay (<0.005)	**6.4%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

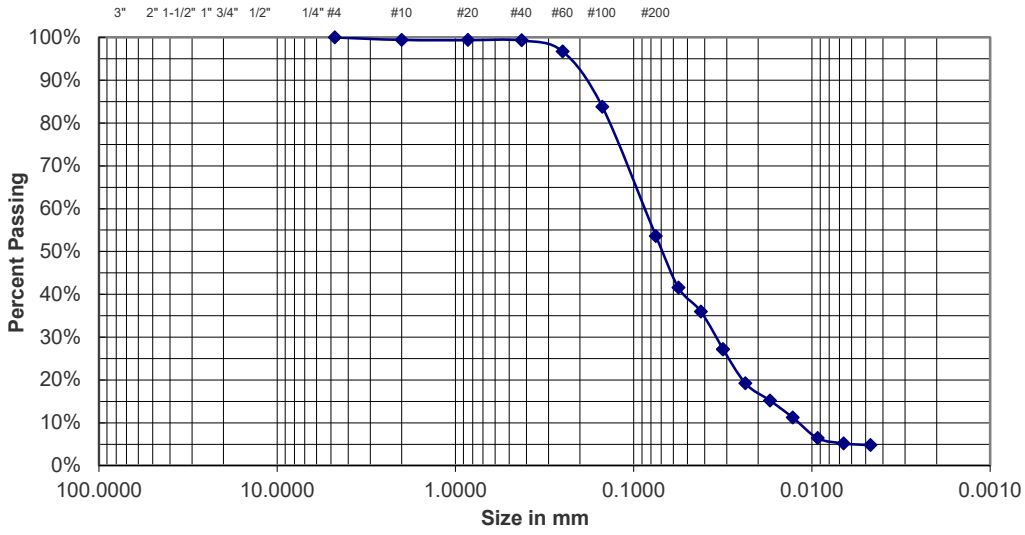
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6385M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/10/2022
Material Source:	B-2, 2D, 2-4'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**100**	
¼"	6.3	**100**	
No. 4	4.75	**100**	
No. 10	2	**99**	
No. 20	0.85	**99**	
No. 40	0.425	**99**	
No. 60	0.25	**97**	
No. 100	0.15	**84**	
No. 200	0.075	**53.6**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05603	**41.5**
0.04200	**36.0**
0.03157	**27.2**
0.03157	**27.2**
0.02357	**19.2**
0.01719	**15.2**
0.01278	**11.2**
0.00930	**6.4**
0.00664	**5.2**
0.00470	**4.8**
0.00334	**4.0**
0.00236	**4.0**
0.00136	**4.0**



Particle Distribution:				
	Gravel (3" - No. 4)	**0.0%**	Fines (0.074 -0.005)	**48.5%**
	Sand (No. 4 - No. 200)	**46.4%**	Clay (<0.005)	**5.1%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

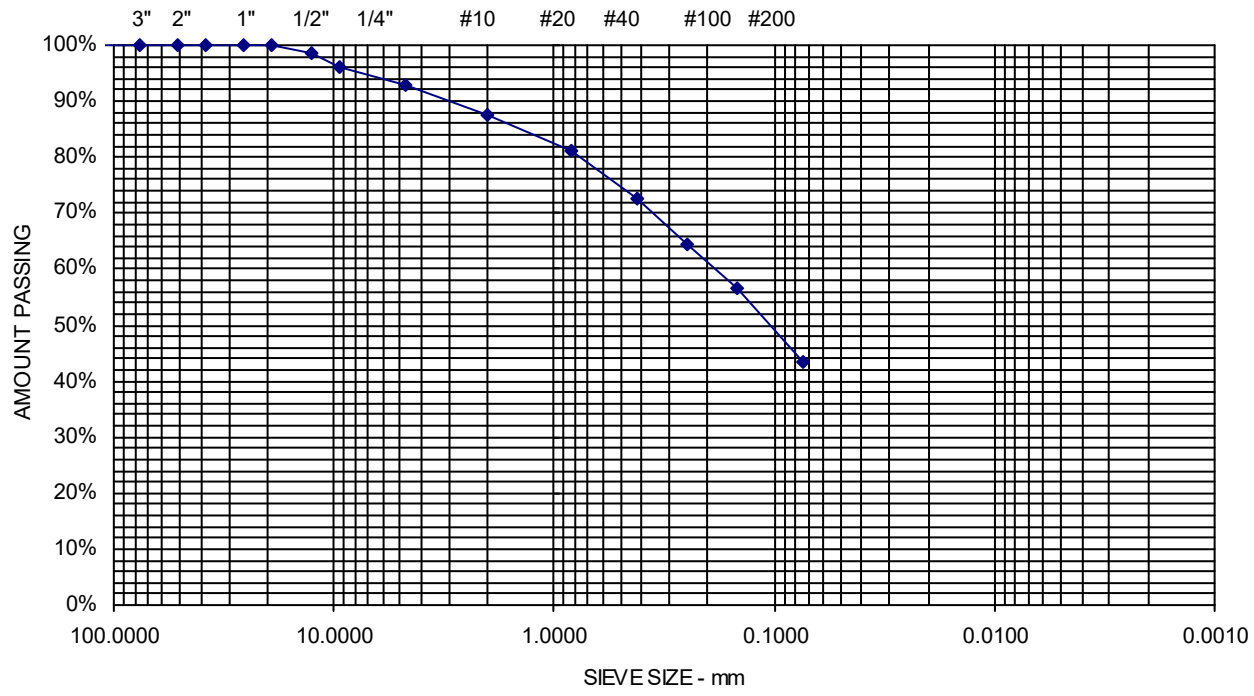
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-3, 2D, 2-4'**

Project Number: 21-1421
Lab ID: 6386M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**99**	
9.5 mm	**3/8"**	**96**	
4.75 mm	**No. 4**	**93**	7% Gravel
2.00 mm	**No. 10**	**88**	
850 um	**No. 20**	**81**	
425 um	**No. 40**	**72**	49.6% Sand
250 um	**No. 60**	**64**	
150 um	**No. 100**	**56**	
75 um	**No. 200**	**43.4**	43.4% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

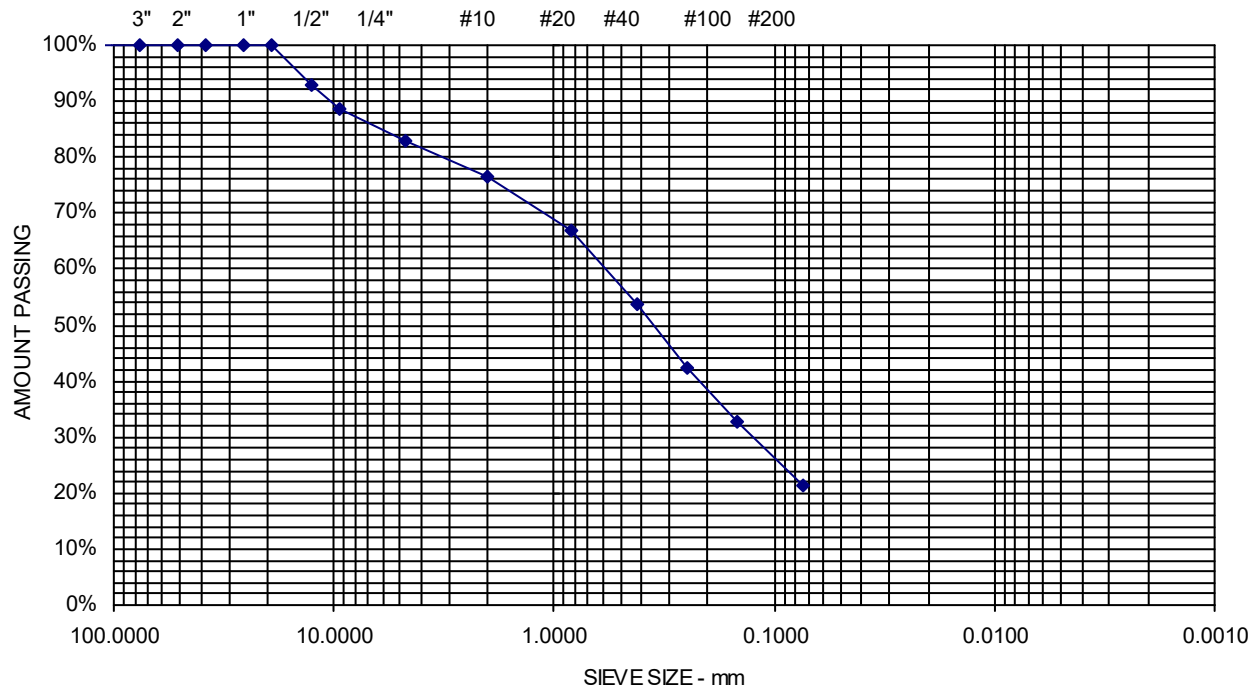
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-6, 3D, 5-7'**

Project Number: 21-1421
Lab ID: 6387M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**93**	
9.5 mm	**3/8"**	**89**	
4.75 mm	**No. 4**	**83**	17% Gravel
2.00 mm	**No. 10**	**76**	
850 um	**No. 20**	**67**	
425 um	**No. 40**	**54**	61.5% Sand
250 um	**No. 60**	**42**	
150 um	**No. 100**	**33**	
75 um	**No. 200**	**21.5**	21.5% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

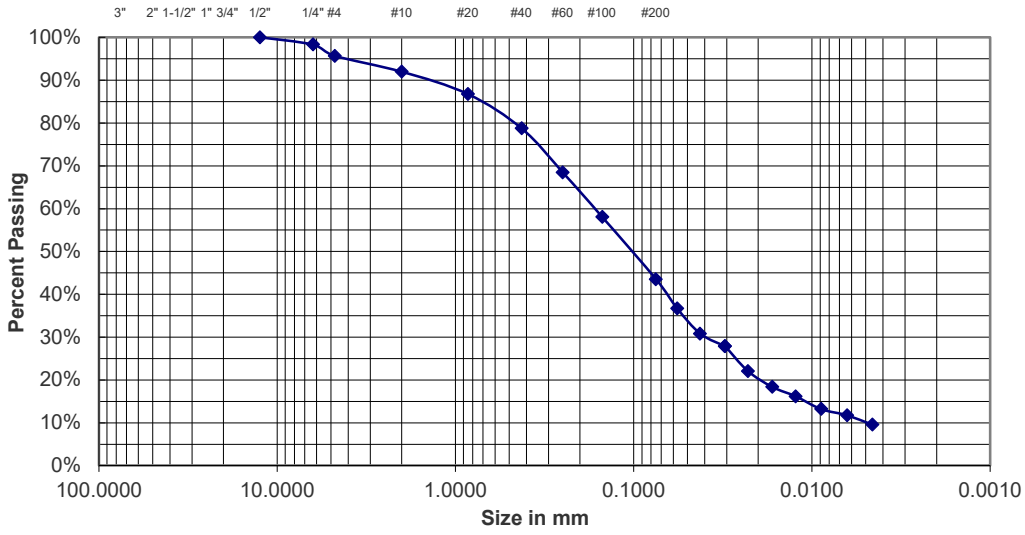
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6388M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/10/2022
Material Source:	B-8, 2D, 2-4'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**100**	
¼"	6.3	**98**	
No. 4	4.75	**96**	
No. 10	2	**92**	
No. 20	0.85	**87**	
No. 40	0.425	**79**	
No. 60	0.25	**68**	
No. 100	0.15	**58**	
No. 200	0.075	**43.5**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05696	**36.7**
0.04241	**30.8**
0.03072	**27.9**
0.03072	**27.9**
0.02281	**22.0**
0.01667	**18.3**
0.01232	**16.1**
0.00888	**13.2**
0.00635	**11.7**
0.00457	**9.5**
0.00325	**7.7**
0.00232	**7.0**
0.00136	**5.1**



Particle Distribution:				
	Gravel (3" - No. 4)	**4.3%**	Fines (0.074 -0.005)	**33.7%**
	Sand (No. 4 - No. 200)	**52.2%**	Clay (<0.005)	**9.8%**

Comments:

Reviewed By

13 Delta Drive, Unit 8, Londonderry, NH 03053 • P: (603) 716.2111 • F: (603) 716.2112 • E: infolondonderry@swcole.com

S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

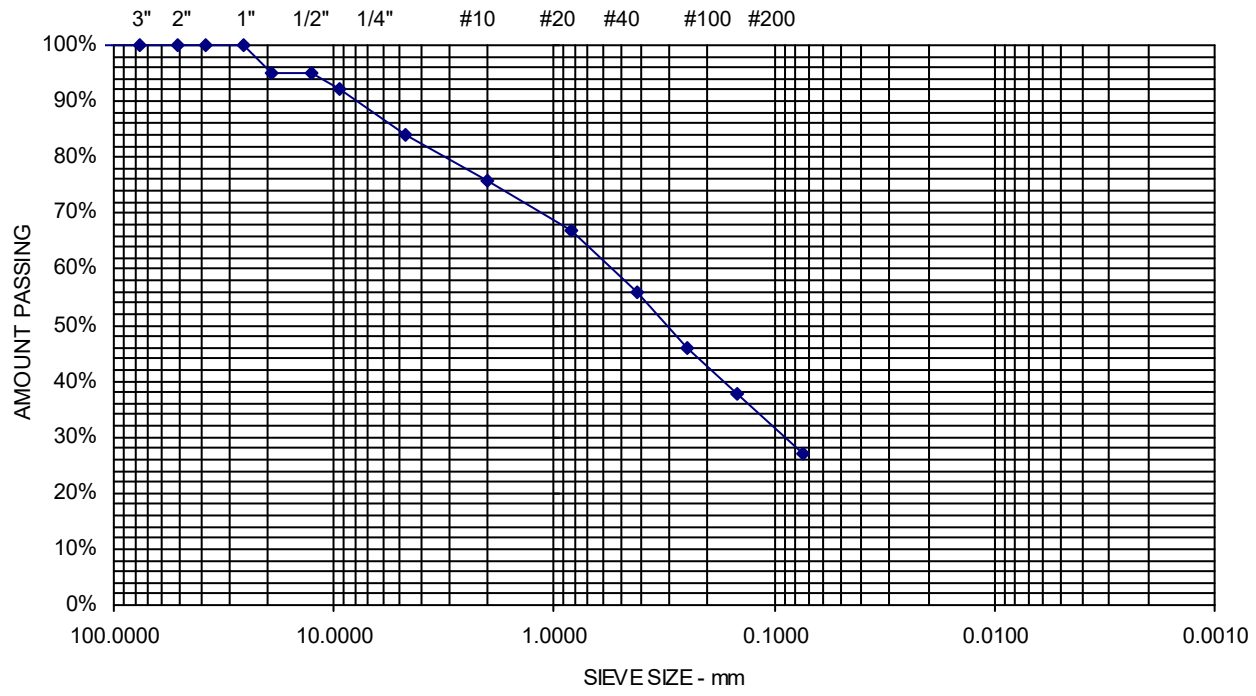
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-10, 3D, 5-7'**

Project Number: 21-1421
Lab ID: 6389M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**95**	
12.5 mm	**1/2"**	**95**	
9.5 mm	**3/8"**	**92**	
4.75 mm	**No. 4**	**84**	16.1% Gravel
2.00 mm	**No. 10**	**76**	
850 um	**No. 20**	**67**	
425 um	**No. 40**	**56**	56.9% Sand
250 um	**No. 60**	**46**	
150 um	**No. 100**	**38**	
75 um	**No. 200**	**27.1**	27.1% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

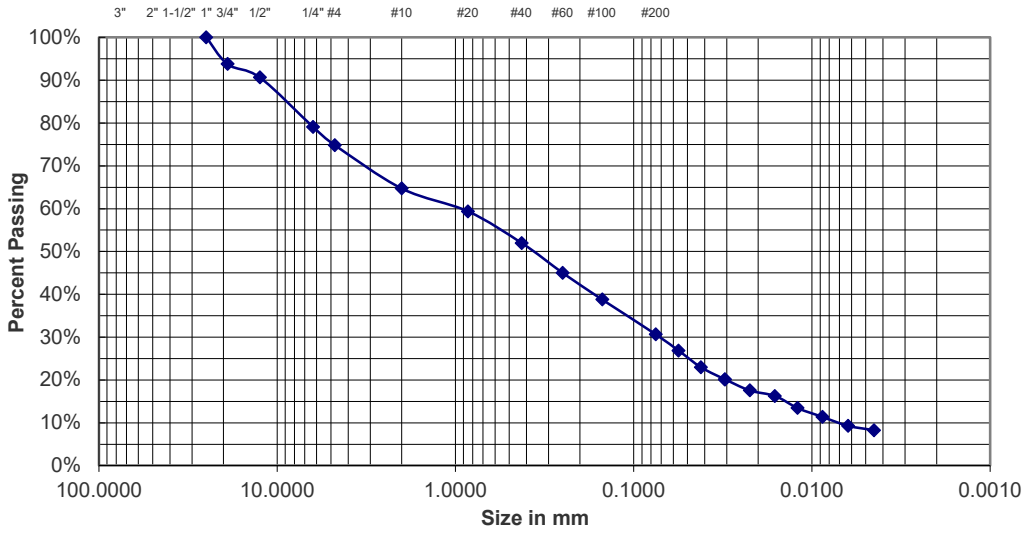
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6390M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/10/2022
Material Source:	B-12, 1D, 0-2'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**94**	
½"	12.5	**91**	
¼"	6.3	**79**	
No. 4	4.75	**75**	
No. 10	2	**65**	
No. 20	0.85	**59**	
No. 40	0.425	**52**	
No. 60	0.25	**45**	
No. 100	0.15	**39**	
No. 200	0.075	**30.6**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05603	**26.8**
0.04200	**23.0**
0.03072	**20.1**
0.03072	**20.1**
0.02232	**17.5**
0.01613	**16.3**
0.01203	**13.4**
0.00871	**11.4**
0.00628	**9.3**
0.00449	**8.3**
0.00320	**7.2**
0.00228	**6.2**
0.00134	**4.6**



Particle Distribution:

Gravel (3" - No. 4)	**25.2%**	Fines (0.074 -0.005)	**22.0%**
Sand (No. 4 - No. 200)	**44.2%**	Clay (<0.005)	**8.7%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

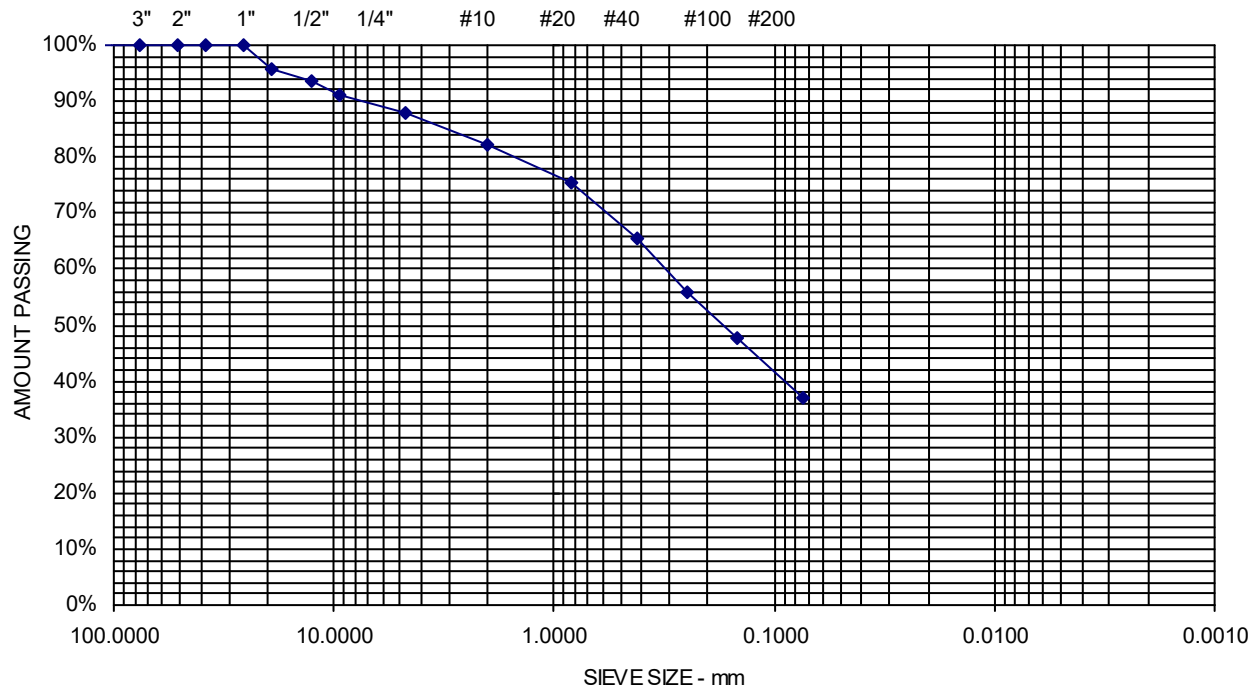
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-14, 2D, 2-3.8'**

Project Number: 21-1421
Lab ID: 6391M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**96**	
12.5 mm	**1/2"**	**94**	
9.5 mm	**3/8"**	**91**	
4.75 mm	**No. 4**	**88**	12.2% Gravel
2.00 mm	**No. 10**	**82**	
850 um	**No. 20**	**75**	
425 um	**No. 40**	**65**	50.7% Sand
250 um	**No. 60**	**56**	
150 um	**No. 100**	**48**	
75 um	**No. 200**	**37.1**	37.1% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

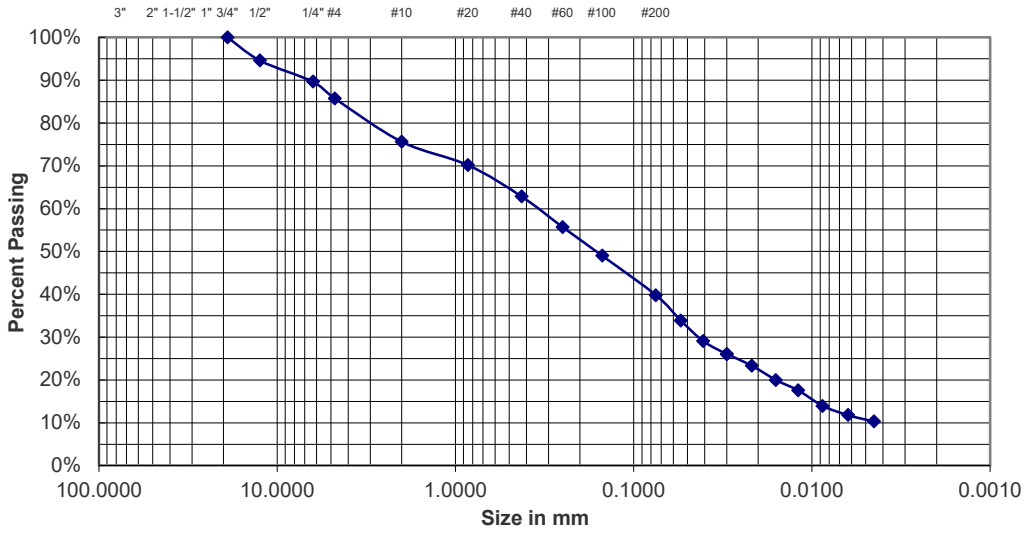
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6392M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/10/2022
Material Source:	B-18, 3D, 5-7'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**95**	
¼"	6.3	**90**	
No. 4	4.75	**86**	
No. 10	2	**76**	
No. 20	0.85	**70**	
No. 40	0.425	**63**	
No. 60	0.25	**56**	
No. 100	0.15	**49**	
No. 200	0.075	**39.8**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05443	**33.9**
0.04072	**29.0**
0.02999	**26.0**
0.02999	**26.0**
0.02172	**23.3**
0.01592	**20.0**
0.01193	**17.6**
0.00871	**13.9**
0.00628	**11.8**
0.00449	**10.3**
0.00320	**8.5**
0.00228	**7.9**
0.00133	**6.1**



Particle Distribution:

Gravel (3" - No. 4)	**14.3%**	Fines (0.074 -0.005)	**28.9%**
Sand (No. 4 - No. 200)	**46.0%**	Clay (<0.005)	**10.9%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

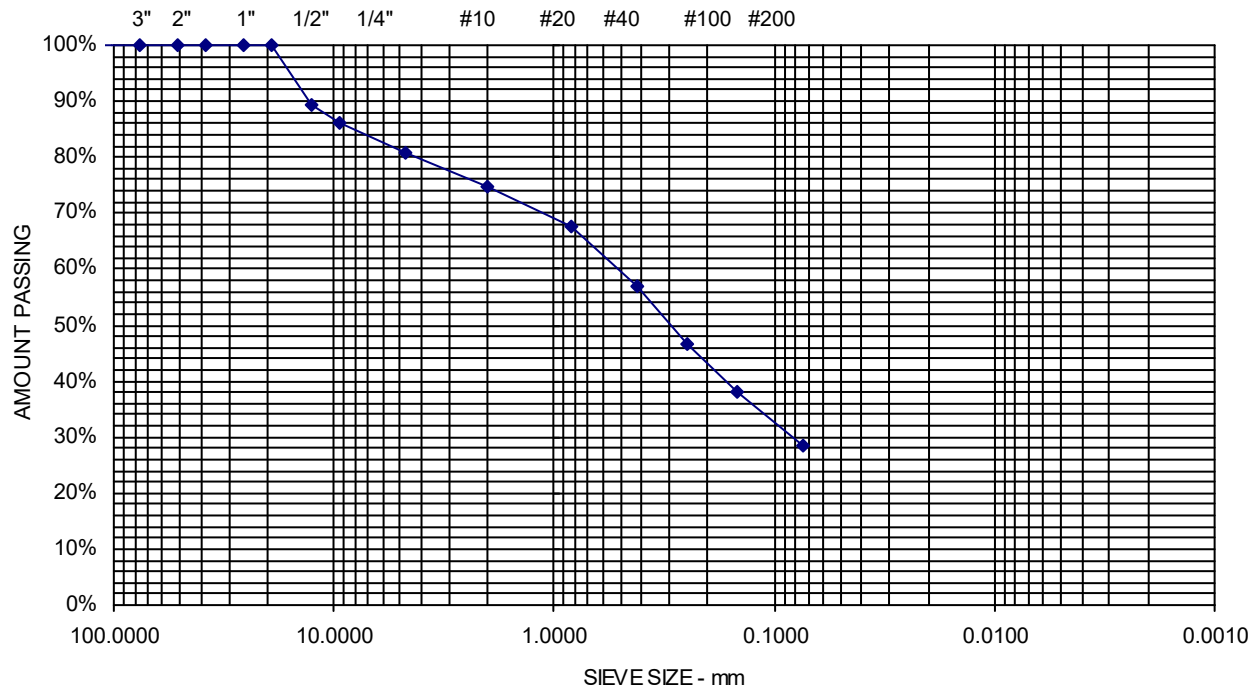
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-21, 3D, 5-7'**

Project Number: 21-1421
Lab ID: 6393M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**89**	
9.5 mm	**3/8"**	**86**	
4.75 mm	**No. 4**	**81**	19.1% Gravel
2.00 mm	**No. 10**	**75**	
850 um	**No. 20**	**68**	
425 um	**No. 40**	**57**	52.4% Sand
250 um	**No. 60**	**46**	
150 um	**No. 100**	**38**	
75 um	**No. 200**	**28.6**	28.6% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

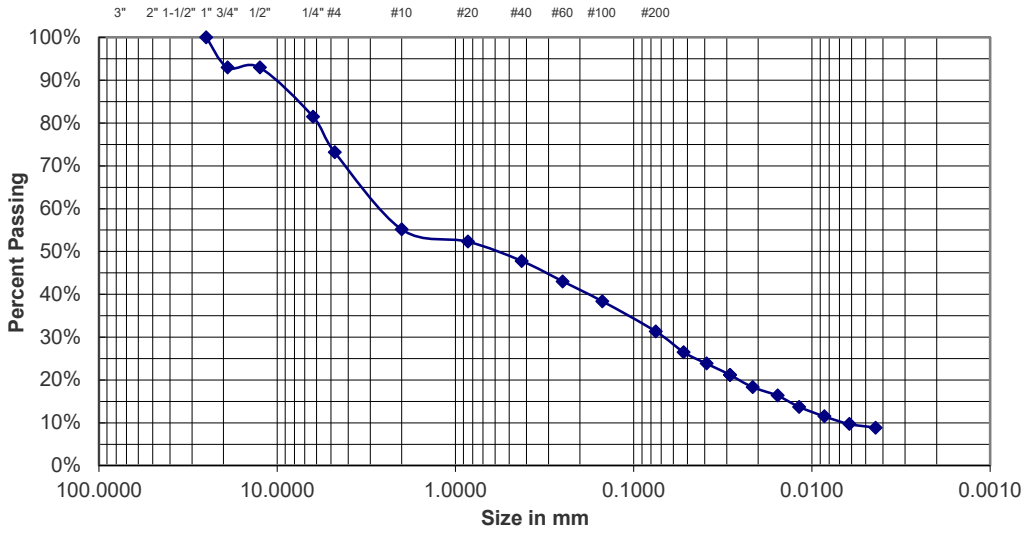
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6394M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/11/2022
Material Source:	B-23, 1D, 0-2'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**93**	
½"	12.5	**93**	
¼"	6.3	**81**	
No. 4	4.75	**73**	
No. 10	2	**55**	
No. 20	0.85	**52**	
No. 40	0.425	**48**	
No. 60	0.25	**43**	
No. 100	0.15	**38**	
No. 200	0.075	**31.3**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05245	**26.5**
0.03894	**23.8**
0.02879	**21.2**
0.02879	**21.2**
0.02152	**18.3**
0.01557	**16.3**
0.01178	**13.7**
0.00850	**11.5**
0.00616	**9.7**
0.00439	**8.8**
0.00314	**7.9**
0.00224	**7.3**
0.00132	**5.3**



Particle Distribution:

Gravel (3" - No. 4)	**26.8%**	Fines (0.074 -0.005)	**22.1%**
Sand (No. 4 - No. 200)	**41.8%**	Clay (<0.005)	**9.2%**

Comments:

Reviewed By

S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

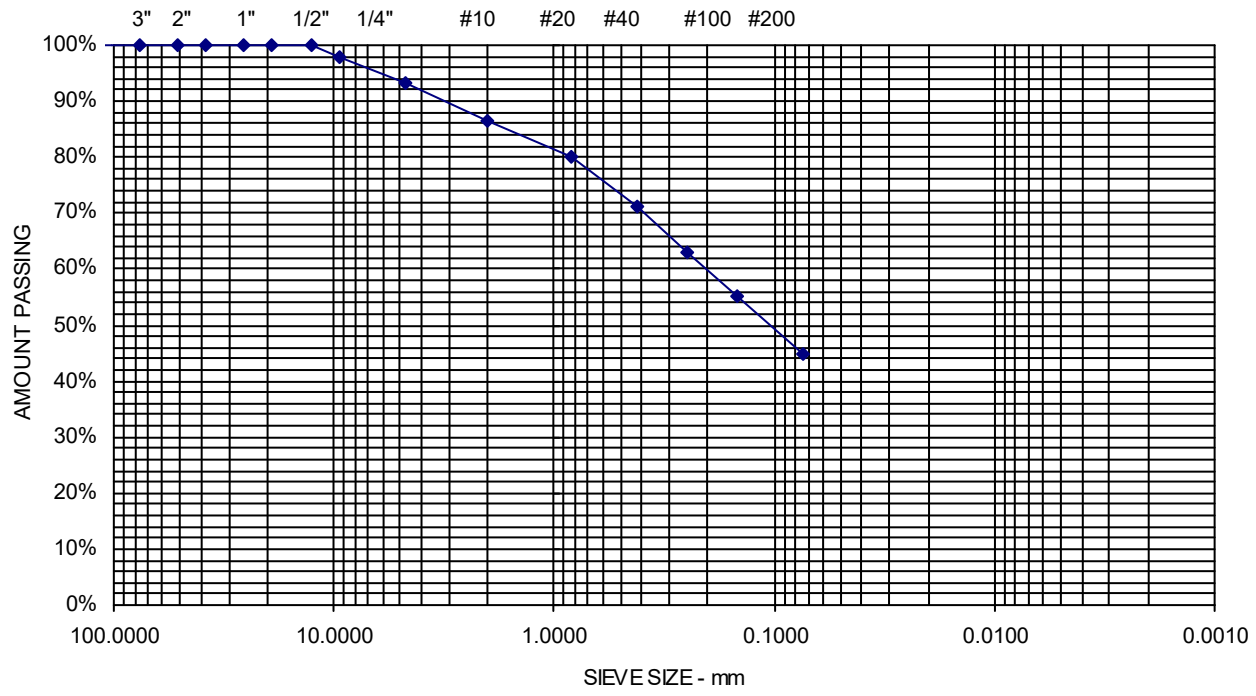
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-25, 2D, 2-4'**

Project Number: 21-1421
Lab ID: 6395M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**100**	
9.5 mm	**3/8"**	**98**	
4.75 mm	**No. 4**	**93**	6.9% Gravel
2.00 mm	**No. 10**	**87**	
850 um	**No. 20**	**80**	
425 um	**No. 40**	**71**	48.4% Sand
250 um	**No. 60**	**63**	
150 um	**No. 100**	**55**	
75 um	**No. 200**	**44.7**	44.7% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

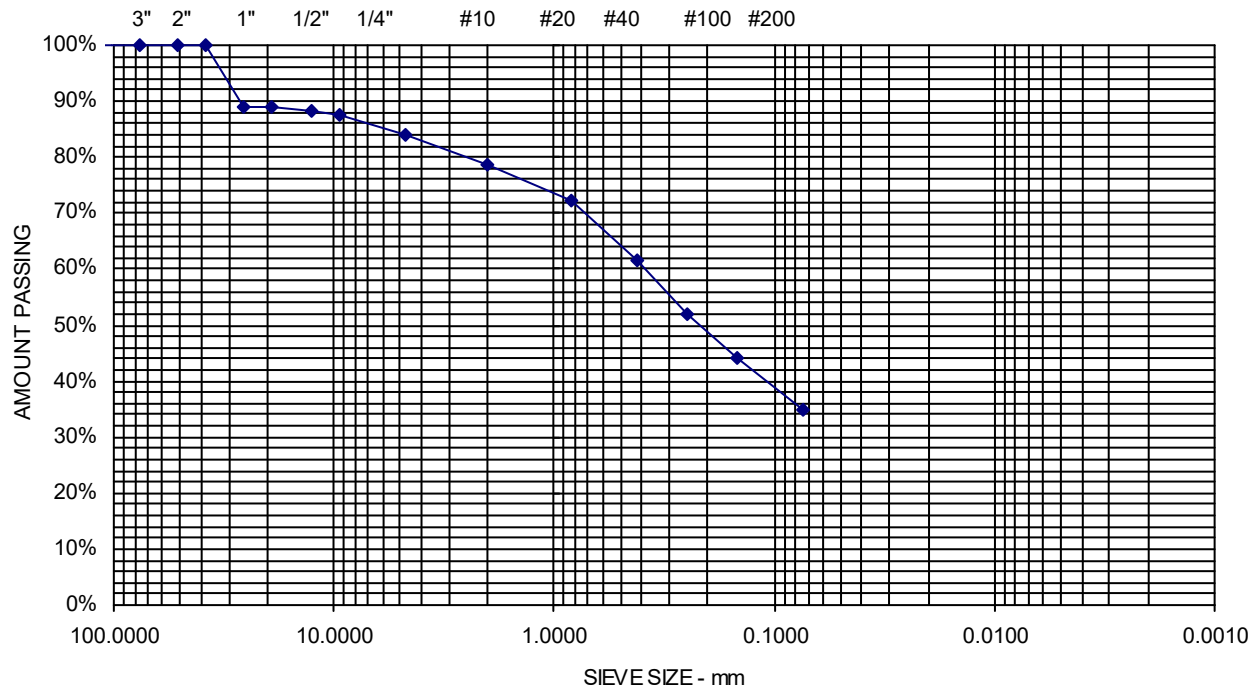
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-28, 2D, 2-4'**

Project Number: 21-1421
Lab ID: 6396M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**89**	
19.0 mm	**3/4"**	**89**	
12.5 mm	**1/2"**	**88**	
9.5 mm	**3/8"**	**88**	
4.75 mm	**No. 4**	**84**	16.2% Gravel
2.00 mm	**No. 10**	**79**	
850 um	**No. 20**	**72**	
425 um	**No. 40**	**61**	48.8% Sand
250 um	**No. 60**	**52**	
150 um	**No. 100**	**44**	
75 um	**No. 200**	**35.0**	35% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

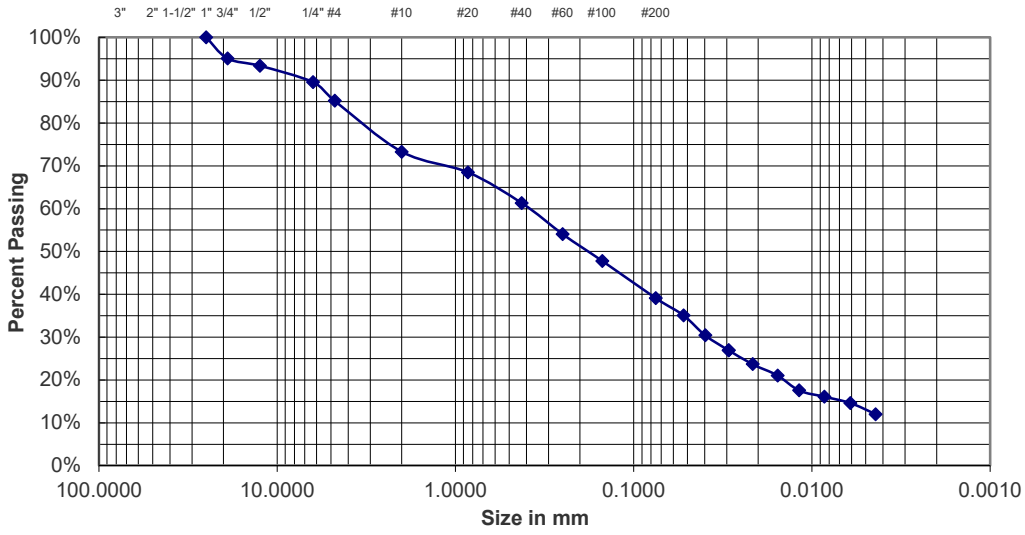
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6397M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/11/2022
Material Source:	B-30, 2D, 2-4'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**95**	
½"	12.5	**93**	
¼"	6.3	**90**	
No. 4	4.75	**85**	
No. 10	2	**73**	
No. 20	0.85	**68**	
No. 40	0.425	**61**	
No. 60	0.25	**54**	
No. 100	0.15	**48**	
No. 200	0.075	**39.1**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05245	**35.1**
0.03962	**30.4**
0.02925	**26.9**
0.02925	**26.9**
0.02152	**23.7**
0.01557	**21.0**
0.01178	**17.5**
0.00850	**16.1**
0.00609	**14.6**
0.00439	**12.0**
0.00317	**9.9**
0.00226	**8.5**
0.00132	**7.0**



Particle Distribution:	Gravel (3" - No. 4)	**14.8%**	Fines (0.074 -0.005)	**26.8%**
	Sand (No. 4 - No. 200)	**46.1%**	Clay (<0.005)	**12.2%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

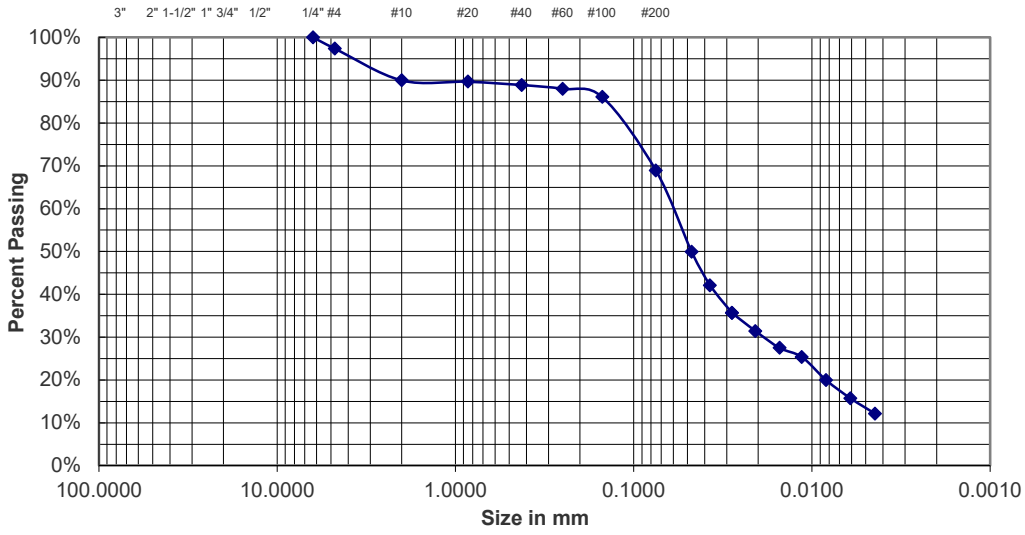
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6398M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/11/2022
Material Source:	B-32, 3D, 5-7'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**100**	
¼"	6.3	**100**	
No. 4	4.75	**97**	
No. 10	2	**90**	
No. 20	0.85	**90**	
No. 40	0.425	**89**	
No. 60	0.25	**88**	
No. 100	0.15	**86**	
No. 200	0.075	**68.9**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.04730	**50.0**
0.03734	**42.1**
0.02814	**35.7**
0.02814	**35.7**
0.02074	**31.4**
0.01517	**27.5**
0.01139	**25.3**
0.00833	**20.0**
0.00608	**15.7**
0.00443	**12.1**
0.00319	**9.3**
0.00227	**7.1**
0.00133	**6.4**



Particle Distribution:	Gravel (3" - No. 4)	**2.6%**	Fines (0.074 -0.005)	**55.3%**
	Sand (No. 4 - No. 200)	**28.5%**	Clay (<0.005)	**13.6%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

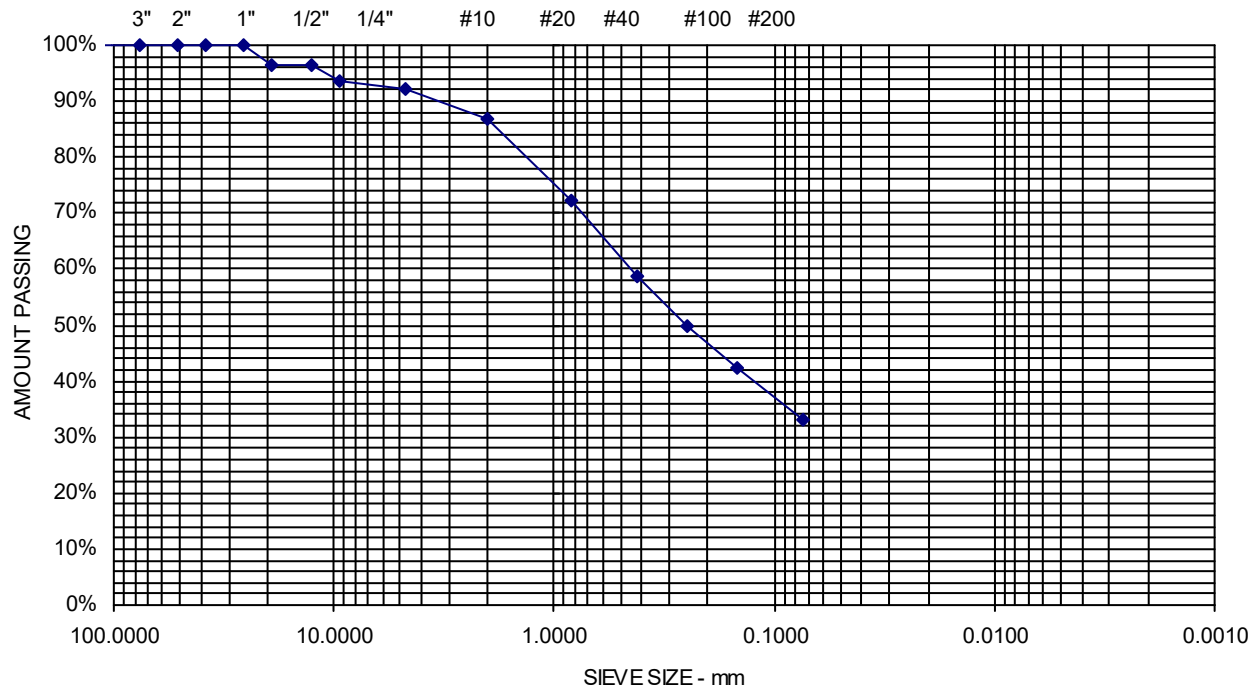
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-33, 3D, 5-7'**

Project Number: 21-1421
Lab ID: 6399M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**97**	
12.5 mm	**1/2"**	**97**	
9.5 mm	**3/8"**	**94**	
4.75 mm	**No. 4**	**92**	7.8% Gravel
2.00 mm	**No. 10**	**87**	
850 um	**No. 20**	**72**	
425 um	**No. 40**	**59**	59% Sand
250 um	**No. 60**	**50**	
150 um	**No. 100**	**43**	
75 um	**No. 200**	**33.3**	33.3% Fines



Comments:

Sheet

S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

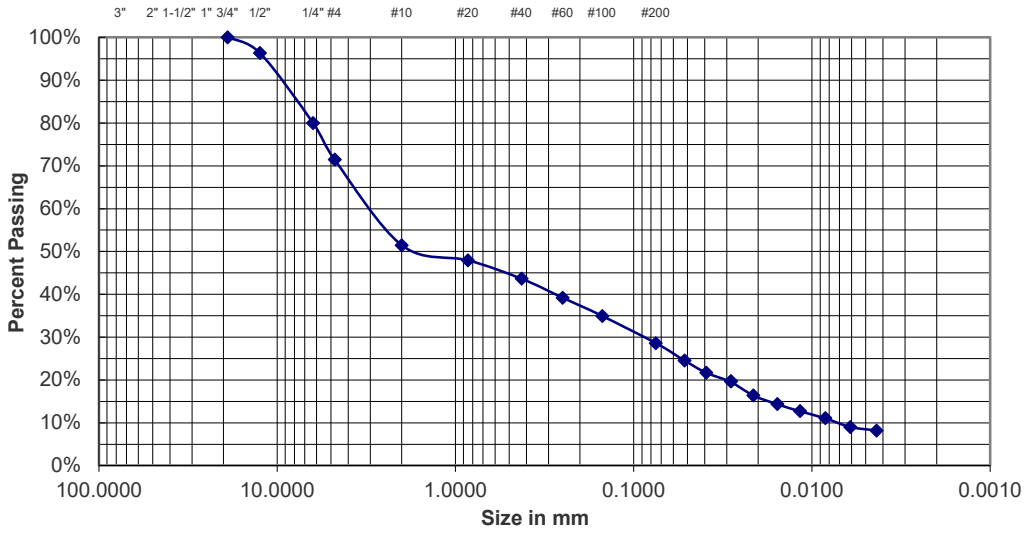
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6400M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/11/2022
Material Source:	B-34, 2D, 2-4'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**96**	
¼"	6.3	**80**	
No. 4	4.75	**71**	
No. 10	2	**51**	
No. 20	0.85	**48**	
No. 40	0.425	**44**	
No. 60	0.25	**39**	
No. 100	0.15	**35**	
No. 200	0.075	**28.6**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05182	**24.5**
0.03914	**21.7**
0.02844	**19.6**
0.02844	**19.6**
0.02126	**16.4**
0.01559	**14.3**
0.01164	**12.7**
0.00840	**11.0**
0.00608	**9.0**
0.00433	**8.2**
0.00313	**6.5**
0.00223	**6.3**
0.00130	**5.3**



Particle Distribution:

Gravel (3" - No. 4)	**28.6%**	Fines (0.074 -0.005)	**20.2%**
Sand (No. 4 - No. 200)	**42.8%**	Clay (<0.005)	**8.4%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

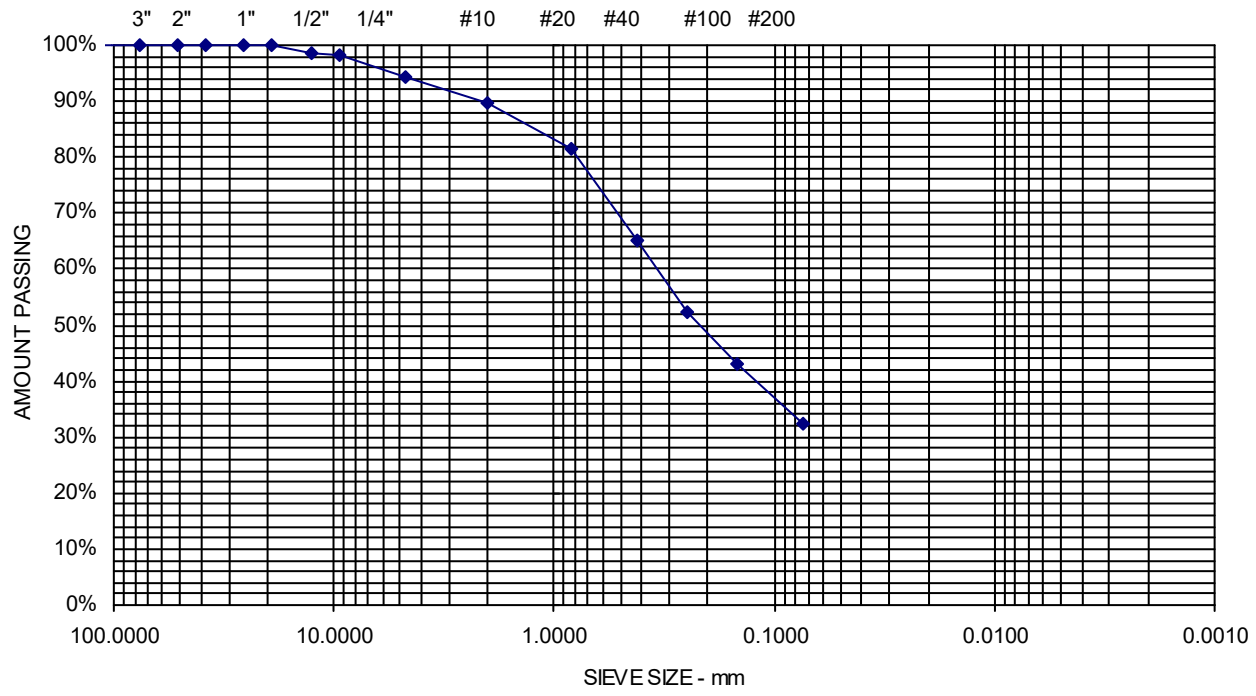
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-35, 2D, 2-4'**

Project Number: 21-1421
Lab ID: 6401M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**99**	
9.5 mm	**3/8"**	**98**	
4.75 mm	**No. 4**	**94**	5.8% Gravel
2.00 mm	**No. 10**	**90**	
850 um	**No. 20**	**81**	
425 um	**No. 40**	**65**	61.8% Sand
250 um	**No. 60**	**52**	
150 um	**No. 100**	**43**	
75 um	**No. 200**	**32.5**	32.5% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

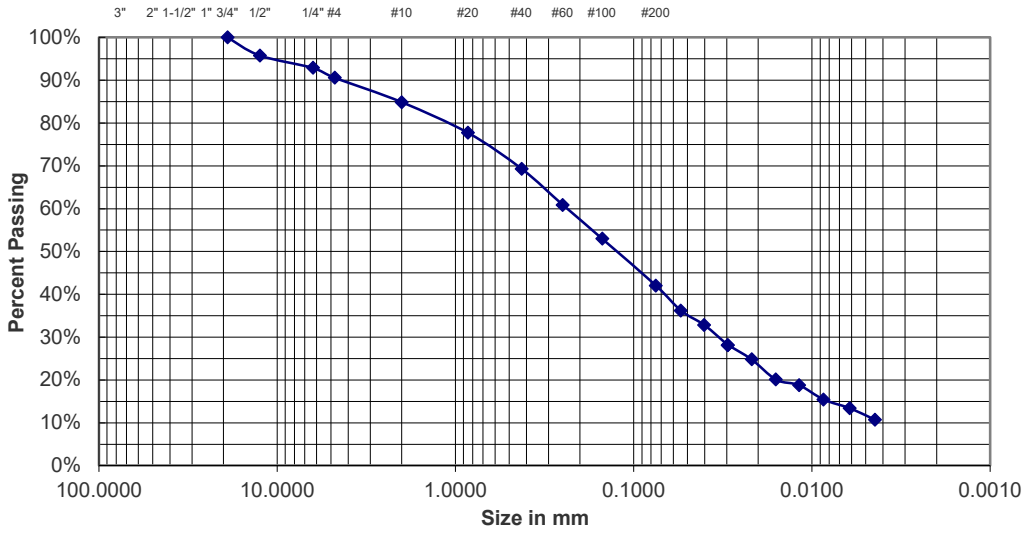
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6402M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/12/2022
Material Source:	B-36, 3D, 5-7'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**96**	
¼"	6.3	**93**	
No. 4	4.75	**91**	
No. 10	2	**85**	
No. 20	0.85	**78**	
No. 40	0.425	**69**	
No. 60	0.25	**61**	
No. 100	0.15	**53**	
No. 200	0.075	**42.0**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05441	**36.2**
0.04023	**32.8**
0.02963	**28.1**
0.02963	**28.1**
0.02176	**24.8**
0.01593	**20.1**
0.01178	**18.8**
0.00860	**15.4**
0.00613	**13.4**
0.00443	**10.7**
0.00319	**8.7**
0.00227	**7.4**
0.00131	**6.7**



Particle Distribution:	Gravel (3" - No. 4)	**9.4%**	Fines (0.074 -0.005)	**30.6%**
	Sand (No. 4 - No. 200)	**48.6%**	Clay (<0.005)	**11.4%**

Comments:

Reviewed By

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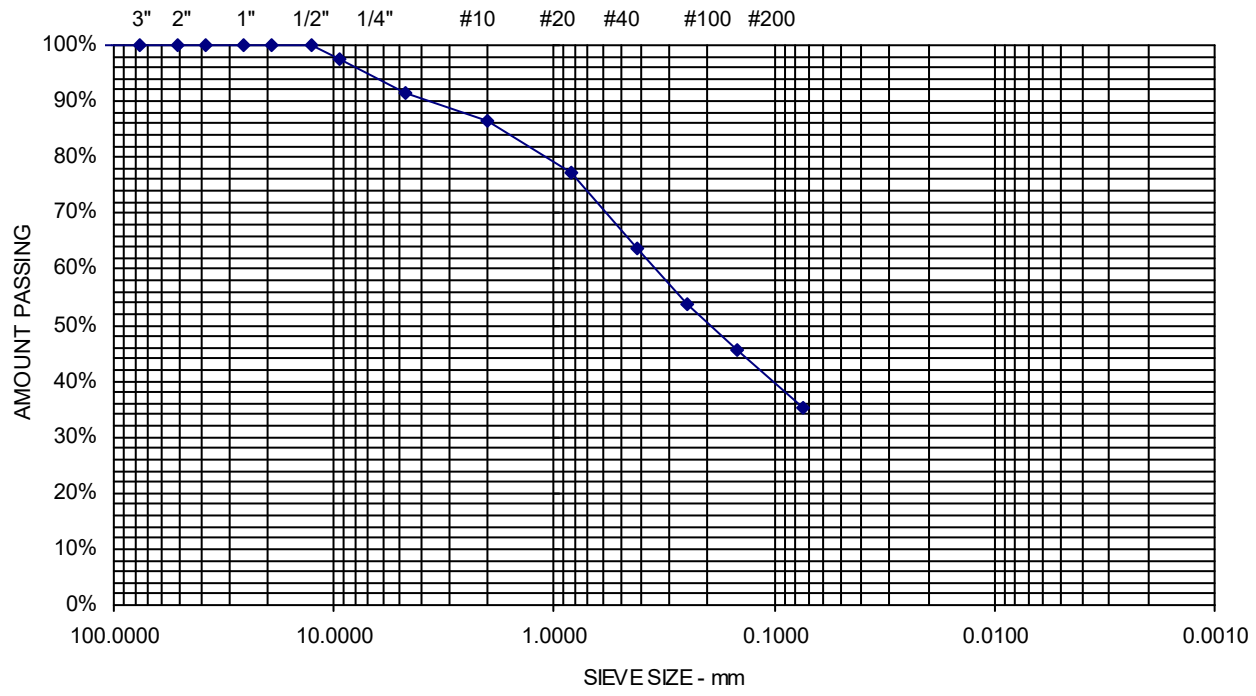
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING	Project Number	21-1421
Client	STANTEC CONSULTING SERVICES, INC.	Lab ID	6403M
		Date Received	5/5/2022
		Date Completed	5/9/2022
Material Source	**B-37, 2D, 5-7'**	Tested By	DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**100**	
9.5 mm	**3/8"**	**98**	
4.75 mm	**No. 4**	**92**	8.5% Gravel
2.00 mm	**No. 10**	**87**	
850 um	**No. 20**	**77**	
425 um	**No. 40**	**64**	56.1% Sand
250 um	**No. 60**	**54**	
150 um	**No. 100**	**46**	
75 um	**No. 200**	**35.4**	35.4% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

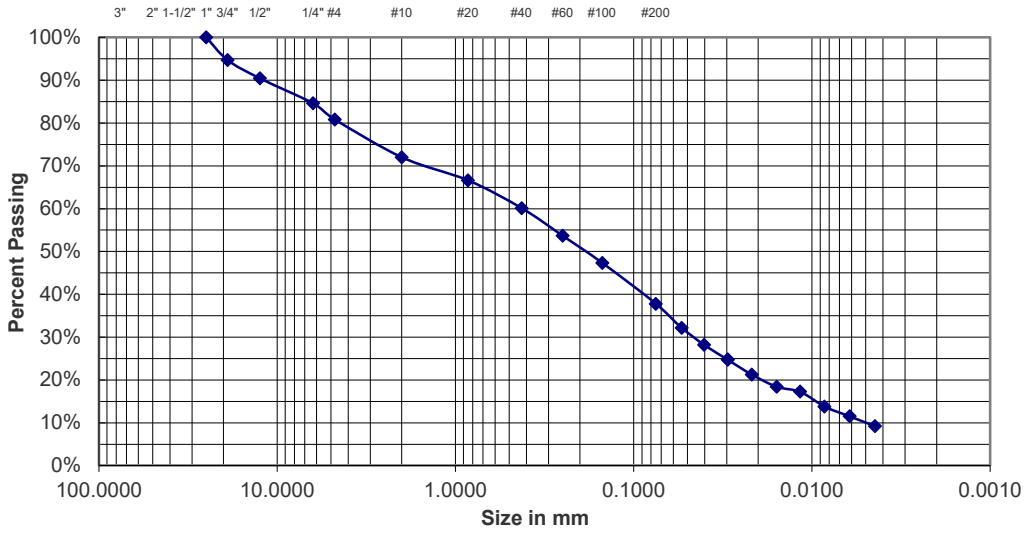
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6404M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/12/2022
Material Source:	B-38, 3D, 5-7'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**95**	
½"	12.5	**90**	
¼"	6.3	**85**	
No. 4	4.75	**81**	
No. 10	2	**72**	
No. 20	0.85	**67**	
No. 40	0.425	**60**	
No. 60	0.25	**54**	
No. 100	0.15	**47**	
No. 200	0.075	**37.8**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05378	**32.2**
0.04023	**28.1**
0.02963	**24.7**
0.02963	**24.7**
0.02176	**21.3**
0.01573	**18.4**
0.01164	**17.2**
0.00850	**13.8**
0.00613	**11.5**
0.00443	**9.2**
0.00319	**7.5**
0.00227	**6.6**
0.00131	**5.7**



Particle Distribution:				
	Gravel (3" - No. 4)	**19.2%**	Fines (0.074 -0.005)	**27.6%**
	Sand (No. 4 - No. 200)	**43.1%**	Clay (<0.005)	**10.1%**

Comments:

Reviewed By

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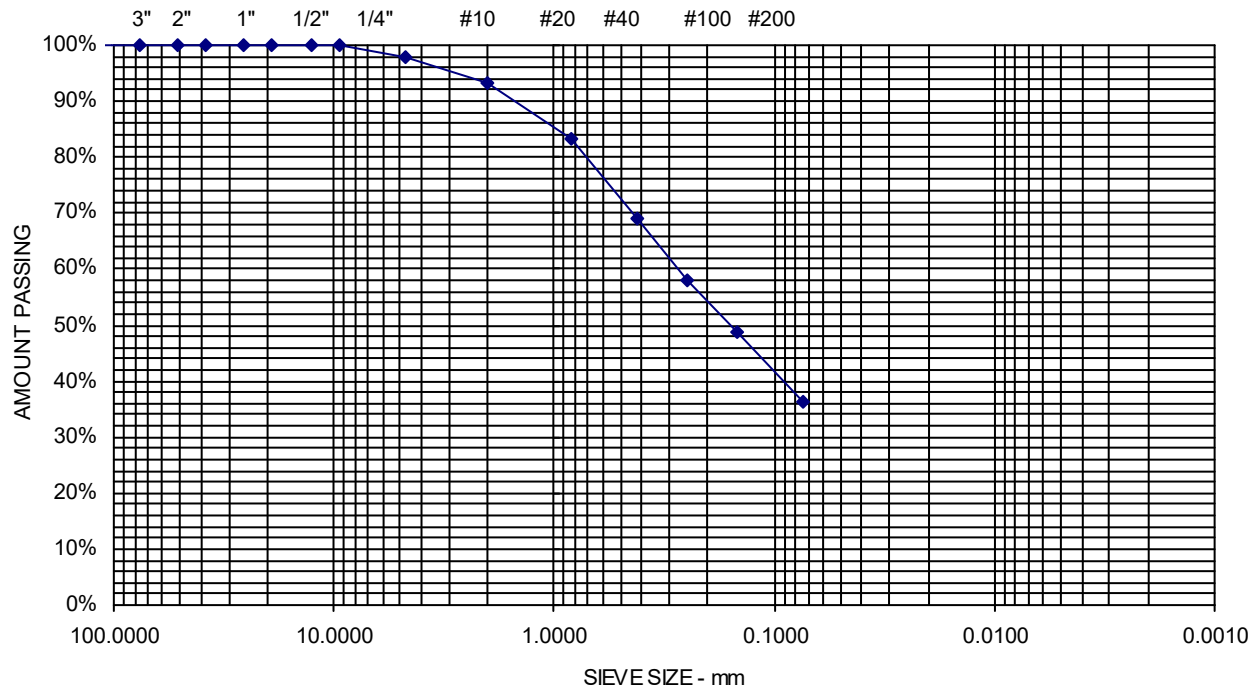
S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

Project Name	LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING	Project Number	21-1421
Client	STANTEC CONSULTING SERVICES, INC.	Lab ID	6405M
		Date Received	5/5/2022
		Date Completed	5/9/2022
Material Source	**B-39, 1D, 0-2'**	Tested By	DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**100**	
9.5 mm	**3/8"**	**100**	
4.75 mm	**No. 4**	**98**	2.3% Gravel
2.00 mm	**No. 10**	**93**	
850 um	**No. 20**	**83**	
425 um	**No. 40**	**69**	61.5% Sand
250 um	**No. 60**	**58**	
150 um	**No. 100**	**49**	
75 um	**No. 200**	**36.2**	36.2% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

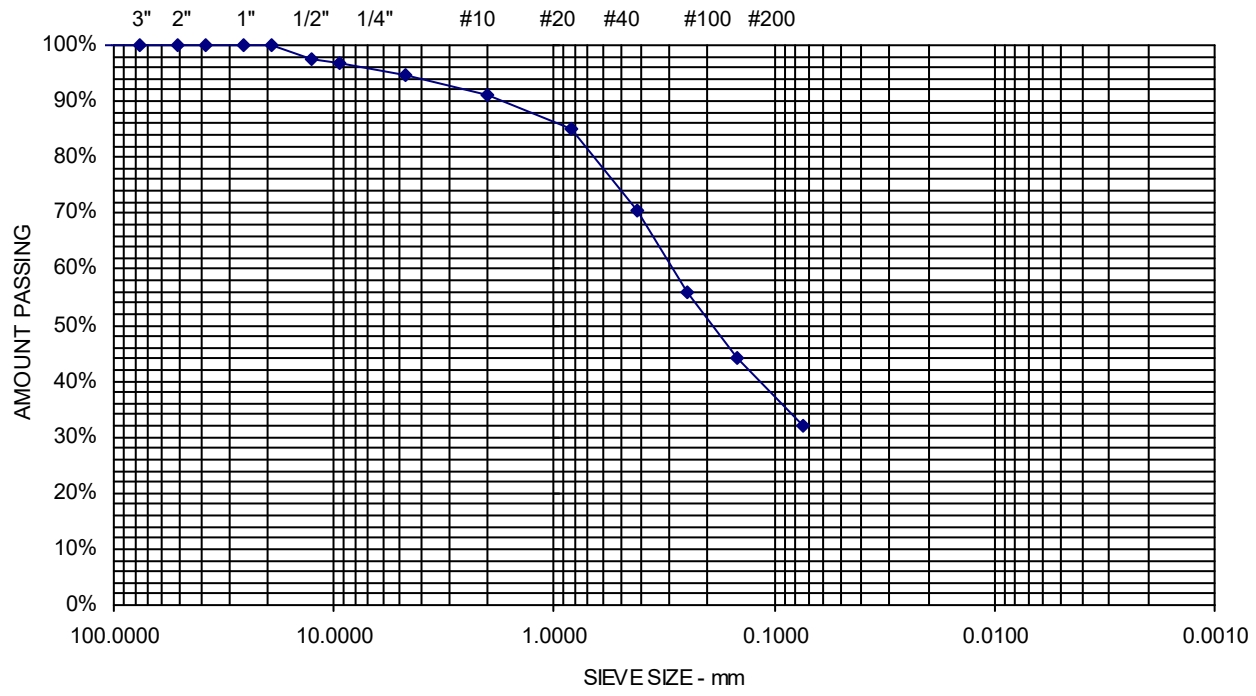
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-40, 3D, 5-7'**

Project Number: 21-1421
Lab ID: 6406M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**100**	
19.0 mm	**3/4"**	**100**	
12.5 mm	**1/2"**	**98**	
9.5 mm	**3/8"**	**97**	
4.75 mm	**No. 4**	**95**	5.5% Gravel
2.00 mm	**No. 10**	**91**	
850 um	**No. 20**	**85**	
425 um	**No. 40**	**70**	62.5% Sand
250 um	**No. 60**	**56**	
150 um	**No. 100**	**44**	
75 um	**No. 200**	**32.1**	32.1% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

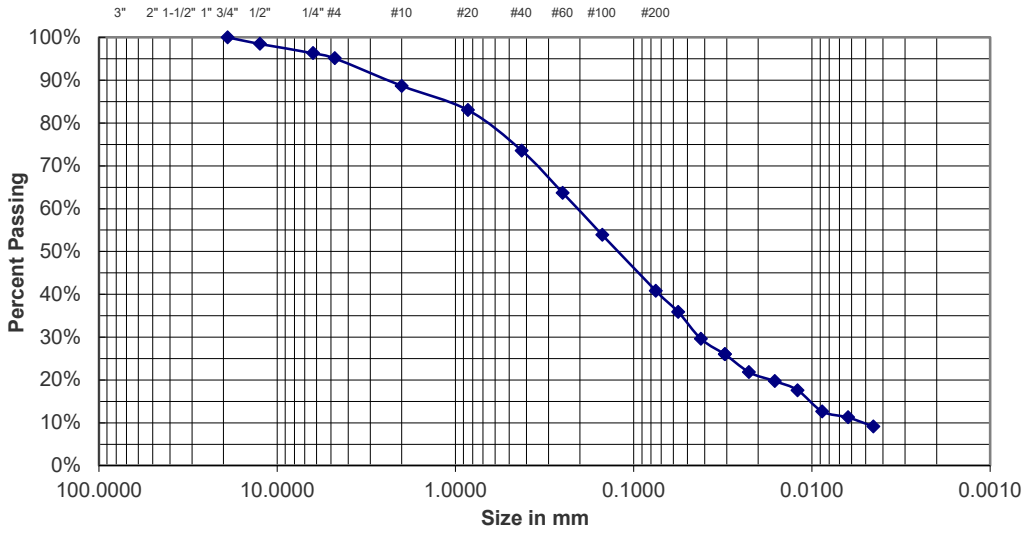
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6407M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/12/2022
Material Source:	B-41, 3D, 5-7'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**99**	
¼"	6.3	**96**	
No. 4	4.75	**95**	
No. 10	2	**89**	
No. 20	0.85	**83**	
No. 40	0.425	**74**	
No. 60	0.25	**64**	
No. 100	0.15	**54**	
No. 200	0.075	**40.8**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05628	**35.9**
0.04190	**29.6**
0.03077	**26.0**
0.03077	**26.0**
0.02253	**21.8**
0.01614	**19.7**
0.01202	**17.6**
0.00877	**12.7**
0.00627	**11.3**
0.00451	**9.1**
0.00321	**7.4**
0.00227	**7.0**
0.00133	**5.6**



Particle Distribution:	Gravel (3" - No. 4)	**4.9%**	Fines (0.074 -0.005)	**30.7%**
	Sand (No. 4 - No. 200)	**54.3%**	Clay (<0.005)	**10.1%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

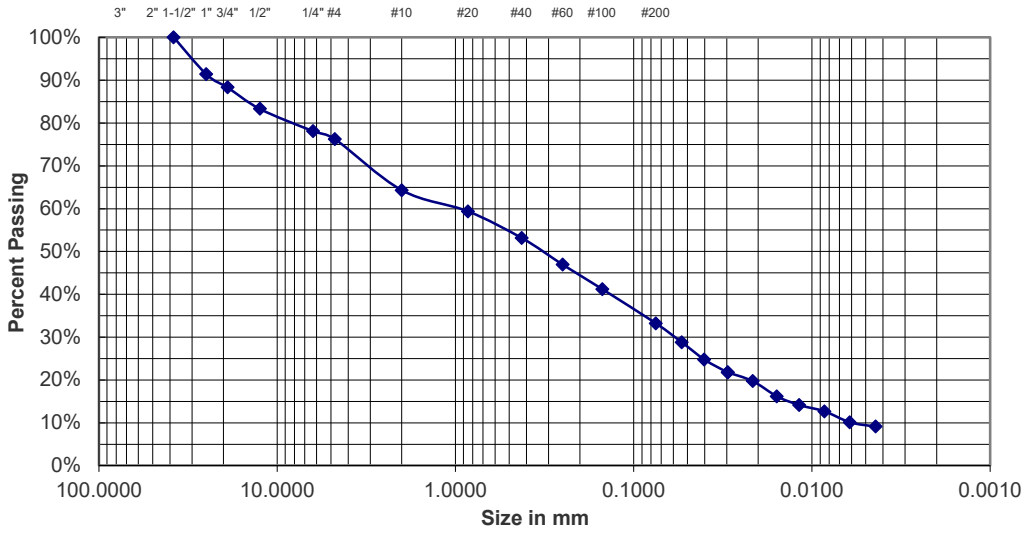
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6408M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/13/2022
Material Source:	B-42, 2D, 2-3.8'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**91**	
¾"	19	**88**	
½"	12.5	**83**	
¼"	6.3	**78**	
No. 4	4.75	**76**	
No. 10	2	**64**	
No. 20	0.85	**59**	
No. 40	0.425	**53**	
No. 60	0.25	**47**	
No. 100	0.15	**41**	
No. 200	0.075	**33.2**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05378	**28.8**
0.04023	**24.8**
0.02963	**21.7**
0.02963	**21.7**
0.02146	**19.7**
0.01573	**16.2**
0.01178	**14.1**
0.00850	**12.6**
0.00613	**10.1**
0.00438	**9.1**
0.00316	**7.6**
0.00226	**6.8**
0.00130	**6.1**



Particle Distribution:				
	Gravel (3" - No. 4)	**23.7%**	Fines (0.074 -0.005)	**23.7%**
	Sand (No. 4 - No. 200)	**43.0%**	Clay (<0.005)	**9.5%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

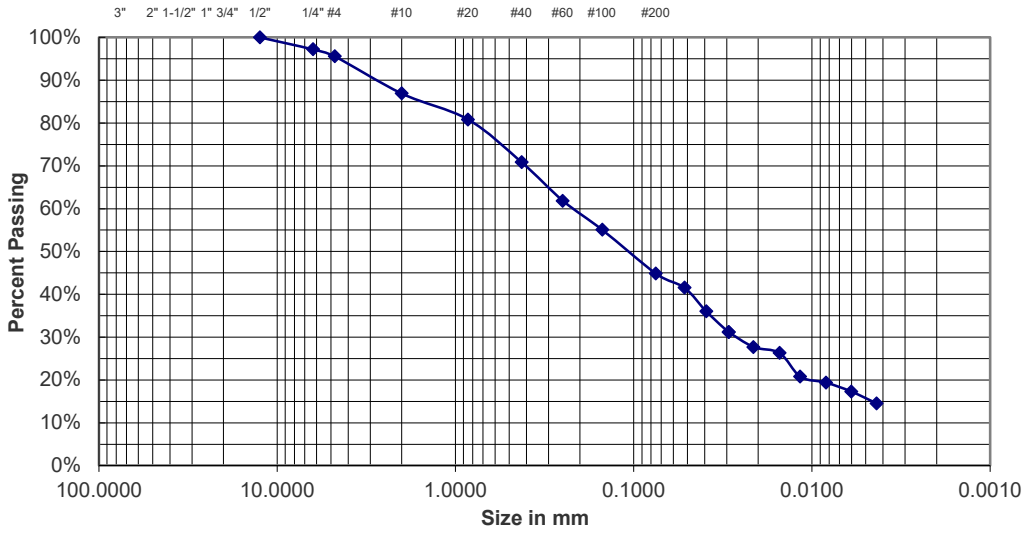
Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	6409M
Client:	Stantec	**Date Received:**	5/2/2022
Material Description:	Jar sample	**Date Completed:**	5/18/2022
Material Source:	B-43, 2D, 5-7'	**Tested By:**	D. Jack

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**100**	
1½"	38.1	**100**	
1"	25	**100**	
¾"	19	**100**	
½"	12.5	**100**	
¼"	6.3	**97**	
No. 4	4.75	**96**	
No. 10	2	**87**	
No. 20	0.85	**81**	
No. 40	0.425	**71**	
No. 60	0.25	**62**	
No. 100	0.15	**55**	
No. 200	0.075	**44.8**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05182	**41.5**
0.03914	**36.0**
0.02934	**31.1**
0.02934	**31.1**
0.02126	**27.7**
0.01517	**26.3**
0.01164	**20.8**
0.00833	**19.4**
0.00601	**17.3**
0.00433	**14.5**
0.00310	**12.5**
0.00222	**11.4**
0.00129	**10.4**



Particle Distribution:				
	Gravel (3" - No. 4)	**4.4%**	Fines (0.074 -0.005)	**29.5%**
	Sand (No. 4 - No. 200)	**50.7%**	Clay (<0.005)	**15.3%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Gradation

ASTM C-117 & C-136

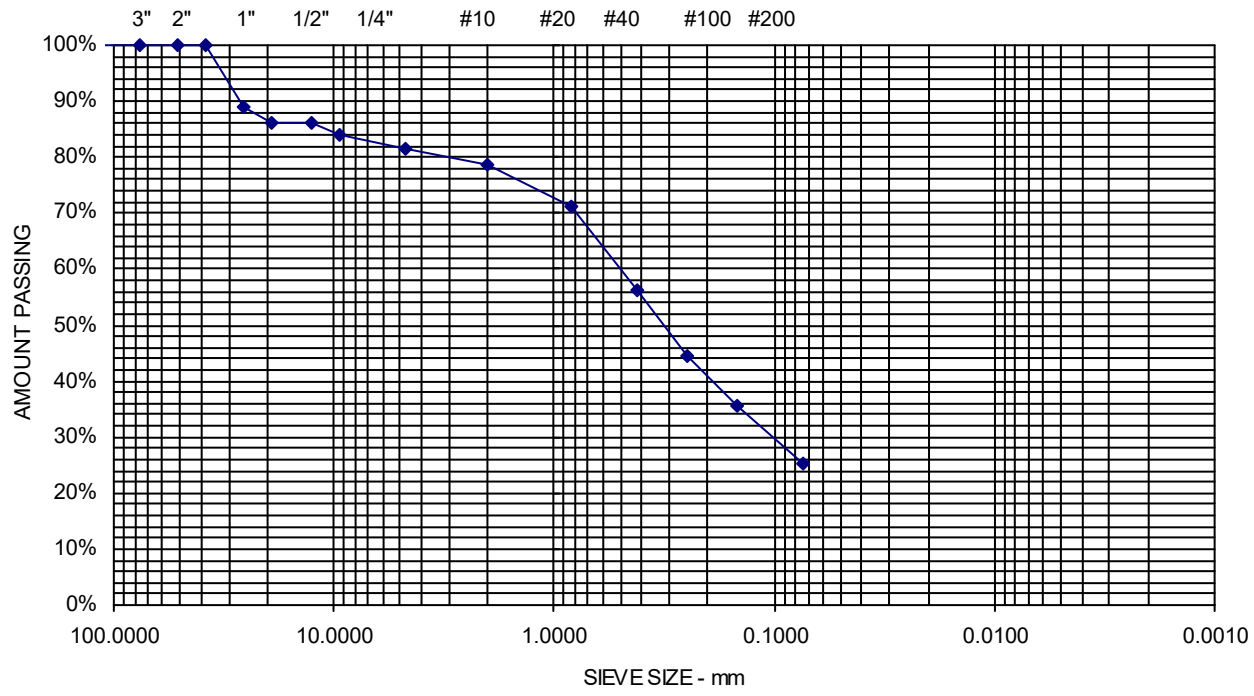
Project Name: LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL ENGINEERING

Client: STANTEC CONSULTING SERVICES, INC.

Material Source: **B-44, 2D, 2-4'**

Project Number: 21-1421
Lab ID: 6410M
Date Received: 5/5/2022
Date Completed: 5/9/2022
Tested By: DANIEL JACK

STANDARD DESIGNATION (mm/µm)	SIEVE SIZE	AMOUNT PASSING (%)	
150 mm	**6"**	**100**	
100 mm	**4"**	**100**	
75 mm	**3"**	**100**	
50 mm	**2"**	**100**	
38.1 mm	**1-1/2"**	**100**	
25.0 mm	**1"**	**89**	
19.0 mm	**3/4"**	**86**	
12.5 mm	**1/2"**	**86**	
9.5 mm	**3/8"**	**84**	
4.75 mm	**No. 4**	**82**	18.4% Gravel
2.00 mm	**No. 10**	**79**	
850 um	**No. 20**	**71**	
425 um	**No. 40**	**56**	56.4% Sand
250 um	**No. 60**	**44**	
150 um	**No. 100**	**35**	
75 um	**No. 200**	**25.2**	25.2% Fines



Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

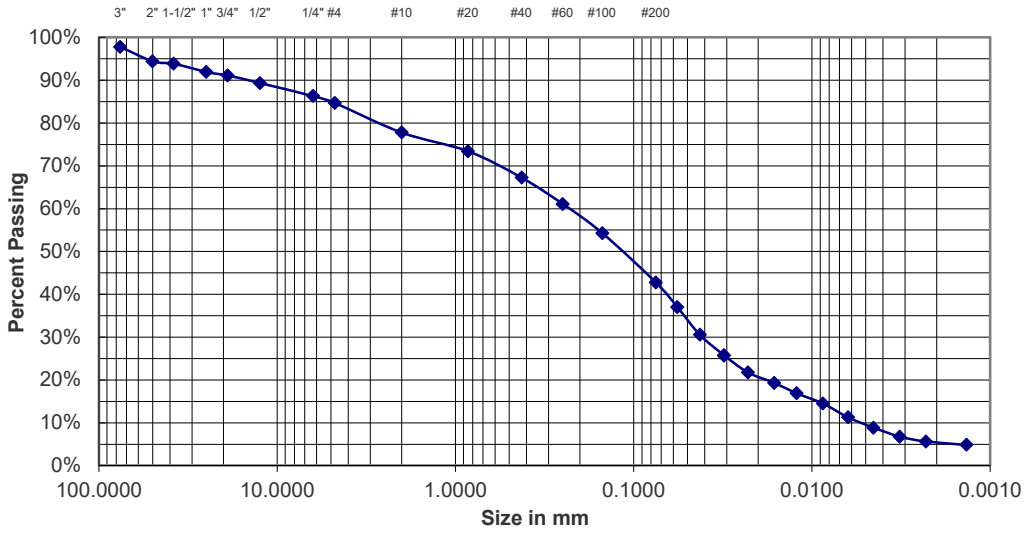
Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21775S
Client:	Stantec	**Date Received:**	6/6/2022
Material Description:	Test Pit Samples	**Date Completed:**	6/15/2022
Material Source:	CBR TP-1, 5-6'	**Tested By:**	BIG

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**98**	
2"	50	**94**	
1½"	38.1	**94**	
1"	25	**92**	
¾"	19	**91**	
½"	12.5	**89**	
¼"	6.3	**86**	
No. 4	4.75	**85**	
No. 10	2	**78**	
No. 20	0.85	**73**	
No. 40	0.425	**67**	
No. 60	0.25	**61**	
No. 100	0.15	**54**	
No. 200	0.075	**42.7**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05689	**37.0**
0.04251	**30.6**
0.03119	**25.7**
0.03119	**25.7**
0.02282	**21.7**
0.01627	**19.3**
0.01217	**16.9**
0.00867	**14.5**
0.00627	**11.3**
0.00451	**8.8**
0.00321	**6.8**
0.00230	**5.6**
0.00136	**4.8**



Particle Distribution:	Gravel (3" - No. 4)	**13.1%**	Fines (0.074 -0.005)	**35.3%**
	Sand (No. 4 - No. 200)	**41.9%**	Clay (<0.005)	**9.6%**

Comments:

Reviewed By

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

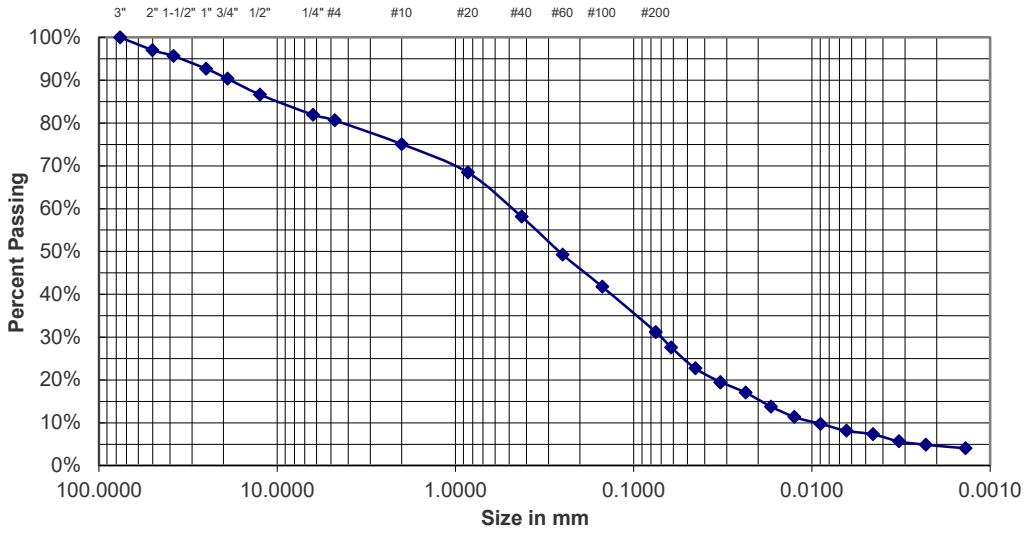
Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21776S
Client:	Stantec	**Date Received:**	6/6/2022
Material Description:	Test Pit Samples	**Date Completed:**	6/15/2022
Material Source:	CBR TP-2, 5-6'	**Tested By:**	BIG

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**97**	
1½"	38.1	**96**	
1"	25	**93**	
¾"	19	**90**	
½"	12.5	**87**	
¼"	6.3	**82**	
No. 4	4.75	**81**	
No. 10	2	**75**	
No. 20	0.85	**68**	
No. 40	0.425	**58**	
No. 60	0.25	**49**	
No. 100	0.15	**42**	
No. 200	0.075	**31.2**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.06154	**27.6**
0.04507	**22.7**
0.03254	**19.5**
0.03254	**19.5**
0.02356	**17.0**
0.01698	**13.8**
0.01254	**11.4**
0.00893	**9.7**
0.00638	**8.1**
0.00454	**7.3**
0.00325	**5.7**
0.00230	**4.9**
0.00137	**4.1**



Particle Distribution:	Gravel (3" - No. 4)	**19.4%**	Fines (0.074 -0.005)	**23.9%**
	Sand (No. 4 - No. 200)	**49.5%**	Clay (<0.005)	**7.2%**

Comments:

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S.W.COLE ENGINEERING, INC.

Report of Hydrometer

ASTM D422-63 (07)

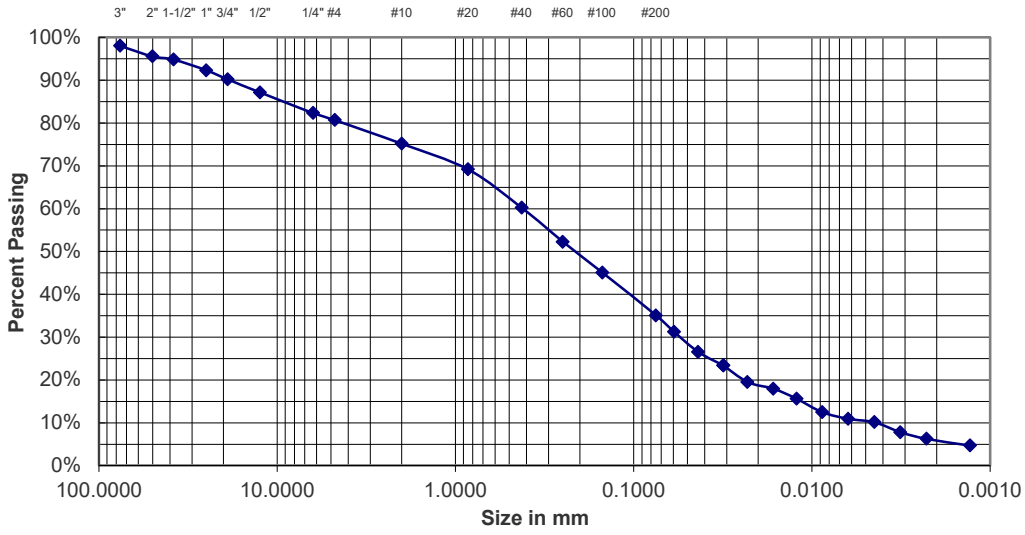
Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21777S
Client:	Stantec	**Date Received:**	6/6/2022
Material Description:	Test Pit Samples	**Date Completed:**	6/17/2022
Material Source:	CBR TP-3, 5-6'	**Tested By:**	BIG

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**98**	
2"	50	**96**	
1½"	38.1	**95**	
1"	25	**92**	
¾"	19	**90**	
½"	12.5	**87**	
¼"	6.3	**82**	
No. 4	4.75	**81**	
No. 10	2	**75**	
No. 20	0.85	**69**	
No. 40	0.425	**60**	
No. 60	0.25	**52**	
No. 100	0.15	**45**	
No. 200	0.075	**35.1**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05926	**31.2**
0.04351	**26.5**
0.03146	**23.4**
0.03146	**23.4**
0.02301	**19.5**
0.01647	**17.9**
0.01217	**15.6**
0.00877	**12.5**
0.00627	**10.9**
0.00447	**10.1**
0.00319	**7.8**
0.00227	**6.2**
0.00130	**4.7**



Particle Distribution:

Gravel (3" - No. 4)	**17.4%**	Fines (0.074 -0.005)	**27.4%**
Sand (No. 4 - No. 200)	**45.6%**	Clay (<0.005)	**9.6%**

Comments:

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Report of Hydrometer

ASTM D422-63 (07)

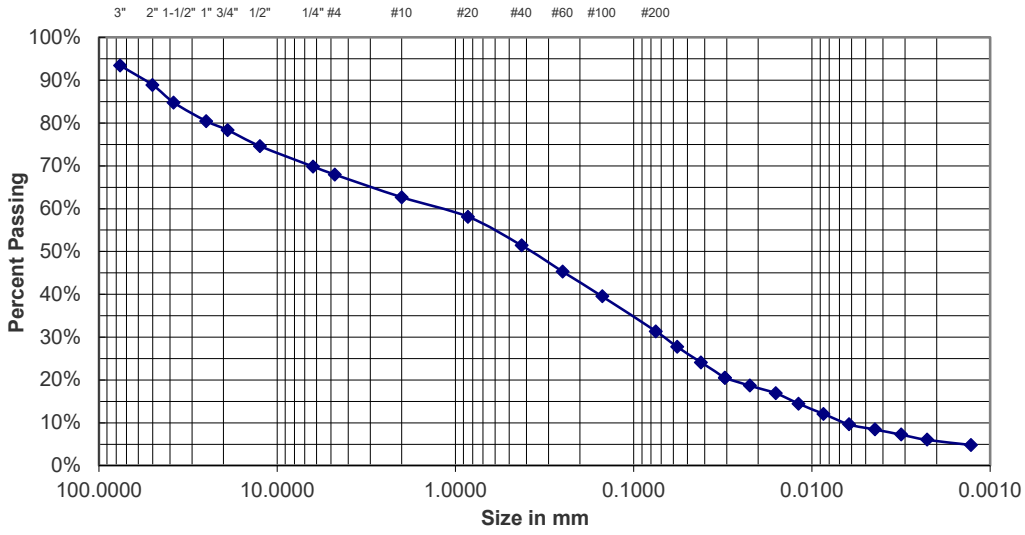
Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21778S
Client:	Stantec	**Date Received:**	6/6/2022
Material Description:	Test Pit Samples	**Date Completed:**	6/17/2022
Material Source:	CBR TP-4, 5-6'	**Tested By:**	BIG

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**93**	
2"	50	**89**	
1½"	38.1	**85**	
1"	25	**80**	
¾"	19	**78**	
½"	12.5	**75**	
¼"	6.3	**70**	
No. 4	4.75	**68**	
No. 10	2	**63**	
No. 20	0.85	**58**	
No. 40	0.425	**51**	
No. 60	0.25	**45**	
No. 100	0.15	**40**	
No. 200	0.075	**31.3**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05689	**27.7**
0.04190	**24.1**
0.03077	**20.5**
0.03077	**20.5**
0.02225	**18.7**
0.01593	**16.9**
0.01188	**14.5**
0.00860	**12.0**
0.00620	**9.6**
0.00443	**8.4**
0.00316	**7.2**
0.00226	**6.0**
0.00128	**4.8**



Particle Distribution:

Gravel (3" - No. 4)	**25.5%**	Fines (0.074 -0.005)	**28.9%**
Sand (No. 4 - No. 200)	**36.6%**	Clay (<0.005)	**9.0%**

Comments:

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Report of Hydrometer

ASTM D422-63 (07)

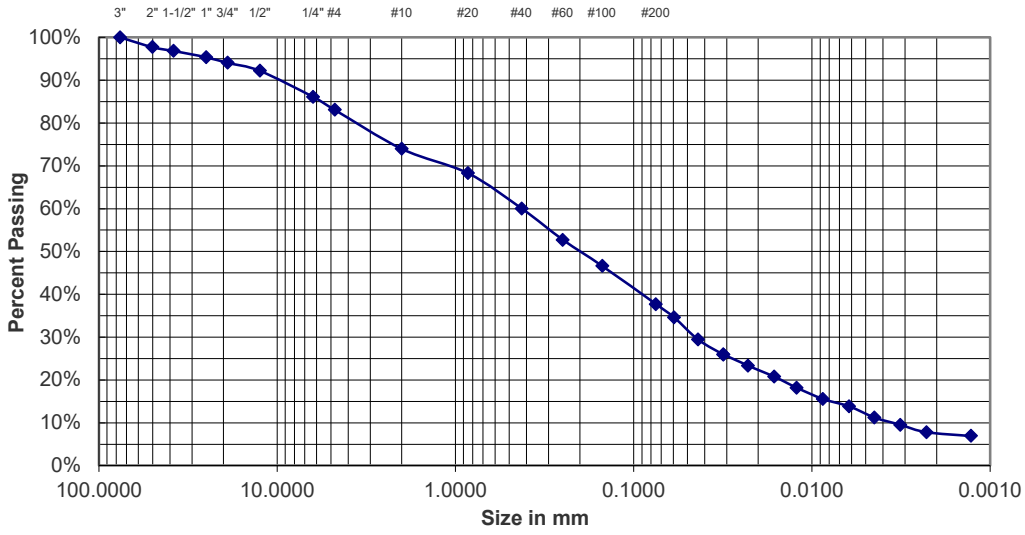
Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21779S
Client:	Stantec	**Date Received:**	6/6/2022
Material Description:	Test Pit Samples	**Date Completed:**	6/17/2022
Material Source:	CBR TP-5, 5-6'	**Tested By:**	BIG

Sieve Analysis

Sieve Size	Standard Designation (mm)	Amount Passing (%)	Specification (name)
3"	76	**100**	
2"	50	**98**	
1½"	38.1	**97**	
1"	25	**95**	
¾"	19	**94**	
½"	12.5	**92**	
¼"	6.3	**86**	
No. 4	4.75	**83**	
No. 10	2	**74**	
No. 20	0.85	**68**	
No. 40	0.425	**60**	
No. 60	0.25	**53**	
No. 100	0.15	**47**	
No. 200	0.075	**37.7**	

Hydrometer Analysis

Particle Size (mm)	Amount Passing (%)
0.05926	**34.6**
0.04351	**29.4**
0.03146	**25.9**
0.03146	**25.9**
0.02282	**23.4**
0.01627	**20.8**
0.01217	**18.2**
0.00867	**15.6**
0.00620	**13.8**
0.00447	**11.2**
0.00319	**9.5**
0.00227	**7.8**
0.00128	**6.9**



Particle Distribution:	Gravel (3" - No. 4)	**16.9%**	Fines (0.074 -0.005)	**25.8%**
	Sand (No. 4 - No. 200)	**45.4%**	Clay (<0.005)	**11.9%**

Comments:

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/18/22
Mix Type / Design ID:	CB-1	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 5.86%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	100
½"	100
⅜"	99
No. 4	69
No. 8	47
No. 16	34
No. 30	23
No. 50	14
No. 100	8
No. 200	5.4

Comments:

Reviewed By: _____

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/18/22
Mix Type / Design ID:	CB-2	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 5.65%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	99
½"	92
⅜"	83
No. 4	67
No. 8	46
No. 16	32
No. 30	21
No. 50	13
No. 100	7
No. 200	4.2

Comments:

Reviewed By: _____

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/31/22
Mix Type / Design ID:	CB-3	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 5.85%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	100
½"	100
⅜"	99
No. 4	68
No. 8	46
No. 16	33
No. 30	22
No. 50	13
No. 100	8
No. 200	5.1

Comments:

Reviewed By: _____

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/26/22
Mix Type / Design ID:	CB-4	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 6.03%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	100
½"	100
⅜"	99
No. 4	69
No. 8	48
No. 16	35
No. 30	23
No. 50	14
No. 100	9
No. 200	5.8

Comments:

Reviewed By: _____

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/31/22
Mix Type / Design ID:	CB-5	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 5.76%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	100
½"	100
⅜"	99
No. 4	66
No. 8	45
No. 16	32
No. 30	22
No. 50	13
No. 100	8
No. 200	4.8

Comments:

Reviewed By: _____

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/31/22
Mix Type / Design ID:	CB-6	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 5.36%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	100
½"	89
⅜"	81
No. 4	64
No. 8	44
No. 16	30
No. 30	20
No. 50	12
No. 100	7
No. 200	4.0

Comments:

Reviewed By: _____

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/13/22
Mix Type / Design ID:	CB-7	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 6.08%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	100
½"	91
⅜"	82
No. 4	67
No. 8	46
No. 16	31
No. 30	20
No. 50	12
No. 100	7
No. 200	3.9

Comments:

Reviewed By: _____

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S.W.COLE ENGINEERING, INC.

Report of Asphalt Content and Gradation by Chemical Extraction

ASTM D2172-11, AASHTO T 164

Project Name:	Runway 18-36 and Taxiway A Extension	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	0
Client:	Stantec	**Date Received:**	05/02/22
Material Supplier:	Existing	**Date Completed:**	05/13/22
Mix Type / Design ID:	CB-8	**Tested By:**	D. Jack
Course Description:	Surface		

Asphalt Content (%) 5.70%

Sieve Designation	Percent Passing
2"	100
1½"	100
1"	100
¾"	100
½"	91
⅜"	83
No. 4	67
No. 8	47
No. 16	32
No. 30	21
No. 50	13
No. 100	7
No. 200	4.4

Comments:

Reviewed By: _____

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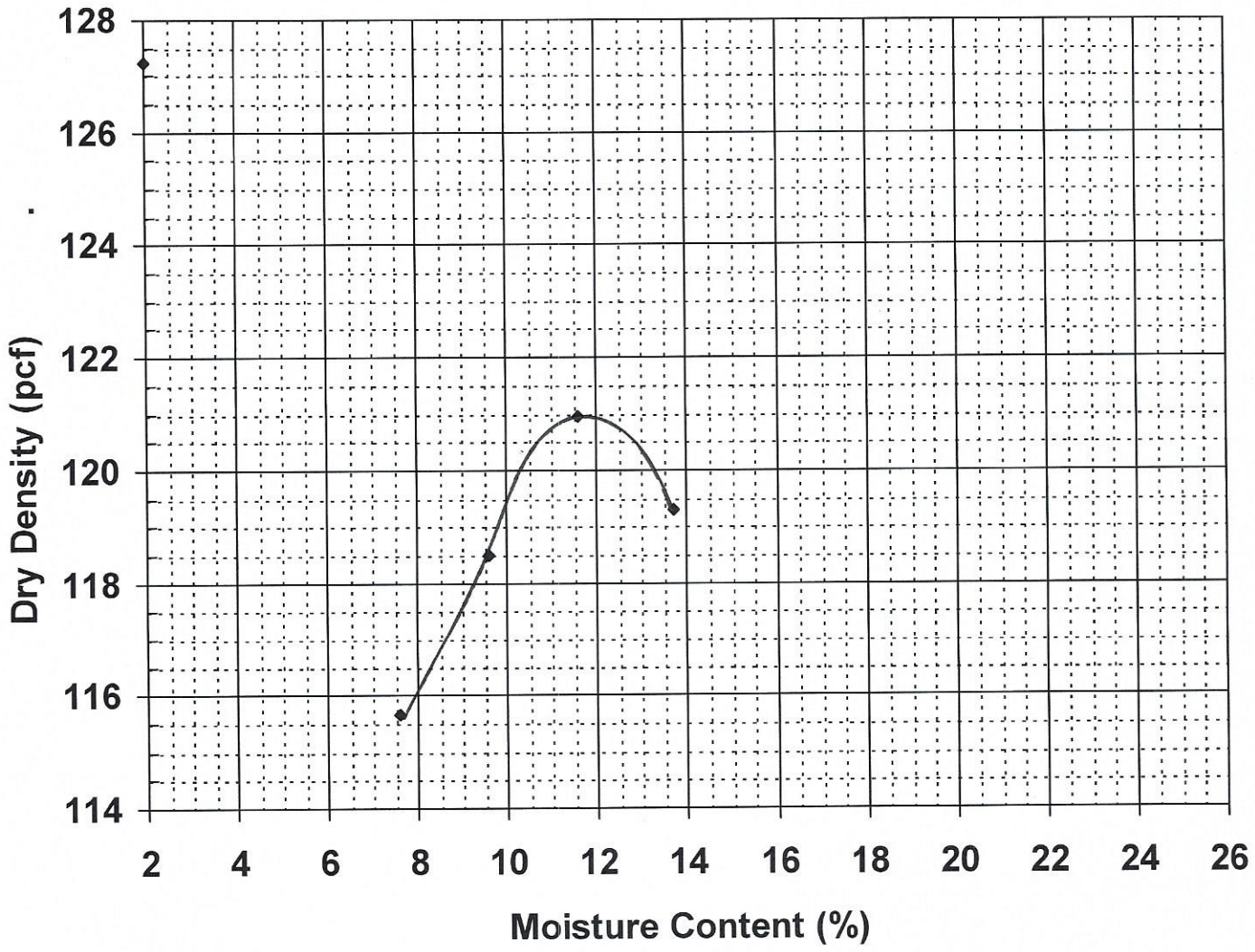
S.W.COLE ENGINEERING, INC.

Report of Moisture-Density

Method ASTM D-698 STANDARD Procedure A

Project Name	LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL	Project Number	21-1421
Client	STANTEC CONSULTING SERVICES, INC.	Lab ID	21775S
Material Type	TEST PIT SAMPLES	Date Received	6/3/2022
Material Source	CBR TP-1	Date Completed	6/10/2022
		Tested By	IVY TRUDEAU

Moisture-Density Relationship Curve



Maximum Dry Density (pcf)	121
Optimum Moisture Content (%)	11.6
Percent Oversized	13.7%

Corrected Dry Density (pcf)	**124.9**
Corrected Moisture Content (%)	**10.3**

Comments

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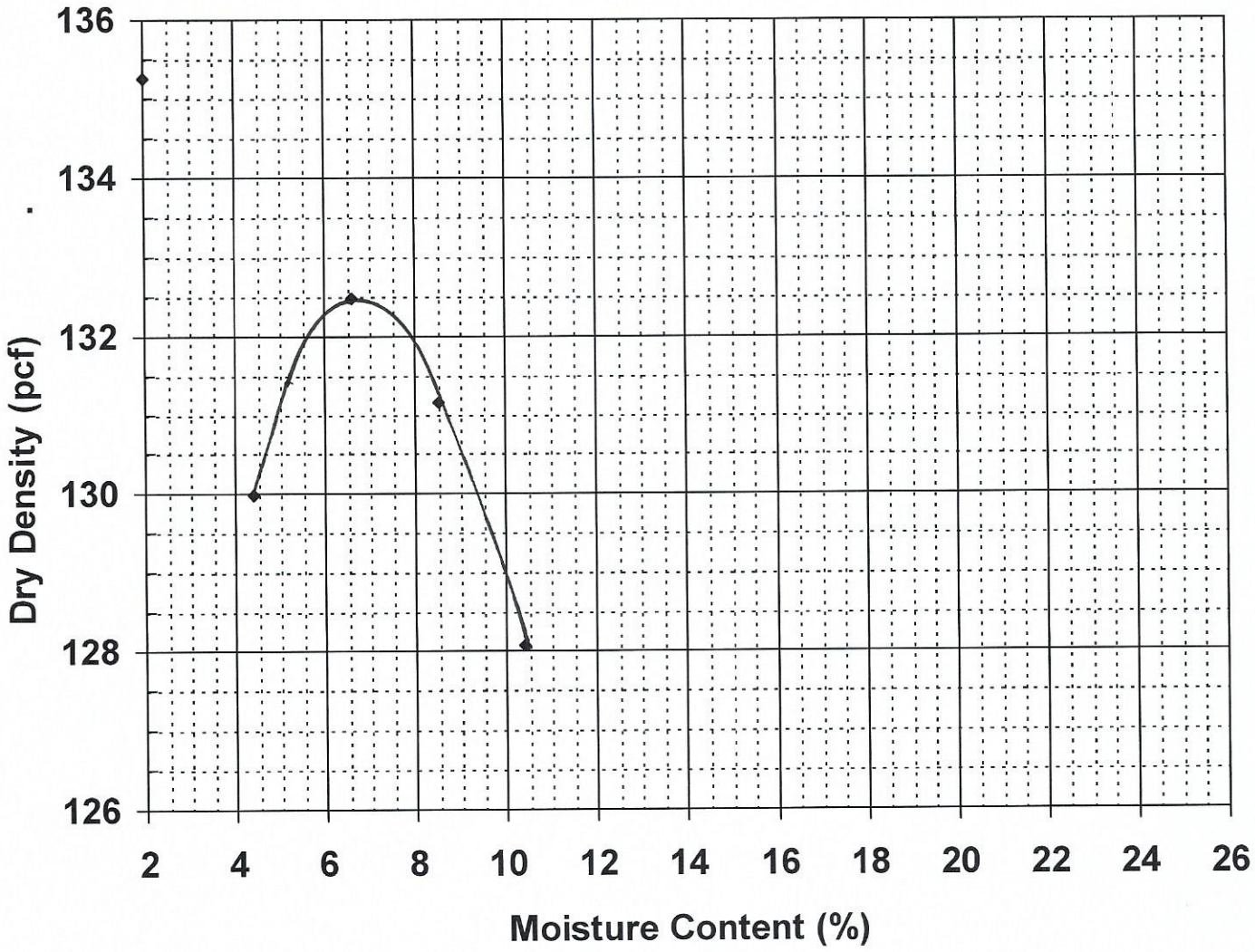
S.W.COLE ENGINEERING, INC.

Report of Moisture-Density

Method ASTM D-698 STANDARD Procedure C

Project Name	LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL	Project Number	21-1421
Client	STANTEC CONSULTING SERVICES, INC.	Lab ID	21776S
Material Type	TEST PIT SAMPLES	Date Received	6/3/2022
Material Source	CBR TP-2	Date Completed	6/10/2022
		Tested By	IVY TRUDEAU

Moisture-Density Relationship Curve



Maximum Dry Density (pcf)	132.5
Optimum Moisture Content (%)	6.6
Percent Oversized	9.7%

Corrected Dry Density (pcf)	**134.6**
Corrected Moisture Content (%)	**6.2**

Comments

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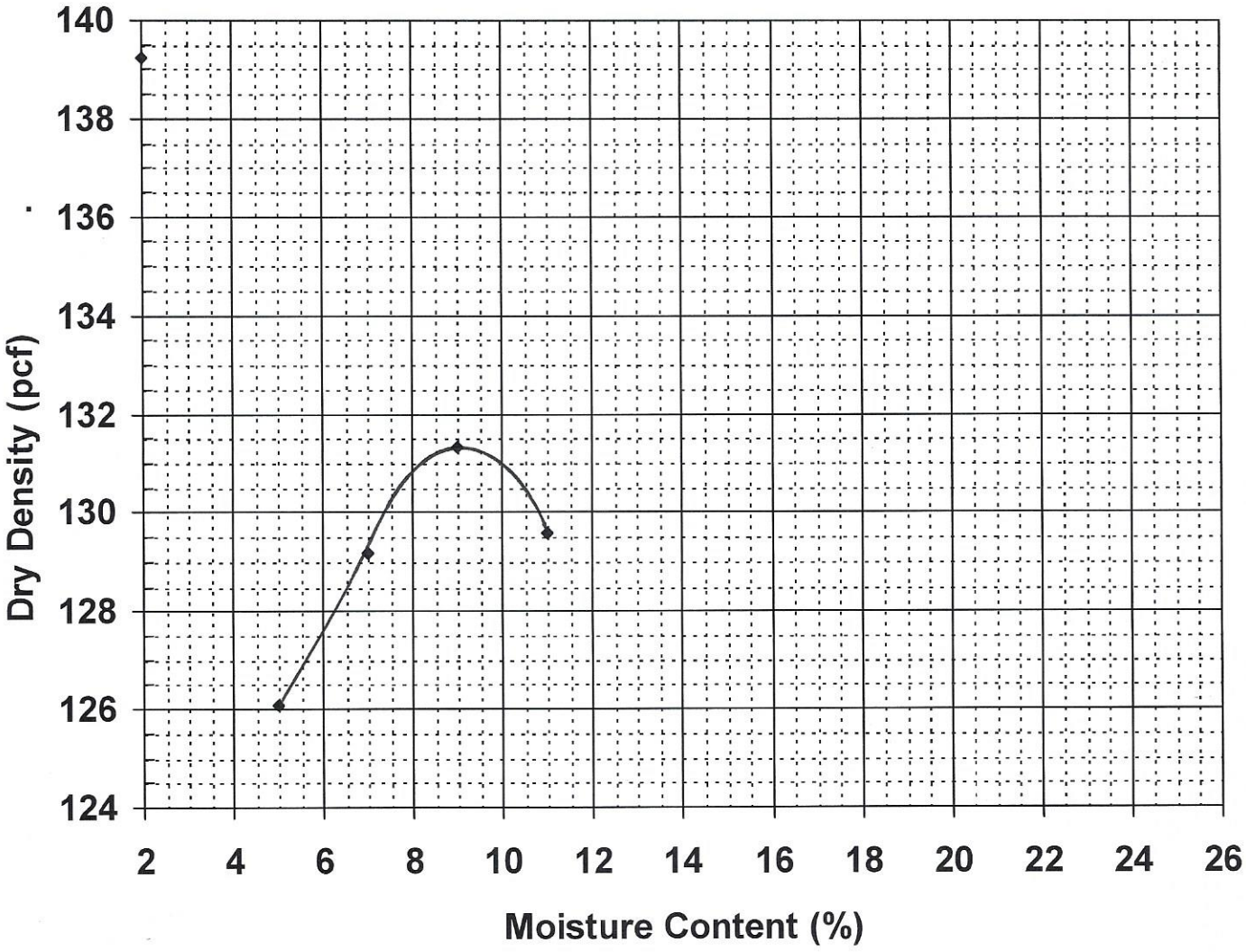
S.W.COLE ENGINEERING, INC.

Report of Moisture-Density

Method ASTM D-698 STANDARD Procedure C

Project Name	LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL	Project Number	21-1421
Client	STANTEC CONSULTING SERVICES, INC.	Lab ID	21777S
Material Type	TEST PIT SAMPLES	Date Received	6/3/2022
Material Source	CBR TP-3	Date Completed	6/15/2022
		Tested By	IVY TRUDEAU

Moisture-Density Relationship Curve



Maximum Dry Density (pcf)	131.3
Optimum Moisture Content (%)	9.1
Percent Oversized	12.6%

Corrected Dry Density (pcf)	**134.1**
Corrected Moisture Content (%)	**8.2**

Comments

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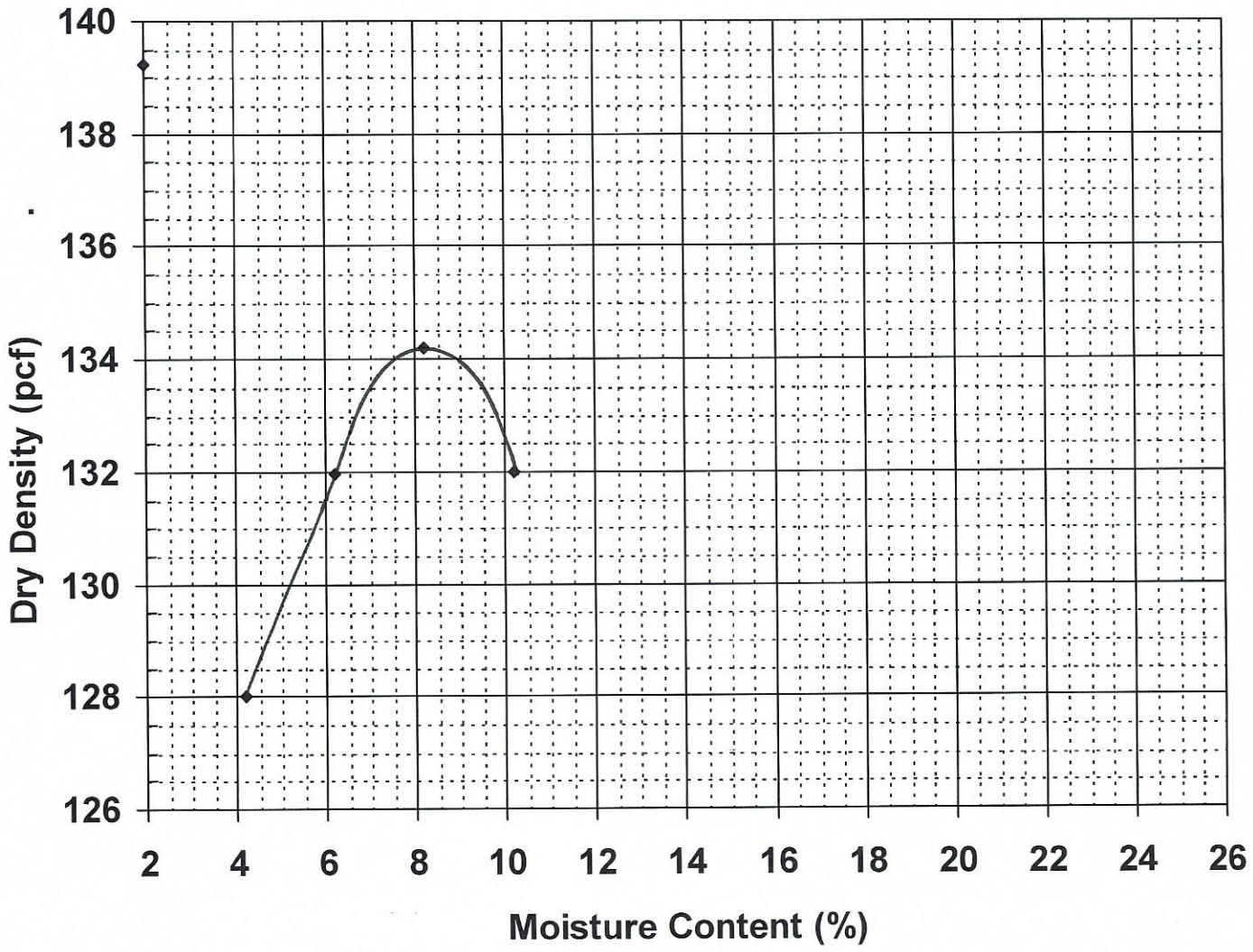
Report of Moisture-Density

Method ASTM D-698 STANDARD Procedure C

Project Name	LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL	Project Number	21-1421
Client	STANTEC CONSULTING SERVICES, INC.	Lab ID	21778S
Material Type	TEST PIT SAMPLES	Date Received	6/3/2022
Material Source	CBR TP-4	Date Completed	6/15/2022
		Tested By	IVY TRUDEAU

Moisture-Density Relationship Curve



Maximum Dry Density (pcf)	134.2
Optimum Moisture Content (%)	8.2
Percent Oversized	19.3%

Corrected Dry Density (pcf)	**138.1**
Corrected Moisture Content (%)	**7.0**

Comments

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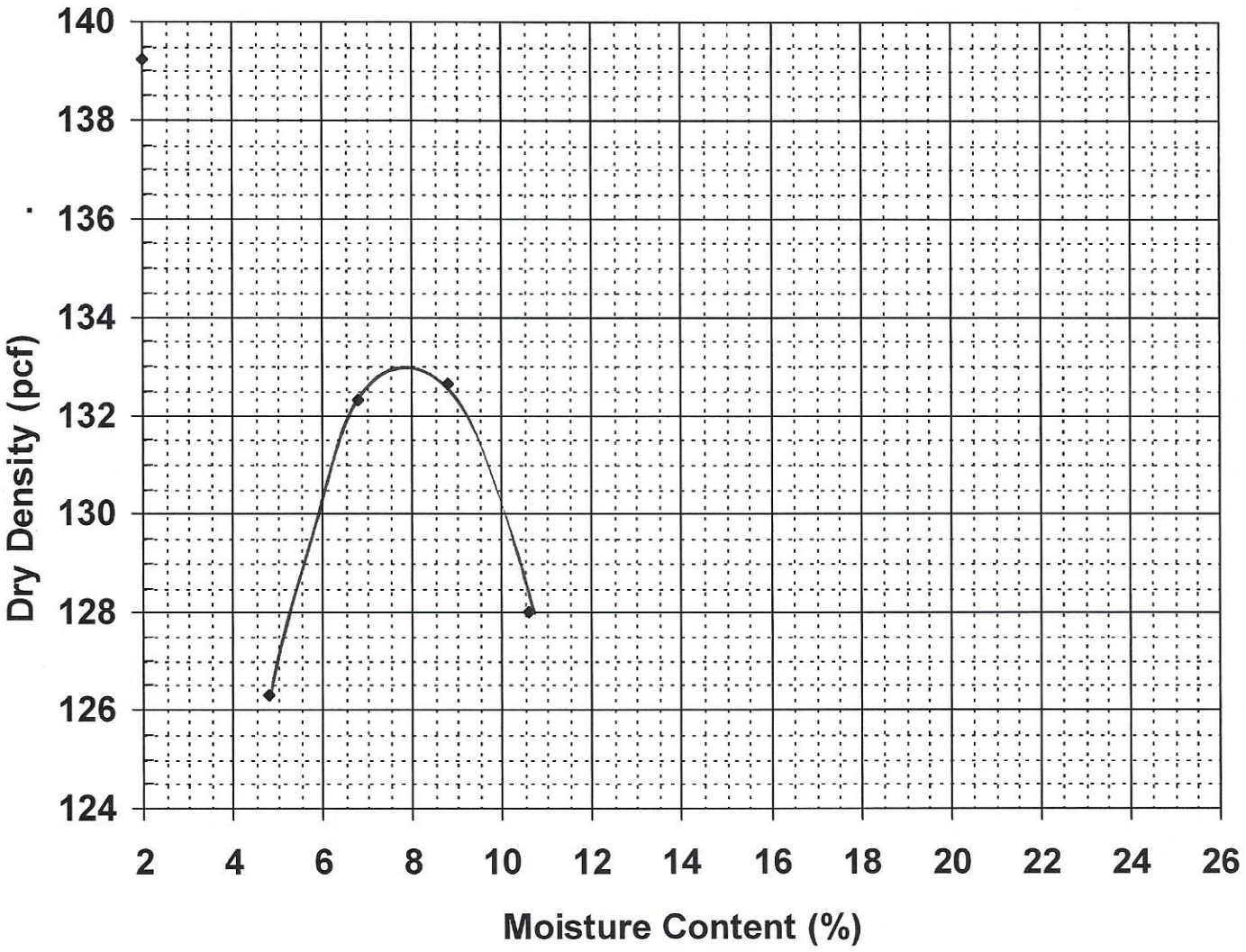
S.W.COLE ENGINEERING, INC.

Report of Moisture-Density

Method ASTM D-698 STANDARD Procedure C

Project Name	LEBANON NH - LEBANON MUNICIPAL AIRPORT RUNWAY 18-36 AND TAXIWAY A EXTENSION - GEOTECHNICAL	Project Number	21-1421
Client	STANTEC CONSULTING SERVICES, INC.	Lab ID	21779S
Material Type	TEST PIT SAMPLES	Date Received	6/3/2022
Material Source	CBR TP-5	Date Completed	6/15/2022
		Tested By	IVY TRUDEAU

Moisture-Density Relationship Curve



Maximum Dry Density (pcf)	132
Optimum Moisture Content (%)	7.8
Percent Oversized	5.0%

Corrected Dry Density (pcf)	**133.1**
Corrected Moisture Content (%)	**7.5**

Comments

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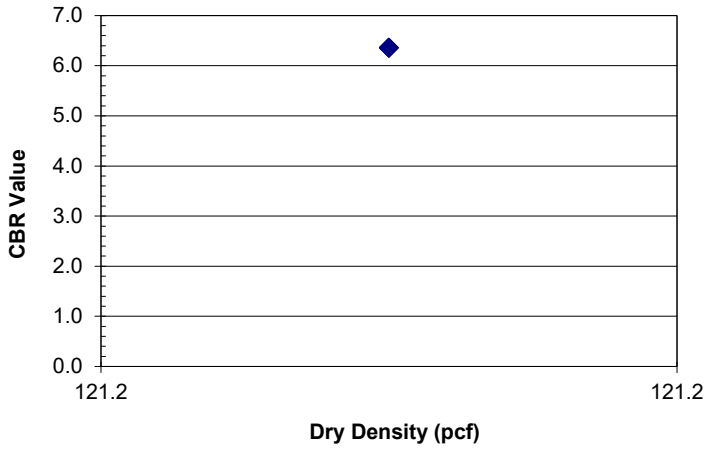
S.W.COLE ENGINEERING, INC.

Report of California Bearing Ratio

ASTM D1883-07

Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21775S
Client:	Stantec	**Date Received:**	06/03/22
Material Description:	Test Pit Samples	**Date Completed:**	06/17/22
Material Source:	CBR TP-1, 5-6'	**Tested By:**	BIG

CBR Value at 97% Compaction: 6.4



Moisture Content as Compacted:	10.3%
Dry Density at 97% Compaction:	121.2 pcf
ASTM Test Method Used:	D698
Surcharge Weight:	5 lbs
Condition of Sample:	Soaked
Moisture Content of Top 1 inch:	14.7%
Swell (% of initial height):	Test Not Performed
Material Retained on ¾" sieve:	9%

Comments:

Reviewed By: _____

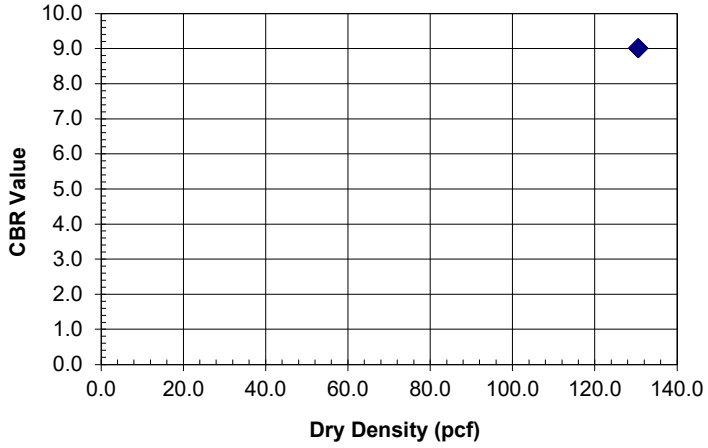
S.W.COLE ENGINEERING, INC.

Report of California Bearing Ratio

ASTM D1883-07

Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21776S
Client:	Stantec	**Date Received:**	06/03/22
Material Description:	Test Pit Samples	**Date Completed:**	06/17/22
Material Source:	CBR TP-2, 5-6'	**Tested By:**	BIG

CBR Value at 97% Compaction: 9.0



Moisture Content as Compacted: 6.2%
Dry Density at 97% Compaction: 130.6 pcf
ASTM Test Method Used: D698
Surcharge Weight: 5 lbs
Condition of Sample: Soaked
Moisture Content of Top 1 inch: 12.3%
Swell (% of initial height): Test Not Performed
Material Retained on ¾" sieve: 10%

Comments:

Reviewed By: _____

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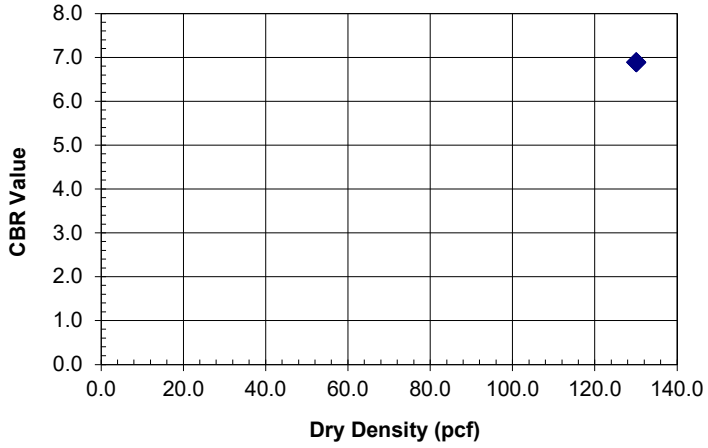
S.W.COLE ENGINEERING, INC.

Report of California Bearing Ratio

ASTM D1883-07

Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21777S
Client:	Stantec	**Date Received:**	06/03/22
Material Description:	Test Pit Samples	**Date Completed:**	06/21/22
Material Source:	CBR TP-3, 5-6'	**Tested By:**	BIG

CBR Value at 97% Compaction: 6.9



Moisture Content as Compacted: 8.2%
Dry Density at 97% Compaction: 130.1 pcf
ASTM Test Method Used: D698
Surcharge Weight: 5 lbs
Condition of Sample: Soaked
Moisture Content of Top 1 inch: 11.9%
Swell (% of initial height): Test Not Performed
Material Retained on ¾" sieve: 10%

Comments:

Reviewed By: _____

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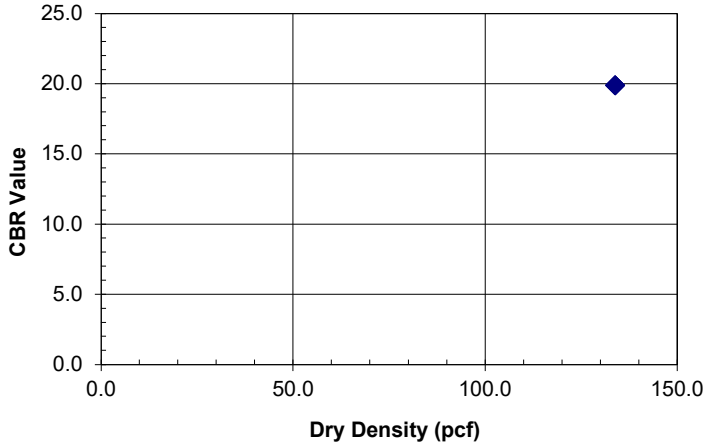
S.W.COLE ENGINEERING, INC.

Report of California Bearing Ratio

ASTM D1883-07

Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21778S
Client:	Stantec	**Date Received:**	06/03/22
Material Description:	Test Pit Samples	**Date Completed:**	06/21/22
Material Source:	CBR TP-4, 5-6'	**Tested By:**	BIG

CBR Value at 97% Compaction: 19.9



Moisture Content as Compacted: 7.0%
Dry Density at 97% Compaction: 134.0 pcf
ASTM Test Method Used: D698
Surcharge Weight: 5 lbs
Condition of Sample: Soaked
Moisture Content of Top 1 inch: 9.0%
Swell (% of initial height): Test Not Performed
Material Retained on ¾" sieve: 22%

Comments:

Reviewed By: _____

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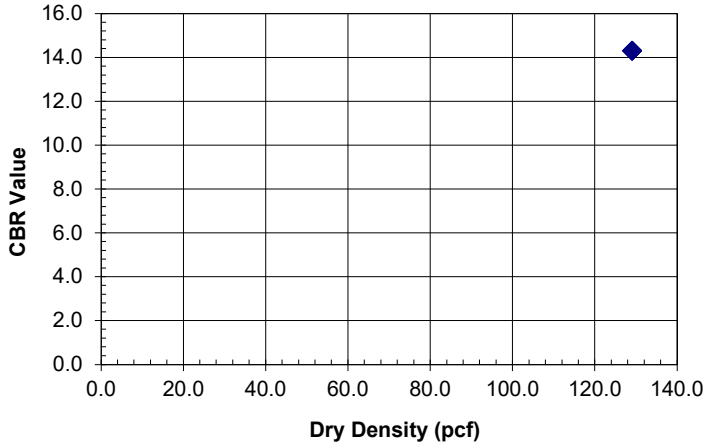
S.W.COLE ENGINEERING, INC.

Report of California Bearing Ratio

ASTM D1883-07

Project Name:	RW 18-36 and Taxiway A Ext.	**Project Number:**	21-1421
Project Location:	Lebanon Municipal Airport	**Lab ID:**	21779S
Client:	Stantec	**Date Received:**	06/03/22
Material Description:	Test Pit Samples	**Date Completed:**	06/21/22
Material Source:	CBR TP-5, 5-6'	**Tested By:**	BIG

CBR Value at 97% Compaction: 14.3



Moisture Content as Compacted: 7.5%
Dry Density at 97% Compaction: 129.1 pcf
ASTM Test Method Used: D698
Surcharge Weight: 5 lbs
Condition of Sample: Soaked
Moisture Content of Top 1 inch: 11.0%
Swell (% of initial height): Test Not Performed
Material Retained on ¾" sieve: 6%

Comments:

Reviewed By: _____

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II-B1. ACCESS TO RECORDS AND REPORTS

The Contractor must maintain an acceptable cost accounting system. The Contractor agrees to provide the Owner, the Federal Aviation Administration and the Comptroller General of the United States or any of their duly authorized representatives access to any books, documents, papers and records of the Contractor which are directly pertinent to the specific contract for the purpose of making audit, examination, excerpts and transcriptions. The Contractor agrees to maintain all books, records and reports required under this contract for a period of not less than three years after final payment is made and all pending matters are closed.

II-B2. NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO ENSURE EQUAL EMPLOYMENT OPPORTUNITY

1. The Offeror's or Bidder's attention is called to the "Equal Opportunity Clause" and the "Standard Federal Equal Employment Opportunity Construction Contract Specifications" set forth herein.

2. The goals and timetables for minority and female participation, expressed in percentage terms for the Contractor's aggregate workforce in each trade on all construction work in the covered area, are as follows:

Timetables

Goals for minority participation for each trade:	**4.0%**
Goals for female participation in each trade:	6.9%

These goals are applicable to all of the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it shall apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and nonfederally involved construction.

The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 shall be based on its implementation of the Equal Opportunity Clause, specific affirmative action obligations required by the specifications set forth in 41 CFR 60-4.3(a) and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the contract, and in each trade, and the Contractor shall make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority or female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals shall be a violation of the contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

3. The Contractor shall provide written notification to the Director of the Office of Federal Contract Compliance Programs (OFCCP) within 10 working days of award of any construction subcontract in excess of $10,000 at any tier for construction work under the contract resulting from this solicitation. The notification shall list the name, address, and telephone number of the subcontractor; employer identification number of the subcontractor; estimated dollar amount of the subcontract; estimated

starting and completion dates of the subcontract; and the geographical area in which the subcontract is to be performed.

4. As used in this notice and in the contract resulting from this solicitation, the "covered area" is **West Lebanon, Grafton County, New Hampshire.**

II-B3. BREACH OF CONTRACT TERMS

Any violation or breach of terms of this contract on the part of the **Contractor** or its subcontractors may result in the suspension or termination of this contract or such other action that may be necessary to enforce the rights of the parties of this agreement.

Owner will provide **Contractor** written notice that describes the nature of the breach and corrective actions the **Contractor** must undertake in order to avoid termination of the contract. Owner reserves the right to withhold payments to Contractor until such time the Contractor corrects the breach or the Owner elects to terminate the contract. The Owner's notice will identify a specific date by which the **Contractor** must correct the breach. Owner may proceed with termination of the contract if the **Contractor** fails to correct the breach by the deadline indicated in the Owner's notice.

The duties and obligations imposed by the Contract Documents and the rights and remedies available thereunder are in addition to, and not a limitation of, any duties, obligations, rights and remedies otherwise imposed or available by law.

II-B4. FAA BUY AMERICAN PREFERENCE

The Contractor certifies that its bid/offer is in compliance with 49 USC § 50101, BABA and other related Made in America Laws,[1] U.S. statutes, guidance, and FAA policies, which provide that Federal funds may not be obligated unless all iron, steel and manufactured goods used in AIP funded projects are produced in the United States, unless the Federal Aviation Administration has issued a waiver for the product; the product is listed as an Excepted Article, Material Or Supply in Federal Acquisition Regulation subpart 25.108; or is included in the FAA Nationwide Buy American Waivers Issued list.

The bidder or offeror must complete and submit the certification of compliance with FAA's Buy American Preference, BABA and Made in America laws included herein with their bid or offer. The Airport Sponsor/Owner will reject as nonresponsive any bid or offer that does not include a completed certification of compliance with FAA's Buy American Preference and BABA.

The bidder or offeror certifies that all constructions materials, defined to mean an article, material, or supply other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that are or consist primarily of: non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber; or drywall used in the project are manufactured in the U.S.

[1] Per Executive Order 14005 "Made in America Laws" means all statutes, regulations, rules, and Executive Orders relating to federal financial assistance awards or federal procurement, including those that refer to "Buy America" or "Buy American," that require, or provide a preference for, the purchase or acquisition of goods, products, or materials produced in the United States, including iron, steel, and manufactured products offered in the United States.

Certification of Compliance with FAA Buy American Preference – Construction Projects

As a matter of bid responsiveness, the bidder or offeror must complete, sign, date, and submit this certification statement with its proposal. The bidder or offeror must indicate how it intends to comply with 49 USC § 50101, BABA and other related Made in America Laws, U.S. statutes, guidance, and FAA policies, by selecting one of the following certification statements. These statements are mutually exclusive. Bidder must select one or the other (i.e., not both) by inserting a checkmark (✓) or the letter "X".

☐ Bidder or offeror hereby certifies that it will comply with 49 USC § 50101, BABA and other related U.S. statutes, guidance, and policies of the FAA by:

a) Only installing iron, steel and manufactured products produced in the United States;

b) Only installing construction materials defined as: an article, material, or supply – other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives that are or consist primarily of non-ferrous metals; plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables); glass (including optic glass); lumber or drywall that have been manufactured in the United States.

c) Installing manufactured products for which the Federal Aviation Administration (FAA) has issued a waiver as indicated by inclusion on the current FAA Nationwide Buy American Waivers Issued listing; or

d) Installing products listed as an Excepted Article, Material or Supply in Federal Acquisition Regulation Subpart 25.108.

By selecting this certification statement, the bidder or offeror agrees:

a) To provide to the Airport Sponsor or the FAA evidence that documents the source and origin of the iron, steel, and/or manufactured product.

b) To faithfully comply with providing U.S. domestic products.

c) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

d) Certify that all construction materials used in the project are manufactured in the U.S.

☐ The bidder or offeror hereby certifies it cannot comply with the 100 percent Buy American Preferences of 49 USC § 50101(a) but may qualify for a Type 3 or Type 4 waiver under 49 USC § 50101(b). By selecting this certification statement, the apparent bidder or offeror with the apparent low bid agrees:

a) To the submit to the Airport Sponsor or FAA within 15 calendar days of being selected as the responsive bidder, a formal waiver request and required documentation that supports the type of waiver being requested.

b) That failure to submit the required documentation within the specified timeframe is cause for a non-responsive determination that may result in rejection of the proposal.

c) To faithfully comply with providing U.S. domestic products at or above the approved U.S. domestic content percentage as approved by the FAA.

d) To furnish U.S. domestic product for any waiver request that the FAA rejects.

e) To refrain from seeking a waiver request after establishment of the contract, unless extenuating circumstances emerge that the FAA determines justified.

Required Documentation

Type 2 Waiver (Nonavailability) - The iron, steel, manufactured goods or construction materials or manufactured goods are not available in sufficient quantity or quality in the United States. The required documentation for the Nonavailability waiver is

a) Completed Content Percentage Worksheet and Final Assembly Questionnaire

b) Record of thorough market research, consideration where appropriate of qualifying alternate items, products, or materials including;

c) A description of the market research activities and methods used to identify domestically manufactured items capable of satisfying the requirement, including the timing of the research and conclusions reached on the availability of sources.

Type 3 Waiver – The cost of components and subcomponents produced in the United States is more than 60 percent of the cost of all components and subcomponents of the "facility/project." The required documentation for a Type 3 waiver is:

a) Completed Content Percentage Worksheet and Final Assembly Questionnaire including;
b) Listing of all manufactured products that are not comprised of 100 percent U.S. domestic content (excludes products listed on the FAA Nationwide Buy American Waivers Issued listing and products excluded by Federal Acquisition Regulation Subpart 25.108; products of unknown origin must be considered as non-domestic products in their entirety).
c) Cost of non-domestic components and subcomponents, excluding labor costs associated with final assembly and installation at project location.
d) Percentage of non-domestic component and subcomponent cost as compared to total "facility" component and subcomponent costs, excluding labor costs associated with final assembly and installation at project location.

Type 4 Waiver (Unreasonable Costs) - Applying this provision for iron, steel, manufactured goods or construction materials would increase the cost of the overall project by more than 25 percent. The required documentation for this waiver is:

a) A completed Content Percentage Worksheet and Final Assembly Questionnaire from
b) At minimum two comparable equal bids and/or offers;
c) Receipt or record that demonstrates that supplier scouting called for in Executive Order 14005, indicates that no domestic source exists for the project and/or component;
d) Completed waiver applications for each comparable bid and/or offer.

False Statements: Per 49 USC § 47126, this certification concerns a matter within the jurisdiction of the Federal Aviation Administration and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18, United States Code.

Date	Signature
Company Name	Title

II-B5. GENERAL CIVIL RIGHTS PROVISIONS

In all its activities within the scope of its airport program, the Contractor agrees to comply with pertinent statutes, Executive Orders, and such rules as identified in Title VI List of Pertinent Nondiscrimination Acts and Authorities to ensure that no person shall, on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability be excluded from participating in any activity conducted with or benefiting from Federal assistance.

This provision is in addition to that required by Title VI of the Civil Rights Act of 1964.

The above provision binds the Contractor and subcontractors from the bid solicitation period through the completion of the contract.

II-B6. TITLE VI SOLICITATION NOTICE

The **City of Lebanon**, in accordance with the provisions of Title VI of the Civil Rights Act of 1964 (78 Stat. 252, 42 USC §§ 2000d to 2000d-4) and the Regulations, hereby notifies all bidders or offerors that it will affirmatively ensure that for any contract entered into pursuant to this advertisement, [select businesses, or disadvantaged business enterprises or airport concession disadvantaged business enterprises] will be afforded full and fair opportunity to submit bids in response to this invitation and no businesses will be discriminated against on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability in consideration for an award.

Title VI List of Pertinent Nondiscrimination Acts and Authorities

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees to comply with the following non-discrimination statutes and authorities; including but not limited to:

- Title VI of the Civil Rights Act of 1964 (42 USC § 2000d *et seq*., 78 stat. 252) (prohibits discrimination on the basis of race, color, national origin);
- 49 CFR part 21 (Non-discrimination in Federally-Assisted programs of the Department of Transportation—Effectuation of Title VI of the Civil Rights Act of 1964);
- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, (42 USC § 4601) (prohibits unfair treatment of persons displaced or whose property has been acquired because of Federal or Federal-aid programs and projects);
- Section 504 of the Rehabilitation Act of 1973 (29 USC § 794 *et seq*.), as amended (prohibits discrimination on the basis of disability); and 49 CFR part 27 (Nondiscrimination on the Basis of Disability in Programs or Activities Receiving Federal Financial Assistance);
- The Age Discrimination Act of 1975, as amended (42 USC § 6101 *et seq*.) (prohibits discrimination on the basis of age);
- Airport and Airway Improvement Act of 1982 (49 USC § 47123), as amended (prohibits discrimination based on race, creed, color, national origin, or sex);
- The Civil Rights Restoration Act of 1987 (PL 100-259) (broadened the scope, coverage and applicability of Title VI of the Civil Rights Act of 1964, the Age Discrimination Act of 1975 and Section 504 of the Rehabilitation Act of 1973, by expanding the definition of the terms "programs or activities" to include all of the programs or activities of the Federal-aid recipients, sub-recipients and contractors, whether such programs or activities are Federally funded or not);

- Titles II and III of the Americans with Disabilities Act of 1990 (42 USC § 12101, et seq) (prohibit discrimination on the basis of disability in the operation of public entities, public and private transportation systems, places of public accommodation, and certain testing entities) as implemented by U.S. Department of Transportation regulations at 49 CFR parts 37 and 38;
- The Federal Aviation Administration's Nondiscrimination statute (49 USC § 47123) (prohibits discrimination on the basis of race, color, national origin, and sex);
- Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (ensures nondiscrimination against minority populations by discouraging programs, policies, and activities with disproportionately high and adverse human health or environmental effects on minority and low-income populations);
- Executive Order 13166, Improving Access to Services for Persons with Limited English Proficiency, and resulting agency guidance, national origin discrimination includes discrimination because of limited English proficiency (LEP). To ensure compliance with Title VI, you must take reasonable steps to ensure that LEP persons have meaningful access to your programs [70 Fed. Reg. 74087 (2005)];
- Title IX of the Education Amendments of 1972, as amended, which prohibits you from discriminating because of sex in education programs or activities (20 USC § 1681, et seq).

Compliance with Nondiscrimination Requirements:

During the performance of this contract, the Contractor, for itself, its assignees, and successors in interest (hereinafter referred to as the "Contractor"), agrees as follows:

1. **Compliance with Regulations:** The Contractor (hereinafter includes consultants) will comply with the Title VI List of Pertinent Nondiscrimination Acts and Authorities, as they may be amended from time to time, which are herein incorporated by reference and made a part of this contract.
2. **Nondiscrimination:** The Contractor, with regard to the work performed by it during the contract, will not discriminate on the grounds of race, color, national origin (including limited English proficiency), creed, sex (including sexual orientation and gender identity), age, or disability in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The Contractor will not participate directly or indirectly in the discrimination prohibited by the Nondiscrimination Acts and Authorities, including employment practices when the contract covers any activity, project, or program set forth in Appendix B of 49 CFR part 21.
3. **Solicitations for Subcontracts, including Procurements of Materials and Equipment:** In all solicitations, either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurements of materials, or leases of equipment, each potential subcontractor or supplier will be notified by the Contractor of the contractor's obligations under this contract and the Nondiscrimination Acts and Authorities on the grounds of race, color, or national origin.
4. **Information and Reports:** The Contractor will provide all information and reports required by the Acts, the Regulations, and directives issued pursuant thereto and will permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Sponsor or the Federal Aviation Administration to be pertinent to ascertain compliance with such Nondiscrimination Acts and Authorities and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish the information, the Contractor will so certify to the Sponsor or the Federal

Aviation Administration, as appropriate, and will set forth what efforts it has made to obtain the information.

5. **Sanctions for Noncompliance:** In the event of a Contractor's noncompliance with the non-discrimination provisions of this contract, the Sponsor will impose such contract sanctions as it or the Federal Aviation Administration may determine to be appropriate, including, but not limited to:

    a. Withholding payments to the Contractor under the contract until the Contractor complies; and/or

    b. Cancelling, terminating, or suspending a contract, in whole or in part.

6. **Incorporation of Provisions:** The Contractor will include the provisions of paragraphs one through six in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Acts, the Regulations, and directives issued pursuant thereto. The Contractor will take action with respect to any subcontract or procurement as the Sponsor or the Federal Aviation Administration may direct as a means of enforcing such provisions including sanctions for noncompliance. Provided, that if the Contractor becomes involved in, or is threatened with litigation by a subcontractor, or supplier because of such direction, the Contractor may request the Sponsor to enter into any litigation to protect the interests of the Sponsor. In addition, the Contractor may request the United States to enter into the litigation to protect the interests of the United States.

II-B7. CLEAN AIR AND WATER POLLUTION CONTROL

Contractor agrees to comply with all applicable standards, orders, and regulations issued pursuant to the Clean Air Act (42 USC §§ 7401-7671q) and the Federal Water Pollution Control Act as amended (33 USC §§ 1251-1387). The Contractor agrees to report any violation to the Owner immediately upon discovery. The Owner assumes responsibility for notifying the Environmental Protection Agency (EPA) and the Federal Aviation Administration.

Contractor must include this requirement in all subcontracts that exceed $150,000.

II-B8. CONTRACT WORKHOURS AND SAFETY STANDARDS ACT REQUIREMENTS

1. Overtime Requirements.

No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic, including watchmen and guards, in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

2. Violation; Liability for Unpaid Wages; Liquidated Damages.

In the event of any violation of the clause set forth in paragraph (1) of this clause, the Contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the

District of Columbia or a territory, to such District or to such territory), for liquidated damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (1) of this clause, in the sum of $29 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (1) of this clause.

3. Withholding for Unpaid Wages and Liquidated Damages.

The Federal Aviation Administration (FAA) or the Owner shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2) of this clause.

4. Subcontractors.

The Contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraphs (1) through (4) and also a clause requiring the subcontractor to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1) through (4) of this clause.

II-B9. COPELAND "ANTI-KICKBACK" ACT

Contractor must comply with the requirements of the Copeland "Anti-Kickback" Act (18 USC 874 and 40 USC 3145), as supplemented by Department of Labor regulation 29 CFR part 3. Contractor and subcontractors are prohibited from inducing, by any means, any person employed on the project to give up any part of the compensation to which the employee is entitled. The Contractor and each Subcontractor must submit to the Owner, a weekly statement on the wages paid to each employee performing on covered work during the prior week. Owner must report any violations of the Act to the Federal Aviation Administration.

II-B10. DAVIS-BACON REQUIREMENTS

1. Minimum Wages.

(i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by the Secretary of Labor under the Copeland Act (29 CFR Part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalent thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the Contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR § 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: *Provided,* that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including any additional classification and wage rates conformed under (1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the Contractor and its subcontractors at the site of the work in a prominent and accessible place where it can easily be seen by the workers.

(ii)(A) The contracting officer shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination;

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the Contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the contracting officer agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), a report of the action taken shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, U.S. Department of Labor, Washington, DC 20210. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(C) In the event the Contractor, the laborers, or mechanics to be employed in the classification, or their representatives, and the contracting officer do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the contracting officer shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Administrator for determination. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to subparagraphs (1)(ii) (B) or (C) of this paragraph, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the Contractor does not make payments to a trustee or other third person, the Contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, *Provided,* that the Secretary of Labor has found, upon the written request of the Contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the Contractor to set aside in a separate account assets for the meeting of obligations under the plan or program.

2. Withholding. The Federal Aviation Administration or the Sponsor shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld from the Contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the Contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Federal Aviation Administration may, after written notice to the Contractor, Sponsor, Applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

3. Payrolls and Basic Records.

(i) Payrolls and basic records relating thereto shall be maintained by the Contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker; his or her correct classification; hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in 1(b)(2)(B) of the Davis-Bacon Act); daily and weekly number of hours worked; deductions made; and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the Contractor shall maintain records that show that the commitment to provide such benefits is enforceable, that the plan or program is financially responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual costs incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The Contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit the payrolls to the applicant, Sponsor, or

Owner, as the case may be, for transmission to the Federal Aviation Administration. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR § 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (*e.g.,* the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at *https://www.dol.gov/agencies/whd/government-contracts/construction/payroll-certification* or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Federal Aviation Administration if the agency is a party to the contract, but if the agency is not such a party, the Contractor will submit them to the applicant, Sponsor, or Owner, as the case may be, for transmission to the Federal Aviation Administration, the Contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the sponsoring government agency (or the applicant, Sponsor, or Owner).

(B) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the Contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under 29 CFR § 5.5(a)(3)(ii), the appropriate information is being maintained under 29 CFR § 5.5 (a)(3)(i), and that such information is correct and complete;

(2) That each laborer and mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR Part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph (3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the Contractor or subcontractor to civil or criminal prosecution under Section 1001 of Title 18 and Section 231 of Title 31 of the United States Code.

(iii) The Contractor or subcontractor shall make the records required under paragraph (3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the Sponsor, the Federal Aviation Administration, or the Department of Labor and shall permit such representatives to interview employees during working hours on the job. If the Contractor or subcontractor fails to

submit the required records or to make them available, the Federal agency may, after written notice to the Contractor, Sponsor, applicant, or Owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR § 5.12.

4. Apprentices and Trainees.

(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the Contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the Contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR § 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the

provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination that provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate that is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the Contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal Employment Opportunity. The utilization of apprentices, trainees, and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR Part 30.

5. Compliance with Copeland Act Requirements.

The Contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

6. Subcontracts.

The Contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR §§ 5.5(a)(1) through (10) and such other clauses as the Federal Aviation Administration may by appropriate instructions require, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR § 5.5.

7. Contract Termination: Debarment.

A breach of the contract clauses in paragraph 1 through 10 of this section may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR § 5.12.

8. Compliance with Davis-Bacon and Related Act Requirements.

All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR Parts 1, 3, and 5 are herein incorporated by reference in this contract.

9. Disputes Concerning Labor Standards.

Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR Parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the Contractor (or any of its subcontractors) and the contracting agency, the U.S. Department of Labor, or the employees or their representatives.

10. Certification of Eligibility.

(i) By entering into this contract, the Contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the Contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR § 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR § 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 USC § 1001.

II-B11. CERTIFICATION OF OFFEROR/BIDDER REGARDING DEBARMENT

By submitting a bid/proposal under this solicitation, the bidder or offeror certifies that neither it nor its principals are presently debarred or suspended by any Federal department or agency from participation in this transaction.

Certification Of Lower Tier Contractors Regarding Debarment

The successful bidder, by administering each lower tier subcontract that exceeds $25,000 as a "covered transaction", must confirm each lower tier participant of a "covered transaction" under the project is not presently debarred or otherwise disqualified from participation in this federally-assisted project. The successful bidder will accomplish this by:

1. Checking the System for Award Management at website: http://www.sam.gov.
2. Collecting a certification statement similar to the Certification of Offeror /Bidder Regarding Debarment, above.
3. Inserting a clause or condition in the covered transaction with the lower tier contract.

If the Federal Aviation Administration later determines that a lower tier participant failed to disclose to a higher tier participant that it was excluded or disqualified at the time it entered the covered transaction, the FAA may pursue any available remedies, including suspension and debarment of the non-compliant participant.

II-B12. DISADVANTAGED BUSINESS ENTERPRISE

The Owner's award of this contract is conditioned upon Bidder or Offeror satisfying the good faith effort requirements of 49 CFR § 26.53.

As a condition of responsiveness, the Bidder or Offeror must submit the following information with its proposal on the forms provided herein:

1) The names and addresses of Disadvantaged Business Enterprise (DBE) firms that will participate in the contract;
2) A description of the work that each DBE firm will perform;
3) The dollar amount of the participation of each DBE firm listed under (1);
4) Written statement from Bidder or Offeror that attests their commitment to use the DBE firm(s) listed under (1) to meet the Owner's project goal

5) Written confirmation from each listed DBE firm that it is participating in the contract in the kind and amount of work provided in the prime contractor's commitment; and
6) If Bidder or Offeror cannot meet the advertised project DBE goal, evidence of good faith efforts undertaken by the Bidder or Offeror as described in appendix A to 49 CFR part 26. The documentation of good faith efforts must include copies of each DBE and non-DBE subcontractor quote submitted to the bidder when a non-DBE subcontractor was selected over a DBE for work on the contract.

Contract Assurance (49 CFR § 26.13) –

The Contractor, subrecipient or subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this contract. The Contractor shall carry out applicable requirements of 49 CFR part 26 in the award and administration of DOT-assisted contracts. Failure by the Contractor to carry out these requirements is a material breach of this contract, which may result in the termination of this contract or such other remedy as the recipient deems appropriate, which may include, but is not limited to:

1) Withholding monthly progress payments;

2) Assessing sanctions;

3) Liquidated damages; and/or

4) Disqualifying the Contractor from future bidding as non-responsible.

Prompt Payment (49 CFR § 26.29) –

The prime contractor agrees to pay each subcontractor under this prime contract for satisfactory performance of its contract no later than **30** days from the receipt of each payment the prime contractor receives from the **City of Lebanon**. The prime contractor agrees further to return retainage payments to each subcontractor within **30** days after the subcontractor's work is satisfactorily completed. Any delay or postponement of payment from the above referenced time frame may occur only for good cause following written approval of the **City of Lebanon**. This clause applies to both DBE and non-DBE subcontractors.

Termination of DBE Subcontracts (49 CFR § 26.53(f)) –

The prime contractor must not terminate a DBE subcontractor listed in their proposal (or an approved substitute DBE firm) without prior written consent of the **City of Lebanon**. This includes, but is not limited to, instances in which the prime contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

The prime contractor shall utilize the specific DBEs listed to perform the work and supply the materials for which each is listed unless the contractor obtains written consent from the **City of Lebanon**. Unless the **City of Lebanon's** consent is provided, the prime contractor shall not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE.

The **City of Lebanon** may provide such written consent only if the **City of Lebanon** agrees, for reasons stated in the concurrence document, that the prime contractor has good cause to terminate the DBE firm. For purposes of this paragraph, good cause includes the circumstances listed in 49 CFR §26.53.

Before transmitting to the **City of Lebanon** its request to terminate and/or substitute a DBE subcontractor, the prime contractor must give notice in writing to the DBE subcontractor, with a copy to the **City of Lebanon**, of its intent to request to terminate and/or substitute, and the reason for the request.

The prime contractor must give the DBE five days to respond to the prime contractor's notice and advise the **City of Lebanon** and the contractor of the reasons, if any, why it objects to the proposed termination of its subcontract and why the City of Lebanon should not approve the prime contractor's action. If required in a particular case as a matter of public necessity (e.g., safety), the **City of Lebanon** may provide a response period shorter than five days.

In addition to post-award terminations, the provisions of this section apply to preaward deletions of or substitutions for DBE firms put forward by offerors in negotiated procurements.

II-B13. TEXTING WHEN DRIVING

In accordance with Executive Order 13513, "Federal Leadership on Reducing Text Messaging While Driving", (10/1/2009) and DOT Order 3902.10, "Text Messaging While Driving", (12/30/2009), the Federal Aviation Administration encourages recipients of Federal grant funds to adopt and enforce safety policies that decrease crashes by distracted drivers, including policies to ban text messaging while driving when performing work related to a grant or subgrant.

In support of this initiative, the Owner encourages the Contractor to promote policies and initiatives for its employees and other work personnel that decrease crashes by distracted drivers, including policies that ban text messaging while driving motor vehicles while performing work activities associated with the project. The Contractor must include the substance of this clause in all sub-tier contracts exceeding $10,000 that involve driving a motor vehicle in performance of work activities associated with the project.

II-B14. CERTIFICATION REGARDING DOMESTIC PREFERENCES FOR PROCUREMENTS

The Bidder or Offeror certifies by signing and submitting this bid or proposal that, to the greatest extent practicable, the Bidder or Offeror has provided a preference for the purchase, acquisition, or use of goods, products, or materials produced in the United States (including, but not limited to, iron, aluminum, steel, cement, and other manufactured products) in compliance with 2 CFR § 200.322.

II-B15. EQUAL OPPORTUNITY CLAUSE

During the performance of this contract, the Contractor agrees as follows:

(1) The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, sexual orientation, gender identity, or national origin. The Contractor will take affirmative action to ensure that applicants are employed, and that employees are treated during

employment, without regard to their race, color, religion, sex, sexual orientation, gender identify, or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff, or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this nondiscrimination clause.

(2) The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, sexual orientation, gender identity, or national origin.

(3) The contractor will not discharge or in any other manner discriminate against any employee or applicant for employment because such employee or applicant has inquired about, discussed, or disclosed the compensation of the employee or applicant or another employee or applicant. This provision shall not apply to instances in which an employee who has access to the compensation information of other employees or applicants as a part of such employee's essential job functions discloses the compensation of such other employees or applicants to individuals who do not otherwise have access to such information, unless such disclosure is in response to a formal complaint or charge, in furtherance of an investigation, proceeding, hearing, or action, including an investigation conducted by the employer, or is consistent with the contractor's legal duty to furnish information.

(4) The Contractor will send to each labor union or representative of workers with which it has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the Contractor's commitments under this section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

(5) The Contractor will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.

(6) The Contractor will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.

(7) In the event of the Contractor's noncompliance with the nondiscrimination clauses of this contract or with any such rules, regulations, or orders, this contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and remedies invoked as provided in Executive Order 11246 of September 24, 1965, or by rule, regulation, or order of the Secretary of Labor, or as otherwise provided by law.

(8) The Contractor will include the provisions of paragraphs (1) through (8) in every subcontract or purchase order unless exempted by rules, regulations, or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as may be directed by the Secretary of Labor as a means of enforcing such provisions, including sanctions for noncompliance*: Provided,* however, that in the event the contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such

direction, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.

Standard Federal Equal Employment Opportunity Construction Contract Specifications

1. As used in these specifications:

a. "Covered area" means the geographical area described in the solicitation from which this contract resulted;

b. "Director" means Director, Office of Federal Contract Compliance Programs (OFCCP), U.S. Department of Labor, or any person to whom the Director delegates authority;

c. "Employer identification number" means the Federal social security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941;

d. "Minority" includes:

(1) Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);

(2) Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race);

(3) Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and

(4) American Indian or Alaskan native (all persons having origins in any of the original peoples of North America and maintaining identifiable tribal affiliations through membership and participation or community identification).

2. Whenever the Contractor, or any subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it shall physically include in each subcontract in excess of $10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this contract resulted.

3. If the Contractor is participating (pursuant to 41 CFR part 60-4.5) in a Hometown Plan approved by the U.S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) shall be in accordance with that Plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each contractor or subcontractor participating in an approved plan is individually required to comply with its obligations under the EEO clause and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other contractors or subcontractors toward a goal in an approved Plan does not excuse any covered contractor's or subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.

4. The Contractor shall implement the specific affirmative action standards provided in paragraphs 7a through 7p of these specifications. The goals set forth in the solicitation from which this contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in

which it has employees in the covered area. Covered construction contractors performing construction work in a geographical areas where they do not have a Federal or federally assisted construction contract shall apply the minority and female goals established for the geographical area where the work is being performed. Goals are published periodically in the Federal Register in notice form, and such notices may be obtained from any Office of Federal Contract Compliance Programs office or from Federal procurement contracting officers. The Contractor is expected to make substantially uniform progress in meeting its goals in each craft during the period specified.

5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women shall excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.

6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U.S. Department of Labor.

7. The Contractor shall take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications shall be based upon its effort to achieve maximum results from its actions. The Contractor shall document these efforts fully, and shall implement affirmative action steps at least as extensive as the following:

a. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor shall specifically ensure that all foremen, superintendents, and other onsite supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.

b. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.

c. Maintain a current file of the names, addresses, and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source, or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this shall be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.

d. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral process has impeded the Contractor's efforts to meet its obligations.

e. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the Department of Labor. The Contractor shall provide notice of these programs to the sources compiled under 7b above.

f. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

g. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination, or other employment decisions including specific review of these items with onsite supervisory personnel such superintendents, general foremen, etc., prior to the initiation of construction work at any job site. A written record shall be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.

h. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other contractors and subcontractors with whom the Contractor does or anticipates doing business.

i. Direct its recruitment efforts, both oral and written, to minority, female, and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month prior to the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor shall send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.

j. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer, and vacation employment to minority and female youth both on the site and in other areas of a contractor's work force.

k. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR part 60-3.

l. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel, for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.

m. Ensure that seniority practices, job classifications, work assignments, and other personnel practices do not have a discriminatory effect by continually monitoring all personnel and

employment related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.

n. Ensure that all facilities and company activities are nonsegregated except that separate or single-user toilet and necessary changing facilities shall be provided to assure privacy between the sexes.

o. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.

p. Conduct a review, at least annually, of all supervisor's adherence to and performance under the Contractor's EEO policies and affirmative action obligations.

8. Contractors are encouraged to participate in voluntary associations, which assist in fulfilling one or more of their affirmative action obligations (7a through 7p). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant may be asserted as fulfilling any one or more of its obligations under 7a through 7p of these specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation shall not be a defense for the Contractor's noncompliance.

9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).

10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, sexual orientation, gender identity, or national origin.

11. The Contractor shall not enter into any subcontract with any person or firm debarred from Government contracts pursuant to Executive Order 11246.

12. The Contractor shall carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination, and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any contractor who fails to carry out such sanctions and penalties shall be in violation of these specifications and Executive Order 11246, as amended.

13. The Contractor, in fulfilling its obligations under these specifications, shall implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these

specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director shall proceed in accordance with 41 CFR part 60-4.8.

14. The Contractor shall designate a responsible official to monitor all employment related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government, and to keep records. Records shall at least include for each employee, the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records shall be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, contractors shall not be required to maintain separate records.

15. Nothing herein provided shall be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g. those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).

II-B16. FEDERAL FAIR LABOR STANDARDS ACT (FEDERAL MINIMUM WAGE)

All contracts and subcontracts that result from this solicitation incorporate by reference the provisions of 29 CFR part 201, et seq, the Federal Fair Labor Standards Act (FLSA), with the same force and effect as if given in full text. The FLSA sets minimum wage, overtime pay, recordkeeping, and child labor standards for full and part-time workers.

The **Contractor** has full responsibility to monitor compliance to the referenced statute or regulation. The **Contractor** must address any claims or disputes that arise from this requirement directly with the U.S. Department of Labor – Wage and Hour Division.

II-B17. TRADE RESTRICTION CERTIFICATION

By submission of an offer, the Offeror certifies that with respect to this solicitation and any resultant contract, the Offeror –

1) is not owned or controlled by one or more citizens of a foreign country included in the list of countries that discriminate against U.S. firms as published by the Office of the United States Trade Representative (USTR);

2) has not knowingly entered into any contract or subcontract for this project with a person that is a citizen or national of a foreign country included on the list of countries that discriminate against U.S. firms as published by the USTR; and

3) has not entered into any subcontract for any product to be used on the Federal project that is produced in a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR.

This certification concerns a matter within the jurisdiction of an agency of the United States of America and the making of a false, fictitious, or fraudulent certification may render the maker subject to prosecution under Title 18 USC § 1001.

The Offeror/Contractor must provide immediate written notice to the Owner if the Offeror/Contractor learns that its certification or that of a subcontractor was erroneous when submitted or has become erroneous by reason of changed circumstances. The Contractor must require subcontractors provide immediate written notice to the Contractor if at any time it learns that its certification was erroneous by reason of changed circumstances.

Unless the restrictions of this clause are waived by the Secretary of Transportation in accordance with 49 CFR § 30.17, no contract shall be awarded to an Offeror or subcontractor:

1) who is owned or controlled by one or more citizens or nationals of a foreign country included on the list of countries that discriminate against U.S. firms published by the USTR; or
2) whose subcontractors are owned or controlled by one or more citizens or nationals of a foreign country on such USTR list; or

3) who incorporates in the public works project any product of a foreign country on such USTR list.

Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render, in good faith, the certification required by this provision. The knowledge and information of a contractor is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

The Offeror agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification without modification in all lower tier subcontracts. The Contractor may rely on the certification of a prospective subcontractor that it is not a firm from a foreign country included on the list of countries that discriminate against U.S. firms as published by USTR, unless the Offeror has knowledge that the certification is erroneous.

This certification is a material representation of fact upon which reliance was placed when making an award. If it is later determined that the Contractor or subcontractor knowingly rendered an erroneous certification, the Federal Aviation Administration (FAA) may direct through the Owner cancellation of the contract or subcontract for default at no cost to the Owner or the FAA.

II-B18. CERTIFICATION REGARDING LOBBYING

The Bidder or Offeror certifies by signing and submitting this bid or proposal, to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the Bidder or Offeror, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying,” in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all sub-awards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all sub-recipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required

certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure.

II-B19. OCCUPATIONAL SAFETY AND HEALTH ACT OF 1970

All contracts and subcontracts that result from this solicitation incorporate by reference the requirements of 29 CFR Part 1910 with the same force and effect as if given in full text. The employer must provide a work environment that is free from recognized hazards that may cause death or serious physical harm to the employee. The employer retains full responsibility to monitor its compliance and their subcontractor's compliance with the applicable requirements of the Occupational Safety and Health Act of 1970 (29 CFR Part 1910). The employer must address any claims or disputes that pertain to a referenced requirement directly with the U.S. Department of Labor – Occupational Safety and Health Administration.

II-B20. PROHIBITION ON CERTAIN TELECOMMUNICATIONS AND VIDEO SURVEILLANCE SERVICES OR EQUIPMENT

Contractor and Subcontractor agree to comply with mandatory standards and policies relating to use and procurement of certain telecommunications and video surveillance services or equipment in compliance with the National Defense Authorization Act [Public Law 115-232 § 889(f)(1)].

II-B21. PROHIBITION OF SEGREGATED FACILITIES

(a) The Contractor agrees that it does not and will not maintain or provide for its employees any segregated facilities at any of its establishments, and that it does not and will not permit its employees to perform their services at any location under its control where segregated facilities are maintained. The Contractor agrees that a breach of this clause is a violation of the Equal Employment Opportunity clause in this contract.

(b) "Segregated facilities," as used in this clause, means any waiting rooms, work areas, rest rooms and wash rooms, restaurants and other eating areas, time clocks, locker rooms and other storage or dressing areas, parking lots, drinking fountains, recreation or entertainment areas, transportation, and housing facilities provided for employees that are segregated by explicit directive or are in fact segregated on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin because of written or oral policies or employee custom. The term does not include separate or single-user rest rooms or necessary dressing or sleeping areas provided to assure privacy between the sexes.

(c) The Contractor shall include this clause in every subcontract and purchase order that is subject to the Equal Employment Opportunity clause of this contract.

II-B22. PROCUREMENT OF RECOVERED MATERIALS

Contractor and subcontractor agree to comply with Section 6002 of the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act, and the regulatory provisions of 40 CFR Part 247. In the performance of this contract and to the extent practicable, the Contractor and subcontractors

are to use products containing the highest percentage of recovered materials for items designated by the Environmental Protection Agency (EPA) under 40 CFR Part 247 whenever:

1) The contract requires procurement of $10,000 or more of a designated item during the fiscal year; or
2) The contractor has procured $10,000 or more of a designated item using Federal funding during the previous fiscal year.

The list of EPA-designated items is available at www.epa.gov/smm/comprehensive-procurement-guidelines-construction-products.

Section 6002(c) establishes exceptions to the preference for recovery of EPA-designated products if the contractor can demonstrate the item is:

a) Not reasonably available within a timeframe providing for compliance with the contract performance schedule;
b) Fails to meet reasonable contract performance requirements; or
c) Is only available at an unreasonable price.

II-B23. CERTIFICATION OF OFFEROR/BIDDER REGARDING TAX DELINQUENCY AND FELONY CONVICTIONS

The applicant must complete the following two certification statements. The applicant must indicate its current status as it relates to tax delinquency and felony conviction by inserting a checkmark (✓) in the space following the applicable response. The applicant agrees that, if awarded a contract resulting from this solicitation, it will incorporate this provision for certification in all lower tier subcontracts.

Certifications

1) The applicant represents that it is ( ) is not ( ) a corporation that has any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

2) The applicant represents that it is ( ) is not ( ) a corporation that was convicted of a criminal violation under any Federal law within the preceding 24 months.

Note

If an applicant responds in the affirmative to either of the above representations, the applicant is ineligible to receive an award unless the Sponsor has received notification from the agency suspension and debarment official (SDO) that the SDO has considered suspension or debarment and determined that further action is not required to protect the Government's interests. The applicant therefore must provide information to the owner about its tax liability or conviction to the Owner, who will then notify the FAA Airports District Office, which will then notify the agency's SDO to facilitate completion of the required considerations before award decisions are made.

Term Definitions

Felony conviction: Felony conviction means a conviction within the preceding twenty four (24) months of a felony criminal violation under any Federal law and includes conviction of an offense defined in a section of the U.S. Code that specifically classifies the offense as a felony and conviction of an offense that is classified as a felony under 18 USC § 3559.

Tax Delinquency: A tax delinquency is any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted, or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

II-B24. TERMINATION OF CONTRACT

TERMINATION FOR CONVENIENCE (CONSTRUCTION & EQUIPMENT CONTRACTS)

The Owner may terminate this contract in whole or in part at any time by providing written notice to the Contractor. Such action may be without cause and without prejudice to any other right or remedy of Owner. Upon receipt of a written notice of termination, except as explicitly directed by the Owner, the Contractor shall immediately proceed with the following obligations regardless of any delay in determining or adjusting amounts due under this clause:

1. Contractor must immediately discontinue work as specified in the written notice.
2. Terminate all subcontracts to the extent they relate to the work terminated under the notice.
3. Discontinue orders for materials and services except as directed by the written notice.
4. Deliver to the Owner all fabricated and partially fabricated parts, completed and partially completed work, supplies, equipment and materials acquired prior to termination of the work, and as directed in the written notice.
5. Complete performance of the work not terminated by the notice.
6. Take action as directed by the Owner to protect and preserve property and work related to this contract that Owner will take possession.

Owner agrees to pay Contractor for:

1. Completed and acceptable work executed in accordance with the contract documents prior to the effective date of termination;
2. Documented expenses sustained prior to the effective date of termination in performing work and furnishing labor, materials, or equipment as required by the contract documents in connection with uncompleted work;
3. Reasonable and substantiated claims, costs, and damages incurred in settlement of terminated contracts with Subcontractors and Suppliers; and
4. Reasonable and substantiated expenses to the Contractor directly attributable to Owner’s termination action.

Owner will not pay Contractor for loss of anticipated profits or revenue or other economic loss arising out of or resulting from the Owner’s termination action.

The rights and remedies this clause provides are in addition to any other rights and remedies provided by law or under this contract.

TERMINATION FOR CAUSE (CONSTRUCTION)

Section 80-09 of FAA Advisory Circular 150/5370-10 establishes standard language for conditions, rights, and remedies associated with Owner termination of this contract for cause due to default of the Contractor.

II-B25. VETERAN’S PREFERENCE

In the employment of labor (excluding executive, administrative, and supervisory positions), the Contractor and all sub-tier contractors must give preference to covered veterans as defined within Title 49 United States Code Section 47112. Covered veterans include Vietnam-era veterans, Persian Gulf

veterans, Afghanistan-Iraq war veterans, disabled veterans, and small business concerns (as defined by 15 USC § 632) owned and controlled by disabled veterans. This preference only applies when there are covered veterans readily available and qualified to perform the work to which the employment relates.

ATTACHMENT II-C CONSTRUCTION SAFETY & PHASING PLAN

Lebanon Municipal Airport
Extend Taxiway 'A' & Relocate Localizer

CONSTRUCTION SAFETY AND PHASING PLAN

Issued For OE/AAA Submission

January 10, 2024

Prepared for:

Lebanon Municipal Airport
5 Airpark Road
West Lebanon, NH 03784

Prepared by:
Stantec Consulting Services Inc.

In Conjunction with:
Lebanon Municipal Airport

This document entitled **Extend Taxiway A & Relocate Localizer – Construction Safety And Phasing Plan** was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of the Lebanon Municipal Airport (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material herein reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
(signature)

Leslie Merrithew, P.Eng., PE, Project Manager

Approved by 
(signature)

Dominic Zazzaro, PE, Senior Civil Engineer, EOR

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LIST OF APPENDICES

1 SAFETY PLAN COMPLIANCE DOCUMENT (SPCD)

The Contractor shall submit to the RPR (Resident Project Representative), a minimum of two weeks prior to the issuance of the notice to proceed for construction, a written Safety Plan Compliance Document (SPCD) prepared in accordance with the guidance specified in FAA Advisory Circular AC 150/5370-2G, Chapter 3, which can be located online at:

https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5370-2G.pdf

The SPDC shall detail how the Contractor will comply with the Construction Safety and Phasing Plan (CSPP) included herein and shown on the project drawings, as well as in the specifications. The SPCD will specifically identify the precautions that the Contractor proposes to control vehicle traffic and construction activities. This includes signs, flaggers, and escorts, as well as any other proposed measures. The SPCD will also specifically identify the Contractor's on-site employees responsible for compliance with both the CSPP and the SPCD during construction.

In accordance with Section 2.4.2 within FAA AC 150/5370-2G, the SPDC should include a general statement by the construction Contractor that he/she has read and will abide by the CSPP. In addition, the SPCD must include all supplemental information that could not be included in the CSPP prior to the contract award. The Contractor statement should include the name of the Contractor, the title of the project CSPP, the approval date of the CSPP, and a reference to any supplemental information (that is, "I, (Name of Contractor), have read the (Title of Project) CSPP, approved on (Date), and will abide by it as written and with the following additions as noted:"). The supplemental information in the SPCD should be written to match the format of the CSPP indicating each subject by corresponding CSPP subject number and title. If no supplemental information is necessary for any specific subject, the statement, "No supplemental information," should be written after the corresponding subject title. The SPCD should not duplicate information in the CSPP. Refer to Section 2.4.2 for additional guidance on the topics to be discussed within the SPCD.

No work shall start until the SPCD is approved by the Airport Manager.

2 COORDINATION

Predesign, prebid, and preconstruction meetings have occurred or will be scheduled as noted below. These meetings include discussion around airport operational safety during construction.

Predesign/Scoping Meeting:

- Meeting was held on May 4, 2022
- Attendants included:
  - Carl Gross, Lebanon Municipal Airport
  - John Kirkendall, FAA Airports Division
  - John Carli, FAA Airports Division
  - Carol Niewola, NH DOT
  - Richard Dyment, NH DOT
  - Leslie Merrithew, Stantec
  - Alexandra Kavanagh, Stantec
  - Craig Sullivan, Stantec

Prebid Meeting:

- The prebid meeting is anticipated to be held February 2, 2023, from 2:00 pm to 3:30 pm.
- Discussion will occur regarding airport safety requirements during construction.
- The Contractor will be advised of airport access requirements and protocols to maintain the Security Identification Display Area (SIDA) safe and secure for the duration of the project.
- Contractors will learn of operational impacts on construction and should plan accordingly.
- Contractors will be informed of the requirement of producing a SPCD which shall be prepared prior to the Notice to Proceed for Construction.

Preconstruction Meeting:

- The Preconstruction conference will be conducted before construction begins, prior to the Notice to Proceed for Construction. Discussion shall include:
  - Airport safety requirements
  - The approval of the SPCD by the RPR, Airport Manager, and FAA
  - Construction access
  - Other details contained herein.
- Attendance will include:
  - Construction Contractor
  - Any Major Subcontractors
  - Airport Management Personnel
  - Airport Maintenance Staff
  - Lebanon Fire Department
  - Stantec Design Team and Resident Inspection Staff
  - FAA Airports Division
  - FAA Tech Ops
  - NH DOT
  - FAA Air Traffic Controllers based at LEB

2.1 CONTRACTOR PROGRESS MEETINGS

Communication is the backbone of safety. Operational safety shall be a standing agenda item for discussion during regular progress meetings through the construction phase. It is expected that the following meetings and tasks will be ongoing during the project.

Weekly Coordination Meetings:

- Project progress meetings will be held once per week, or more frequently as needed.
- Attendants will include:
    - Contractor and Major Subconsultants
    - Stantec's Project Manager and Resident Project Representative (RPR)
    - Airport Management
    - Airport Maintenance Staff
    - FAA Airports Division
    - FAA Tech Ops (as needed)
    - NH DOT
    - FAA Air Traffic Controllers based at LEB (as needed)
- Discussion will include:
    - Concerns regarding safety.
    - Security, as a result of the ongoing work
    - Location of contractor's equipment/material staging area(s)
    - Detailed confirmation of proposed access routes, as well as procedures
    - Notification to access any Air Operating Areas (AOAs)
    - Any closures of airport surfaces that have not already been coordinated.
    - Taxiway Safety Areas (TSAs) and Taxiway Object Free Areas (TOFAs)
    - Runway Safety Areas (RSAs), Runway Object Free Areas (ROFAs), and Runway Obstacle Free Zones (OFZ).
    - Impacts to existing NAVAIDs
    - Approved work hours of operation

Daily Coordination Tasks:

- The Contractor shall coordinate daily construction activities with Airport Management through the RPR. Airport Management shall then coordinate with the airport tenants, as needed.
- The Contractor shall conduct a daily "safety huddle" at the commencement of each work shift. The RPR and Airport Manager should be included along with daily visitors and sub-contractors. Stantec will work with the Contractor to facilitate daily "safety huddles" by assisting with figures/ sketches which depict work area limits, access routes and barricade locations.
- The Contractor and the RPR shall perform, at minimum, a daily site safety inspection of the construction area.
- Runway status to be confirmed and verified at the start of each work shift.

2.2 SCOPE OR SCHEDULE CHANGES

Any changes in scope of work or schedule will be coordinated immediately with the Contractor, and the CSPP will be updated for review and approval.

2.3 FAA ATO COORDINATION

The FAA Air Traffic Organization has been involved during the design and preconstruction phases of the project. They shall continue to be involved during the construction phase of the project through attendance at the meetings noted in paragraph 2.1 and close coordination for any relocation or adjustments to NAVAIDs, or changes to final grades in critical areas.

3 PHASING

This project is divided into specific phases of construction, to minimize disruptions and maintain a safe environment to airport operations. Refer to the accompanying phasing drawings in APPENDIX A for each phase. Generally, the project is divided into 7 distinctive phases, specific information relating to each phase is shown in this section.

Proposed access and haul routes for the project are shown on the attached General Plan (G001), the Overall Safety & Phasing Plan (G100), and on all individual phasing sheets. Specific requirements regarding access and phase routes are included on the attached General Notes (G002) sheet.

NOTAMs will be issued by the Airport Manager on an as needed basis, to ensure pilots are informed of workers and equipment in the vicinity of the airport operational surfaces and approaches. The contractor shall provide a minimum of 48-hour notice to the RPR and airport operator, to allow time to coordinate a NOTAM.

For all phases, a dedicated, full-time gate guard shall be required at the temporary construction gate during hauling or anytime the gate is unlocked. The gate guard shall only be responsible for allowing authorized contractor personnel through the gate and staging trucks just inside the gate where trucks shall wait for the contractor's radio-equipped escort to lead them to the work site. The dedicated gate guard shall also be responsible for controlling vehicle traffic in and out of the gate.

See Phasing & Safety Plans (G200 series) for details of each phase. All work associated with each phase shall be completed within the specified time frame unless otherwise noted.

3.1 PHASE ELEMENTS

3.1.1 Phase 1 – TW A Reconstruction Between Terminal Ramp and South Ramp

DRAWING: G201
DURATION: 42 consecutive calendar days – DAY WORK

WORK SCHEDULE: Monday – Friday: 7:00 am to 5:00 pm
Saturday: 7:00 am to 3:00 pm
Sunday: No Work

CONCURRENT PHASES: N/A

CLOSURES:

- Taxiway 'A' (Terminal Ramp to South Ramp).
- Access to the Maintenance ramp and the South Ramp.

MAJOR WORK ITEMS:

Civil

- Pavement removal.
- Grading and excavation.
- Placing and compacting subbase and base.
- Asphalt mix pavement control strip - The contractor shall not commence any other phases until the Control Strip has been accepted by the RPR.
- Asphalt mix pavement, Base lift only (Top lift shall be paved with Phase 2)
- Pavement markings.
- Topsoil and seed.

Stormwater

- Sand filter.
- Underdrain system.
- Catch basins.
- RCP pipe.

Electrical

- Demolition of existing taxiway edge lighting system (light fixtures, light bases, conduit, cable, ductbank, junction cans, airfield signage).
- New taxiway edge lighting system (LED light fixtures, light bases, conduit, cable, junction cans).
- New electrical ductbank and junction cans.
- New airfield guidance signage, foundations, and junction cans.

Affected Circuits/Navaids:

- Taxiway 'A'.
- Circuits shall be looped out at isolation transformer as shown on E201 Temporary Lighting Plan to de-energize circuit south of this point while maintaining Taxiway 'A' and 'A1' fixtures and signs.
- TW 'A' signage and edge lights from the west ramp to TW 'A2' shall be covered or removed from service.

ADDITIONAL NOTES AND REQUIREMENTS

- Runway 7-25 shall remain open.
- Runway 18-36 shall remain open.
- Taxiway A closed south of West Ramp.
- Contractor to leave room for operations vehicles to drive between west ramp and maintenance building.

3.1.2 Phase 2 – TW A Reconstruction at Echo Ramp

DRAWING: G202

DURATION: 21 consecutive calendar days – DAY WORK

WORK SCHEDULE: Monday – Friday: 7:00 am to 5:00 pm
Saturday: 7:00 am to 3:00 pm
Sunday: No Work

CONCURRENT PHASES: N/A

CLOSURES:

- Taxiway 'A' (Echo Ramp Intersection).
- Taxiway Stub 'A2'.

MAJOR WORK ITEMS:

Civil

- Pavement removal.
- Grading and excavation.
- Placing and compacting subbase and base.
- Asphalt mix pavement.
- Pavement markings.
- Topsoil and seed.

Stormwater

- Sand filter.
- Underdrain system.
- Catch basins.
- RCP pipe.

Electrical

- Demolition of existing taxiway edge lighting system (light fixtures, light bases, conduit, cable, ductbank, junction cans, airfield signage).
- New taxiway edge lighting system (LED light fixtures, light bases, conduit, cable, junction cans).
- New electrical ductbank and junction cans.
- New airfield guidance signage, foundations, and junction cans.

Affected Circuits/Navaids:

- Taxiway 'A'.
- TW 'A' signage and edge lights from the south ramp to TW 'A2' shall be installed per E201 Temporary Lighting Plan.
- Taxiway 'A' signage and edge lights remain operational from intersection with the south ramp to Runway 7-25.
- TW 'A2' signage and edge lights from the echo ramp to RW 18-36 shall be covered or removed from service.

ADDITIONAL NOTES AND REQUIREMENTS

- Runway 7-25 shall remain open.
- Runway 18-36 shall remain open.

3.1.3 Phase 3 – Extension of TW A Between Existing and New TW Stub A2

DRAWING: G203
DURATION: 168 consecutive calendar days – DAY WORK

WORK SCHEDULE: Monday – Friday: 7:00 am to 5:00 pm
Saturday: 7:00 am to 3:00 pm
Sunday: No Work

CONCURRENT PHASES: N/A

CLOSURES:

- None.

MAJOR WORK ITEMS:

Civil

- Grading and excavation.
- Placing and compacting subbase and base.
- Asphalt mix pavement.
- Pavement markings.
- Topsoil and seed.

Stormwater

- Sand filter.
- Underdrain system.
- Catch basins.
- RCP pipe.

Electrical

- Modification of existing runway 36 PAPI power feed.
- New taxiway edge lighting system (LED light fixtures, light bases, conduit, cable, junction cans).
- New electrical ductbank and junction cans.
- New airfield guidance signage, foundations, and junction cans.

Affected Circuits/Navaids:

- RW 18 Localizer will be shut down for the remainder of the project.

- TW 'A' remains operational between RW 7-25 and Echo Ramp refer to E201 Temporary Lighting Plan.

ADDITIONAL NOTES AND REQUIREMENTS

- Runway 7-25 shall remain open.
- Runway 18-36 shall remain open.
- Airport to require tenant on Blue Hangar to provide a 30-min notice to contractor for movement. Contractor to sweep the taxilane and remove channelizer cones once taxilane is clear for aircraft use. Contractor to replace channelizer cones once aircraft has cleared the area.
- Taxiway 'A' between the South Ramp and Echo Ramp will operate with a reduced TOFA of 62' to accommodate ADG 1.
- Safety fence shown for Phase 3 is not required when Phase 3 is concurrent with Phases 4 and 5. Safety fence to be erected when Phase 3 work is concurrent with active Runway 18-36 operations.

3.1.4 Phase 4 – Demolition of Existing TW Stub A2 and Installation of Diversion Swale Between Existing & New TW Stub A2

DRAWING: G204
DURATION: 21 consecutive calendar days – DAY WORK

WORK SCHEDULE: Monday – Friday: 7:00 am to 5:00 pm
Saturday: 7:00 am to 3:00 pm
Sunday: No Work

CONCURRENT PHASES: N/A

CLOSURES:

- Runway 18-36.
- Taxiway Stub 'A2'.

MAJOR WORK ITEMS:

Civil

- Pavement removal.
- Grading and excavation.
- Placing and compacting subbase and base.
- Asphalt mix pavement.
- Pavement markings.
- Topsoil and seed.

Stormwater

- Sand filter.
- Underdrain system.

- Catch basins.
- RCP pipe.

Electrical

- Demolition of existing runway edge lighting system (light fixture, light base, conduit, cable, junction cans, airfield signage).
- Demolition of existing taxiway edge lighting system (light fixtures, light bases, conduit, cable, ductbank, junction cans, airfield signage).
- New runway edge lighting system (light fixture, light base, conduit, cable).

Affected Circuits/Navaids:

- TW 'A2' signage and edge lights from the echo ramp to RW 18-36 shall be removed from service.
- RW 18 Localizer & Glide Slope not in service.

ADDITIONAL NOTES AND REQUIREMENTS

- Runway 7-25 shall remain open.
- Airport to require tenant on Blue Hangar to provide a 30-min notice to contractor for movement. Contractor to sweep the taxilane and remove channelizer cones once taxilane is clear for aircraft use. Contractor to replace channelizer cones once aircraft has cleared the area.
- Taxiway 'A' between the South Ramp and Echo Ramp will operate with a reduced TOFA of 62' to accommodate ADG 1.

3.1.5 Phase 5 - New TW Stub A2

DRAWING: G205
DURATION: 24 consecutive calendar days – DAY WORK

WORK SCHEDULE: Monday – Friday: 7:00 am to 5:00 pm
Saturday: 7:00 am to 3:00 pm
Sunday: No Work

CONCURRENT PHASES: N/A

CLOSURES:

- Runway 18-36.
- Taxiway Stub 'A1'.
- Taxiway Stub 'A2'.

MAJOR WORK ITEMS:

Civil

- Grading and excavation.

- Placing and compacting subbase and base.
- Asphalt mix pavement.
- Pavement markings.
- Topsoil and seed.

Stormwater

- Sand filter.
- Underdrain system.
- Catch basins.
- RCP pipe.

Electrical

- Demolition of existing runway edge lighting system (light fixture, light base, conduit, cable, junction cans, airfield signage).
- New runway edge lighting system (conduit, cable).
- New taxiway edge lighting system (LED light fixtures, light bases, conduit, cable, junction cans).
- New electrical ductbank and handholes.
- New airfield guidance signage, foundations, and junction cans.

Affected Circuits/Navaids:

- RW 18-36 lights & PAPIs.
- RW 18 Localizer & Glide Slope.

ADDITIONAL NOTES AND REQUIREMENTS

- Runway 7-25 shall remain open.
- Airport to require tenant on Blue Hangar to provide a 30-min notice to contractor for movement. Contractor to sweep the taxilane and remove channelizer cones once taxilane is clear for aircraft use. Contractor to replace channelizer cones once aircraft has cleared the area.

3.1.6 Add-Alternate #1 – Localizer Critical Area Grading

DRAWING: G206
DURATION: 49 consecutive calendar days – DAY WORK

WORK SCHEDULE: Monday – Friday: 7:00 am to 5:00 pm
Saturday: 7:00 am to 3:00 pm
Sunday: No Work

CONCURRENT PHASES: N/A

CLOSURES:

- Runway 18-36.

MAJOR WORK ITEMS:

Civil

- Grading and excavation.
- Placing and compacting subbase and base.
- Topsoil and seed.

Stormwater

- Catch basins.
- RCP pipe.

Electrical

- None.

Affected Circuits/Navaids:

- RW 18-36 lights & PAPIs.
- RW 18 Localizer & Glide Slope.

ADDITIONAL NOTES AND REQUIREMENTS

- Runway 7-25 shall remain open.

3.1.7 Add-Alternate #2 – Existing Localizer Dismantling & Relocation Per Volume II Drawings

DRAWING: G207
DURATION: 28 consecutive calendar days – DAY WORK

WORK SCHEDULE: Monday – Friday: 7:00 am to 5:00 pm
Saturday: 7:00 am to 3:00 pm
Sunday: No Work

CONCURRENT PHASES: N/A

CLOSURES:

- Runway 18-36.

MAJOR WORK ITEMS:

Civil

- Installation of concrete foundations for Localizer Array, Localizer Shelter Building, and DME as specified in the Vol II drawings.

Stormwater

- None.

Electrical

- Dismantling of existing localizer antenna array and DME equipment as specified in the Vol II drawings.
- Removal of existing localizer shelter as specified in the Vol II drawings.
- Installation of localizer array, DME and new localizer shelter pre-fabricated building, along with electrical required and specified in the Vol II drawings.

Affected Circuits/Navaids:

- RW 18-36 lights & PAPIs.
- RW 18 Localizer & Glide Slope.

ADDITIONAL NOTES AND REQUIREMENTS

- Runway 7-25 shall remain open.

3.2 CONSTRUCTION SAFETY DRAWINGS

Refer to the accompanying phasing drawings in APPENDIX A for each phase.

4 AREAS AND OPERATIONS AFFECTED BY THE CONSTRUCTION ACTIVITY

4.1 IDENTIFICATION OF AFFECTED AREAS

Refer to the accompanying phasing drawings in APPENDIX A for identification of each phase. The areas affected are summarized in section 3.1.

4.2 MITIGATION OF EFFECTS

Contractor shall adhere to the following minimum timelines to provide notice in writing to the RPR and Airport for any planned work within the AOA that requires a NOTAM.

Runway Closures	7 days minimum
Taxiway Closures	72 hours minimum
All Other NOTAMs	48 hours minimum

1) Closing, or partially closing, of runways and taxiways: NOTAMs will be issued by the Lebanon Municipal Airport for each phase of construction. All NOTAMs will be coordinated with the FAA, airport management and the RPR during weekly construction meetings and as needed.

2) Closing Aircraft Rescue and Fire Fighting access routes: Not applicable.

3) Closing of access routes used by airport and airline support vehicles: Not applicable.

4) Interruption of utilities, including water supplies for firefighting: Not applicable.

5) Approach/departure surfaces affected by heights of objects: Phase 8 will impact the approach/ departure surfaces for Runway 18-36. NOTAMs will be issued by the Lebanon Municipal Airport to close the Runway during this phase of work. The Contractor shall provide 48 hours' notice for the closure.

6) Closure of Gates: Not Applicable. There are no phase elements which impact terminal gate closures.

7) Construction areas, storage areas, and access routes: Contractor staging, and laydown areas and construction access routes will be restricted to what is shown on phasing plans and approved by airport management. All construction vehicles shall follow the Contractor's radio-equipped escort vehicles from the gate to the active work site. The Contractor's radio-equipped escorts shall be aware of any air traffic, as well as aircraft taxiing for to/from a runway with a route that crosses or is adjacent to construction haul routes. The Contractor's radio-equipped escorts shall monitor the airport's UNICOM frequency between 22:00 and 6:00, when the FAA ATCT is closed.

5 PROTECTION OF NAVIGATION AIDS (NAVAIDS)

- Refer to *General Plan (G001), General Notes (G002)* and *Safety & Phasing Plan Notes & Details (G101)* for additional information regarding NAVAIDs. The existing NAVAID critical areas are shown on the *General Plan (G001)*.
- Prior to the start of any closures, the Contractor shall submit for approval a work schedule requiring NAVAID shutdowns (Glide Slope, Localizer, REILS, PAPIs, etc.)
- Any stockpile areas will be approved by airport management and the RPR to maintain clearance from any NAVAID Critical Areas.
- The Contractor shall be required to verify the location of all utilities in the field prior to starting excavation.
- Any impact to NAVAIDs, airfield lighting circuits, communication or power circuits shall immediately be communicated to airport management through the RPR for coordination with the FAA, FAA Technical Operations, and any other relevant stakeholder.
- The Contractor will hand dig when work is within three feet of any known utilities and/or cables.
- The Contractor shall coordinate all work on and in the vicinity of the underground utilities and cables with the following agencies when appropriate:
    - Airport Management
    - Local Federal Aviation Administration
    - Contact information is located at Appendix B.
- Contractor shall provide the FAA, airport management, and the RPR with records of coordination with the necessary utility companies and agencies prior to commencing with excavation.

6 CONTRACTOR ACCESS

The construction area limits shall be delineated on the ground by means of safety fence, water ballasted lighted safety barricades and/or channelizer cones. Construction signs shall be used for site access, and rerouting traffic. Cones and barricades shall be equipped with a red battery-powered flashing light with a photocell. Refer to G200 series drawings for locations and details for safety fence, cones, barricades, and construction signs.

6.1 LOCATION OF STOCKPILED CONSTRUCTION MATERIALS

Staging and laydown areas shall be as shown on the general plan and phasing drawings. Equipment and material stockpiles are not permitted in the AOA without the approval of Airport Management except as shown on the plans.

Appropriate erosion control BMPs shall be placed around each stockpile area as directed by the RPR prior to commencement of work. No stockpiling is permitted within Taxiway and Runway object free areas, unless noted on the phasing plans.

6.2 VEHICLE AND PEDESTRIAN OPERATIONS

6.2.1 Site Access

See attached General Plan (G001), General Notes (G002), Overall Safety & Phasing Plan (G100) and Phasing & Safety Plans (G200 series drawings), for locations of proposed work, access routes, and staging and material storage areas.

Material deliveries and Contractor access to project areas shall be as follows:

- All phases shall be accessed/egressed as shown on General Plan (G001), Overall Safety & Phasing Plan (G100) and Phasing & Safety Plans (G200 series drawings).
- All personnel, equipment, and materials requiring access to the work site must access/egress the airfield through the gates shown on the plans.
- Non-badged individuals shall be escorted by authorized badged personnel at all times when inside the airfield perimeter security fence.

Haul routes shall be clearly delineated and shall be lighted with cones/barricades and will be located outside of the Movement Area when possible.

Each Contractor's motorized vehicle operating in the AOA shall be equipped with an amber flashing light and a 3-foot-square orange and white checkered flag. The company identification must be plainly visible on both sides of the vehicle in accordance with AC 150-5210-5D.

Additionally, the Contractor's escort vehicles must have an amber flashing light, an orange and white checkered flag, company identification, and the vehicle call sign plainly visible on both sides, in 16" letters, of the vehicle.

6.2.2 Escorts and Radio Communication

The Contractor shall ensure that all vehicles needing to enter the airfield for construction purposes are escorted by approved Contractor radio equipped escort vehicles to and from the work area. The Contractor shall have on site at all times at least one radio-equipped escort vehicle with qualified operator who shall monitor/operate the radio during all working hours.

The Contractor shall have a minimum of two radio-equipped escort vehicles with qualified operators who shall monitor/operate the radio when scheduled activities require construction equipment/activities to cross/access locations in the AOA (taxiways, aprons, runways or work within the runway obstacle free zone, runway approach surfaces or taxiway object free area). The contractor shall note that crossing of active runways is strictly prohibited. Airfield radio communications personnel shall not perform any other task during performance of this duty.

The escort vehicle will be parked in an appropriate location so that the operator can view the work. Radio control will be required whenever the Contractor is working in or adjacent to the aircraft operations areas. Radio control will be required whenever the Contractor's vehicle and equipment are operating on or crossing active runways, taxiways, and/or aircraft parking aprons.

The escort vehicles shall have a two-way radio on the appropriate GROUND/TOWER/ CTAF/UNICOM frequency and the radio shall be capable of reliable two-way communication with the GROUND/TOWER/CTAF/UNICOM from any location on the airport. The contractor shall monitor the GROUND/TOWER frequencies when the tower is open and the UNICOM frequency when the FAA Air Traffic Control Tower (ATCT) it is closed.

Escort vehicles shall be properly equipped with a rotating amber light on the roof and have the escort's call sign with a minimum inscription height of 16" labeled on both sides of the vehicle. The escort vehicle drivers shall be trained to perform escort duties on the airfield and will be briefed on Airport safety, security and radio protocol prior to the start of construction. The Contractor's superintendent and foremen will also be required to attend this safety briefing at no additional cost.

The contractor's radio communications personnel shall monitor the following frequencies:

- LEBANON TOWER: 125.95 (6:00AM-10:00PM)
- LEBANON GROUND: 121.6 (6:00AM-10:00PM)
- LEBANON UNICOM: 122.95 (9:00PM - 7:00AM)

Contractors' vehicles will not be allowed to access portions of the airport, other than those within the work and staging areas.

7 WILDLIFE MANAGEMENT

7.1 TRASH

Contractor personnel will dispose of any trash and garbage generated by project work in closed containers provided by the contractor. Periodic off-site trash and garbage will be required from the site to prevent attracting wildlife.

7.2 STANDING WATER

The contractor will immediately re-grade any area with standing water that remains more than (3) hours after rainfall.

7.3 TALL GRASS AND SEEDS

The seed mixture specified for topsoil and seed is compliant with the Airport's Wildlife Hazard Management Plan (WHMP) provided by others. Contractor shall use this mixture for all seeding requirements as specified.

The Airport will mow all restored grass per the WHMP.

7.4 FENCING AND GATES

The contractor will ensure the perimeter security fence remains unaltered.

7.5 DISRUPTION OF EXISTING WILDLIFE HABITAT

The Contractor shall notify the Airport of any wildlife activity that may impact operations.

8 FOREIGN OBJECT DEBRIS (FOD) MANAGEMENT

The Airport shall manage FOD control during construction as follows:

- The Contractor is responsible for dust and debris control on roads surrounding the airport.
- The Contractor shall keep the construction site free of paper, boxes, and other debris that could be blown onto the AOA and/or attract wildlife.
- The Contractor will check the runway and taxiways for FOD, as deemed necessary by the RPR and/or the Airport.
- The Contractor will be required to utilize water trucks on an as needed basis and as directed by the Airport and the RPR to control dust and foreign object debris.

Failure to control these items shall result in suspension of project work.

9 HAZARDOUS MATERIALS (HAZMAT) MANAGEMENT

The Airport will manage hazard material transported during construction as follows:

- The Contractor is required to maintain a spill kit capable of containing and removing leaked fuel and hydraulic fluids.
- The Contractor is required to notify the Airport Manager and the RPR of any spills immediately.

10 NOTIFICATION OF CONSTRUCTION ACTIVITIES

10.1 MAINTENANCE OF A LIST OF RESPONSIBLE REPRESENTATIVES/ POINTS OF CONTACT

The contact list for the Airport, Consultant, and Emergency contacts are in Appendix B.

Contractor's contact list to be included in the SPCD.

Contact 911 for medical and fire emergencies.

10.2 NOTAM

Airport management will issue all NOTAMs through the eNOTAM system. The Airport will also notify airport users/tenants prior to construction of the following:

- Project goals and proposed scope of work for each phase
- Tentative roadway, runway, and taxiway closures
- Work within runway safety areas and under protected surfaces

10.3 EMERGENCY NOTIFICATION PROCEDURES

Contractor shall establish emergency notification procedures with the Airport and the RPR during the pre-construction meeting. The Contractor will furnish a copy of the procedure in writing to all parties.

10.4 COORDINATION WITH FIRE DEPARTMENT

Coordination by the Contractor with the City and Lebanon Fire Department will be required to mitigate the impact construction operations will have on emergency access routes on the airfield. The contractor shall notify the agencies and Airport Operations of the following, as necessary:

- Rerouting, blocking and restoration of emergency access routes
- Use of hazardous materials on the airfield (none anticipated in this project)
- Deactivation / re-activation of water lines or fire hydrants (none anticipated in this project)

Contact information for the Fire Department and other emergency contact information can be found in APPENDIX B.

10.5 NOTIFICATION TO THE FAA

The FAA contacts for this project are included in APPENDIX B.

11 INSPECTION REQUIREMENTS

11.1 DAILY (OR MORE FREQUENT) INSPECTIONS

The Contractor is responsible for Quality Control inspections for their own work, as well as safety requirements. This includes but is not limited to an inspection of all runway closure markers, safety fence, lighted barricades, lighted cones, security of perimeter access gates, and equipment daily.

The RPR shall review the work areas followed by an inspection conducted by Airport Management prior to opening to air traffic operations.

Airport Management will perform daily and periodic night inspections of CSPP requirements. Airport management will coordinate with the RPR and the Contractor for any issues noted for correction.

11.2 FINAL INSPECTIONS

At the completion of each phase of the project and at any time an area will be re-opened to aircraft operations, the RPR, Airport Management, and the Contractor shall inspect the project for re-opening.

Any items identified as unsafe for aircraft operations shall be remedied by the Contractor prior to opening the phase, and prior to beginning the next phase of work.

Upon completion of the entire project, the FAA, NH DOT, Airport Management, the RPR, and the Contractor shall inspect the entire project. Any items identified as insufficient shall be remedied by the Contractor prior to final acceptance.

12 UNDERGROUND UTILITIES

12.1 EXISTING UTILITIES

The Contractor is responsible for conducting investigations to locate existing utilities within the limit of work. Existing utilities shown on the plan set are approximate locations based on record drawings and investigative work in select areas during the data collection and design phase. These utilities must be verified by the contractor. The Contractor will immediately notify the RPR in writing of any discrepancies found during investigation.

The Contractor will contact Dig Safe to delineate all municipal utilities a minimum of seven days prior to any excavation work.

The Contractor shall perform an airfield lighting check at the completion of each work shift for phases that require reopening of pavements for aircraft use to verify that the lighting system and NAVAIDs are both operational. In areas to remain closed, the Contractor shall perform an airfield lighting check when requested by Airport Management and/or the RPR.

Any impact to NAVAIDs, airfield lighting circuits, communication, or power circuits, shall immediately be communicated to the Airport through the RPR for coordination with the FAA and any other relevant stakeholder.

12.2 UTILITY DAMAGE

The Contractor shall immediately notify the RPR and Airport Management if any utilities are damaged and will be responsible for all immediate repairs, at the Contractor's expense.

13 PENALTIES

Any Contractor not conforming to safety and security requirements will be considered in direct violation of this CSPP and the work will be stopped until approval is given by Airport Management to start once again. No time extension for the contract will be given, nor will any consideration for extra cost claims be given relative to security violations. It is the Contractor's responsibility to instruct, monitor, and supervise work staff to avoid this situation.

A Contractor who causes an incursion will have their driving privileges revoked, the incursion will be investigated by the FAA, and the entire project may be subject to stoppage.

It is the Contractor's responsibility to provide qualified, responsible, and experienced personnel so that violations do not occur.

14 SPECIAL CONDITIONS

14.1 AIRCRAFT IN DISTRESS

Airport Management, the RPR, and/or the Contractor Superintendent will immediately clear all construction personnel of all runways and approach areas upon receiving instructions from the LEB ATCT or monitoring a distress call on UNICOM.

14.2 AIRCRAFT INCIDENT

All construction personnel will immediately vacate the airfield and remain off airport property until cleared by the Airport Manager.

15 RUNWAY AND TAXIWAY VISUAL AIDS. MARKING, LIGHTING, SIGNS, AND VISUAL NAVAIDS

15.1 GENERAL

Throughout certain phases of construction during this project, certain sign panels will be covered, and certain lighting circuits will be disconnected based on the Contractor's location of work.

Daily closures shall be delineated with safety fence, low-profile barricades and/or channelizer cones as shown on the drawings and as approved/directed by the RPR.

15.2 MARKINGS

No special or temporary markings are anticipated during construction.

15.3 LIGHTING AND VISUAL NAVAIDS

Lighted portable runway closure markers (lighted X's) with unlit vinyl closure markers are required as shown in Phasing Drawings.

All visual aids will be inspected at the start and end of each days construction to ensure they are in good working order.

15.4 SIGNS, TEMPORARY, INCLUDING ORANGE CONSTRUCTION SIGNS, AND PERMANENT SIGNS

Temporary wayfinding and required signs for construction are shown on the Phasing Drawings. Permanent signage changes are outlined in the design drawings.

16 MARKING AND SIGNS FOR ACCESS ROUTES

The Contractor shall obey all instructions as to the operation and routes to be taken by equipment travelling on Airport property. Any sign, lights, signals, markings, traffic control, and other devices which may be required shall be provided and maintained by the Contractor during the work, subject to approval of the RPR. See Overall Safety & Phasing Plan (G100).

All signage will be located and constructed to standards, including size, coloring, and lettering that conform to State highway specifications. Signage shall be approved by the RPR.

The Contractor shall clearly mark and maintain all haul routes to ensure vehicles will remain clear of all active movement areas.

17 HAZARD MARKING AND LIGHTING

17.1 PURPOSE

Barricades will be used during construction to prevent aircraft from entering the closed runway or taxiways and to keep humans and equipment from straying into active airfield operations areas. The Contractor shall ensure these barricades and associated markings/lighting are kept in good working order and maintained properly.

17.2 EQUIPMENT

Construction work areas will be delineated with safety fence, low profile barricades with flashing red lights, and/or channelizer cones with flashing red lights. See Safety & Phasing Notes & Details (G101) for safety fence, barricade, and channelizer cones details.

Open trenches, equipment, and any temporary or exposed utilities shall be clearly marked and delineated with safety fence, lighted barricades, and cones. Safety fence, cones, and barricades shall be inspected, at minimum, at the start and end of each day to ensure they are in good working order. Contractor shall provide a 24-hour response for emergency maintenance of airport hazard lighting, as well as runway and taxiway visual aids. All hazard lighting using photocells shall be protected from turning off when exposed to direct light from a vehicle's headlights or aircraft's taxi lights.

18 WORK ZONE LIGHTING FOR NIGHTTIME CONSTRUCTION

The Contractor shall provide light towers to sufficiently illuminate the work area.

The work area shall be protected by lighted cones and barricades to prevent aircraft or vehicles from entering the area.

19 PROTECTION OF RUNWAY AND TAXIWAY SAFETY AREAS, OBJECT FREE AREAS, OBSTACLE FREE ZONES, AND APPROACH/DEPARTURE SURFACES

The Contractor is responsible for marking out the haul routes, which are located outside of all active runway obstacle free zones and taxiway object free areas where possible. The work area must be delineated with barricades/safety fence/channelizer cones, at the limits of phasing (refer to G200 series for locations).

Any ground disturbance created as a result of construction vehicles shall be reported immediately to the RPR and restored, by the Contractor, to a smooth condition.

The Contractor, RPR, and Airport Management shall be responsible for checking safety areas and object free areas daily.

Protection of RSA, OFZ, ROFAs, and approach surfaces will be coordinated through Airport Management prior to any activity adjacent to an active runway.

19.1 RUNWAY SAFETY AREA (RSA)

Crossing of active RSA shall only be allowed while being escorted by approved contractor escorts equipped with appropriate radio communications.

No work is permitted within RSA while the runway is open. Work within any RSA requires prior approval and coordination between the Contractor, RPR, and Airport Management.

19.2 RUNWAY OBJECT FREE AREA (ROFA)

Crossing an active ROFA shall only be allowed while being escorted by approved contractor escorts equipped with appropriate radio communications.

No work is permitted within ROFA while the runway is open. Work within any ROFA require prior approval and coordination between the Contractor, RPR, and Airport Management.

19.3 TAXIWAY SAFETY AREA (TSA)

Crossing of active TSA shall only be allowed while being escorted by approved contractor escorts equipped with appropriate radio communications.

No work is permitted within TSA while the taxiway is open. Work within any TSA require prior approval and coordination between the Contractor, RPR, and Airport Management.

19.4 TAXIWAY OBJECT FREE AREA (TOFA)

Crossing an active TOFA shall only be allowed while being escorted by approved contractor escorts equipped with appropriate radio communications.

No work is permitted within TOFA while the taxiway is open. Work within any TOFA requires prior approval and coordination between the Contractor, RPR, and Airport Management.

19.5 OBSTACLE FREE ZONE (OFZ)

Crossing into the OFZ of an active runway shall only be allowed while being escorted by approved contractor escorts equipped with appropriate radio communications.

No work is permitted within OFZ while the runway is open. Work within any OFZ requires prior approval and coordination between the Contractor, RPR, and Airport Management.

19.6 RUNWAY APPROACH/DEPARTURE SURFACES

No construction equipment may penetrate an approach surface while the runway is active.

20 OTHER LIMITATIONS ON CONSTRUCTION

20.1 PROHIBITIONS

Prohibited items within airport limits unless otherwise noted:

No cranes or equipment over 30 feet in height are permitted on the AOA without approval from Airport Management and the FAA (File Form 7460). The Contractor shall coordinate any crane use with the airport manager, through the RPR, 60 days in advance.

No open flame welding, torches, electrical blast caps and flare pots may be used at any time. Smoking is prohibited on the airfield at all times.

20.2 RESTRICTIONS

A 7460-1 will be filed for construction equipment with a maximum height of 30 feet. Any increase in this height (greater than 30 feet), will require the Contractor to file a new 7460-1 and subsequent FAA approval. All cranes shall be marked and lighted in accordance with FAA AC 70/7460-1 (latest edition).

APPENDIX A Construction Safety and Phasing Plan Drawings

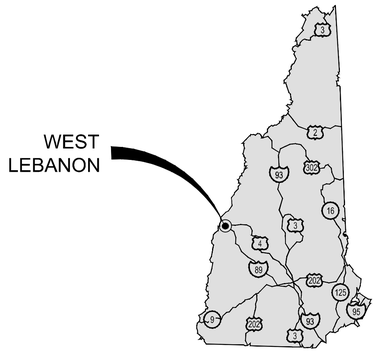
Stantec

LEBANON MUNICIPAL AIRPORT
WEST LEBANON, NEW HAMPSHIRE

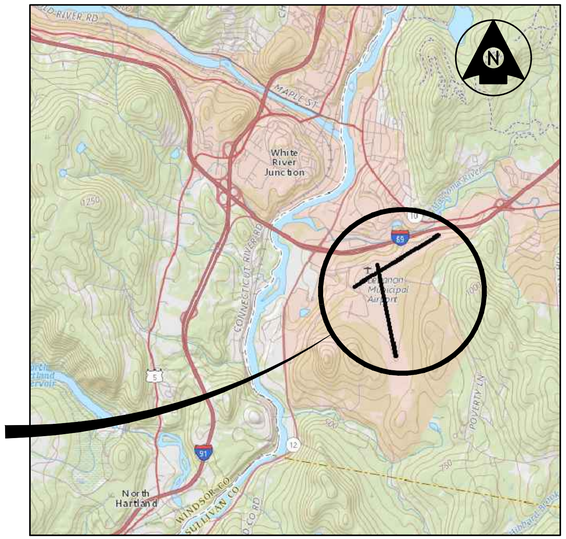
EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

CONSTRUCTION SAFETY & PHASING PLAN

ISSUED FOR OEAAA SUBMISSION
JANUARY 10, 2024

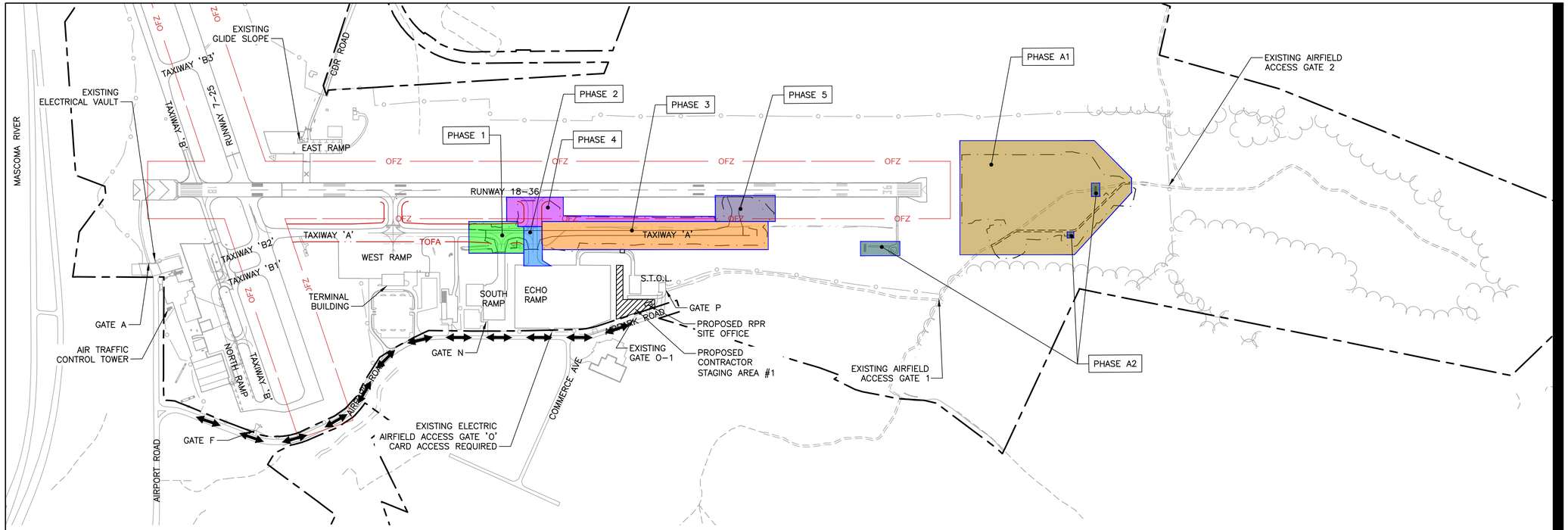


LOCATION MAP



VICINITY MAP
NOT TO SCALE

ORIGINAL SHEET - ANSI D



OVERALL PHASING NOTES:

1. ANTICIPATED CONTRACT EXECUTION IS APPROXIMATELY SEPTEMBER 2024.
2. APPROXIMATE NOTICE TO PROCEED FOR CONSTRUCTION IS MAY 1, 2025.
3. FOR SAFETY & PHASING NOTES & DETAILS, SEE G101.
4. FOR DETAILED PHASING PLANS WITH RUNWAY AND TAXIWAY CLOSURES AND CLOSURE SETUPS, SEE G201 TO G207.
5. REFER TO DETAILED PHASING PLANS FOR THE HAUL ROUTE FOR EACH SPECIFIC PHASE.
6. THE CONTRACTOR SHALL NOT BEGIN WORK IN ANY PHASE WITHOUT WRITTEN AUTHORIZATION FROM THE RESIDENT PROJECT REPRESENTATIVE (RPR).
7. PHASES SHALL BE COMPLETED IN SEQUENTIAL ORDER UNLESS OTHERWISE NOTED OR AUTHORIZED BY THE RPR AND THE AIRPORT MANAGER.
8. WORK HOURS ARE AS NOTED ON THE INDIVIDUAL PHASING PLANS. NO WORK SHALL BE PERFORMED ON SUNDAYS. ANY CHANGES TO THE WORK SCHEDULE REQUIRE WRITTEN AUTHORIZATION FROM THE RPR.
9. CONSTRUCTION EQUIPMENT SHALL NOT BE PERMITTED ON RUNWAY 7-25 OR RUNWAY 18-36 EXCEPT LINE STRIPING EQUIPMENT AND RUNWAY CLOSURE MARKERS, CONES AND BARRICADES.
10. ALL AIRFIELD LIGHTING CIRCUITS SHALL REMAIN OPERATIONAL BETWEEN DUSK AND DAWN UNLESS OTHERWISE NOTED ON THE INDIVIDUAL PHASING PLANS.
11. CONTRACTOR TO PROVIDE VINYL AND LIGHTED RUNWAY CLOSURE MARKERS

WORK SCHEDULE:

1. WORK IS TO BE COMPLETED WITHIN 168 CALENDAR DAYS, ANTICIPATED PROJECT SCHEDULE IS EXPECTED TO RUN FROM SEPTEMBER 2024 TO NOVEMBER 2025.
2. PHASE 1 WORK SHALL INCLUDE ALL WORK WITHIN THE PHASE LIMITS UP TO THE ASPHALT PAVEMENT BASE COURSE.
3. PHASE 2 SHALL BE COMPLETED WITHIN 21 DAYS TO MINIMIZE ACCESS RESTRAINTS ON AIRPORT USERS OF THE ECHO RAMP. THE CONTRACTOR SHALL SCHEDULE WORK FORCES ACCORDINGLY.
4. AT THE CONCLUSION OF THE PHASE 2 ASPHALT PAVING BASE COURSE THE CONTRACTOR WILL COMPLETE SURFACE COURSE PAVING FOR PHASE 1 AND 2 OVER 2 DAYS.
5. FORECAST WIND AND WEATHER CONDITIONS SHALL BE MONITORED CONTINUALLY BY THE CONTRACTOR, AND CONSTRUCTION SCHEDULES MODIFIED APPROPRIATELY. WORK MAY BEGIN ON ANY DAY OF THE WEEK UPON APPROVAL BY THE AIRPORT MANAGER AND THE RPR.
6. 42 DAY CLOSURE OF RUNWAY 18-36 – CONTRACTOR IS REQUIRED TO NOTIFY THE AIRPORT MANAGER A MINIMUM OF 7 DAYS PRIOR TO RUNWAY CLOSURE TO ALLOW ENOUGH TIME FOR AIRPORT TO ISSUE A NOTAM. REFER TO CSPP FOR ADDITIONAL DETAILS AND TIMELINE REQUIREMENTS.
7. RUNWAY 18-36 IS REQUIRED TO BE CLOSED FOR PHASES 4 AND 5, AS WELL AS FOR WORK RELATING TO ADD-ALTERNATES #1 AND #2. MAXIMUM RUNWAY CLOSURE PERIOD TO BE NO MORE THAN 42 DAYS FOR ALL WORK. RUNWAY CLOSURE MUST BE COMPLETED IN A SINGLE CONTINUOUS DURATION. THE CONTRACTOR SHALL SCHEDULE WORK FORCES ACCORDINGLY.

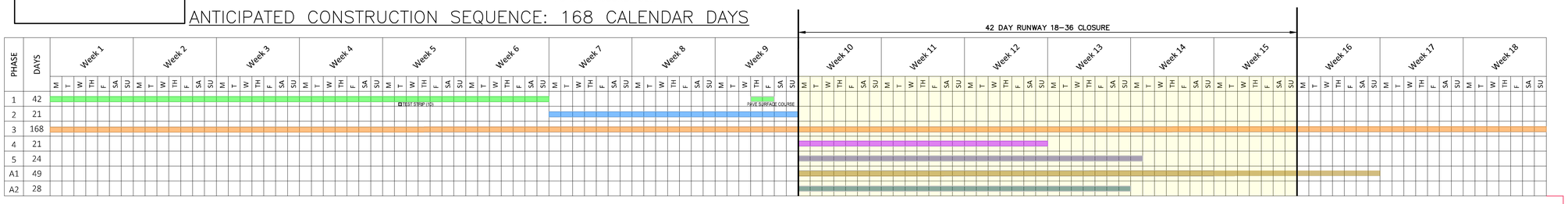
LEGEND

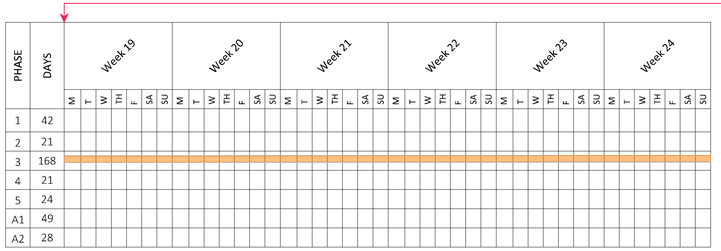
PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	RUNWAY OBSTACLE FREE ZONE
	TAXIWAY OBJECT FREE AREA

LEGEND

DAY WORK (COLORS VARY)

ANTICIPATED CONSTRUCTION SEQUENCE: 168 CALENDAR DAYS





DETAILED PHASING:

REFER TO G200 SERIES DRAWINGS FOR DETAILS OF INDIVIDUAL CONSTRUCTION PHASES (I.E. ASSOCIATED RUNWAY & TAXIWAY CLOSURES, WORK HOURS, HAUL ROUTES, TEMPORARY CIRCUITS, ETC.)

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Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
OVERALL PHASING AND SAFETY PLAN

Project No.
179450522

Drawing No. G100 | Sheet 4 of 80 | Revision 0

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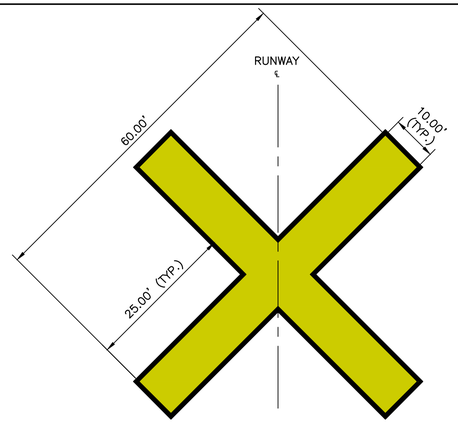
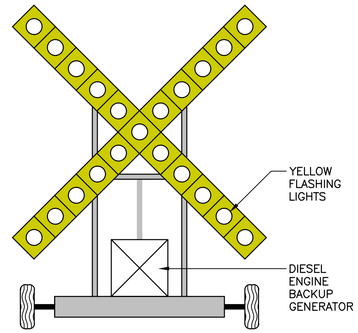
ORIGINAL SHEET - ANSI D

SAFETY AND PHASING NOTES:

1. SAFETY/SECURITY PLAN: THE CONTRACTOR SHALL REVIEW THE OUTLINED REQUIREMENTS AND PROCEDURES CONTAINED IN THE FAA ADVISORY CIRCULAR NO. 150/5370-2G OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION AND A DRAFT COPY OF THE CONSTRUCTION SAFETY AND PHASING PLAN (CSPP) REPORT, A COPY OF THE CSPP REPORT IS INCLUDED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL A SAFETY PLAN COMPLIANCE DOCUMENT (SPCD) IN ACCORDANCE WITH THE REQUIREMENTS OF AC 150/5370-2G. THE AIRPORT MANAGER AND THE RPR SHALL REVIEW THE CONTRACTOR'S SPCD, AND THEIR WRITTEN APPROVAL OF THE PLAN WILL BE REQUIRED PRIOR TO THE CONTRACTOR'S MOBILIZATION FOR THE PROJECT. THE SPCD SHALL ADDRESS THE FOLLOWING MAJOR ITEMS AT A MINIMUM AS THEY PERTAIN TO THE SCHEDULED WORK EFFORTS:
   - PROCEDURES AND REQUIREMENTS FOR RUNWAY AND TAXIWAY CLOSURES.
   - NOTIFICATION OF SCHEDULED CONSTRUCTION ACTIVITIES.
   - CONSTRUCTION ACTIVITIES WITHIN RUNWAY AND TAXIWAY SAFETY AREAS, OBSTACLE FREE ZONES, AND OTHER AIRPORT OPERATIONAL AREAS.
   - DAILY AIRFIELD AND RADIO COMMUNICATIONS.
   - PLACEMENT OF ALL BARRICADES/CONES.
   - CONSTRUCTION AND PUBLIC ROADWAY SIGNAGE.
   - GATE ACCESS PROCEDURES.
2. SAFETY OFFICER: THE CONTRACTOR SHALL PROVIDE A SAFETY OFFICER/POINT OF CONTACT PERSON WHO CAN BE CONTACTED 24 HOURS A DAY-SEVEN DAYS A WEEK FOR THE DURATION OF THE PROJECT. THIS PERSON SHALL BE RESPONSIBLE FOR TAKING IMMEDIATE ACTION TO CORRECT ANY CONSTRUCTION ACTIVITIES IDENTIFIED AS NOT IN THE BEST INTEREST OF AIRPORT'S SAFE OPERATION AND/OR SECURITY.
3. AT NO TIME SHALL THE CONTRACTOR CROSS/ACCESS ACTIVE RUNWAYS/TAXIWAYS OR STAGE EQUIPMENT IN ACTIVE RUNWAY APPROACHES, THE RUNWAY OBSTACLE FREE ZONE OR TAXIWAY OBJECT FREE AREAS WITHOUT PRIOR COORDINATION WITH THE AIRPORT MANAGER AND THE RPR. CROSSING OF ACTIVE RUNWAYS ARE STRICTLY PROHIBITED. THE CONTRACTOR'S RADIO COMMUNICATIONS PERSONNEL SHALL MONITOR THE FOLLOWING FREQUENCIES:
   - LEBANON TOWER: 125.95 (6:00AM-10:00PM)
   - LEBANON GROUND: 121.6 (6:00AM-10:00PM)
   - LEBANON UNICOM: 122.95 (9:00PM - 7:00AM)
4. THE CONTRACTOR SHALL HAVE ON SITE AT ALL TIMES AT LEAST ONE RADIO EQUIPPED ESCORT VEHICLE WITH QUALIFIED OPERATOR WHO SHALL MONITOR THE RADIO DURING ALL WORKING HOURS. A MINIMUM OF TWO (2) RADIO EQUIPPED CONSTRUCTION SAFETY VEHICLES MANNED WITH QUALIFIED AIRFIELD RADIO COMMUNICATIONS PERSONNEL (ESCORTS) SHALL BE PROVIDED BY THE CONTRACTOR WHEN SCHEDULED ACTIVITIES REQUIRE CONSTRUCTION EQUIPMENT/ACTIVITIES TO CROSS/ACCESS LOCATIONS IN THE AOA (TAXIWAYS, APRONS, RUNWAYS OR WORK WITHIN THE RUNWAY OBSTACLE FREE ZONE, RUNWAY APPROACH SURFACES OR TAXIWAY OBJECT FREE AREA). THE CONTRACTOR SHALL NOTE THAT CROSSING OF ACTIVE RUNWAYS ARE STRICTLY PROHIBITED. AIRFIELD RADIO COMMUNICATIONS PERSONNEL SHALL NOT PERFORM ANY OTHER TASK DURING PERFORMANCE OF THIS DUTY. CONTRACTOR'S RADIO PERSONNEL SHALL BE REQUIRED TO MEET LAWRENCE'S SAFETY AND SECURITY REQUIREMENTS AND SHALL MAINTAIN PROPER RADIO PROTOCOL. THE CONTRACTOR SHALL PROVIDE ALL APPROVED VEHICLES, RADIOS, EQUIPMENT, PERSONNEL AND PRIOR TRAINING FOR THIS PURPOSE. AT NO TIME SHALL THE CONTRACTOR CROSS/ACCESS ACTIVE RUNWAYS/TAXIWAYS OR STAGE EQUIPMENT IN RUNWAY APPROACHES WITHOUT PRIOR COORDINATION WITH THE AIRPORT MANAGER AND THE RPR.
5. ALL AUTHORIZED CONSTRUCTION VEHICLES SHALL DISPLAY AN ORANGE/WHITE CHECKERED FLAG, SHALL HAVE AN AMBER/YELLOW STROBE BEACON LIGHT ATTACHED TO THE ROOF AND BE CLEARLY IDENTIFIED BY EITHER ASSIGNED INITIALS OR NUMBERS PROMINENTLY DISPLAYED ON EACH SIDE OF VEHICLE. THERE SHALL BE NO SEPARATE PAYMENT FOR PROVIDING FLASHING YELLOW BEACONS, ORANGE/WHITE CHECKERED FLAGS OR VEHICLE DECALS IN ACCORDANCE WITH FAA AC 150/5210-5D.
6. CONSTRUCTION PERSONNEL: ALL PERSONNEL SHALL WEAR APPROPRIATE REFLECTIVE SAFETY VESTS AND CUSTOMARY PERSONAL PROTECTIVE EQUIPMENT (PPE) AT ALL TIMES WHEN WORKING ON THE AIRFIELD AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL MAKE ALL PERSONNEL AWARE OF SAFETY REQUIREMENTS AND THE DANGERS OF WORKING ADJACENT TO ACTIVE AIR OPERATIONAL AREAS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL ENSURE THAT ALL PERSONNEL UNDERSTAND AND COMPLY WITH THE AIRFIELD'S SAFETY/SECURITY REQUIREMENTS AND THE FOREIGN OBJECT DEBRIS (FOD) PROCEDURES.
7. IN THE EVENT OF A CONSTRUCTION ACCIDENT THE CONTRACTOR SHALL CALL 911 AND IMMEDIATELY NOTIFY THE RPR AND THE AIRPORT MANAGER.
8. ANY WORK WITHIN THE OBSTACLE FREE ZONE (OFZ) OF A RUNWAY AS SHOWN ON THE PLANS SHALL REQUIRE A RUNWAY CLOSURE. ALL RUNWAY CLOSURES MUST BE COORDINATED IN WRITING WITH THE AIRPORT MANAGER THROUGH THE RPR A MINIMUM OF 7 DAYS IN ADVANCE.
9. ANY WORK WITHIN THE TAXIWAY OBJECT FREE AREA (TOFA) AS SHOWN ON THE PLANS SHALL REQUIRE A TAXIWAY CLOSURE. ALL TAXIWAY CLOSURES MUST BE COORDINATED IN WRITING WITH THE AIRPORT MANAGER THROUGH THE RPR A MINIMUM OF 72 HOURS IN ADVANCE.
10. PRIOR TO REOPENING ANY RUNWAY OR TAXIWAY PAVEMENTS (INCLUDING DAILY/NIGHTLY CLOSURES):
    - ALL PAVEMENTS SHALL BE CLEANED AND FREE FROM FOD
    - ALL TRENCHES AND EXCAVATIONS ADJACENT TO PAVED SURFACES AND WITHIN RUNWAY/TAXIWAY SAFETY AREAS SHALL BE BACKFILLED AND GRADED TO WITHIN +/- 2 INCHES OF ADJACENT EXISTING GRADES. ALL OTHER TRENCHES SHALL BE PROTECTED AND LIGHTED.
    - THE CONTRACTOR SHALL REQUEST AN INSPECTION OF THE WORK AREA BY THE AIRPORT MANAGER AND THE RPR. THE CONTRACTOR SHALL CORRECT ANY HAZARDS WHICH MAY PRESENT A SAFETY CONCERN TO AIRCRAFT, VEHICLES OR PERSONS AS DETERMINED BY THE AIRPORT MANAGER AND THE RPR.
10. CLOSURE BARRICADES/CONES: ALL REQUIRED LIGHTED SAFETY BARRICADES, LIGHTED CHANNELIZER CONES, FLAGGED STAKES, TRAFFIC CONES, TEMPORARY TRAFFIC SIGNS, COVERED AIRFIELD SIGNS, COVERED AIRFIELD LIGHTING, ETC., SHALL BE IN PLACE PRIOR TO THE COMMENCEMENT OF WORK. THERE SHALL BE NO SEPARATE PAYMENT FOR FURNISHING, PLACING, RELOCATING, MAINTAINING, AND REMOVAL OF THESE AS MAY BE REQUIRED BY THE AIRPORT MANAGER OR THE RPR TO ENSURE SAFETY OVER THE LIFE OF THE PROJECT. THIS WORK SHALL BE INCIDENTAL TO THE PROJECT. NO SEPARATE PAYMENT SHALL BE MADE. AT THE COMPLETION OF THE PROJECT, ALL LIGHTED SAFETY BARRICADES, CHANNELIZER CONES AND SIGNS SHALL BE REMOVED, AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR. METHODS FOR COVERING AIRFIELD SIGNS AND LIGHTS (BLANK PANELS/LENS, SECURED FABRIC, ETC.) SHALL BE AS APPROVED BY THE RPR. SIGNS IDENTIFIED TO BE COVERED THAT WILL BE REMOVED/REPLACED AS PART OF THIS PROJECT MAY HAVE PANELS OR SIGN REMOVED AT START OF CONSTRUCTION IN LIEU OF COVERING THE SIGN.
11.
12. CLOSURE MARKERS: LIGHTED RUNWAY CLOSURE MARKERS AND VINYL RUNWAY CLOSURE MARKERS SHALL BE IN PLACE, OPERATIONAL AND APPROVED BY THE AIRPORT MANAGER AND RPR PRIOR TO THE COMMENCEMENT OF WORK. THERE SHALL BE NO SEPARATE PAYMENT FOR FURNISHING, PLACING, RELOCATING, MAINTAINING, AND REMOVAL OF THESE AS MAY BE REQUIRED BY THE AIRPORT MANAGER OR THE RPR TO ENSURE SAFETY OVER THE LIFE OF THE PROJECT.
13. MATERIAL STOCKPILING AND EQUIPMENT PARKING: NO MATERIAL SHALL BE STOCKPILED WITHIN THE OBJECT FREE AREA OF AN OPEN RUNWAY OR TAXIWAY. NO EQUIPMENT SHALL BE PARKED WITH AN ACTIVE RUNWAY/TAXIWAY OBJECT FREE AREA WHEN NOT IN USE AND/OR OUTSIDE WORK HOURS.

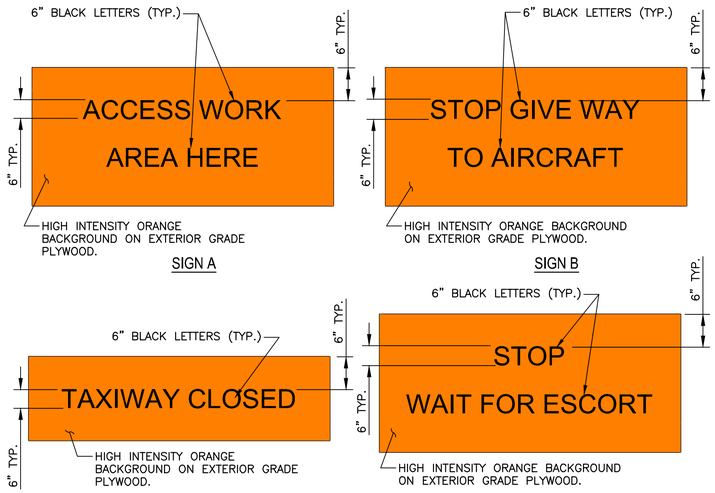


VINYL RUNWAY CLOSURE MARKER
NOT TO SCALE



LIGHTED RUNWAY CLOSURE MARKER
NOT TO SCALE

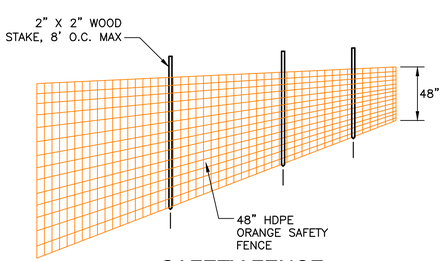
VINYL AND LIGHTED RUNWAY CLOSURE MARKER NOTES:
1. CONTRACTOR TO FURNISH BARRICADES AND LIGHTED RUNWAY CLOSURE MARKERS. ALL COSTS ASSOCIATED WITH FURNISHING, INSTALLING AND MAINTAINING RUNWAY CLOSURE MARKERS SHALL BE INCIDENTAL TO THE VARIOUS CONTRACT PAY ITEMS.
2. VINYL RUNWAY CLOSURE MARKERS SHALL BE USED IN TANDEM WITH PORTABLE ELECTRIC LIGHTED RUNWAY CLOSURE MARKERS DURING DAY CLOSURES AND SHALL BE INSTALLED AT THE EACH END OF THE APPLICABLE CLOSED RUNWAY. DURING NIGHTLY CLOSURES, THE CONTRACTOR SHALL INSTALL ONLY LIGHTED PORTABLE RUNWAY CLOSURE MARKERS.
3. VINYL RUNWAY CLOSURE MARKERS SHALL BE HIGH STRENGTH, YELLOW, VINYL, REUSABLE CLOSURE MARKERS. MARKERS SHALL BE BALLASTED WITH SAND BAGS OR OTHER BALLASTS THAT DO NOT OBSCURE THE SIGN, AS APPROVED BY THE RPR. MARKERS SHALL BE FAA APPROVED.
4. ALL COSTS ASSOCIATED WITH COORDINATING WITH LEBANON MUNICIPAL AIRPORT, SUPPLYING, HAULING, PLACING, SECURING, CONNECTIONS FOR POWER, MAINTAINING, FUELING AND RELOCATING THESE MARKERS SHALL BE INCIDENTAL TO THE THE VARIOUS CONTRACT PAY ITEMS.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING LIGHTED RUNWAY CLOSURE MARKERS THROUGHOUT THE PROJECT. IF CONTRACTOR IS GOING TO BE OFF SITE THE CONTRACTOR SHALL PROVIDE PERSONNEL TO CHECK OPERATION OF CLOSURE MARKERS DURING THESE PERIODS.



CONSTRUCTION SIGNAGE
NOT TO SCALE

CONSTRUCTION SIGN NOTES:
1. SIGN SHALL CONFORM TO LATEST FHWA "STANDARD HIGHWAY SIGNS"
2. SIGNS SHALL NOT BE MOUNTED HIGHER THAN 4' ABOVE EXISTING GRADE.
3. IF WORKING IN MULTIPLE NON ADJACENT AREAS, THE CONTRACTOR SHALL PROVIDE ANY ADDITIONAL SIGNS REQUIRED AT THEIR OWN EXPENSE. THESE SIGNS SHALL REMAIN THE CONTRACTORS PROPERTY AT THE COMPLETION OF THE PROJECT.
4. THE CONTRACTOR SHALL ANCHOR THE SIGNS TO RESIST JET BLAST AND/OR WIND.
5. ALL COSTS ASSOCIATED WITH FURNISHING, INSTALLING AND MAINTAINING SIGNS SHALL BE INCIDENTAL TO THE VARIOUS CONTRACT PAY ITEMS.
6. REFER TO PHASING PLANS FOR SIGN LOCATIONS.

SAFETY FENCE NOTES:
1. CONTINUOUS SAFETY FENCE TO BE INSTALLED FOR EACH PHASE OF THE PROJECT TO PROVIDE A BARRIER BETWEEN CONSTRUCTION AREAS AND OPERATIONAL AREAS.
2. SAFETY FENCE TO BE INSTALLED AS SHOWN ON THE INDIVIDUAL PHASING PLANS OR AS DIRECTED BY THE RPR.



SAFETY FENCE
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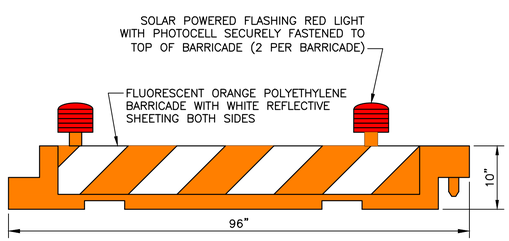
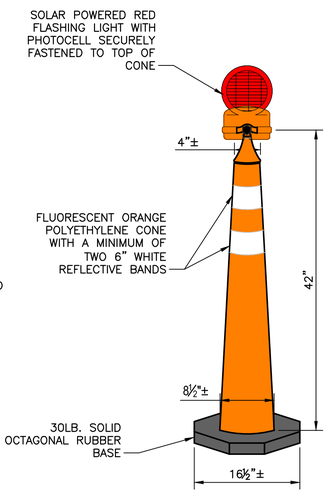


LIGHTED LOW PROFILE BARRICADE
NOT TO SCALE

SAFETY FENCE, LIGHTED CHANNELIZER CONE AND LIGHTED LOW PROFILE BARRICADE NOTES:
1. ALL COSTS ASSOCIATED WITH FURNISHING, INSTALLING AND MAINTAINING SAFETY FENCE, BARRICADES, AND CONES SHALL BE INCIDENTAL TO THE VARIOUS CONTRACT PAY ITEMS.
2. THE LIGHTED SAFETY BARRICADES SHALL BE PLACED WHERE SHOWN ON PLANS AND BE USED WHEN A WORK AREA IS DIRECTLY ADJACENT TO AN ACTIVE TAXIWAY OR RUNWAY TO KEEP AIRCRAFTS AND VEHICLES FROM TRAVELING INTO A WORK AREA.
3. BARRICADES SHALL BE INTERCONNECTED ON AIRFIELD PAVEMENTS AND WITHIN A.O.A.'s. BARRICADE SPACING MAY BE INCREASED TO 4' ON CENTER IN ALL OTHER AREAS UNLESS OTHERWISE DIRECTED BY THE RPR. REFER TO PHASING DRAWINGS G201 THROUGH ####.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RELOCATING AND/OR PROVIDING ADDITIONAL BARRICADES AROUND THE SITE AS NECESSARY TO ACCOMMODATE THE PROPOSED WORK AND IN ACCORDANCE WITH THE PHASING PLANS.
5. THE CONTRACTOR SHALL ENSURE THE CONTINUOUS OPERATION OF ALL LIGHTS FOR THE DURATION OF THE PROJECT. LIGHTS AND BATTERIES SHALL BE REPLACED AS NEEDED.
6. THE BARRICADES SHALL BE FILLED WITH WATER.
7. CHANNELIZER CONES SHALL BE PLACED CONTINUOUSLY AT 4' ON CENTER.



LIGHTED CHANNELIZER CONE
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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN NOTES AND DETAILS

Project No.
179450522

Drawing No.	Sheet	Revision
G101	5 of 80	0

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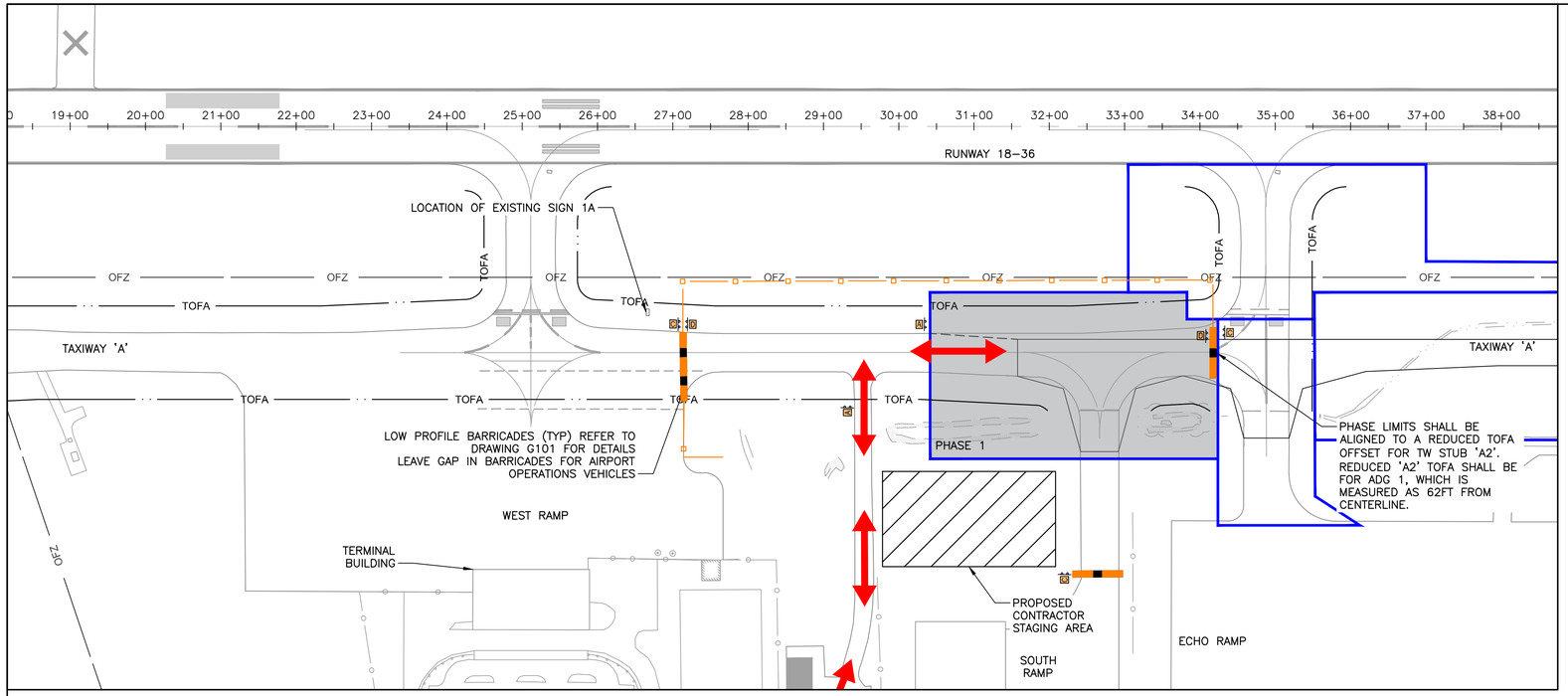


PHASE 1 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 1 - TW A RECONSTRUCTION BETWEEN TERMINAL RAMP AND SOUTH RAMP

DRAWING: G201
DURATION: 42 CONSECUTIVE CALENDAR DAYS - DAY WORK

WORK SCHEDULE: MONDAY - FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- TAXIWAY 'A' (TERMINAL RAMP TO SOUTH RAMP).
- ACCESS TO THE MAINTENANCE RAMP AND THE SOUTH RAMP.

MAJOR WORK ITEMS:

CIVIL
- PAVEMENT REMOVAL.
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT CONTROL STRIP - THE CONTRACTOR SHALL NOT COMMENCE ANY OTHER PHASES UNTIL THE CONTROL STRIP HAS BEEN ACCEPTED BY THE RPR.
- ASPHALT MIX PAVEMENT, BASE LIFT ONLY (TOP LIFT SHALL BE PAVED WITH PHASE 2)
- PAVEMENT MARKINGS.
- TOPSOIL AND SEED.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- DEMOLITION OF EXISTING TAXIWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, DUCTBANK, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND JUNCTION CANS.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

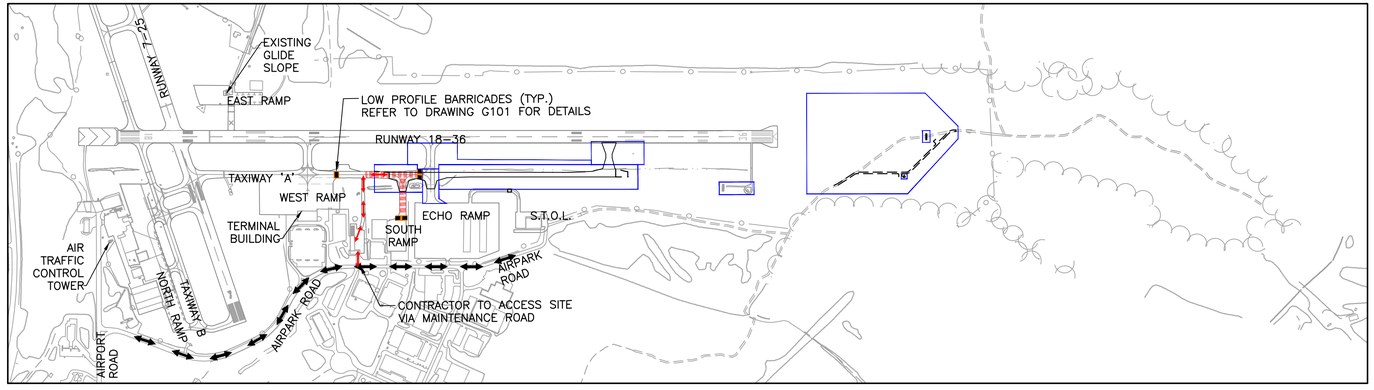
AFFECTED CIRCUITS/NAVAIDS:
- TAXIWAY 'A'.
- CIRCUITS SHALL BE LOOPED OUT AT ISOLATION TRANSFORMER AS SHOWN ON E201 TEMPORARY LIGHTING PLAN TO DE-ENERGIZE CIRCUIT SOUTH OF THIS POINT WHILE MAINTAINING TAXIWAY 'A' AND 'A1' FIXTURES AND SIGNS.
- TW 'A' SIGNAGE AND EDGE LIGHTS FROM THE WEST RAMP TO TW 'A2' SHALL BE COVERED OR REMOVED FROM SERVICE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7-25 SHALL REMAIN OPEN.
- RUNWAY 18-36 SHALL REMAIN OPEN.
- TAXIWAY A CLOSED SOUTH OF WEST RAMP.
- CONTRACTOR TO LEAVE ROOM FOR OPERATIONS VEHICLES TO DRIVE BETWEEN WEST RAMP AND MAINTENANCE BUILDING.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

PHASE 1 SIGN BLACKOUTS

SIGN NUMBER	SIGN LEGEND A
1A	A

NOTE:

REFER TO DRAWING E201 FOR TEMPORARY LIGHTING PLAN

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Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR OEAAA SUBMISSION	DMZ	LAM	24.01.10

Issued

SEB Dwn. | LAM Chkd. | ADK Dsgn.

Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 1

Project No.
179450522

Drawing No. G201 | Sheet 6 of 80 | Revision 0

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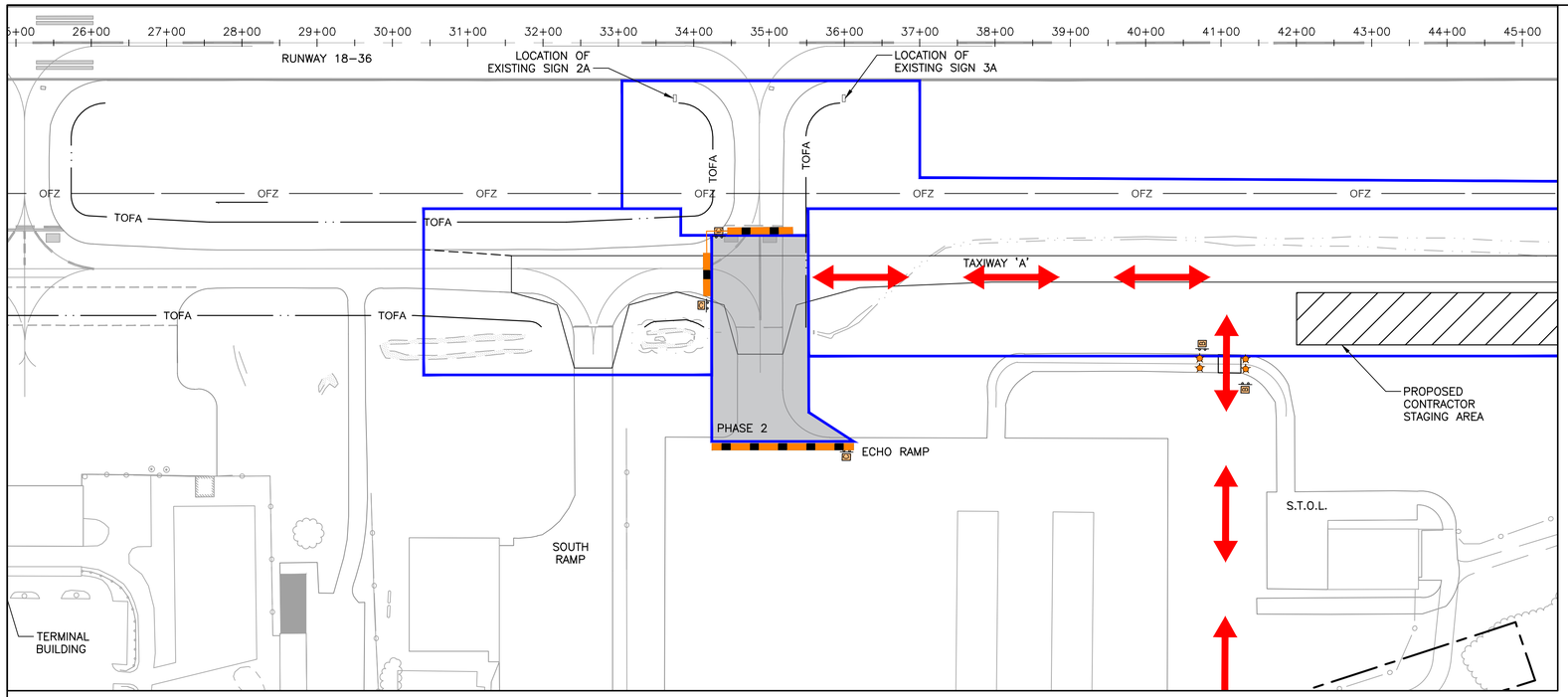
12/29/2023 2:12 PM By: McKay, Sean (Boston)

ORIGINAL SHEET - ANSI D



PHASE 2 AREA
SCALE: 1"=100'

0 100' 200'

PHASE 2 - TW A RECONSTRUCTION AT ECHO RAMP

DRAWING: G202

DURATION: 21 CONSECUTIVE CALENDAR DAYS - DAY WORK

WORK SCHEDULE: MONDAY - FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:

- TAXIWAY 'A' (ECHO RAMP INTERSECTION).
- TAXIWAY STUB 'A2'.

MAJOR WORK ITEMS:

CIVIL

- PAVEMENT REMOVAL.
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL AND SEED.

STORMWATER

- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL

- DEMOLITION OF EXISTING TAXIWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, DUCTBANK, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND JUNCTION CANS.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

AFFECTED CIRCUITS/NAVAIDS:

- TAXIWAY 'A'.
- TW 'A' SIGNAGE AND EDGE LIGHTS FROM THE SOUTH RAMP TO TW 'A2' SHALL BE INSTALLED PER E201 TEMPORARY LIGHTING PLAN.
- TAXIWAY 'A' SIGNAGE AND EDGE LIGHTS REMAIN OPERATIONAL FROM INTERSECTION WITH THE SOUTH RAMP TO RUNWAY 7-25.
- TW 'A2' SIGNAGE AND EDGE LIGHTS FROM THE ECHO RAMP TO RW 18-36 SHALL BE COVERED OR REMOVED FROM SERVICE.

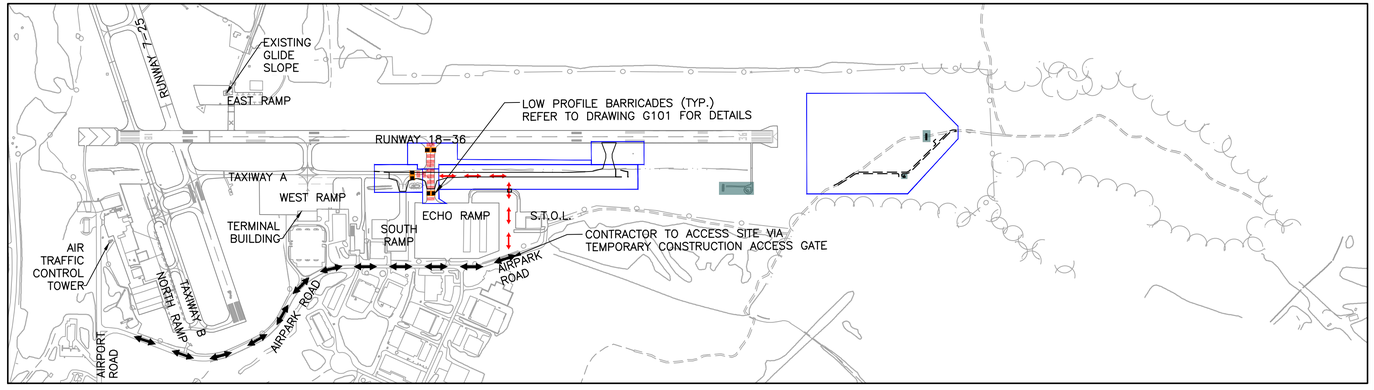
ADDITIONAL NOTES AND REQUIREMENTS

- RUNWAY 7-25 SHALL REMAIN OPEN.
- RUNWAY 18-36 SHALL REMAIN OPEN.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'

0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

PHASE 2 SIGN BLACKOUTS

SIGN NUMBER	SIGN LEGEND A	
2A	A2	→
3A	←	A2

NOTE:

REFER TO DRAWING E201 FOR TEMPORARY LIGHTING PLAN

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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
G202	7 of 80	0

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12/29/2023 1:54 PM By: McKay, Sean (Boston)

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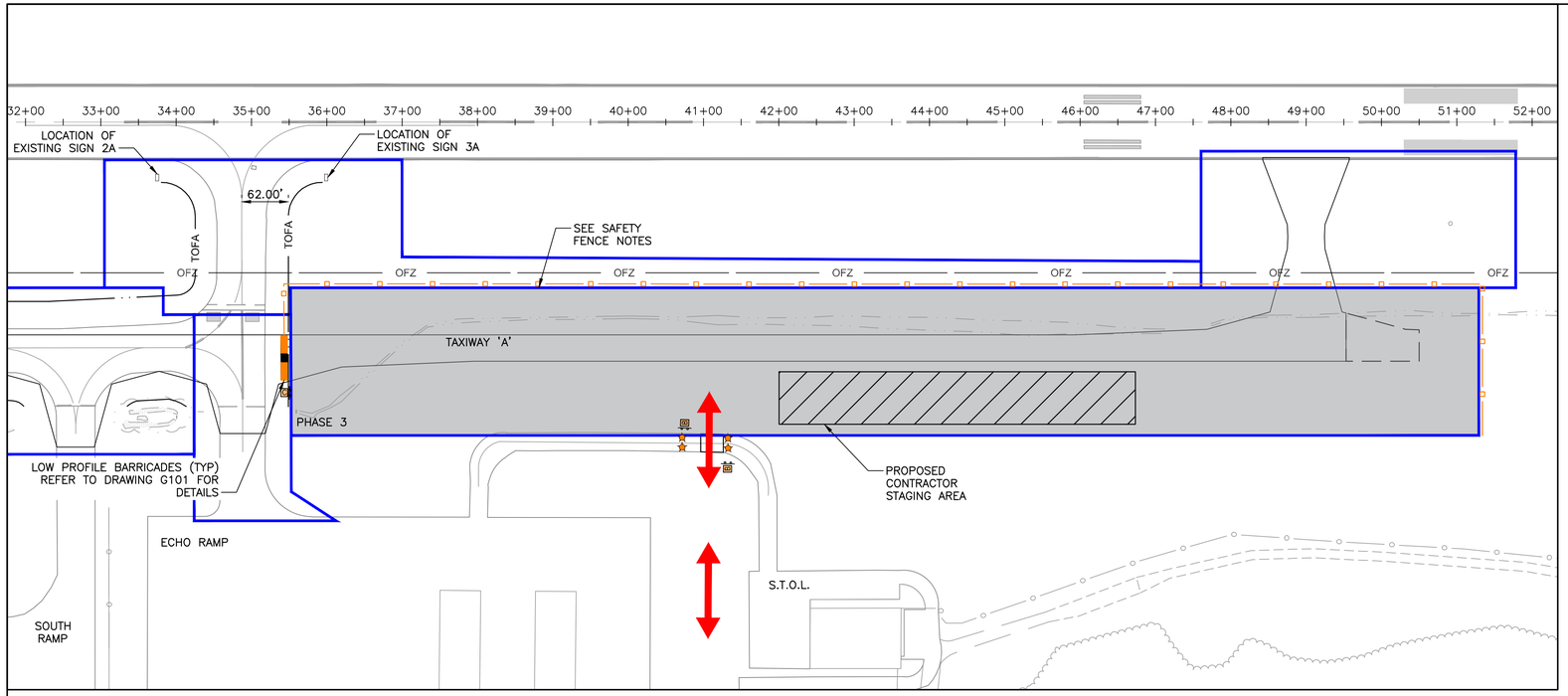


PHASE 3 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 3 - EXTENSION OF TW A BETWEEN EXISTING AND NEW TW STUB A2

DRAWING: G203
DURATION: 168 CONSECUTIVE CALENDAR DAYS - DAY WORK

WORK SCHEDULE: MONDAY - FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- NONE.

MAJOR WORK ITEMS:

CIVIL
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL AND SEED.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- MODIFICATION OF EXISTING RUNWAY 36 PAPI POWER FEED.
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND JUNCTION CANS.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

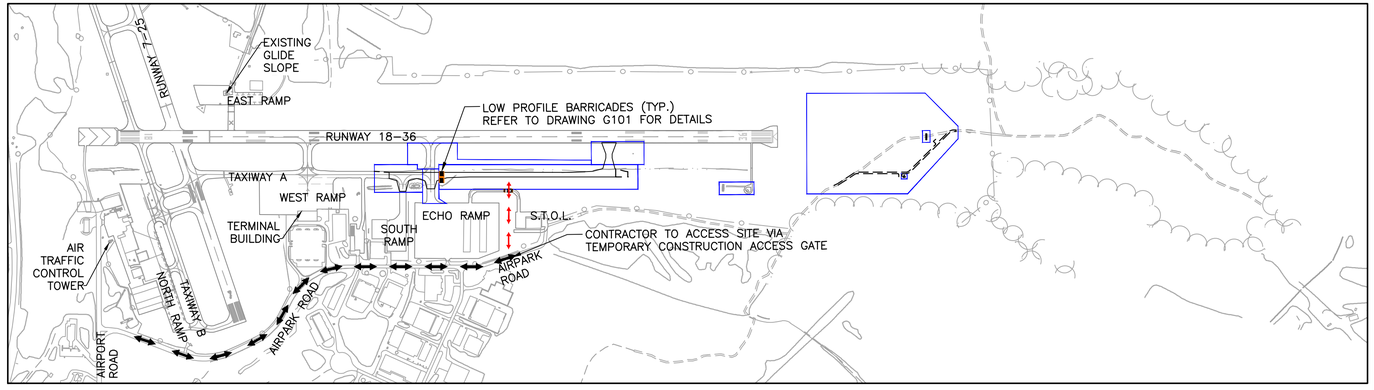
AFFECTED CIRCUITS/NAVAIDS:
- RW 18 LOCALIZER WILL BE SHUT DOWN FOR THE REMAINDER OF THE PROJECT.
- TW 'A' REMAINS OPERATIONAL BETWEEN RW 7-25 AND ECHO RAMP REFER TO E201 TEMPORARY LIGHTING PLAN.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7-25 SHALL REMAIN OPEN.
- RUNWAY 18-36 SHALL REMAIN OPEN.
- AIRPORT TO REQUIRE TENANT ON BLUE HANGAR TO PROVIDE A 30-MIN NOTICE TO CONTRACTOR FOR MOVEMENT. CONTRACTOR TO SWEEP THE TAXILANE AND REMOVE CHANNELIZER CONES ONCE TAXILANE IS CLEAR FOR AIRCRAFT USE. CONTRACTOR TO REPLACE CHANNELIZER CONES ONCE AIRCRAFT HAS CLEARED THE AREA.
- TAXIWAY 'A' BETWEEN THE SOUTH RAMP AND ECHO RAMP WILL OPERATE WITH A REDUCED TOFA OF 62' TO ACCOMMODATE ADG 1.
- SAFETY FENCE SHOWN FOR PHASE 3 IS NOT REQUIRED WHEN PHASE 3 IS CONCURRENT WITH PHASES 4 AND 5. SAFETY FENCE TO BE ERECTED WHEN PHASE 3 WORK IS CONCURRENT WITH ACTIVE RUNWAY 18-36 OPERATIONS.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

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Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 3

Project No.
179450522

Drawing No.	Sheet	Revision
G203	8 of 80	0

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12/29/2023 1:58 PM By: McKay, Sean (Boston)

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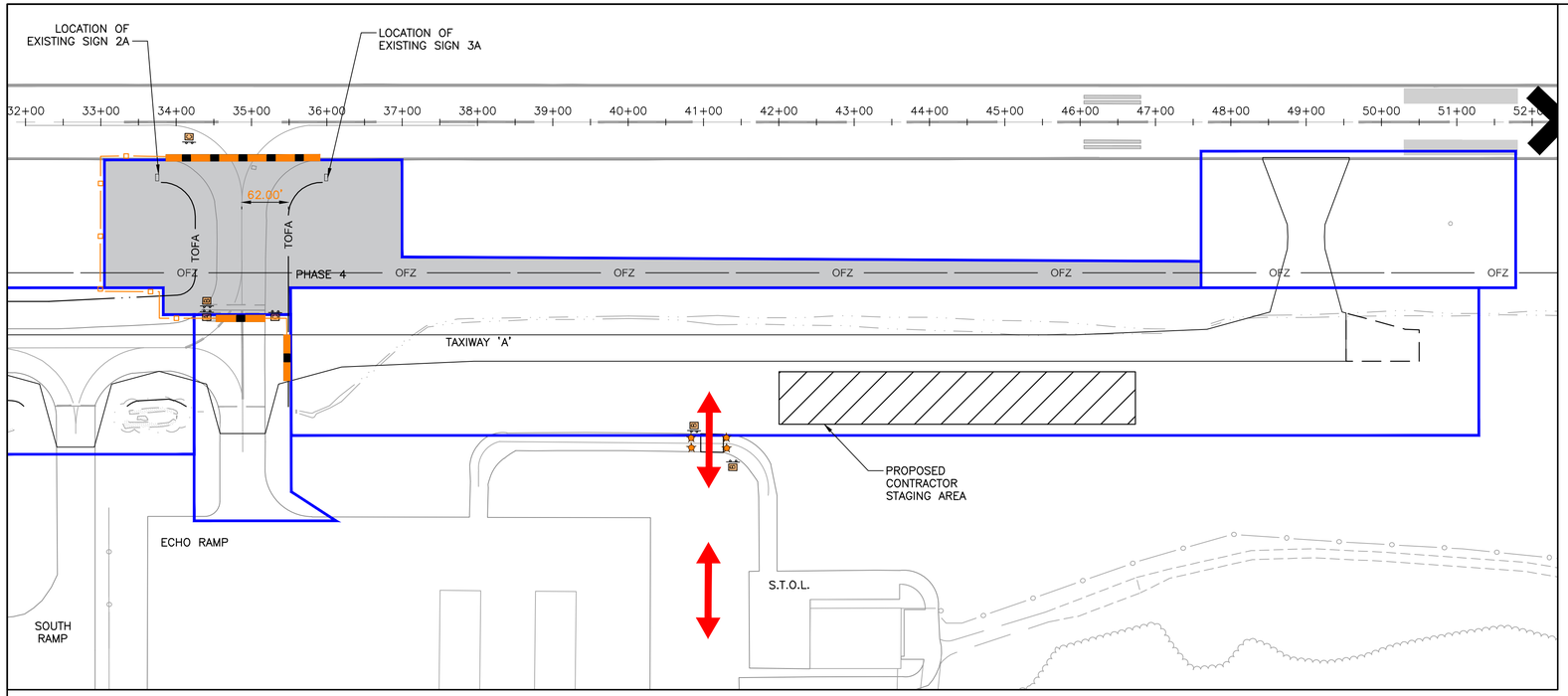


PHASE 4 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 4 - DEMOLITION OF EXISTING TW STUB A2 AND INSTALLATION OF DIVERSION SWALE BETWEEN EXISTING & NEW TW STUB A2

DRAWING: G204
DURATION: 21 CONSECUTIVE CALENDAR DAYS - DAY WORK

WORK SCHEDULE: MONDAY - FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18-36.
- TAXIWAY STUB 'A2'.

MAJOR WORK ITEMS:

CIVIL
- PAVEMENT REMOVAL.
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL AND SEED.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- DEMOLITION OF EXISTING RUNWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURE, LIGHT BASE, CONDUIT, CABLE, JUNCTION CANS, AIRFIELD SIGNAGE).
- DEMOLITION OF EXISTING TAXIWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, DUCTBANK, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW RUNWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURE, LIGHT BASE, CONDUIT, CABLE).

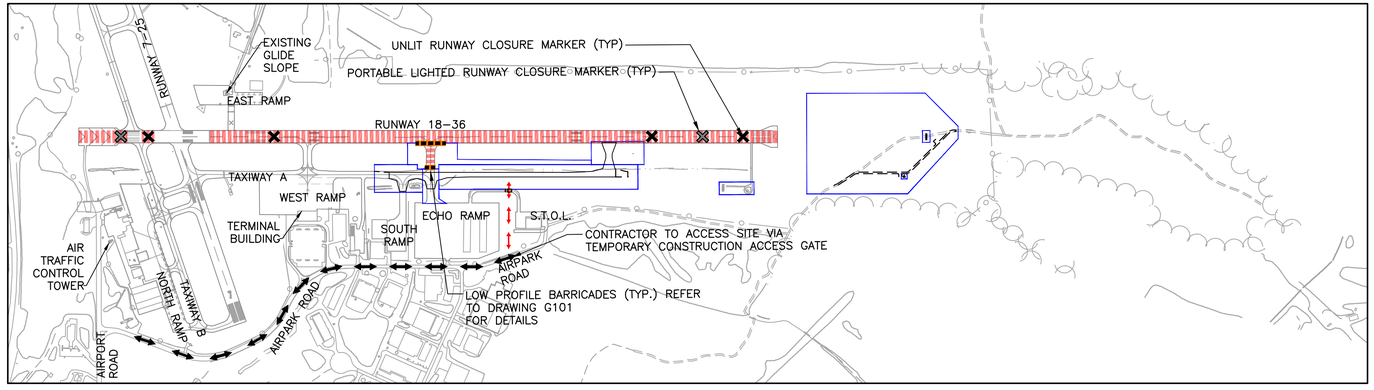
AFFECTED CIRCUITS/NAVAIDS:
- TW 'A2' SIGNAGE AND EDGE LIGHTS FROM THE ECHO RAMP TO RW 18-36 SHALL BE REMOVED FROM SERVICE.
- RW 18 LOCALIZER & GLIDE SLOPE NOT IN SERVICE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7-25 SHALL REMAIN OPEN.
- AIRPORT TO REQUIRE TENANT ON BLUE HANGAR TO PROVIDE A 30-MIN NOTICE TO CONTRACTOR FOR MOVEMENT. CONTRACTOR TO SWEEP THE TAXILANE AND REMOVE CHANNELIZER CONES ONCE TAXILANE IS CLEAR FOR AIRCRAFT USE. CONTRACTOR TO REPLACE CHANNELIZER CONES ONCE AIRCRAFT HAS CLEARED THE AREA.
- TAXIWAY 'A' BETWEEN THE SOUTH RAMP AND ECHO RAMP WILL OPERATE WITH A REDUCED TOFA OF 62' TO ACCOMMODATE ADG 1.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

PHASE 4 SIGN BLACKOUTS

SIGN NUMBER	SIGN LEGEND A	
2A	A2	→
3A	←	A2

NOTE:

REFER TO DRAWING E201 TEMPORARY LIGHTING PLAN

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Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 4

Project No.
179450522

Drawing No.	Sheet	Revision
G204	9 of 80	0

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12/29/2023 2:03 PM By: McKay, Sean (Boston)

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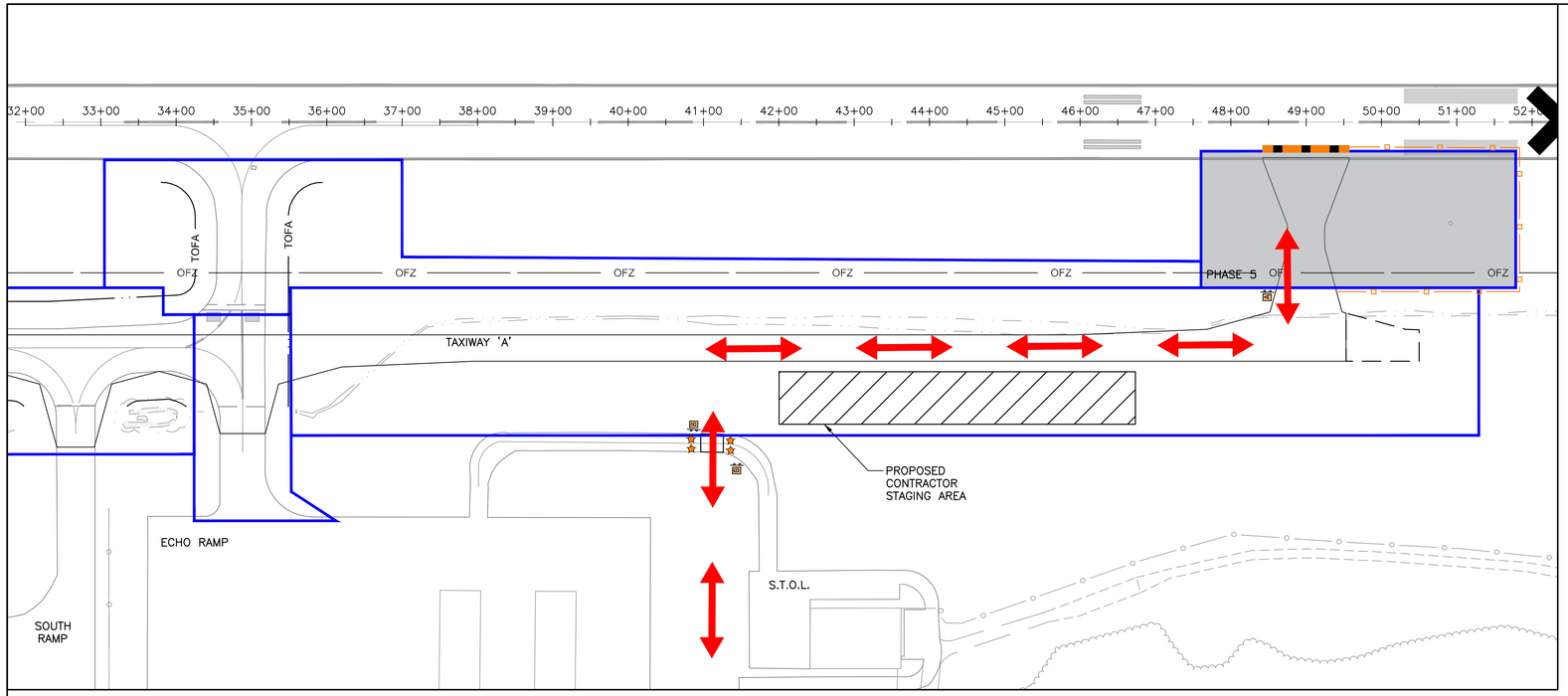


PHASE 5 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 5 - NEW TW STUB A2
DRAWING: G205
DURATION: 24 CONSECUTIVE CALENDAR DAYS - DAY WORK

WORK SCHEDULE: MONDAY - FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18-36.
- TAXIWAY STUB 'A1'.
- TAXIWAY STUB 'A2'.

MAJOR WORK ITEMS:

CIVIL
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL AND SEED.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- DEMOLITION OF EXISTING RUNWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURE, LIGHT BASE, CONDUIT, CABLE, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW RUNWAY EDGE LIGHTING SYSTEM (CONDUIT, CABLE).
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND HANDHOLES.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

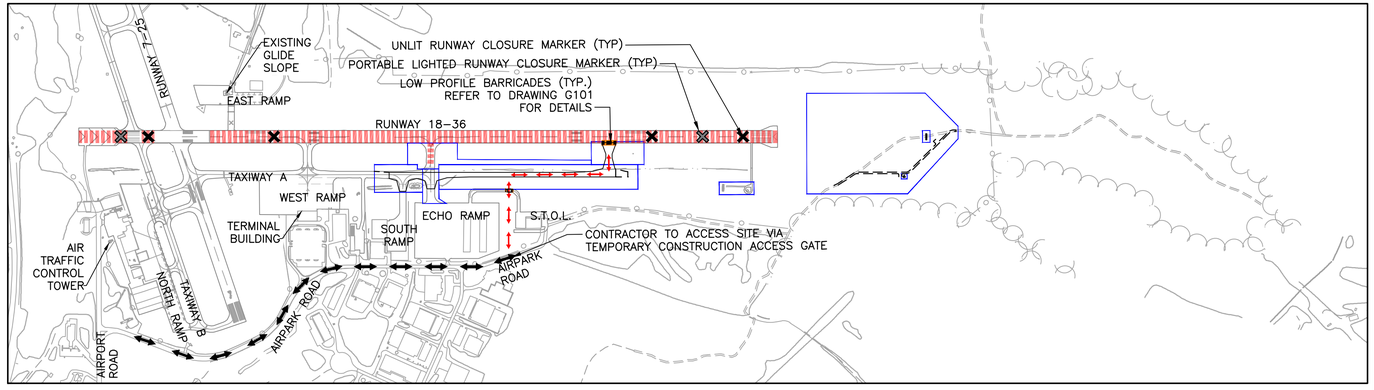
AFFECTED CIRCUITS/NAVAIDS:
- RW 18-36 LIGHTS & PAPIS.
- RW 18 LOCALIZER & GLIDE SLOPE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7-25 SHALL REMAIN OPEN.
- AIRPORT TO REQUIRE TENANT ON BLUE HANGAR TO PROVIDE A 30-MIN NOTICE TO CONTRACTOR FOR MOVEMENT. CONTRACTOR TO SWEEP THE TAXILANE AND REMOVE CHANNELIZER CONES ONCE TAXILANE IS CLEAR FOR AIRCRAFT USE. CONTRACTOR TO REPLACE CHANNELIZER CONES ONCE AIRCRAFT HAS CLEARED THE AREA.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 5

Project No.
179450522

Drawing No.	Sheet	Revision
G205	10 of 80	0

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12/29/2023 2:58 PM By: McKay, Sean (Boston)

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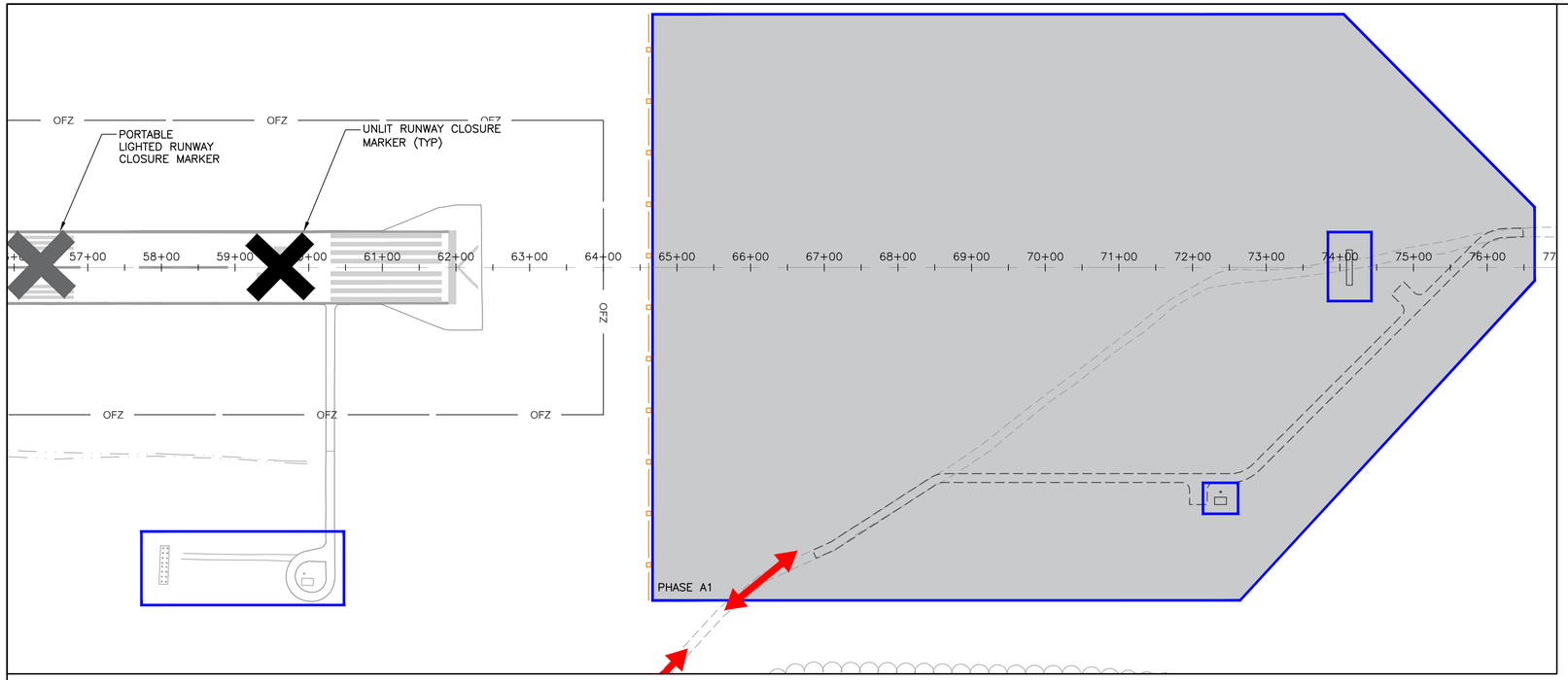


PHASE A1 AREA
SCALE: 1"=100'
0 100' 200'

ADD-ALTERNATE #1 - LOCALIZER CRITICAL AREA GRADING

DRAWING: G206
DURATION: 49 CONSECUTIVE CALENDAR DAYS - DAY WORK

WORK SCHEDULE: MONDAY - FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18-36.

MAJOR WORK ITEMS:

CIVIL
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- TOPSOIL AND SEED.

STORMWATER
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- NONE.

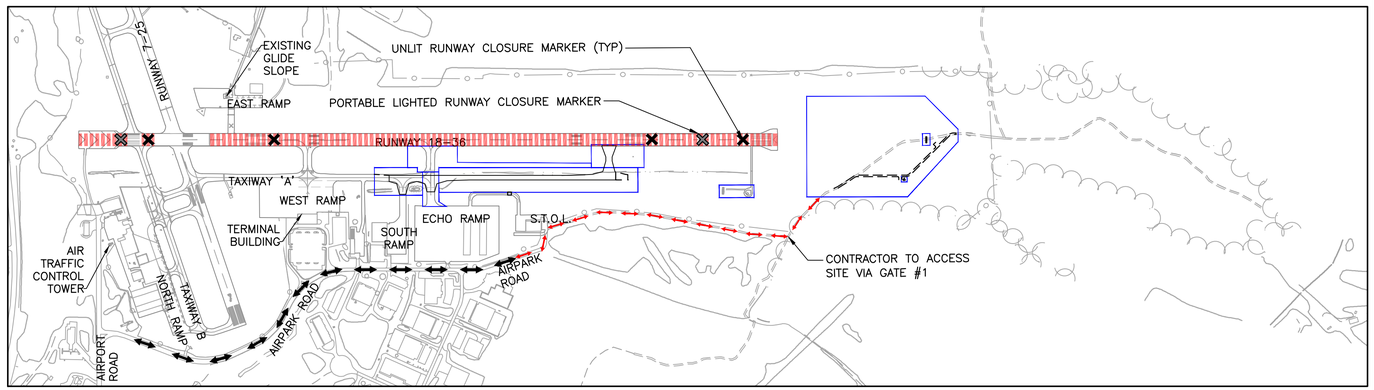
AFFECTED CIRCUITS/NAVAIDS:
- RW 18-36 LIGHTS & PAPIS.
- RW 18 LOCALIZER & GLIDE SLOPE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7-25 SHALL REMAIN OPEN.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	VEGETATION REMOVAL

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 6

Project No.
179450522

Drawing No.	Sheet	Revision
G206	11 of 80	0

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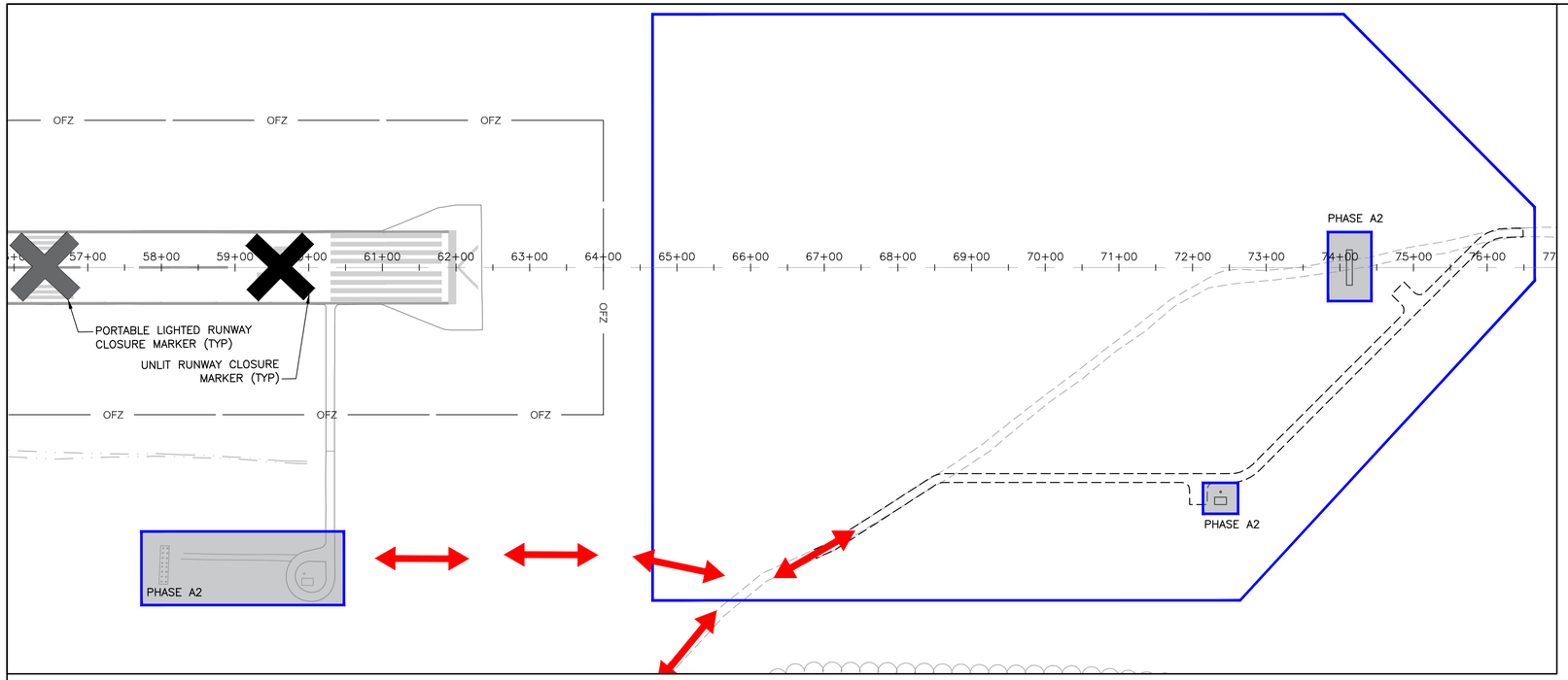


PHASE A2 AREAS
SCALE: 1"=100'
0 100' 200'

ADD-ALTERNATE #2 - EXISTING LOCALIZER DISMANTLING & RELOCATION PER VOLUME II DRAWINGS

DRAWING: G207

DURATION: 28 CONSECUTIVE CALENDAR DAYS - DAY WORK

WORK SCHEDULE: MONDAY - FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18-36.

MAJOR WORK ITEMS:

CIVIL
- INSTALLATION OF CONCRETE FOUNDATIONS FOR LOCALIZER ARRAY, LOCALIZER SHELTER BUILDING, AND DME AS SPECIFIED IN THE VOL II DRAWINGS.

STORMWATER
- NONE.

ELECTRICAL
- DISMANTLING OF EXISTING LOCALIZER ANTENNA ARRAY AND DME EQUIPMENT AS SPECIFIED IN THE VOL II DRAWINGS.
- REMOVAL OF EXISTING LOCALIZER SHELTER AS SPECIFIED IN THE VOL II DRAWINGS.
- INSTALLATION OF LOCALIZER ARRAY, DME AND NEW LOCALIZER SHELTER PRE-FABRICATED BUILDING, ALONG WITH ELECTRICAL REQUIRED AND SPECIFIED IN THE VOL II DRAWINGS.

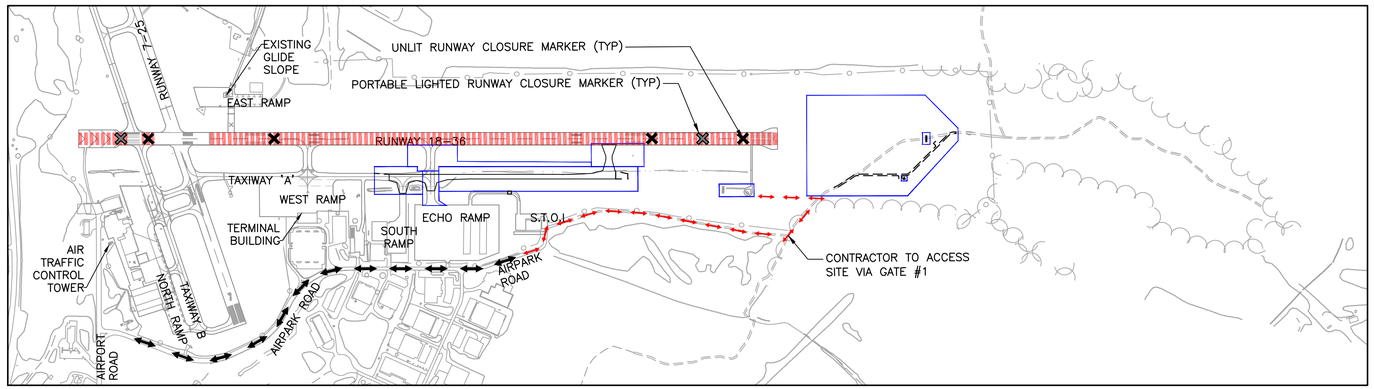
AFFECTED CIRCUITS/NAVAIDS:
- RW 18-36 LIGHTS & PAPIS.
- RW 18 LOCALIZER & GLIDE SLOPE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7-25 SHALL REMAIN OPEN.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

Stantec

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N

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR OEAAA SUBMISSION	DMZ	LAM	24.01.10

Issued

Dwn.	Chkd.	Dsgn.
ADK	LAM	ADK

Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 7

Project No.
179450522

Drawing No.	Sheet	Revision
G207	12 of 80	0

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12/29/2023 2:11 PM By: McKay, Sean (Boston)

ORIGINAL SHEET - ANSI D

APPENDIX B Project Contact List

SECTION INTENTIONALLY LEFT BLANK & WILL BE UPDATED ONCE CONTRACTOR IS ENGAGED

Lebanon Municipal Airport
Extend Taxiway 'A' & Relocate Localizer

DIV III -
TECHNICAL SPECIFICATIONS

Issued For Bid

Date

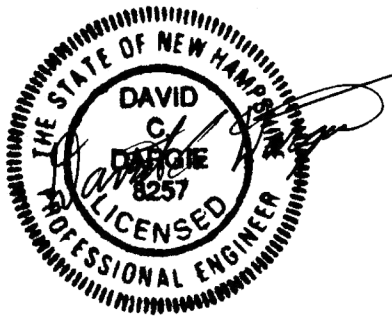
January 31, 2024

Prepared for:

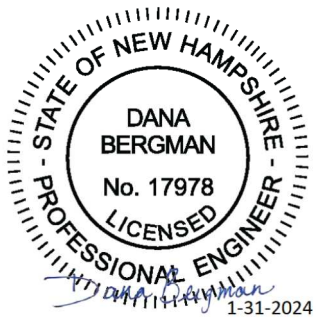
Lebanon Municipal Airport
5 Airpark Road
West Lebanon, NH 03784

Prepared by:
Stantec Consulting Services Inc.

Stantec



Engineer of Record for Civil and Drainage Content (C-, P-, F-, D-, and T- Specifications)



Engineer of Record for Electrical Content (L- Specifications)

DIVISION III
TECHNICAL SPECIFICATIONS

Item C-100 Contractor Quality Control Program (CQCP)

100-1 General. Quality is more than test results. Quality is the combination of proper materials, testing, workmanship, equipment, inspection, and documentation of the project. Establishing and maintaining a culture of quality is key to achieving a quality project. The Contractor shall establish, provide, and maintain an effective Contractor Quality Control Program (CQCP) that details the methods and procedures that will be taken to assure that all materials and completed construction required by this contract conform to contract plans, technical specifications and other requirements, whether manufactured by the Contractor, or procured from subcontractors or vendors. Although guidelines are established and certain minimum requirements are specified here and elsewhere in the contract technical specifications, the Contractor shall assume full responsibility for accomplishing the stated purpose.

The Contractor shall establish a CQCP that will:

a. Provide qualified personnel to develop and implement the CQCP.

b. Provide for the production of acceptable quality materials.

c. Provide sufficient information to assure that the specification requirements can be met.

d. Document the CQCP process.

The Contractor shall not begin any construction or production of materials to be incorporated into the completed work until the CQCP has been reviewed and approved by the Resident Project Representative (RPR). No partial payment will be made for materials subject to specific quality control (QC) requirements until the CQCP has been reviewed and approved.

The QC requirements contained in this section and elsewhere in the contract technical specifications are in addition to and separate from the quality assurance (QA) testing requirements. QA testing requirements are the responsibility of the RPR or Contractor as specified in the specifications.

The QA test results will be used to determine final acceptance of the Contractor's work. Therefore, once the Contractor has obtained satisfactory QC test results, they shall request that the RPR perform the QA testing. If the RPR's QA determines that the material fails to meet the requirements outlined in the specifications, the Contractor shall take the necessary steps to rework and retest the material at their own expense until a passing QA test result is achieved. A Quality Control (QC)/Quality Assurance (QA) workshop with the Engineer, Resident Project Representative (RPR), Contractor, subcontractors, testing laboratories, and Owner's representative must be held prior to start of construction. The QC/QA workshop will be facilitated by the Contractor. The Contractor shall coordinate with the Airport and the RPR on time and location of the QC/QA workshop. Items to be addressed, at a minimum, will include:

a. Review of the CQCP including submittals, QC Testing, Action & Suspension Limits for Production, Corrective Action Plans, Distribution of QC reports, and Control Charts.

b. Discussion of the QA program.

c. Discussion of the QC and QA Organization and authority including coordination and information exchange between QC and QA.

d. Establish regular meetings to discuss control of materials, methods and testing.

e. Establishment of the overall QC culture.

100-2 Description of program.

a. General description. The Contractor shall establish a CQCP to perform QC inspection and testing of all items of work required by the technical specifications, including those performed by subcontractors. The CQCP shall ensure conformance to applicable specifications and plans with respect to materials, off-site fabrication, workmanship, construction, finish, and functional performance. The CQCP shall be effective for control of all construction work performed under this Contract and shall specifically include surveillance and tests required by the technical specifications, in addition to other requirements of this section and any other activities deemed necessary by the Contractor to establish an effective level of QC.

b. Contractor Quality Control Program (CQCP). The Contractor shall describe the CQCP in a written document that shall be reviewed and approved by the RPR prior to the start of any production, construction, or off-site fabrication. The written CQCP shall be submitted to the RPR for review and approval at least 10 calendar days before the CQCP Workshop. The Contractor's CQCP and QC testing laboratory must be approved in writing by the RPR prior to the Notice to Proceed (NTP).

The CQCP shall be organized to address, as a minimum, the following:

1. QC organization and resumes of key staff
2. Project progress schedule
3. Submittals schedule
4. Inspection requirements
5. QC testing plan
6. Documentation of QC activities and distribution of QC reports
7. Requirements for corrective action when QC and/or QA acceptance criteria are not met
8. Material quality and construction means and methods. Address all elements applicable to the project that affect the quality of the pavement structure including subgrade, subbase, base, and surface course. Some elements that must be addressed include, but is not limited to mix design, aggregate grading, stockpile management, mixing and transporting, placing and finishing, quality control testing and inspection, smoothness, laydown plan, equipment, and temperature management plan.

The Contractor must add any additional elements to the CQCP that is necessary to adequately control all production and/or construction processes required by this contract.

100-3 CQCP organization. The CQCP shall be implemented by the establishment of a QC organization. An organizational chart shall be developed to show all QC personnel, their authority, and how these personnel integrate with other management/production and construction functions and personnel.

The organizational chart shall identify all QC staff by name and function, and shall indicate the total staff required to implement all elements of the CQCP, including inspection and testing for each item of work. If necessary, different technicians can be used for specific inspection and testing functions for different items of work. If an outside organization or independent testing laboratory is used for implementation of all or part of the CQCP, the personnel assigned shall be subject to the qualification requirements of paragraphs 100-03a and 100-03b. The organizational chart shall indicate which personnel are Contractor employees and which are provided by an outside organization.

The QC organization shall, as a minimum, consist of the following personnel:

a. Program Administrator. The Contractor Quality Control Program Administrator (CQCPA) must be a full-time employee of the Contractor, or a consultant engaged by the Contractor. The CQCPA must have a minimum of five (5) years of experience in QC pavement construction with prior QC experience on a project of comparable size and scope as the contract.

Included in the five (5) years of paving/QC experience, the CQCPA must meet at least one of the following requirements:

(1) Professional Engineer with one (1) year of airport paving experience.

(2) Engineer-in-training with two (2) years of airport paving experience.

(3) National Institute for Certification in Engineering Technologies (NICET) Civil Engineering Technology Level IV with three (3) years of airport paving experience.

(4) An individual with four (4) years of airport paving experience, with a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology or Construction.

The CQCPA must have full authority to institute any and all actions necessary for the successful implementation of the CQCP to ensure compliance with the contract plans and technical specifications. The CQCPA authority must include the ability to immediately stop production until materials and/or processes are in compliance with contract specifications. The CQCPA must report directly to a principal officer of the construction firm. The CQCPA may supervise the Quality Control Program on more than one project provided that person can be at the job site within two (2) hours after being notified of a problem.

b. QC technicians. A sufficient number of QC technicians necessary to adequately implement the CQCP must be provided. These personnel must be either Engineers, engineering technicians, or experienced craftsman with qualifications in the appropriate field equivalent to NICET Level II in Civil Engineering Technology or higher, and shall have a minimum of two (2) years of experience in their area of expertise.

The QC technicians must report directly to the CQCPA and shall perform the following functions:

(1) Inspection of all materials, construction, plant, and equipment for conformance to the technical specifications, and as required by paragraph 100-6.

(2) Performance of all QC tests as required by the technical specifications and paragraph100-8.

(3) Performance of tests for the RPR when required by the technical specifications.

Certification at an equivalent level of qualification and experience by a state or nationally recognized organization will be acceptable in lieu of NICET certification.

c. Staffing levels. The Contractor shall provide sufficient qualified QC personnel to monitor each work activity at all times. Where material is being produced in a plant for incorporation into the work, separate plant and field technicians shall be provided at each plant and field placement location. The scheduling and coordinating of all inspection and testing must match the type and pace of work activity. The CQCP shall state where different technicians will be required for different work elements.

100-4 Project progress schedule. Critical QC activities must be shown on the project schedule as required by Section 80, paragraph 80-03, *Execution and Progress*.

100-5 Submittals schedule. The Contractor shall submit a detailed listing of all submittals (for example, mix designs, material certifications) and shop drawings required by the technical specifications. The listing can be developed in a spreadsheet format and shall include as a minimum:

a. Specification item number

b. Item description

c. Description of submittal

d. Specification paragraph requiring submittal

e. Scheduled date of submittal

100-6 Inspection requirements. QC inspection functions shall be organized to provide inspections for all definable features of work, as detailed below. All inspections shall be documented by the Contractor as specified by paragraph 100-9.

Inspections shall be performed as needed to ensure continuing compliance with contract requirements until completion of the particular feature of work. Inspections shall include the following minimum requirements:

a. During plant operation for material production, QC test results and periodic inspections shall be used to ensure the quality of aggregates and other mix components, and to adjust and control mix proportioning to meet the approved mix design and other requirements of the technical specifications. All equipment used in proportioning and mixing shall be inspected to ensure its proper operating condition. The CQCP shall detail how these and other QC functions will be accomplished and used.

b. During field operations, QC test results and periodic inspections shall be used to ensure the quality of all materials and workmanship. All equipment used in placing, finishing, and compacting shall be inspected to ensure its proper operating condition and to ensure that all such operations are in conformance to the technical specifications and are within the plan dimensions, lines, grades, and tolerances specified. The CQCP shall document how these and other QC functions will be accomplished and used.

100-7 Contractor QC testing facility.

a. For projects that include Item P-401, Item P-403, and Item P-404, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM D3666, *Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials*:

- 8.1.3 Equipment Calibration and Checks;
- 8.1.9 Equipment Calibration, Standardization, and Check Records;
- 8.1.12 Test Methods and Procedures

b. For projects that include P-501, the Contractor shall ensure facilities, including all necessary equipment, materials, and current reference standards, are provided that meet requirements in the following paragraphs of ASTM C1077, Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation:

- 7 Test Methods and Procedures
- 8 Facilities, Equipment, and Supplemental Procedures

100-8 QC testing plan. As a part of the overall CQCP, the Contractor shall implement a QC testing plan, as required by the technical specifications. The testing plan shall include the minimum tests and test frequencies required by each technical specification Item, as well as any additional QC tests that the Contractor deems necessary to adequately control production and/or construction processes.

The QC testing plan can be developed in a spreadsheet fashion and shall, as a minimum, include the following:

a. Specification item number (e.g., P-401)

b. Item description (e.g., Hot Mix Asphalt Pavements)

c. Test type (e.g., gradation, grade, asphalt content)

d. Test standard (e.g., ASTM or American Association of State Highway and Transportation Officials (AASHTO) test number, as applicable)

e. Test frequency (e.g., as required by technical specifications or minimum frequency when requirements are not stated)

f. Responsibility (e.g., plant technician)

g. Control requirements (e.g., target, permissible deviations)

The QC testing plan shall contain a statistically-based procedure of random sampling for acquiring test samples in accordance with ASTM D3665. The RPR shall be provided the opportunity to witness QC sampling and testing.

All QC test results shall be documented by the Contractor as required by paragraph 100-9.

100-9 Documentation. The Contractor shall maintain current QC records of all inspections and tests performed. These records shall include factual evidence that the required QC inspections or tests have been performed, including type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, etc.; proposed remedial action; and corrective actions taken.

These records must cover both conforming and defective or deficient features, and must include a statement that all supplies and materials incorporated in the work are in full compliance with the terms of the contract. Legible copies of these records shall be furnished to the RPR daily. The records shall cover all work placed subsequent to the previously furnished records and shall be verified and signed by the CQCPA.

Contractor QC records required for the contract shall include, but are not necessarily limited to, the following records:

a. Daily inspection reports. Each Contractor QC technician shall maintain a daily log of all inspections performed for both Contractor and subcontractor operations. These technician's daily reports shall provide factual evidence that continuous QC inspections have been performed and shall, as a minimum, include the following:

(1) Technical specification item number and description

(2) Compliance with approved submittals

(3) Proper storage of materials and equipment

(4) Proper operation of all equipment

(5) Adherence to plans and technical specifications

(6) Summary of any necessary corrective actions

(7) Safety inspection.

The daily inspection reports shall identify all QC inspections and QC tests conducted, results of inspections, location and nature of defects found, causes for rejection, and remedial or corrective actions taken or proposed.

The daily inspection reports shall be signed by the responsible QC technician and the CQCPA. The RPR shall be provided at least one copy of each daily inspection report on the work day following the day of record. When QC inspection and test results are recorded and transmitted electronically, the results must be archived.

b. Daily test reports. The Contractor shall be responsible for establishing a system that will record all QC test results. Daily test reports shall document the following information:

(1) Technical specification item number and description
(2) Test designation
(3) Location
(4) Date of test
(5) Control requirements
(6) Test results
(7) Causes for rejection
(8) Recommended remedial actions
(9) Retests

Test results from each day's work period shall be submitted to the RPR prior to the start of the next day's work period. When required by the technical specifications, the Contractor shall maintain statistical QC charts. When QC daily test results are recorded and transmitted electronically, the results must be archived.

100-10 Corrective action requirements. The CQCP shall indicate the appropriate action to be taken when a process is deemed, or believed, to be out of control (out of tolerance) and detail what action will be taken to bring the process into control. The requirements for corrective action shall include both general requirements for operation of the CQCP as a whole, and for individual items of work contained in the technical specifications.

The CQCP shall detail how the results of QC inspections and tests will be used for determining the need for corrective action and shall contain clear rules to gauge when a process is out of control and the type of correction to be taken to regain process control.

When applicable or required by the technical specifications, the Contractor shall establish and use statistical QC charts for individual QC tests. The requirements for corrective action shall be linked to the control charts.

100-11 Inspection and/or observations by the RPR. All items of material and equipment are subject to inspection and/or observation by the RPR at the point of production, manufacture or shipment to determine if the Contractor, producer, manufacturer or shipper maintains an adequate QC system in conformance with the requirements detailed here and the applicable technical specifications and plans. In addition, all items of materials, equipment and work in place shall be subject to inspection and/or observation by the RPR at the site for the same purpose.

Inspection and/or observations by the RPR does not relieve the Contractor of performing QC inspections of either on-site or off-site Contractor's or subcontractor's work.

100-12 Noncompliance.

a. The Resident Project Representative (RPR) will provide written notice to the Contractor of any noncompliance with their CQCP. After receipt of such notice, the Contractor must take corrective action.

b. When QC activities do not comply with either the CQCP or the contract provisions or when the Contractor fails to properly operate and maintain an effective CQCP, and no effective corrective actions have been taken after notification of non-compliance, the RPR will recommend the Owner take the following actions:

(1) Order the Contractor to replace ineffective or unqualified QC personnel or subcontractors and/or

(2) Order the Contractor to stop operations until appropriate corrective actions are taken.

METHOD OF MEASUREMENT

100-13 Basis of measurement and payment. Contractor Quality Control Program (CQCP) is for the personnel, tests, facilities and documentation required to implement the CQCP. The CQCP will be paid as a lump sum with the following schedule of partial payments:

a. With first pay request, 25% with approval of CQCP and completion of the Quality Control (QC)/Quality Assurance (QA) workshop.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 20%.

d. When 75% or more of the original contract is earned, an additional 20%

e. After final inspection and acceptance of project, the final 10%.

BASIS OF PAYMENT

100-14 Payment will be made under:

Item C-100.01 Contractor Quality Control Program (CQCP) - per lump sum

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

National Institute for Certification in Engineering Technologies (NICET)

ASTM International (ASTM)

ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

END OF ITEM C-100

Item C-102 Temporary Air and Water Pollution, Soil Erosion, and Siltation Control

DESCRIPTION

102-1. This item shall consist of temporary control measures as shown on the plans or as ordered by the Resident Project Representative (RPR) during the life of a contract to control pollution of air and water, soil erosion, and siltation through the use of silt fences, berms, dikes, dams, sediment basins, fiber mats, gravel, mulches, grasses, slope drains, and other erosion control devices or methods.

Temporary erosion control shall be in accordance with the approved erosion control plan; the approved Construction Safety and Phasing Plan (CSPP) and AC 150/5370-2, *Operational Safety on Airports During Construction*. The temporary erosion control measures contained herein shall be coordinated with the permanent erosion control measures specified as part of this contract to the extent practical to assure economical, effective, and continuous erosion control throughout the construction period.

Temporary control may include work outside the construction limits such as borrow pit operations, equipment and material storage sites, waste areas, and temporary plant sites.

Temporary control measures shall be designed, installed and maintained to minimize the creation of wildlife attractants that have the potential to attract hazardous wildlife on or near public-use airports.

MATERIALS

102-2.1 Grass. Grass that will not compete with the grasses sown later for permanent cover per Item T-901.shall be a quick-growing species (such as ryegrass, Italian ryegrass, or cereal grasses) suitable to the area providing a temporary cover. Selected grass species shall not create a wildlife attractant.

102-2.2 Mulches. Mulches may be straw, cellulose fiber, or manufactured mulch, or other suitable material reasonably clean and free of noxious weeds and deleterious materials per Item T-908. Mulches shall not create a wildlife attractant.

102-2.3 Fertilizer. Fertilizer shall be a standard commercial grade and shall conform to all federal and state regulations and to the standards of the Association of Official Agricultural Chemists.

102-2.4 Slope drains. Slope drains may be constructed of pipe, fiber mats, rubble, concrete, asphalt, or other materials that will adequately control erosion.

102-2.5 Silt fence. Silt fence shall consist of polymeric filaments which are formed into a stable network such that filaments retain their relative positions. Synthetic filter fabric shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life. Silt fence shall meet the requirements of ASTM D6461.

102-2.6 Straw Bales. The straw bales are to be composed of straw or other suitable material reasonably clean and free of noxious weeds and deleterious materials. Straw bales shall have a minimum weight of 40 pounds. Wood stakes shall have a minimum size of 1 inch by 1 inch and a minimum length of 4 feet.

102-2.7 Erosion Control Blanket. Erosion control blanket shall be composed of a straw fiber matrix sewn between two photo-degradable nets.

102-2.8 Silt Sack. Silt sack for drain inlet protection shall be manufactured from a specially designed woven polypropylene geotextile and have lifting straps as an integral part of the system. Silt sack shall be manufactured to fit the opening of the catch basin or drop inlet. Silt sack shall have overflows.

102-2.9 Crushed Stone. Crushed stone for construction access and stone check dams shall be clean, crushed, and angular meeting AASHTO-M-43, No. 1.

102-2.9 Other. All other materials shall meet commercial grade standards and shall be approved by the RPR before being incorporated into the project.

CONSTRUCTION REQUIREMENTS

102-3.1 General. In the event of conflict between these requirements and pollution control laws, rules, or regulations of other federal, state, or local agencies, the more restrictive laws, rules, or regulations shall apply.

The RPR shall be responsible for assuring compliance to the extent that construction practices, construction operations, and construction work are involved.

102-3.2 Schedule. Prior to the start of construction, the Contractor shall submit schedules in accordance with the approved Construction Safety and Phasing Plan (CSPP) and the plans for accomplishment of temporary and permanent erosion control work for clearing and grubbing; grading; construction; paving; and structures at watercourses. The Contractor shall also submit a proposed method of erosion and dust control on haul roads and borrow pits and a plan for disposal of waste materials. Work shall not be started until the erosion control schedules and methods of operation for the applicable construction have been accepted by the RPR.

102-3.3 Construction details. The Contractor will be required to incorporate all permanent erosion control features into the project at the earliest practicable time as outlined in the plans and approved CSPP. Except where future construction operations will damage slopes, the Contractor shall perform the permanent seeding and mulching and other specified slope protection work in stages, as soon as substantial areas of exposed slopes can be made available. Temporary erosion and pollution control measures will be used to correct conditions that develop during construction that were not foreseen during the design stage; that are needed prior to installation of permanent control features; or that are needed temporarily to control erosion that develops during normal construction practices, but are not associated with permanent control features on the project.

Where erosion may be a problem, schedule and perform clearing and grubbing operations so that grading operations and permanent erosion control features can follow immediately if project conditions permit. Temporary erosion control measures are required if permanent measures cannot immediately follow grading operations. The RPR shall limit the area of clearing and grubbing, excavation, borrow, and embankment operations in progress, commensurate with the Contractor’s capability and progress in keeping the finish grading, mulching, seeding, and other such permanent control measures current with the accepted schedule. If seasonal limitations make such coordination unrealistic, temporary erosion control measures shall be taken immediately to the extent feasible and justified as directed by the RPR.

The Contractor shall provide immediate permanent or temporary pollution control measures to minimize contamination of adjacent streams or other watercourses, lakes, ponds, or other areas of water impoundment as directed by the RPR. If temporary erosion and pollution control measures are required due to the Contractor’s negligence, carelessness, or failure to install permanent controls as a part of the work as scheduled or directed by the RPR, the work shall be performed by the Contractor and the cost shall be incidental to this item.

The RPR may increase or decrease the area of erodible earth material that can be exposed at any time based on an analysis of project conditions.

The erosion control features installed by the Contractor shall be maintained by the Contractor during the construction period.

Provide temporary structures whenever construction equipment must cross watercourses at frequent intervals. Pollutants such as fuels, lubricants, bitumen, raw sewage, wash water from concrete mixing operations, and other harmful materials shall not be discharged into any waterways, impoundments or into natural or manmade channels.

102-3.4 Installation, maintenance and removal of silt fence. Silt fences shall extend a minimum of 16 inches (41 cm) and a maximum of 34 inches (86 cm) above the ground surface. Posts shall be set no more than 10 feet (3 m) on center. Filter fabric shall be cut from a continuous roll to the length required minimizing joints where possible. When joints are necessary, the fabric shall be spliced at a support post with a minimum 12-inch (300-mm) overlap and securely sealed. A trench shall be excavated approximately 4 inches (100 mm) deep by 4 inches (100 mm) wide on the upslope side of the silt fence. The trench shall be backfilled and the soil compacted over the silt fence fabric. The Contractor shall remove and dispose of silt that accumulates during construction and prior to establishment of permanent erosion control. The fence shall be maintained in good working condition until permanent erosion control is established. Silt fence shall be removed upon approval of the RPR.

102-3.5 Installation, maintenance, and removal of temporary stabilized construction exits/construction access roads. Construction exits/access roads shall be installed at the locations and according to the details shown on the plans or as directed by the RPR. The Contractor shall remove any debris from the construction access roads throughout the life of the project as directed by the RPR. At the conclusion of the project, the Contractor must completely remove the construction access roads from the project site and restore the area to the original condition as directed by the RPR.

102-3.6 Installation and maintenance of erosion control blanket. Erosion control blanket shall be installed as indicated on plans and details or as directed by the RPR. The erosion control blanket shall be maintained and kept securely fastened until a good stand of grass of uniform color and density is established to the satisfaction of the RPR. A grass stand shall be considered adequate when bare spots are one square foot or less, randomly dispersed, and do not exceed 3% of the area seeded.

102-3.7 Installation and maintenance of temporary sediment traps. Temporary sediment traps shall be constructed at locations directed by the RPR in areas of concentrated flow to collect sediment laden runoff from upstream areas that are disturbed and not yet stabilized. The sediment traps shall be constructed by constructing shallow excavations and/or downstream earthen berms to temporarily detain runoff and allow for settling of the sediment to the bottom of the trap. Sediment traps shall be sized as needed to provide a minimum of 3,600 cubic yards of storage per acre of upstream disturbed and unstabilized area. No more than three acres of disturbed and unstabilized area shall be allowed to drain to a single sediment trap. Sediment traps shall be constructed according to the details shown on the plans, and include a stone outlet apron that drains to a stable non-erodible area. Accumulated sediment shall be removed once storage volume is reduced by 50%, and the removed material shall be incorporated into areas of the work that have not yet undergone final grading or topsoiling. Once the upstream disturbed area has been fully stabilized, remove the sediment trap by backfilling all excavations to raise to finished grade and remove temporary stone aprons.

METHOD OF MEASUREMENT

102-4.1 Temporary erosion and pollution control work required will be performed as scheduled or directed by the RPR. Completed and accepted work will be measured as follows:

a. Installation and Removal of Sediment Barrier will be measured by the linear foot.
b. Installation and Removal of Straw Bales will be measured by the linear foot.
c. Installation of Erosion Control Blanket will be measured by the square yard.
d. Installation and Removal of Drain inlet protection will be measured by each.
e. Installation and Removal of Temporary Stabilized Construction Exits will be measured by each for each 24’ wide by 50’ long stabilized construction exit installed in accordance with the plans and details.
f. Temporary seeding and mulching will be measured by the square yard
g. Installation and Removal of Temporary Construction Access Roads will be incidental and installed in accordance with the plans and details.
h. Installation of Stone Check Dams will be measured by each.
i. Installation and Removal of Temporary Sediment Traps will be measured by each as a complete unit, at the various storage sizes provided.

102-4.2 Control work performed for protection of construction areas outside the construction limits, such as borrow and waste areas, haul roads, equipment and material storage sites, and temporary plant sites, will not be measured and paid for directly but shall be considered as a subsidiary obligation of the Contractor.

BASIS OF PAYMENT

102-5.1 Accepted quantities of temporary water pollution, soil erosion, and siltation control work ordered by the RPR and measured as provided in paragraph 102-4.1 will be paid for under:

Item C-102.01	Installation and Removal of Sediment Barrier - per linear foot
Item C-102.02	Installation and Removal of Straw Bales – per linear foot
Item C-102.03	Installation of Erosion Control Blanket – per square yard
Item C-102.04	Installation and Removal of Drain Inlet Protection - per each
Item C-102.05	Installation and Removal of Temporary Stabilized Construction Exits - per each
Item C-102.06	Temporary Seeding and Mulching – per 1,000 square feet (MSF)
Item C-102.07	Installation of Stone Check Dams – per each
Item C-102.08	Installation and Removal of Temporary Sediment Trap (≤3,600 CF Storage) – per each
Item C-102.09	Installation and Removal of Temporary Sediment Trap (>3,600 CF Storage) – per each

Where other directed work falls within the specifications for a work item that has a contract price, the units of work shall be measured and paid for at the contract unit price bid for the various items.

Temporary control features not covered by contract items that are ordered by the RPR will be paid for in accordance with Section 90, paragraph 90-05 *Payment for Extra Work*.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5200-33 *Hazardous Wildlife Attractants on or Near Airports*

AC 150/5370-2 *Operational Safety on Airports During Construction*

ASTM International (ASTM)

ASTM D6461 *Standard Specification for Silt Fence Materials*

United States Department of Agriculture (USDA)

FAA/USDA Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM C-102

Item C-105 Mobilization

105-1 Description. This item of work shall consist of, but is not limited to, work and operations necessary for the movement of personnel, equipment, material and supplies to and from the project site for work on the project except as provided in the contract as separate pay items.

105-2 Mobilization limit. Mobilization shall be limited to 10 percent of the total project cost.

105-3 Posted notices. Prior to commencement of construction activities, the Contractor must post the following documents in a prominent and accessible place where they may be easily viewed by all employees of the prime Contractor and by all employees of subcontractors engaged by the prime Contractor: Equal Employment Opportunity (EEO) Poster "Equal Employment Opportunity is the Law" in accordance with the Office of Federal Contract Compliance Programs Executive Order 11246, as amended; Davis Bacon Wage Poster (WH 1321) - DOL "Notice to All Employees" Poster; and Applicable Davis-Bacon Wage Rate Determination. These notices must remain posted until final acceptance of the work by the Owner.

105-4 Resident Project Representative (RPR) field office. The Contractor shall provide dedicated space for the use of the field RPR and inspectors, as a field office for the duration of the project. This space shall be located conveniently near the construction and shall be separate from any space used by the Contractor. The Contractor shall furnish water, sanitary facilities, heat, air conditioning, and electricity in accordance with local building codes.

A mobile field office trailer is acceptable if it contains the required facilities described herein:

Size:	Equivalent 10' x 30'
Windows:	Two arranged for cross ventilation with screens
Door:	With closer and secure lock
Lighting:	Adequate lights over all work areas, convenience outlets each wall
Heating:	Adequate heating system, thermostat control
Plumbing:	Toilet or privy or outside porta potty maintained by the Contractor
Internet Access:	Required to be provided as a wireless data connection device and monthly plan compatible with the engineer's laptop computer for the duration of the project.
Sign:	14" x 36" waterproof sign erected outside office, white background, black letter, lettering to read:

STANTEC
BOSTON, MASSACHUSETTS

The following office furniture and equipment shall be furnished:

1 - Flat top desk, 2 1/2 x 4 1/2 feet, with drawers at each end
2 - Plywood drawing tables, 3 feet x 6 feet top
8 - Chairs. (1) chair shall be a padded office chair
1 - 4-drawer steel filing cabinet with lock and key
2 - Large metal wastebaskets

1 - Rack from which to hang drawings, including related appurtenances
1 - Wall mounted fire extinguisher
1 - Desk lamp
2 - Drafting table lamp
1 – Broom and dust pan
1 - Bottled water cooler
1 - Air conditioning unit
1 - Copying machine
1 - Microwave oven
1 - Small refrigerator

Sufficient floor sweeping compound, window cleaning materials, toilet paper, paper towels and all consumables related to operating the field office trailer for the duration of the job. The office site shall have parking space for three vehicles and the parking area shall have a gravel or stone surface, properly maintained by the Contractor. On completion of the project, the field office and all related improvements shall be removed from the site, and the gravel parking area shall be restored to original conditions by the Contractor. The Contractor shall make all provisions for hook-ups and disconnections for electrical, high speed Internet access, plumbing, and water.

METHOD OF MEASUREMENT

105-5 Basis of measurement and payment. Based upon the contract lump sum price for "Mobilization" partial payments will be allowed as follows:

a. With first pay request, 25%.

b. When 25% or more of the original contract is earned, an additional 25%.

c. When 50% or more of the original contract is earned, an additional 40%.

d. After Final Inspection, Staging area clean-up and delivery of all Project Closeout materials as required by Section 90, paragraph 90-11, *Contractor Final Project Documentation*, the final 10%.

Payment for "Resident Project Representative (RPR) Field Office" will be made at the contract per month price.

BASIS OF PAYMENT

105-6 Payment will be made under:

Item C-105.01	Mobilization (Limited to 10 percent of the Total Project Cost) – per lump sum
Item C-105.02	Resident Project Representative (RPR) Field Office – per month

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Office of Federal Contract Compliance Programs (OFCCP)

Executive Order 11246, as amended

EEOC-P/E-1 – Equal Employment Opportunity is the Law Poster

United States Department of Labor, Wage and Hour Division (WHD)

WH 1321 – Employee Rights under the Davis-Bacon Act Poster

END OF ITEM C-105

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Item C-110 Method of Estimating Percentage of Material Within Specification Limits (PWL)

110-1 General. When the specifications provide for acceptance of material based on the method of estimating percentage of material within specification limits (PWL), the PWL will be determined in accordance with this section. All test results for a lot will be analyzed statistically to determine the total estimated percent of the lot that is within specification limits. The PWL is computed using the sample average (X) and sample standard deviation (S_n) of the specified number (n) of sublots for the lot and the specification tolerance limits, L for lower and U for upper, for the particular acceptance parameter. From these values, the respective Quality index, Q_L for Lower Quality Index and/or Q_U for Upper Quality Index, is computed and the PWL for the lot for the specified n is determined from Table 1. All specification limits specified in the technical sections shall be absolute values. Test results used in the calculations shall be to the significant figure given in the test procedure.

There is some degree of uncertainty (risk) in the measurement for acceptance because only a small fraction of production material (the population) is sampled and tested. This uncertainty exists because all portions of the production material have the same probability to be randomly sampled. The Contractor's risk is the probability that material produced at the acceptable quality level is rejected or subjected to a pay adjustment. The Owner's risk is the probability that material produced at the rejectable quality level is accepted.

It is the intent of this section to inform the Contractor that, in order to consistently offset the Contractor's risk for material evaluated, production quality (using population average and population standard deviation) must be maintained at the acceptable quality specified or higher. In all cases, it is the responsibility of the Contractor to produce at quality levels that will meet the specified acceptance criteria when sampled and tested at the frequencies specified.

110-2 Method for computing PWL. The computational sequence for computing PWL is as follows:

a. Divide the lot into n sublots in accordance with the acceptance requirements of the specification.

b. Locate the random sampling position within the sublot in accordance with the requirements of the specification.

c. Make a measurement at each location, or take a test portion and make the measurement on the test portion in accordance with the testing requirements of the specification.

d. Find the sample average (X) for all sublot test values within the lot by using the following formula:

$$\mathbf{X = (x_1 + x_2 + x_3 + \ldots x_n) / n}$$

Where: X = Sample average of all sublot test values within a lot

$x_1, x_2, \ldots x_n$ = Individual sublot test values

n = Number of sublot test values

e. Find the sample standard deviation (S_n) by use of the following formula:

$$S_n = [(d_1^2 + d_2^2 + d_3^2 + \ldots d_n^2)/(n-1)]^{1/2}$$

Where: S_n = Sample standard deviation of the number of sublot test values in the set

$d_1, d_2, \ldots d_n$ = Deviations of the individual sublot test values $x_1, x_2, \ldots$ from the average value X

that is: $d_1 = (x_1 - X)$, $d_2 = (x_2 - X) \ldots d_n = (x_n - X)$

n = Number of sublot test values

f. For single sided specification limits (i.e., L only), compute the Lower Quality Index Q_L by use of the following formula:

$$Q_L = (X - L) / S_n$$

Where: L = specification lower tolerance limit

Estimate the percentage of material within limits (PWL) by entering Table 1 with Q_L, using the column appropriate to the total number (n) of measurements. If the value of Q_L falls between values shown on the table, use the next higher value of PWL.

g. For double-sided specification limits (i.e., L and U), compute the Quality Indexes Q_L and Q_U by use of the following formulas:

$$Q_L = (X - L) / S_N$$

AND

$$Q_U = (U - X) / S_n$$

Where: L and U = specification lower and upper tolerance limits

Estimate the percentage of material between the lower (L) and upper (U) tolerance limits (PWL) by entering Table 1 separately with Q_L and Q_U, using the column appropriate to the total number (n) of measurements, and determining the percent of material above P_L and percent of material below P_U for each tolerance limit. If the values of Q_L fall between values shown on the table, use the next higher value of P_L or P_U. Determine the PWL by use of the following formula:

$$PWL = (P_U + P_L) - 100$$

Where: P_L = percent within lower specification limit

P_U = percent within upper specification limit

EXAMPLE OF PWL CALCULATION

Project: Example Project

Test Item: Item P-401, Lot A.

A. PWL Determination for Mat Density.

1. Density of four random cores taken from Lot A.

A-1 = 96.60

A-2 = 97.55

A-3 = 99.30

A-4 = 98.35

n = 4

2. Calculate average density for the lot.

$X = (x_1 + x_2 + x_3 + \ldots x_n) / n$

$X = (96.60 + 97.55 + 99.30 + 98.35) / 4$

X = 97.95% density

3. Calculate the standard deviation for the lot.

$S_n = [((96.60 - 97.95)^2 + (97.55 - 97.95)^2 + (99.30 - 97.95)^2 + (98.35 - 97.95)^2)) / (4 - 1)]^{1/2}$

$S_n = [(1.82 + 0.16 + 1.82 + 0.16) / 3]^{1/2}$

$S_n = 1.15$

4. Calculate the Lower Quality Index Q_L for the lot. (L=96.3)

$Q_L = (X - L) / S_n$

$Q_L = (97.95 - 96.30) / 1.15$

$Q_L = 1.4348$

5. Determine PWL by entering Table 1 with Q_L= 1.44 and n= 4.

PWL = 98

B. PWL Determination for Air Voids.

1. Air Voids of four random samples taken from Lot A.

A-1 = 5.00

A-2 = 3.74

A-3 = 2.30

A-4 = 3.25

2. Calculate the average air voids for the lot.

$X = (x_1 + x_2 + x_3 \ldots n) / n$

$X = (5.00 + 3.74 + 2.30 + 3.25) / 4$

X = 3.57%

3. Calculate the standard deviation S_n for the lot.

$S_n = [((3.57 - 5.00)^2 + (3.57 - 3.74)^2 + (3.57 - 2.30)^2 + (3.57 - 3.25)^2) / (4 - 1)]^{1/2}$

$S_n = [(2.04 + 0.03 + 1.62 + 0.10) / 3]^{1/2}$

$S_n = 1.12$

4. Calculate the Lower Quality Index Q_L for the lot. (L= 2.0)

$Q_L = (X - L) / S_n$

$Q_L = (3.57 - 2.00) / 1.12$

$Q_L = 1.3992$

5. Determine P_L by entering Table 1 with Q_L = 1.41 and n = 4.

$P_L = 97$

6. Calculate the Upper Quality Index Q_U for the lot. (U= 5.0)

$Q_U = (U - X) / S_n$

$Q_U = (5.00 - 3.57) / 1.12$

$Q_U = 1.2702$

7. Determine P_U by entering Table 1 with $Q_U = 1.29$ and n = 4.

$P_U = 93$

8. Calculate Air Voids PWL

$PWL = (P_L + P_U) - 100$

$PWL = (97 + 93) - 100 = 90$

EXAMPLE OF OUTLIER CALCULATION (REFERENCE ASTM E178)

Project: Example Project

Test Item: Item P-401, Lot A.

A. Outlier Determination for Mat Density.

1. Density of four random cores taken from Lot A arranged in descending order.

A-3 = 99.30

A-4 = 98.35

A-2 = 97.55

A-1 = 96.60

2. From ASTM E178, Table 1, for n=4 an upper 5% significance level, the critical value for test criterion = 1.463.

3. Use average density, standard deviation, and test criterion value to evaluate density measurements.

a. For measurements greater than the average:

If (measurement - average)/(standard deviation) is less than test criterion, then the measurement is not considered an outlier.

For A-3, check if (99.30 - 97.95) / 1.15 is greater than 1.463.

Since 1.174 is less than 1.463, the value is not an outlier.

b. For measurements less than the average:

If (average - measurement)/(standard deviation) is less than test criterion, then the measurement is not considered an outlier.

For A-1, check if (97.95 - 96.60) / 1.15 is greater than 1.463.

Since 1.435 is less than 1.463, the value is not an outlier.

Note: In this example, a measurement would be considered an outlier if the density were:

Greater than (97.95 + 1.463 × 1.15) = 99.63%

OR

less than (97.95 - 1.463 × 1.15) = 96.27%.

Table 1. Table for Estimating Percent of Lot Within Limits (PWL)

Percent Within Limits (P_L and P_U)	Positive Values of Q (Q_L and Q_U)							
	n=3	**n=4**	**n=5**	**n=6**	**n=7**	**n=8**	**n=9**	**n=10**
99	1.1541	1.4700	1.6714	1.8008	1.8888	1.9520	1.9994	2.0362
98	1.1524	1.4400	1.6016	1.6982	1.7612	1.8053	1.8379	1.8630
97	1.1496	1.4100	1.5427	1.6181	1.6661	1.6993	1.7235	1.7420
96	1.1456	1.3800	1.4897	1.5497	1.5871	1.6127	1.6313	1.6454
95	1.1405	1.3500	1.4407	1.4887	1.5181	1.5381	1.5525	1.5635
94	1.1342	1.3200	1.3946	1.4329	1.4561	1.4717	1.4829	1.4914
93	1.1269	1.2900	1.3508	1.3810	1.3991	1.4112	1.4199	1.4265
92	1.1184	1.2600	1.3088	1.3323	1.3461	1.3554	1.3620	1.3670
91	1.1089	1.2300	1.2683	1.2860	1.2964	1.3032	1.3081	1.3118
90	1.0982	1.2000	1.2290	1.2419	1.2492	1.2541	1.2576	1.2602
89	1.0864	1.1700	1.1909	1.1995	1.2043	1.2075	1.2098	1.2115
88	1.0736	1.1400	1.1537	1.1587	1.1613	1.1630	1.1643	1.1653
87	1.0597	1.1100	1.1173	1.1192	1.1199	1.1204	1.1208	1.1212
86	1.0448	1.0800	1.0817	1.0808	1.0800	1.0794	1.0791	1.0789
85	1.0288	1.0500	1.0467	1.0435	1.0413	1.0399	1.0389	1.0382
84	1.0119	1.0200	1.0124	1.0071	1.0037	1.0015	1.0000	0.9990
83	0.9939	0.9900	0.9785	0.9715	0.9671	0.9643	0.9624	0.9610
82	0.9749	0.9600	0.9452	0.9367	0.9315	0.9281	0.9258	0.9241
81	0.9550	0.9300	0.9123	0.9025	0.8966	0.8928	0.8901	0.8882
80	0.9342	0.9000	0.8799	0.8690	0.8625	0.8583	0.8554	0.8533
79	0.9124	0.8700	0.8478	0.8360	0.8291	0.8245	0.8214	0.8192
78	0.8897	0.8400	0.8160	0.8036	0.7962	0.7915	0.7882	0.7858
77	0.8662	0.8100	0.7846	0.7716	0.7640	0.7590	0.7556	0.7531
76	0.8417	0.7800	0.7535	0.7401	0.7322	0.7271	0.7236	0.7211
75	0.8165	0.7500	0.7226	0.7089	0.7009	0.6958	0.6922	0.6896
74	0.7904	0.7200	0.6921	0.6781	0.6701	0.6649	0.6613	0.6587
73	0.7636	0.6900	0.6617	0.6477	0.6396	0.6344	0.6308	0.6282
72	0.7360	0.6600	0.6316	0.6176	0.6095	0.6044	0.6008	0.5982
71	0.7077	0.6300	0.6016	0.5878	0.5798	0.5747	0.5712	0.5686
70	0.6787	0.6000	0.5719	0.5582	0.5504	0.5454	0.5419	0.5394
69	0.6490	0.5700	0.5423	0.5290	0.5213	0.5164	0.5130	0.5105
68	0.6187	0.5400	0.5129	0.4999	0.4924	0.4877	0.4844	0.4820
67	0.5878	0.5100	0.4836	0.4710	0.4638	0.4592	0.4560	0.4537
66	0.5563	0.4800	0.4545	0.4424	0.4355	0.4310	0.4280	0.4257
65	0.5242	0.4500	0.4255	0.4139	0.4073	0.4030	0.4001	0.3980
64	0.4916	0.4200	0.3967	0.3856	0.3793	0.3753	0.3725	0.3705
63	0.4586	0.3900	0.3679	0.3575	0.3515	0.3477	0.3451	0.3432
62	0.4251	0.3600	0.3392	0.3295	0.3239	0.3203	0.3179	0.3161
61	0.3911	0.3300	0.3107	0.3016	0.2964	0.2931	0.2908	0.2892
60	0.3568	0.3000	0.2822	0.2738	0.2691	0.2660	0.2639	0.2624
59	0.3222	0.2700	0.2537	0.2461	0.2418	0.2391	0.2372	0.2358
58	0.2872	0.2400	0.2254	0.2186	0.2147	0.2122	0.2105	0.2093
57	0.2519	0.2100	0.1971	0.1911	0.1877	0.1855	0.1840	0.1829
56	0.2164	0.1800	0.1688	0.1636	0.1607	0.1588	0.1575	0.1566
55	0.1806	0.1500	0.1406	0.1363	0.1338	0.1322	0.1312	0.1304
54	0.1447	0.1200	0.1125	0.1090	0.1070	0.1057	0.1049	0.1042
53	0.1087	0.0900	0.0843	0.0817	0.0802	0.0793	0.0786	0.0781
52	0.0725	0.0600	0.0562	0.0544	0.0534	0.0528	0.0524	0.0521
51	0.0363	0.0300	0.0281	0.0272	0.0267	0.0264	0.0262	0.0260
50	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Percent Within Limits (P_L and P_U)	Negative Values of Q (Q_L and Q_U)							
	n=3	n=4	n=5	n=6	n=7	n=8	n=9	n=10
49	-0.0363	-0.0300	-0.0281	-0.0272	-0.0267	-0.0264	-0.0262	-0.0260
48	-0.0725	-0.0600	-0.0562	-0.0544	-0.0534	-0.0528	-0.0524	-0.0521
47	-0.1087	-0.0900	-0.0843	-0.0817	-0.0802	-0.0793	-0.0786	-0.0781
46	-0.1447	-0.1200	-0.1125	-0.1090	-0.1070	-0.1057	-0.1049	-0.1042
45	-0.1806	-0.1500	-0.1406	-0.1363	-0.1338	-0.1322	-0.1312	-0.1304
44	-0.2164	-0.1800	-0.1688	-0.1636	-0.1607	-0.1588	-0.1575	-0.1566
43	-0.2519	-0.2100	-0.1971	-0.1911	-0.1877	-0.1855	-0.1840	-0.1829
42	-0.2872	-0.2400	-0.2254	-0.2186	-0.2147	-0.2122	-0.2105	-0.2093
41	-0.3222	-0.2700	-0.2537	-0.2461	-0.2418	-0.2391	-0.2372	-0.2358
40	-0.3568	-0.3000	-0.2822	-0.2738	-0.2691	-0.2660	-0.2639	-0.2624
39	-0.3911	-0.3300	-0.3107	-0.3016	-0.2964	-0.2931	-0.2908	-0.2892
38	-0.4251	-0.3600	-0.3392	-0.3295	-0.3239	-0.3203	-0.3179	-0.3161
37	-0.4586	-0.3900	-0.3679	-0.3575	-0.3515	-0.3477	-0.3451	-0.3432
36	-0.4916	-0.4200	-0.3967	-0.3856	-0.3793	-0.3753	-0.3725	-0.3705
35	-0.5242	-0.4500	-0.4255	-0.4139	-0.4073	-0.4030	-0.4001	-0.3980
34	-0.5563	-0.4800	-0.4545	-0.4424	-0.4355	-0.4310	-0.4280	-0.4257
33	-0.5878	-0.5100	-0.4836	-0.4710	-0.4638	-0.4592	-0.4560	-0.4537
32	-0.6187	-0.5400	-0.5129	-0.4999	-0.4924	-0.4877	-0.4844	-0.4820
31	-0.6490	-0.5700	-0.5423	-0.5290	-0.5213	-0.5164	-0.5130	-0.5105
30	-0.6787	-0.6000	-0.5719	-0.5582	-0.5504	-0.5454	-0.5419	-0.5394
29	-0.7077	-0.6300	-0.6016	-0.5878	-0.5798	-0.5747	-0.5712	-0.5686
28	-0.7360	-0.6600	-0.6316	-0.6176	-0.6095	-0.6044	-0.6008	-0.5982
27	-0.7636	-0.6900	-0.6617	-0.6477	-0.6396	-0.6344	-0.6308	-0.6282
26	-0.7904	-0.7200	-0.6921	-0.6781	-0.6701	-0.6649	-0.6613	-0.6587
25	-0.8165	-0.7500	-0.7226	-0.7089	-0.7009	-0.6958	-0.6922	-0.6896
24	-0.8417	-0.7800	-0.7535	-0.7401	-0.7322	-0.7271	-0.7236	-0.7211
23	-0.8662	-0.8100	-0.7846	-0.7716	-0.7640	-0.7590	-0.7556	-0.7531
22	-0.8897	-0.8400	-0.8160	-0.8036	-0.7962	-0.7915	-0.7882	-0.7858
21	-0.9124	-0.8700	-0.8478	-0.8360	-0.8291	-0.8245	-0.8214	-0.8192
20	-0.9342	-0.9000	-0.8799	-0.8690	-0.8625	-0.8583	-0.8554	-0.8533
19	-0.9550	-0.9300	-0.9123	-0.9025	-0.8966	-0.8928	-0.8901	-0.8882
18	-0.9749	-0.9600	-0.9452	-0.9367	-0.9315	-0.9281	-0.9258	-0.9241
17	-0.9939	-0.9900	-0.9785	-0.9715	-0.9671	-0.9643	-0.9624	-0.9610
16	-1.0119	-1.0200	-1.0124	-1.0071	-1.0037	-1.0015	-1.0000	-0.9990
15	-1.0288	-1.0500	-1.0467	-1.0435	-1.0413	-1.0399	-1.0389	-1.0382
14	-1.0448	-1.0800	-1.0817	-1.0808	-1.0800	-1.0794	-1.0791	-1.0789
13	-1.0597	-1.1100	-1.1173	-1.1192	-1.1199	-1.1204	-1.1208	-1.1212
12	-1.0736	-1.1400	-1.1537	-1.1587	-1.1613	-1.1630	-1.1643	-1.1653
11	-1.0864	-1.1700	-1.1909	-1.1995	-1.2043	-1.2075	-1.2098	-1.2115
10	-1.0982	-1.2000	-1.2290	-1.2419	-1.2492	-1.2541	-1.2576	-1.2602
9	-1.1089	-1.2300	-1.2683	-1.2860	-1.2964	-1.3032	-1.3081	-1.3118
8	-1.1184	-1.2600	-1.3088	-1.3323	-1.3461	-1.3554	-1.3620	-1.3670
7	-1.1269	-1.2900	-1.3508	-1.3810	-1.3991	-1.4112	-1.4199	-1.4265
6	-1.1342	-1.3200	-1.3946	-1.4329	-1.4561	-1.4717	-1.4829	-1.4914
5	-1.1405	-1.3500	-1.4407	-1.4887	-1.5181	-1.5381	-1.5525	-1.5635
4	-1.1456	-1.3800	-1.4897	-1.5497	-1.5871	-1.6127	-1.6313	-1.6454
3	-1.1496	-1.4100	-1.5427	-1.6181	-1.6661	-1.6993	-1.7235	-1.7420
2	-1.1524	-1.4400	-1.6016	-1.6982	-1.7612	-1.8053	-1.8379	-1.8630
1	-1.1541	-1.4700	-1.6714	-1.8008	-1.8888	-1.9520	-1.9994	-2.0362

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM E178	Standard Practice for Dealing with Outlying Observations

END OF ITEM C-110

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ITEM C-125 RUNWAY CLOSURE MARKERS

DESCRIPTION

125-1.1. GENERAL. The proposed phasing plan will require the closure of various runways for portions of the work. For each runway closure, both an unlighted and lighted a Runway Closure Marker (RCM) must be placed over the numerals at each runway end; i.e., one set of two unlighted RCMs and one set of two lighted RCMs are required for each runway closure. Additional unlighted RCMs shall be placed on the runway at 1,000 feet intervals from the runway numerals.

The Contractor shall be responsible for providing one complete set of lighted RCMs, as well as two complete sets of unlighted RCMs.

This item shall consist of furnishing and maintaining the required number of RCMs and placing the RCMs in accordance with the phasing plans, operating, fueling, maintaining (including light bulb replacement), and recovering each set of markers. The RCMs shall be moved around the site as many times as required to comply with project work phasing and maintain airport operations throughout the life of the construction project.

Once the project is complete, all Contractor furnished RCMs shall remain the property of the Contractor.

MATERIAL REQUIREMENTS

125-2.1 PORTABLE LIGHTED RUNWAY CLOSURE MARKERS. For the purposes of this specification a set of markers shall consist of two complete X's. The Contractor furnished sets of lighted RCMs shall meet the requirements of FAA Advisory Circular 150/5345-55A “Specification for L-893 Lighted Visual Aid to Indicate Temporary Runway Closure” and shall be listed in AC 150/5345-53, “Airport Lighting Equipment Certification Program”.

As an alternative to use of the gas or diesel engines to power the lighted X’s, the contractor at the direction of the Owner, may be required to temporarily connect and power the X’s by connecting them electrically to a nearby airfield lighting fixture/circuit. The Contractor shall account for the cost of all miscellaneous materials, equipment, and labor necessary to make such electrical connections/disconnections as many times as may be required throughout the length of the project in the lump sum price for this item.

125-2.2 UNLIGHTED RUNWAY CLOSURE MARKERS. For the purposes of this specification a set of markers shall consist of two complete X's. Unlighted RCMs shall be composed of yellow vinyl coated mesh with 6" black border with overall dimensions of 10' x 60'for each leg and meeting the requirements of FAA Advisory Circulars 150/5340-1M "Standards for Airport Markings" and 150/5370-2G "Operational Safety on Airports During Construction".

COORDINATION AND WORK REQUIREMENTS

125-3.1 COORDINATION. The Contractor shall provide a minimum 48 hours' notice to the Owner and the Resident Project Representative (RPR) in accordance with schedule work which will require closure of a runway. All approvals for runway closures shall be considered tentative and subject to change at any time based upon operational needs of the airport and current weather conditions. Every effort must be made to maximize work effort during periods when the runway must be closed.

125-3.2 PLACEMENT AND MAINTENANCE OF MARKERS. Each time that the runway is closed, the contractor shall be responsible for placing closed runway markers. The contractor shall be responsible for providing all fueling, servicing, and maintenance of the markers to ensure continuous operation during the closure. The lighted RCMs must be operational day and night.

125-3.3. RECOVERY OF MARKERS. Each time the runway must be reopened to accommodate aircraft, the contractor shall recover the markers and transport them to a storage location as directed by the RPR. The Contractor shall be responsible for maintaining all markers in good condition throughout the project. If during operation and use the markers are damaged or become inoperable they shall be repaired or replaced immediately at the contractor's expense. The Contractor furnished markers shall remain the property of the Contractor and shall be removed from the site at the completion of the project.

125-3.4. SAFETY CONSIDERATIONS. The contractor shall accomplish all work in accordance with FAA Advisory Circular AC 150/5370-2F, Operational Safety on Airports During Construction. Additionally, the contractor shall become familiar with vehicle operation requirements at airports as discussed in the FAA Guide to Ground Vehicle Operations on the Airport. The contractor shall monitor and maintain contact with the Airport Control Tower at all times when any work is being performed associated with placing, maintaining, or recovering the RCMs. Refer also to Construction Safety Requirements of the Special Provisions of the contract documents.

METHOD OF MEASUREMENT

125-4.1. No separate measurement for payment shall be made for furnishing or retrieving, and placing, operating, fueling, servicing, maintaining, and recovering Runway Closure Markers. Runway Closure Markers shall be incidental to the project and no separate payment shall be made.

BASIS OF PAYMENT

125-5.1. No payment will be made separately or directly for Runway Closure Markers. Runway Closure Markers shall be incidental to the project and no separate payment shall be made.

MATERIAL REQUIREMENTS

AC 150/5345-55A	Specification for L-893 Lighted Visual Aid to Indicate Temporary Runway Closure

END OF ITEM C-125

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Item P-101 Preparation/Removal of Existing Pavements

DESCRIPTION

101-1 This item shall consist of removal of existing pavement, removal of drainage pipe and inlets/manholes, pavement key milling and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

a. Concrete pavement removal. Not Used.

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. Asphalt pavement removed shall be recycled at an asphalt batch plant or disposed of off site in accordance with Federal, State and Local regulations.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. Not Used.

101-3.3 Removal of Foreign Substances/contaminates prior to remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

Chemicals, cold milling, rotary grinding, or sandblasting may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate

to ravel, or removing pavement over 1/8 inch deep. If it is deemed by the RPR that damage to the existing pavement is caused by operational error, such as permitting the application method to dwell in one location for too long, the Contractor shall repair the damaged area without compensation and as directed by the RPR.

Removal of foreign substances shall not proceed until approved by the RPR. No material shall be deposited on the pavement shoulders. All wastes shall be disposed of in areas indicated in this specification or shown on the plans.

101-3.4 Concrete spall or failed asphaltic concrete pavement repair. Not Used

101-3.5 Cold milling. Milling shall be performed with a power-operated milling machine or grinder, capable of producing a uniform finished surface. The milling machine or grinder shall operate without tearing or gouging the underlaying surface. The milling machine or grinder shall be equipped with a positive means of dust control. All millings shall be removed and disposed off Airport property . If the Contractor mills or grinds deeper or wider than the plans specify, the Contractor shall replace the material removed with new material at the Contractor's Expense.

a. Patching. Not Used.

b. Profiling, grade correction, or surface correction. Not Used.

c. Clean-up. The Contractor shall sweep the milled surface daily and immediately after the milling until all residual materials are removed from the pavement surface. Prior to paving, the Contractor shall wet down the milled pavement and thoroughly sweep and/or blow the surface to remove loose residual material. Waste materials shall be collected and removed from the pavement surface and adjacent areas by sweeping or vacuuming. Waste materials shall be removed and disposed off Airport property.

101-3.6. Preparation of asphalt pavement surfaces prior to surface treatment. Not Used.

101-3.7 Maintenance. The Contractor shall perform all maintenance work necessary to keep the pavement in a satisfactory condition until the full section is complete and accepted by the RPR. The surface shall be kept clean and free from foreign material. The pavement shall be properly drained at all times. If cleaning is necessary or if the pavement becomes disturbed, any work repairs necessary shall be performed at the Contractor's expense.

101-3.8 Preparation of Joints in Rigid Pavement prior to resealing. Not Used.

101-3.8.1 Removal of Existing Joint Sealant. Not Used.

101-3.8.2 Cleaning prior to sealing. Immediately before sealing, joints shall be cleaned by removing any remaining laitance and other foreign material. Allow sufficient time to dry out joints prior to sealing. Joint surfaces will be surface-dry prior to installation of sealant.

101-3.8.3 Joint sealant. Joint material and installation will be in accordance with Item P-605.

101-3.9 Preparation of Cracks in Flexible Pavement prior to sealing. Not Used.

101-3.9.1 Preparation of Crack. Not Used.

101-3.9.2 Removal of Existing Crack Sealant. Not Used.

101-3.9.3 Crack Sealant. Not Used.

101-3.9.4 Removal of Drain Pipe and Drain Structures.

a. **Removal of Existing Drain Pipe Material.** Remove the types of drain pipe as indicated on the plans. The drain pipe material shall be legally disposed of off-site in a timely manner following

removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to **100%** of ASTM D698. Removal of drain pipe outside the limits of grading shall include backfill, compaction and surface restoration with topsoil, seed, mulch and fertilizer. Existing pipes and pipe openings in structures to remain after pipe removal shall be permanently plugged at no additional cost to prevent entry of soil materials and groundwater. Openings and pipes 18-inch diameter or less should be plugged with concrete grout to a minimum length of 8 inches. Openings greater than 18-inch diameter may be constructed of brick or concrete blocks. Plaster the exposed face of block or brick plugs with mortar. All plugs shall be watertight and capable of withstanding all internal and external pressures without leakage.

b. Removal of Catch Basins, Inlets and Drain Manholes. Where indicated on the plans or as directed by the RPR, catch basins, inlets and/or drain manholes shall be removed and legally disposed of off-site in a timely fashion after removal. Excavations after removal shall be backfilled with material equal or better in quality than adjacent embankment. When under paved areas must be compacted to **100%** of ASTM D698, when outside of paved areas must be compacted to 95% of ASTM D698.

METHOD OF MEASUREMENT

101-4.1 Pavement removal. The unit of measurement for pavement removal shall be the number of square yards removed by the Contractor, regardless of pavement thickness. Any pavement removed outside the limits of removal because the pavement was damaged by negligence on the part of the Contractor shall not be included in the measurement for payment. No direct measurement or payment shall be made for saw cutting. Saw cutting shall be incidental to pavement removal. Dowel bar installation shall be incidental to pavement removal.

101-4.2 Joint and crack repair. Not Used.

101-4.3 Removal of Foreign Substances/contaminates. Not Used.

101-4.4 Spalled and failed asphalt pavement repair. Not Used.

101-4.5 Concrete Spall Repair. Not Used.

101-4.6 Cold milling. Not Used.

101-4.7 Removal of Drain Pipe and Drain Structures. The unit of measurement for removal of drain pipe (regardless of pipe size or pipe material type) and drain structures will be made at the contract unit price for each completed and accepted item. This price shall be full compensation for all labor, equipment, tools, and incidentals necessary to complete this item in accordance with paragraph 101-3.9.4. Removal of drain pipe outside the limits of grading shall include backfill, compaction and surface restoration with topsoil, seed, mulch and fertilizer.

101-4.8 Pavement Key Milling. The unit of measure for pavement key milling shall be per square foot. The width and depth of the key shall be as shown on the plans.

BASIS OF PAYMENT

101-5.1 Payment. Payment shall be made at contract unit price for the unit of measurement as specified above. This price shall be full compensation for furnishing all materials and for all preparation, hauling, and placing of the material and for all labor, equipment, tools, and incidentals necessary to complete this item.

Item P-101.01	Pavement Removal - per square yard
Item P-101.02	Pavement Key Milling - per square foot
Item P-101.03	Removal of Drainage Pipe – per linear foot
Item P-101.04	Removal of Drainage Structure – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5380-6	Guidelines and Procedures for Maintenance of Airport Pavements.

ASTM International (ASTM)

ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements

END OF ITEM P-101

Item P-101 Preparation/Removal of Existing Pavements

DESCRIPTION

101-1 This item shall consist of removal of existing pavement, removal of drainage pipe and inlets/manholes, pavement key milling and other miscellaneous items. The work shall be accomplished in accordance with these specifications and the applicable plans.

EQUIPMENT AND MATERIALS

101-2 All equipment and materials shall be specified here and in the following paragraphs or approved by the Resident Project Representative (RPR). The equipment shall not cause damage to the pavement to remain in place.

CONSTRUCTION

101-3.1 Removal of existing pavement.

The Contractor's removal operation shall be controlled to not damage adjacent pavement structure, and base material, cables, utility ducts, pipelines, or drainage structures which are to remain under the pavement.

a. Concrete pavement removal. Not Used.

b. Asphalt pavement removal. Asphalt pavement to be removed shall be cut to the full depth of the asphalt pavement around the perimeter of the area to be removed. Asphalt pavement removed shall be recycled at an asphalt batch plant or disposed of off site in accordance with Federal, State and Local regulations.

c. Repair or removal of Base, Subbase, and/or Subgrade. All failed material including surface, base course, subbase course, and subgrade shall be removed and repaired as shown on the plans or as directed by the RPR. Materials and methods of construction shall comply with the applicable sections of these specifications. Any damage caused by Contractor's removal process shall be repaired at the Contractor's expense.

101-3.2 Preparation of joints and cracks prior to overlay/surface treatment. Not Used.

101-3.3 Removal of Foreign Substances/contaminates prior to remarking. Removal of foreign substances/contaminates from existing pavement that will affect the bond of the new treatment shall consist of removal of rubber, fuel spills, oil, crack sealer, at least 90% of paint, and other foreign substances from the surface of the pavement. Areas that require removal are designated on the plans and as directed by the RPR in the field during construction.

Chemicals, cold milling, rotary grinding, or sandblasting may be used. If chemicals are used, they shall comply with the state's environmental protection regulations. Removal methods used shall not cause major damage to the pavement, or to any structure or utility within or adjacent to the work area. Major damage is defined as changing the properties of the pavement, removal of asphalt causing the aggregate

Item P-151 Clearing and Grubbing

DESCRIPTION

151-1.1 This item shall consist of clearing, or clearing and grubbing, including the disposal of materials, for all areas within the limits designated on the plans or as required by the Resident Project Representative (RPR).

a. Clearing shall consist of the cutting and removal of all trees, stumps, brush, logs, hedges, the removal of fences and other loose or projecting material from the designated areas. The grubbing of stumps and roots will not be required.

b. Clearing and grubbing shall consist of clearing the surface of the ground of the designated areas of all trees, stumps, down timber, logs, snags, brush, undergrowth, hedges, heavy growth of grass or weeds, fences, structures, debris, and rubbish of any nature, natural obstructions or such material which in the opinion of the RPR is unsuitable for the foundation of strips, pavements, or other required structures, including the grubbing of stumps, roots, matted roots, foundations, and the disposal from the project of all spoil materials resulting from clearing and grubbing.

c. Tree Removal. Not Used.

CONSTRUCTION METHODS

151-2.1 General. The areas denoted on the plans to be cleared shall be staked on the ground by the Contractor as indicated on the plans.

The removal of existing structures and utilities required to permit orderly progress of work shall be accomplished by local agencies, unless otherwise shown on the plans. Whenever a telephone pole, pipeline, conduit, sewer, roadway, or other utility is encountered and must be removed or relocated, the Contractor shall advise the RPR who will notify the proper local authority or owner to secure prompt action.

151-2.1.1 Disposal. All materials removed by clearing or by clearing and grubbing shall be disposed of outside the Airport's limits at the Contractor's responsibility, except when otherwise directed by the RPR. As far as practicable, waste concrete and masonry shall be placed on slopes of embankments or channels. When embankments are constructed of such material, this material shall be placed in accordance with requirements for formation of embankments. Any broken concrete or masonry that cannot be used in construction and all other materials not considered suitable for use elsewhere, shall be disposed of by the Contractor. In no case, shall any discarded materials be left in windrows or piles adjacent to or within the airport limits. The manner and location of disposal of materials shall be subject to the approval of the RPR and shall not create an unsightly or objectionable view. When the Contractor is required to locate a disposal area outside the airport property limits, the Contractor shall obtain and file with the RPR permission in writing from the property owner for the use of private property for this purpose.

151-2.1.2 Blasting. Blasting shall not be allowed**.**

151-2.2 Clearing. The Contractor shall clear the staked or indicated area of all materials as indicated on the plans. Trees unavoidably falling outside the specified clearing limits must be cut up, removed, and

disposed of in a satisfactory manner. To minimize damage to trees that are to be left standing, trees shall be felled toward the center of the area being cleared. The Contractor shall preserve and protect from injury all trees not to be removed. The trees, stumps, and brush shall be cut flush with the original ground surface. The grubbing of stumps and roots will not be required.

Fences shall be removed and disposed of as directed by the RPR. Fence wire shall be neatly rolled and the wire and posts stored on the airport if they are to be used again, or stored at a location designated by the RPR if the fence is to remain the property of a local owner or authority.

151-2.3 Clearing and grubbing. In areas designated to be cleared and grubbed, all stumps, roots, buried logs, brush, grass, and other unsatisfactory materials as indicated on the plans, shall be removed, except where embankments exceeding 3-1/2 feet (105 cm) in depth will be constructed outside of paved areas. For embankments constructed outside of paved areas, all unsatisfactory materials shall be removed, but sound trees, stumps, and brush can be cut off flush with the original ground and allowed to remain. Tap roots and other projections over 1-1/2 inches (38 mm) in diameter shall be grubbed out to a depth of at least 18 inches (0.5 m) below the finished subgrade or slope elevation.

Any buildings and miscellaneous structures that are shown on the plans to be removed shall be demolished or removed, and all materials shall be disposed of by removal from the site. The cost of removal is incidental to this item. The remaining or existing foundations, wells, cesspools, and like structures shall be destroyed by breaking down the materials of which the foundations, wells, cesspools, etc., are built to a depth at least 2 feet (60 cm) below the existing surrounding ground. Any broken concrete, blocks, or other objectionable material that cannot be used in backfill shall be removed and disposed of at the Contractor’s expense. The holes or openings shall be backfilled with acceptable material and properly compacted.

All holes in embankment areas remaining after the grubbing operation shall have the sides of the holes flattened to facilitate filling with acceptable material and compacting as required in Item P-152. The same procedure shall be applied to all holes remaining after grubbing in areas where the depth of holes exceeds the depth of the proposed excavation.

METHOD OF MEASUREMENT

151-3.1 No separate measurements for payment shall be made for clearing within the limits of grading. This is considered incidental to the excavation pay item, P-152.

151-3.2 Not Used.

151-3.3 Not Used.

BASIS OF PAYMENT

151-4.1 No separate payment shall be made for clearing within the limits of grading. This is considered incidental to the excavation pay item, P-152.

151-4.2 Not Used.

151-4.3 Not Used.

END OF ITEM P-151

Item P-152 Excavation, Subgrade, and Embankment

DESCRIPTION

152-1.1 This item covers excavation, disposal, placement, and compaction of all materials within the limits of the work required to construct safety areas, runways, taxiways, aprons, and intermediate areas as well as other areas for drainage, electrical, haul roads, staging areas or other purposes in accordance with these specifications and in conformity to the dimensions and typical sections shown on the plans.

152-1.2 Classification. All material excavated shall be classified as defined below:

a. Unclassified excavation. Unclassified excavation shall consist of the excavation and disposal of all material, regardless of its nature which is not otherwise classified and paid for under one of the following items.

b. Rock excavation**.** Rock excavation shall include all solid rock in ledges, in bedded deposits, in unstratified masses, and conglomerate deposits which are so firmly cemented they cannot be removed without blasting or using rippers. All boulders containing a volume of more than 1/2 cubic yard will be classified as “rock excavation.”

c. Muck excavation. Muck excavation shall consist of the removal and disposal of deposits or mixtures of soils and organic matter not suitable for foundation material. Muck shall include materials that will decay or produce subsidence in the embankment. It may consist of decaying stumps, roots, logs, humus, or other material not satisfactory for incorporation in the embankment.

d. Drainage excavation. Drainage excavation shall consist of all excavation made for the primary purpose of drainage and includes drainage ditches, such as intercepting, inlet or outlet ditches; temporary levee construction; or any other type as shown on the plans.

152-1.3 Unsuitable excavation. Unsuitable material shall be disposed in designated waste areas as shown on the plans. Materials containing vegetable or organic matter, such as muck, peat, organic silt, or sod shall be considered unsuitable for use in embankment construction. Material suitable for topsoil may be used on the embankment slope when approved by the RPR.

CONSTRUCTION METHODS

152-2.1 General. Before beginning excavation, grading, and embankment operations in any area, the area shall be cleared or cleared and grubbed in accordance with Item P-151.

The suitability of material to be placed in embankments shall be subject to approval by the RPR. All unsuitable material shall be legally disposed of off airport property. All waste areas shall be graded to allow positive drainage of the area and adjacent areas. The surface elevation of waste areas shall be specified on the plans or approved by the RPR.

When the Contractor’s excavating operations encounter artifacts of historical or archaeological significance, the operations shall be temporarily discontinued and the RPR notified per Section 70, paragraph 70-20. At the direction of the RPR, the Contractor shall excavate the site in such a manner as to preserve the artifacts encountered and allow for their removal. Such excavation will be paid for as extra work.

Areas outside the limits of the pavement areas where the top layer of soil has become compacted by hauling or other Contractor activities shall be scarified and disked to a depth of 4 inches (100 mm), to loosen and pulverize the soil. Stones or rock fragments larger than 4 inches (100 mm) in their greatest dimension will not be permitted in the top 6 inches (150 mm) of the subgrade.

If it is necessary to interrupt existing surface drainage, sewers or under-drainage, conduits, utilities, or similar underground structures, the Contractor shall be responsible for and shall take all necessary precautions to preserve them or provide temporary services. When such facilities are encountered, the Contractor shall notify the RPR, who shall arrange for their removal if necessary. The Contractor, at their own expense, shall satisfactorily repair or pay the cost of all damage to such facilities or structures that may result from any of the Contractor's operations during the period of the contract.

a. Blasting. Blasting shall not be allowed.

152-2.2 Excavation. No excavation shall be started until the work has been staked out by the Contractor and the RPR has obtained from the Contractor, the survey notes of the elevations and measurements of the ground surface. The Contractor and RPR shall agree that the original ground lines shown on the original topographic mapping are accurate, or agree to any adjustments made to the original ground lines.

Digital terrain model (DTM) files of the existing surfaces, finished surfaces and other various surfaces were used to develop the design plans.

Volumetric quantities were calculated by comparing DTM files of the applicable design surfaces and generating Triangle Volume Reports. Electronic copies of DTM files and a paper copy of the original topographic map will be issued to the successful bidder.

Volumetric quantities were calculated using design cross sections which were created for this project using the DTM files of the applicable design surfaces and generating End Area Volume Reports. Paper copies of design cross sections and a paper copy of the original topographic map will be issued to the successful bidder.

Existing grades on the design cross sections or DTM's, where they do not match the locations of actual spot elevations shown on the topographic map, were developed by computer interpolation from those spot elevations. Prior to disturbing original grade, Contractor shall verify the accuracy of the existing ground surface by verifying spot elevations at the same locations where original field survey data was obtained as indicated on the topographic map. Contractor shall recognize that, due to the interpolation process, the actual ground surface at any particular location may differ somewhat from the interpolated surface shown on the design cross sections or obtained from the DTM's. Contractor's verification of original ground surface, however, shall be limited to verification of spot elevations as indicated herein, and no adjustments will be made to the original ground surface unless the Contractor demonstrates that spot elevations shown are incorrect. For this purpose, spot elevations which are within 0.1 foot (30 mm) of the stated elevations for ground surfaces, or within 0.04 foot (12 mm)for hard surfaces (pavements, buildings, foundations, structures, etc.) shall be considered "no change". Only deviations in excess of these will be considered for adjustment of the original ground surface. If Contractor's verification identifies discrepancies in the topographic map, Contractor shall notify the RPR in writing at least two weeks before disturbance of existing grade to allow sufficient time to verify the submitted information and make adjustments to the design cross sections or DTM's. Disturbance of existing grade in any area shall constitute acceptance by the Contractor of the accuracy of the original elevations shown on the topographic map for that area.

All areas to be excavated shall be stripped of vegetation and topsoil. Topsoil shall be stockpiled for future use in areas designated on the plans or by the RPR. All suitable excavated material shall be used in the formation of embankment, subgrade, or other purposes as shown on the plans. All unsuitable material shall be disposed of as shown on the plans.

The grade shall be maintained so that the surface is well drained at all times.

When the volume of the excavation exceeds that required to construct the embankments to the grades as indicated on the plans, the excess shall be used to grade the areas of ultimate development or disposed as directed by the RPR. When the volume of excavation is not sufficient for constructing the embankments to the grades indicated, the deficiency shall be obtained from borrow areas.

a. Selective grading. When selective grading is indicated on the plans, the more suitable material designated by the RPR shall be used in constructing the embankment or in capping the pavement subgrade. If, at the time of excavation, it is not possible to place this material in its final location, it shall be stockpiled in approved areas until it can be placed. The more suitable material shall then be placed and compacted as specified. Selective grading shall be considered incidental to the work involved. The cost of stockpiling and placing the material shall be included in the various pay items of work involved.

b. Undercutting. Rock, shale, hardpan, loose rock, boulders, or other material unsatisfactory for safety areas, subgrades, roads, shoulders, or any areas intended for turf shall be excavated to a minimum depth of 12 inches (300 mm) below the subgrade or to the depth specified by the RPR. Muck, peat, matted roots, or other yielding material, unsatisfactory for subgrade foundation, shall be removed to the depth specified. Unsuitable materials shall be disposed off the airport. The cost is incidental to this item. This excavated material shall be paid for at the contract unit price per cubic yard for rock excavation. The excavated area shall be backfilled with suitable material obtained from the grading operations or borrow areas and compacted to specified densities. The necessary backfill will constitute a part of the embankment. Where rock cuts are made, backfill with select material. Any pockets created in the rock surface shall be drained in accordance with the details shown on the plans. Undercutting will be paid as rock excavation.

c. Over-break. Over-break, including slides, is that portion of any material displaced or loosened beyond the finished work as planned or authorized by the RPR. All over-break shall be graded or removed by the Contractor and disposed of as directed by the RPR. The RPR shall determine if the displacement of such material was unavoidable and their own decision shall be final. Payment will not be made for the removal and disposal of over-break that the RPR determines as avoidable. Unavoidable over-break will be classified as “Unclassified Excavation.”

d. Removal of utilities. The removal of existing structures and utilities required to permit the orderly progress of work will be accomplished by the Contractor as indicated on the plans. All existing foundations shall be excavated at least 2 feet (60 cm) below the top of subgrade or as indicated on the plans, and the material disposed of as directed by the RPR. All foundations thus excavated shall be backfilled with suitable material and compacted as specified for embankment or as shown on the plans.

152-2.3 Borrow excavation. Borrow areas are not required.

152-2.4 Drainage excavation. Drainage excavation shall consist of excavating drainage ditches including intercepting, inlet, or outlet ditches; or other types as shown on the plans. The work shall be performed in sequence with the other construction. Ditches shall be constructed prior to starting adjacent excavation operations. All satisfactory material shall be placed in embankment fills; unsuitable material shall be placed in designated waste areas or as directed by the RPR. All necessary work shall be performed true to final line, elevation, and cross-section. The Contractor shall maintain ditches constructed on the project to the required cross-section and shall keep them free of debris or obstructions until the project is accepted. Drainage excavation shall not be measured for payment separately but considered incidental to the quantity of unclassified excavation.

152-2.5 Preparation of cut areas or areas where existing pavement has been removed. In those areas on which a subbase or base course is to be placed, the top 12 inches of subgrade shall be compacted to not less than 100 % of maximum density for non-cohesive soils, and 95% of maximum density for cohesive

soils as determined by ASTM D698. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

152-2.6 Preparation of embankment area. All sod and vegetative matter shall be removed from the surface upon which the embankment is to be placed. The cleared surface shall be broken up by plowing or scarifying to a minimum depth of 6 inches (150 mm) and shall then be compacted per paragraph 152-2.10.

Sloped surfaces steeper than one (1) vertical to four (4) horizontal shall be plowed, stepped, benched, or broken up so that the fill material will bond with the existing material. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches (300 mm) and compacted as specified for the adjacent fill.

No direct payment shall be made for the work performed under this section. The necessary clearing and grubbing and the quantity of excavation removed will be paid for under the respective items of work.

152-2.7 Control Strip. The first half-day of construction of subgrade and/or embankment shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

152-2.8 Formation of embankments. The material shall be constructed in lifts as established in the control strip, but not less than 6 inches (150 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications.

The lifts shall be placed, to produce a soil structure as shown on the typical cross-section or as directed by the RPR. Materials such as brush, hedge, roots, stumps, grass and other organic matter, shall not be incorporated or buried in the embankment.

Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing, or other unsatisfactory weather conditions in the field. Frozen material shall not be placed in the embankment nor shall embankment be placed upon frozen material. Material shall not be placed on surfaces that are muddy, frozen, or contain frost. The Contractor shall drag, blade, or slope the embankment to provide surface drainage at all times.

The material in each lift shall be within ±2% of optimum moisture content before rolling to obtain the prescribed compaction. The material shall be moistened or aerated as necessary to achieve a uniform moisture content throughout the lift. Natural drying may be accelerated by blending in dry material or manipulation alone to increase the rate of evaporation.

The Contractor shall make the necessary corrections and adjustments in methods, materials or moisture content to achieve the specified embankment density.

The Contractor will take samples of excavated materials which will be used in embankment for testing and develop a Moisture-Density Relations of Soils Report (Proctor) in accordance with ASTM D698. A new Proctor shall be developed for each soil type based on visual classification.

Density tests will be taken by the Contractor for every 3,000 square yards of compacted embankment for each lift which is required to be compacted, or other appropriate frequencies as determined by the RPR.

If the material has greater than 30% retained on the 3/4-inch (19.0 mm) sieve, follow AASHTO T-180 Annex Correction of maximum dry density and optimum moisture for oversized particles.

Rolling operations shall be continued until the embankment is compacted to not less than 100% of maximum density for non-cohesive soils, and 95% of maximum density for cohesive soils as determined by ASTM D698. Under all areas to be paved, the embankments shall be compacted to a depth of 12 inches and to a density of not less than 100 percent of the maximum density as determined by ASTM D698. As used in this specification, "non-cohesive" shall mean those soils having a plasticity index (PI) of less than 3 as determined by ASTM D4318.

On all areas outside of the pavement areas, no compaction will be required on the top 4 inches which shall be prepared for a seedbed in accordance with Item T-901.

The in-place field density shall be determined in accordance with ASTM D1556. The Contractor shall perform all Quality Control density tests. The RPR shall perform all Quality Assurance density tests. If the specified density is not attained, the area represented by the test or as designated by the RPR shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

Compaction areas shall be kept separate, and no lift shall be covered by another lift until the proper density is obtained.

During construction of the embankment, the Contractor shall route all construction equipment evenly over the entire width of the embankment as each lift is placed. Lift placement shall begin in the deepest portion of the embankment fill. As placement progresses, the lifts shall be constructed approximately parallel to the finished pavement grade line.

When rock, concrete pavement, asphalt pavement, and other embankment material are excavated at approximately the same time as the subgrade, the material shall be incorporated into the outer portion of the embankment and the subgrade material shall be incorporated under the future paved areas. Stones, fragmentary rock, and recycled pavement larger than 4 inches (100 mm) in their greatest dimensions will not be allowed in the top 12 inches (300 mm) of the subgrade. Rockfill shall be brought up in lifts as specified or as directed by the RPR and the finer material shall be used to fill the voids forming a dense, compact mass. Rock, cement concrete pavement, asphalt pavement, and other embankment material shall not be disposed of except at places and in the manner designated on the plans or by the RPR.

When the excavated material consists predominantly of rock fragments of such size that the material cannot be placed in lifts of the prescribed thickness without crushing, pulverizing or further breaking down the pieces, such material may be placed in the embankment as directed in lifts not exceeding 2 feet (60 cm) in thickness. Each lift shall be leveled and smoothed with suitable equipment by distribution of spalls and finer fragments of rock. The lift shall not be constructed above an elevation 4 feet (1.2 m) below the finished subgrade.

There will be no separate measurement of payment for compacted embankment. All costs incidental to placing in lifts, compacting, discing, watering, mixing, sloping, and other operations necessary for construction of embankments will be included in the contract price for excavation, borrow, or other items.

152-2.9 Proof rolling. The purpose of proof rolling the subgrade is to identify any weak areas in the subgrade and not for compaction of the subgrade. Before start of embankment,and **a**fter compaction is completed,the subgrade area shall be proof rolled with a 20 ton (18.1 metric ton)Tandem axle Dual Wheel Dump Truck loaded to the legal limit with tires inflated to 150 psi in the presence of the RPR. Apply a minimum of dual coverage, or as specified by the RPR, under pavement areas. A coverage is defined as the application of one tire print over the designated area. Soft areas of subgrade that deflect more than 1 inch (25 mm) or show permanent deformation greater than 1 inch (25 mm) shall be removed and replaced with suitable material or reworked to conform to the moisture content and compaction requirements in accordance with these specifications. Removal and replacement of soft areas is incidental to this item.

152-2.10 Compaction requirements. The subgrade under areas to be paved shall be compacted to a depth of 12 inches and to a density of not less than 100 percent of the maximum dry density as determined by ASTM D698. The subgrade in areas outside the limits of the pavement areas shall be compacted to a depth of 12 inches and to a density of not less than 95 percent of the maximum density as determined by ASTM D698.

The material to be compacted shall be within ±2% of optimum moisture content before being rolled to obtain the prescribed compaction (except for expansive soils). When the material has greater than 30 percent retained on the ¾ inch (19.0 mm) sieve, follow the method in ASTM D698**.** Tests for moisture content and compaction will be taken at a minimum of 1,000 S.Y. of subgrade. All quality assurance testing shall be done by the RPR.

The in-place field density shall be determined in accordance with ASTM D1556**.**

Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

If the specified density is not attained, the entire lot shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached.

All cut-and-fill slopes shall be uniformly dressed to the slope, cross-section, and alignment shown on the plans or as directed by the RPR and the finished subgrade shall be maintained.

152-2.11 Finishing and protection of subgrade. Finishing and protection of the subgrade is incidental to this item. Grading and compacting of the subgrade shall be performed so that it will drain readily. All low areas, holes or depressions in the subgrade shall be brought to grade. Scarifying, blading, rolling and other methods shall be performed to provide a thoroughly compacted subgrade shaped to the lines and grades shown on the plans. All ruts or rough places that develop in the completed subgrade shall be graded, re-compacted, and retested. The Contractor shall protect the subgrade from damage and limit hauling over the finished subgrade to only traffic essential for construction purposes.

The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. No subbase, base, or surface course shall be placed on the subgrade until the subgrade has been accepted by the RPR.

152-2.12 Haul. All hauling will be considered a necessary and incidental part of the work. The Contractor shall include the cost in the contract unit price for the pay of items of work involved. No payment will be made separately or directly for hauling on any part of the work.

The Contractor's equipment shall not cause damage to any excavated surface, compacted lift or to the subgrade as a result of hauling operations. Any damage caused as a result of the Contractor's hauling operations shall be repaired at the Contractor's expense.

The Contractor shall be responsible for providing, maintaining and removing any haul roads or routes within or outside of the work area, and shall return the affected areas to their former condition, unless otherwise authorized in writing by the Owner. No separate payment will be made for any work or materials associated with providing, maintaining and removing haul roads or routes.

152-2.13 Surface Tolerances. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. **Smoothness.** The finished surface shall not vary more than +/- ½ inch (12 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

b. **Grade.** The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +/- 0.05 feet (15 mm) of the specified grade.

On safety areas, turfed areas and other designated areas within the grading limits where no subbase or base is to placed, grade shall not vary more than 0.10 feet (30 mm) from specified grade. Any deviation in excess of this amount shall be corrected by loosening, adding or removing materials, and reshaping.

152-2.14 Topsoil. When topsoil is specified or required as shown on the plans or under Item T-905, it shall be salvaged from stripping or other grading operations. The topsoil shall meet the requirements of Item T-905. If, at the time of excavation or stripping, the topsoil cannot be placed in its final section of finished construction, the material shall be stockpiled at approved locations. Stockpiles shall be located as shown on the plans and the approved CSPP, and shall not be placed on areas that subsequently will require any excavation or embankment fill. If, in the judgment of the RPR, it is practical to place the salvaged topsoil at the time of excavation or stripping, the material shall be placed in its final position without stockpiling or further re-handling.

Upon completion of grading operations, stockpiled topsoil shall be handled and placed as shown on the plans and as required in Item T-905. Topsoil shall be paid for as provided in Item T-905. No direct payment will be made for topsoil under Item P-152.

METHOD OF MEASUREMENT

152-3.1 Measurement for payment specified by the cubic yard shall be computed by the comparison of digital terrain model (DTM) surfaces for computation of neat line design quantities. The end area is that bound by the original ground line established by field cross-sections and the final theoretical pay line established by cross-sections shown on the plans, subject to verification by the RPR.

152-3.1 The quantity of unclassified or rock excavation to be paid for shall be the number of cubic yards measured in its original position. Measurement shall not include the quantity of materials excavated without authorization beyond normal slope lines, or the quantity of material used for purposes other than

those directed. The quantity of embankment, drainage excavation and muck excavation shall not be measured and shall be considered incidental to unclassified excavation.

152-3.3 Stockpiled material shall not be measured for payment in the stockpiled position.

BASIS OF PAYMENT

152-4.1 Unclassified excavation or Rock Excavation payment shall be made at the contract unit price per cubic yard. This price shall be full compensation for furnishing all materials, labor, equipment, tools, and incidentals necessary to complete the item. Payment for embankment, drainage excavation, and muck excavation shall be considered incidental to unclassified excavation. No separate payment for placement and compaction, or disposal of excavated material will be made and shall be considered incidental to unclassified excavation.

Payment will be made under:

Item P-152.01	Unclassified Excavation - per cubic yard
Item P-152.02	Rock Excavation – per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO T-180	Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop

ASTM International (ASTM)

ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2700 kN-m/m^3))
ASTM D6938	Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

Advisory Circulars (AC)

AC 150/5370-2	Operational Safety on Airports During Construction Software

Software

FAARFIELD – FAA Rigid and Flexible Iterative Elastic Layered Design

U.S. Department of Transportation

FAA RD-76-66 Design and Construction of Airport Pavements on Expansive Soils

END OF ITEM P-152

Item P-153 Controlled Low-Strength Material (CLSM)

DESCRIPTION

153-1.1 This item shall consist of furnishing, transporting, and placing a controlled low-strength material (CLSM) as flowable backfill in trenches or at other locations shown on the plans or as directed by the Resident Project Representative (RPR).

MATERIALS

153-2.1 Materials.

a. Cement. Cement shall conform to the requirements of ASTM C150 Type I.

b. Fly ash. Fly ash shall conform to ASTM C618, Class C or F.

c. Fine aggregate (sand). Fine aggregate shall conform to the requirements of ASTM C33 except for aggregate gradation. Any aggregate gradation which produces the specified performance characteristics of the CLSM and meets the following requirements, will be accepted.

Sieve Size	Percent Passing by weight
3/4 inch (19.0 mm)	100
No. 200 (75 μm)	0 - 12

d. Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

MIX DESIGN

153-3.1 Proportions. The Contractor shall submit, to the RPR, a mix design including the proportions and source of aggregate, fly ash, cement, water, and approved admixtures. No CLSM mixture shall be produced for payment until the RPR has given written approval of the proportions. The proportions shall be prepared by a laboratory and shall remain in effect for the duration of the project. The proportions shall establish a single percentage or weight for aggregate, fly ash, cement, water, and any admixtures proposed. Laboratory costs are incidental to this item.

a. Compressive strength. CLSM shall be designed to achieve a 28-day compressive strength of 100 to 200 psi (690 to 1379 kPa) when tested in accordance with ASTM D4832, with no significant strength gain after 28 days.

b. Consistency. Design CLSM to achieve a consistency that will produce an approximate 8-inch (200 mm) diameter circular-type spread without segregation. CLSM consistency shall be determined per ASTM D6103.

CONSTRUCTION METHODS

153-4.1 Placement.

a. Placement. CLSM may be placed by any reasonable means from the mixing unit into the space to be filled. Agitation is required during transportation and waiting time. Placement shall be performed so structures or pipes are not displaced from their final position and intrusion of CLSM into unwanted areas is avoided. The material shall be brought up uniformly to the fill line shown on the plans or as directed by the RPR. Each placement of CLSM shall be as continuous an operation as possible. If CLSM is placed in more than one lift, the base lift shall be free of surface water and loose foreign material prior to placement of the next lift.

b. Contractor Quality Control. The Contractor shall collect all batch tickets to verify the CLSM delivered to the project conforms to the mix design. The Contractor shall verify daily that the CLSM is consistent with 153-3.1a and 153-3.1b. Adjustments shall be made as necessary to the proportions and materials as needed. The Contractor shall provide all batch tickets to the RPR.

c. Limitations of placement. CLSM shall not be placed on frozen ground. Mixing and placing may begin when the air or ground temperature is at least 35°F (2°C) and rising. Mixing and placement shall stop when the air temperature is 40°F (4°C) and falling or when the anticipated air or ground temperature will be 35°F (2°C) or less in the 24-hour period following proposed placement. At the time of placement, CLSM shall have a temperature of at least 40°F (4°C).

153-4.2 Curing and protection

a. Curing. The air in contact with the CLSM shall be maintained at temperatures above freezing for a minimum of 72 hours. If the CLSM is subjected to temperatures below 32°F (0°C), the material may be rejected by the RPR if damage to the material is observed.

b. Protection. The CLSM shall not be subject to loads and shall remain undisturbed by construction activities for a period of 48 hours or until a compressive strength of 15 psi (105 kPa) is obtained. The Contractor shall be responsible for providing evidence to the RPR that the material has reached the desired strength. Acceptable evidence shall be based upon compressive tests made in accordance with paragraph 153-3.1a.

153-4.3 Quality Assurance (QA) Acceptance. CLSM QA acceptance shall be based upon batch tickets provided by the Contractor to the RPR to confirm that the delivered material conforms to the mix design.

METHOD OF MEASUREMENT

153-5.1 Measurement.

Controlled low-strength material (CLSM) shall be measured by the number of cubic yards as specified, completed, and accepted.

BASIS OF PAYMENT

153-6.1 Payment.

Controlled low-strength material (CLSM)shall be paid for at the contract unit price per cubic yard. Payment shall be full compensation for all materials, equipment, labor, and incidentals required to complete the work as specified.

Payment will be made under:

Item P-153.01	Controlled Low-Strength Material (CLSM) – per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates
ASTM C150	Standard Specification for Portland Cement
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C595	Standard Specification for Blended Hydraulic Cements
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D4832	Standard Test Method for Preparation and Testing of Controlled Low-Strength Material (CLSM) Test Cylinders
ASTM D6103	Flow Consistency of Controlled Low Strength Material (CLSM)

END OF ITEM P-153

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Item P-154 Subbase Course

DESCRIPTION

154-1.1 This item shall consist of a subbase course composed of granular materials constructed on a prepared subgrade or underlying course in accordance with these specifications, and in conformity with the dimensions and typical cross-section shown on the plans.

MATERIALS

154-2.1 Materials. The subbase material shall consist of hard durable particles or fragments of granular aggregates. The material may be obtained from gravel pits, stockpiles, or may be produced from a crushing and screening plant with proper blending. The materials from these sources shall meet the requirements for gradation, quality, and consistency. The material shall be free from vegetative matter, excessive amounts of clay, and other objectionable substances; uniformly blended; and be capable of being compacted into a dense, stable subbase.

The subbase material shall exhibit a California Bearing Ratio (CBR) value of at least 20 when tested in accordance with ASTM D1883. The subbase material shall meet the gradation specified in the table below.

Subbase Gradation Requirements

Sieve designation	Percentage by weight passing sieves		Contractor's Final Gradation	Job Control Grading Band Tolerances[1] (Percent)
	Subbase Aggregate			
3 inch (75 mm)	100			0
1 1/2 inch (37.5 mm)				0
3/4 inch (19.0 mm)	70-100			±10
No. 10 (2.00 mm)	20-100			±10
No. 40 (425 µm)	5-60			±5
No. 200 (75 µm)	0–10			±5

[1]The "Job Control Grading Band Tolerances" shall be applied to "Contractor's Final Gradation" to establish the job control grading band.

The portion of the material passing the No. 40 (425 µm) sieve shall have a liquid limit of not more than 25 and a plasticity index of not more than six (6) when tested in accordance with ASTM D4318.

154-2.2 Sampling and testing.

a. Aggregate base materials. Samples shall be taken by the Contractor per ASTM D75 for initial aggregate subbase requirements and gradation. Material shall meet the requirements in paragraphs 154-2.1. The Contractor shall submit to the Resident Project Representative (RPR) certified test results showing that the aggregate meets the Material requirements of this section. Tests shall be representative of the material to be used for the project.

b. Gradation requirements. The Contractor shall take at least one aggregate subbase sample per day in the presence of the RPR to check the final gradation. Samples shall be taken from the in-place, un-compacted material at sampling locations determined by the RPR on a random basis per ASTM D3665. Sampling shall be per ASTM D75 and tested per ASTM C136 and ASTM C117. Results shall be furnished to the RPR by the Contractor each day during construction. Material shall meet the requirements in paragraph 154-2.1.

154-2.3 Separation Geotextile. Separation geotextile shall be Class 2; 0.02 sec-1 permittivity per ASTM D4491; Apparent opening size per ASTM D4751 with 0.60 mm maximum average roll value.

154-2.4 Geogrid. Not used.

CONSTRUCTION METHODS

154-3.1 General. The subbase course shall be placed where designated on the plans or as directed by the RPR. The material shall be shaped and thoroughly compacted within the tolerances specified.

Granular subbases which, due to grain sizes or shapes, are not sufficiently stable to support the construction equipment without movement, shall be mechanically modified to the depth necessary to provide stability as directed by the RPR. The mechanical modification shall include the addition of a fine-grained medium to bind the particles of the subbase material sufficiently to furnish a bearing strength, so the course will not deform under construction equipment traffic.

154-3.2 Preparing underlying course. Prior to constructing the subbase course, clean the underlying course or subgrade of all foreign substances. The surface of the underlying course or subgrade shall meet specified compaction and surface tolerances in accordance with Item P-152. Correct ruts, soft yielding spots in the underlying courses, and subgrade areas having inadequate compaction and/or deviations of the surface from the specified requirements, by loosening and removing soft or unsatisfactory material, adding approved material, reshaping to line and grade, and recompacting to specified density requirements. For cohesionless underlying courses or subgrades containing sands or gravels, as defined in ASTM D2487, the surface shall be stabilized prior to placement of the overlying course by mixing the overlying course material into the underlying course, and compacting by approved methods. The finished underlying course shall not be disturbed by traffic or other operations and shall be maintained in a satisfactory condition until the overlying course is placed. The underlying course shall be checked and accepted by the RPR before placing and spreading operations are started.

To protect the subgrade and to ensure proper drainage, spreading of the subbase shall begin along the centerline of the pavement on a crowned section or on the high side of pavements with a one-way slope.

154-3.3 Control Strip. The first half-day of subbase construction shall be considered as a control strip for the Contractor to demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of this specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted

thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted, or removed and replaced at the Contractor's expense. Full operations shall not begin until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved in advance by the RPR.

154-3.4 Placement. The material shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted. The material shall not be placed when the underlying course is soft or yielding.

The material shall meet gradation and moisture requirements prior to compaction. Material may be free-draining and the minimum moisture content shall be established for placement and compaction of the material.

The material shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications at their own expense.

154-3.5 Compaction. The subbase material shall be compacted, adjusting moisture as necessary, to be within ±2% of optimum moisture. The field density of the compacted material shall be at least 100% of the maximum density as specified in paragraph 154-3.9a. If the specified density is not attained, the area of the lift represented by the test shall be reworked and/or re-compacted and additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

154-3.6 Weather limitation. Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on subbase course shall not be conducted when the subgrade is wet or frozen or the subbase material contains frozen material.

154-3.7 Maintenance. No base or surface course shall be placed on the subbase until the subbase has been accepted by the RPR. The Contractor shall maintain the completed course in satisfactory condition throughout placement of subsequent layers. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, the Contractor shall verify that materials still meet all specification requirements before placement of additional material. Equipment may be routed over completed sections of subbase course, provided the equipment does not damage the subbase course and the equipment is routed over the full width of the completed subbase course. Any damage to the subbase course from routing equipment over the subbase course shall be repaired by the Contractor at their expense.

154-3.8 Surface tolerance. In those areas on which a subbase or base course is to be placed, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and re-compacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. The Contractor shall perform all final smoothness and grade checks in the presence

of the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense.

a. Smoothness. The finished surface shall not vary more than +/- ½ inch (12 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

b. Grade. The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +/- 0.05 feet (15 mm) of the specified grade.

154-3.9 Acceptance sampling and testing. The aggregate base course shall be accepted for density and thickness on an area basis. Two test shall be made for density and thickness for each 1200 square yards (1000 square meters). Sampling locations will be determined on a random basis per ASTM D3665.

a. Density. The Contractor shall perform all Quality Control density tests. The RPR shall perform all Quality Assurance density tests.

Each area shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM D698. The in-place field density shall be determined per ASTM D1556. If the specified density is not attained, the area represented by the failed test shall be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

When the material has greater than 30 percent retained on the ¾ inch (19.0 mm) sieve, use methods in ASTM D698 and the procedures in AASHTO T180 Annex for correction of maximum dry density and optimum moisture for oversized particles.

b. Thickness. The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

METHOD OF MEASUREMENT

154-4.1 Subbase course shall be measured by the number of cubic yards of subbase course material placed and compacted to specified density and plan thickness requirements in the completed course. The quantity of subbase course material shall be measured in final position based upon survey of the completed work computed from elevations to the nearest 0.01 foot (3 mm). On individual depth measurements, thicknesses more than 1/2 inch (12 mm) in excess of that shown on the plans shall be considered as the specified thickness plus 1/2 inch (12 mm) in computing the yardage for payment. Subbase materials shall not be included in any other excavation quantities.

154-4.2 Not Used.

BASIS OF PAYMENT

154-5.1 Payment shall be made at the contract unit price per cubic yard for subbase course. This price shall be full compensation for furnishing all materials; for all preparation, hauling, and placing of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

154-5.2 Payment shall be made at the contract unit price per square yard for separation geotextile-class 2. The price shall be full compensation for furnishing all labor, equipment, material, anchors, and necessary incidentals.

Payment will be made under:

Item P-154.01	Subbase Course - per cubic yard
Item P-154.02	Separation Geotextile - per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3))
ASTM D2487	Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D4253	Standard Test Methods for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table
ASTM D4759	Practice for Determining the Specification Conformance of Geosynthetics
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)

American Association of State Highway and Transportation Officials (AASHTO)

M 288	Geotextile Specification for Highway Applications

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Item P-209 Crushed Aggregate Base Course

DESCRIPTION

209-1.1 This item consists of a base course composed of crushed aggregate base constructed on a prepared course in accordance with these specifications and in conformity to the dimensions and typical cross-sections shown on the plans.

MATERIALS

209-2.1 Crushed aggregate base. Crushed aggregate shall consist of clean, sound, durable particles of crushed stone, or crushed gravel and shall be free from coatings of clay, silt, organic material, clay lumps or balls or other deleterious materials or coatings. The method used to produce the crushed gravel shall result in the fractured particles in the finished product as consistent and uniform as practicable. Fine aggregate portion, defined as the portion passing the No. 4 (4.75 mm) sieve shall consist of fines from the coarse aggregate crushing operation. The fine aggregate shall be produced by crushing stone or gravel that meet the coarse aggregate requirements for wear and soundness. Aggregate base material requirements are listed in the following table.

Crushed Aggregate Base Material Requirements

Material Test	Requirement	Standard
Coarse Aggregate		
Resistance to Degradation	Loss: 45% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Percentage of Fractured Particles	Minimum 90% by weight of particles with at least two fractured faces and 98% with at least one fractured face[1]	ASTM D5821
Flat Particles, Elongated Particles, or Flat and Elongated Particles	10% maximum, by weight, of flat, elongated, or flat and elongated particles [2]	ASTM D4791
Fine Aggregate		
Liquid limit	Less than or equal to 25	ASTM D4318
Plasticity Index	Not more than five (5)	ASTM D4318

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

[2] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

209-2.2 Gradation requirements. The gradation of the aggregate base material shall meet the requirements of the gradation given in the following table when tested per ASTM C117 and ASTM C136. The gradation shall be well graded from coarse to fine and shall not vary from the lower limit on one sieve to the high limit on an adjacent sieve or vice versa.

Gradation of Aggregate Base

Sieve Size	Design Range Percentage by Weight passing	Contractor's Final Gradation	Job Control Grading Band Tolerances[1] (Percent)
2 inch (50 mm)	100		0
1-1/2 inch (37.5 mm)	95-100		±5
1 inch (25.0 mm)	70-95		±8
3/4 inch (19.0 mm)	55-85		±8
No. 4 (4.75 mm)	30-60		±8
No. 40[2] (425 µm)	10-30		±5
No. 200[2] (75 µm)	0-5		±3

[1] The "Job Control Grading Band Tolerances for Contractor's Final Gradation" in the table shall be applied to "Contractor's Final Gradation" to establish a job control grading band. The full tolerance still applies if application of the tolerances results in a job control grading band outside the design range.

[2] The fraction of material passing the No 200 (75 µm) sieve shall not exceed two-thirds the fraction passing the No 40 (425 µm) sieve.

209-2.3 Sampling and Testing.

a. Aggregate base materials. The Contractor shall take samples of the aggregate base in accordance with ASTM D75 to verify initial aggregate base requirements and gradation. Material shall meet the requirements in paragraph 209-2.1. This sampling and testing will be the basis for approval of the aggregate base quality requirements.

b. Gradation requirements. The Contractor shall take at least two aggregate base samples per day in the presence of the Resident Project Representative (RPR) to check the final gradation. Sampling shall be per ASTM D75. Material shall meet the requirements in paragraph 209-2.2. The samples shall be taken from the in-place, un-compacted material at sampling points and intervals designated by the RPR.

209-2.4 Separation Geotextile. Not used.

CONSTRUCTION METHODS

209-3.1 Control strip. The first half-day of construction shall be considered the control strip. The Contractor shall demonstrate, in the presence of the RPR, that the materials, equipment, and construction processes meet the requirements of the specification. The sequence and manner of rolling necessary to obtain specified density requirements shall be determined. The maximum compacted thickness may be increased to a maximum of 12 inches (300 mm) upon the Contractor's demonstration that approved

equipment and operations will uniformly compact the lift to the specified density. The RPR must witness this demonstration and approve the lift thickness prior to full production.

Control strips that do not meet specification requirements shall be reworked, re-compacted or removed and replaced at the Contractor's expense. Full operations shall not continue until the control strip has been accepted by the RPR. The Contractor shall use the same equipment, materials, and construction methods for the remainder of construction, unless adjustments made by the Contractor are approved by the RPR.

209-3.2 Preparing underlying subgrade and/or subbase. The underlying subgrade and/or subbase shall be checked and accepted by the RPR before base course placing and spreading operations begin. Re-proof rolling of the subgrade or proof rolling of the subbase in accordance with Item P-152, at the Contractor's expense, may be required by the RPR if the Contractor fails to ensure proper drainage or protect the subgrade and/or subbase. Any ruts or soft, yielding areas due to improper drainage conditions, hauling, or any other cause, shall be corrected before the base course is placed. To ensure proper drainage, the spreading of the base shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope.

209-3.3 Production. The aggregate shall be uniformly blended and, when at a satisfactory moisture content per paragraph 209-3.5, the approved material may be transported directly to the placement.

209-3.4 Placement. The aggregate shall be placed and spread on the prepared underlying layer by spreader boxes or other devices as approved by the RPR, to a uniform thickness and width. The equipment shall have positive thickness controls to minimize the need for additional manipulation of the material. Dumping from vehicles that require re-handling shall not be permitted. Hauling over the uncompacted base course shall not be permitted.

The aggregate shall meet gradation and moisture requirements prior to compaction. The base course shall be constructed in lifts as established in the control strip, but not less than 4 inches (100 mm) nor more than 12 inches (300 mm) of compacted thickness.

When more than one lift is required to establish the layer thickness shown on the plans, the construction procedure described here shall apply to each lift. No lift shall be covered by subsequent lifts until tests verify that compaction requirements have been met. The Contractor shall rework, re-compact and retest any material placed which does not meet the specifications at the Contractor's expense.

209-3.5 Compaction. Immediately after completion of the spreading operations, compact each layer of the base course, as specified, with approved compaction equipment. The number, type, and weight of rollers shall be sufficient to compact the material to the required density within the same day that the aggregate is placed on the subgrade.

The field density of each compacted lift of material shall be at least 100% of the maximum density of laboratory specimens prepared from samples of the base material delivered to the jobsite. The laboratory specimens shall be compacted and tested in accordance with ASTM D1557. The moisture content of the material during placing operations shall be within ±2 percentage points of the optimum moisture content as determined by ASTM D698. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

209-3.6 Weather limitations. Material shall not be placed unless the ambient air temperature is at least 40°F (4°C) and rising. Work on base course shall not be conducted when the subgrade or subbase is wet or frozen or the base material contains frozen material.

209-3.7 Maintenance. The base course shall be maintained in a condition that will meet all specification requirements. When material has been exposed to excessive rain, snow, or freeze-thaw conditions, prior to placement of additional material, the Contractor shall verify that materials still meet all specification

requirements. Equipment may be routed over completed sections of base course, provided that no damage results and the equipment is routed over the full width of the completed base course. Any damage resulting to the base course from routing equipment over the base course shall be repaired by the Contractor at the Contractor's expense.

209-3.8 Surface tolerances. After the course has been compacted, the surface shall be tested for smoothness and accuracy of grade and crown. Any portion lacking the required smoothness or failing in accuracy of grade or crown shall be scarified to a depth of at least 3 inches (75 mm), reshaped and recompacted to grade until the required smoothness and accuracy are obtained and approved by the RPR. Any deviation in surface tolerances shall be corrected by the Contractor at the Contractor's expense. The smoothness and accuracy requirements specified here apply only to the top layer when base course is constructed in more than one layer.

a. Smoothness. The finished surface shall not vary more than 3/8-inch (9 mm) when tested with a 12-foot (3.7-m) straightedge applied parallel with and at right angles to the centerline. The straightedge shall be moved continuously forward at half the length of the 12-foot (3.7-m) straightedge for the full length of each line on a 50-foot (15-m) grid.

b. Grade. The grade and crown shall be measured on a 50-foot (15-m) grid and shall be within +0 and -1/2 inch (12 mm) of the specified grade.

209-3.9 Acceptance sampling and testing. Crushed aggregate base course shall be accepted for density and thickness on an area basis. Two tests shall be made for density and thickness for each 1200 square yds. Sampling locations will be determined on a random basis per ASTM D3665

a. Density. The Contractor shall perform all Quality Control density testing. The RPR shall perform all Quality Assurance density tests.

Each area shall be accepted for density when the field density is at least 100% of the maximum density of laboratory specimens compacted and tested per ASTM D698. The in-place field density shall be determined per ASTM D6938 using Procedure A, the direct transmission method, and ASTM D6938 shall be used to determine the moisture content of the material. The machine shall be calibrated in accordance with ASTM D6938. If the specified density is not attained, the area represented by the failed test must be reworked and/or recompacted and two additional random tests made. This procedure shall be followed until the specified density is reached. Maximum density refers to maximum dry density at optimum moisture content unless otherwise specified.

b. Thickness. Depth tests shall be made by test holes at least 3 inches (75 mm) in diameter that extend through the base. The thickness of the base course shall be within +0 and -1/2 inch (12 mm) of the specified thickness as determined by depth tests taken by the Contractor in the presence of the RPR for each area. Where the thickness is deficient by more than 1/2-inch (12 mm), the Contractor shall correct such areas at no additional cost by scarifying to a depth of at least 3 inches (75 mm), adding new material of proper gradation, and the material shall be blended and recompacted to grade. The Contractor shall replace, at his expense, base material where depth tests have been taken.

METHOD OF MEASUREMENT

209-4.1 The quantity of crushed aggregate base course will be determined by measurement of the number of cubic yards of material actually constructed and accepted by the RPR as complying with the plans and specifications. Base materials shall not be included in any other excavation quantities.

BASIS OF PAYMENT

209-5.1 Payment shall be made at the contract unit price per `cubic yard` for crushed aggregate base course. This price shall be full compensation for furnishing all materials, for preparing and placing these materials, and for all labor, equipment tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-209.01	Crushed Aggregate Base Course - per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density ("Unit Weight") and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D698	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))
ASTM D1556	Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method
ASTM D1557	Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2700 kN-m/m^3))
ASTM D2167	Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D4491	Standard Test Methods for Water Permeability of Geotextiles by Permittivity
ASTM D4643	Standard Test Method for Determination of Water Content of Soil and Rock by Microwave Oven Heating
ASTM D4751	Standard Test Methods for Determining Apparent Opening Size of a Geotextile
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6938	Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
ASTM D7928	Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis

American Association of State Highway and Transportation Officials (AASHTO)

M288	Standard Specification for Geosynthetic Specification for Highway Applications

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Item P-401 Asphalt Mix Pavement

DESCRIPTION

401-1.1 This item shall consist of pavement courses composed of mineral aggregate and asphalt binder mixed in a central mixing plant and placed on a prepared base or stabilized course in accordance with these specifications and shall conform to the lines, grades, thicknesses, and typical cross-sections shown on the plans. Each course shall be constructed to the depth, typical section, and elevation required by the plans and shall be rolled, finished, and approved before the placement of the next course.

MATERIALS

401-2.1 Aggregate. Aggregates shall consist of crushed stone, crushed gravel, crushed slag, screenings, natural sand, and mineral filler, as required. The aggregates should have no known history of detrimental pavement staining due to ferrous sulfides, such as pyrite. Coarse aggregate is the material retained on the No. 4 (4.75 mm) sieve. Fine aggregate is the material passing the No. 4 (4.75 mm) sieve.

a. Coarse aggregate. Coarse aggregate shall consist of sound, tough, durable particles, free from films of matter that would prevent thorough coating and bonding with the asphalt material and free from organic matter and other deleterious substances. Coarse aggregate material requirements are given in the table below.

Coarse Aggregate Material Requirements

Material Test	Requirement	Standard
Resistance to Degradation	Loss: 40% maximum	ASTM C131
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 12% maximum using Sodium sulfate - or - 18% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0 % maximum	ASTM C142
Percentage of Fractured Particles	For pavements designed for aircraft gross weights of 60,000 pounds (27200 kg) or more: Minimum 75% by weight of particles with at least two fractured faces and 85% with at least one fractured face[1]	ASTM D5821
	For pavements designed for aircraft gross weights less than 60,000 pounds (27200 kg): Minimum 50% by weight of particles with at least two fractured faces and 65% with at least one fractured face[1]	
Flat, Elongated, or Flat and Elongated Particles	8% maximum, by weight, of flat, elongated, or flat and elongated particles at 5:1 [2]	ASTM D4791
Bulk density of slag [3]	Weigh not less than 70 pounds per cubic foot (1.12 Mg/cubic meter)	ASTM C29.

[1] The area of each face shall be equal to at least 75% of the smallest mid-sectional area of the piece. When two fractured faces are contiguous, the angle between the planes of fractures shall be at least 30 degrees to count as two fractured faces.

[2] A flat particle is one having a ratio of width to thickness greater than five (5); an elongated particle is one having a ratio of length to width greater than five (5).

[3] Only required if slag is specified.

b. Fine aggregate. Fine aggregate shall consist of clean, sound, tough, durable, angular shaped particles produced by crushing stone, slag, or gravel and shall be free from coatings of clay, silt, or other objectionable matter. Natural (non-manufactured) sand may be used to obtain the gradation of the fine aggregate blend or to improve the workability of the mix. Fine aggregate material requirements are listed in the table below.

Fine Aggregate Material Requirements

Material Test	Requirement	Standard
Liquid limit	25 maximum	ASTM D4318
Plasticity Index	4 maximum	ASTM D4318
Soundness of Aggregates by Use of Sodium Sulfate **or** Magnesium Sulfate	Loss after 5 cycles: 10% maximum using Sodium sulfate - or - 15% maximum using magnesium sulfate	ASTM C88
Clay lumps and friable particles	1.0% maximum	ASTM C142
Sand equivalent	45 minimum	ASTM D2419

c. Sampling. ASTM D75 shall be used in sampling coarse and fine aggregate.

401-2.2 Mineral filler. Mineral filler (baghouse fines) may be added in addition to material naturally present in the aggregate. Mineral filler shall meet the requirements of ASTM D242.

Mineral Filler Requirements

Material Test	Requirement	Standard
Plasticity Index	4 maximum	ASTM D4318

401-2.3 Asphalt binder. Asphalt binder shall conform to ASTM D6373 Performance Grade (PG) 64-28.

401-2.4 Anti-stripping agent. Any anti-stripping agent or additive (anti-strip) shall be heat stable and shall not change the asphalt binder grade beyond specifications. Anti-strip shall be an approved material of the Department of Transportation of the State in which the project is located.

COMPOSITION

401-3.1 Composition of mixture(s). The asphalt mix shall be composed of a mixture of aggregates, filler and anti-strip agent if required, and asphalt binder. The aggregate fractions shall be sized, handled in separate size groups, and combined in such proportions that the resulting mixture meets the grading requirements of the job mix formula (JMF).

401-3.2 Job mix formula (JMF) laboratory. The laboratory used to develop the JMF shall possess a current certificate of accreditation, listing D3666 from a national accrediting authority and all test methods required for developing the JMF; and be listed on the accrediting authority's website. A copy of the laboratory's current accreditation and accredited test methods shall be submitted to the Resident Project Representative (RPR) prior to start of construction.

401-3.3 Job mix formula (JMF). No asphalt mixture shall be placed until an acceptable mix design has been submitted to the RPR for review and accepted in writing. The RPR's review shall not relieve the Contractor of the responsibility to select and proportion the materials to comply with this section.

When the project requires asphalt mixtures of differing aggregate gradations and/or binders, a separate JMF shall be submitted for each mix. Add anti-stripping agent to meet tensile strength requirements.

The JMF shall be prepared by an accredited laboratory that meets the requirements of paragraph 401-3.2. The asphalt mixture shall be designed using procedures contained in Asphalt Institute MS-2 Mix Design Manual, 7th Edition**.** Samples shall be prepared and compacted using the gyratory compactor in accordance with ASTM D6925.

Should a change in sources of materials be made, a new JMF must be submitted to the RPR for review and accepted in writing before the new material is used. After the initial production JMF has been approved by the RPR and a new or modified JMF is required for whatever reason, the subsequent cost of the new or modified JMF, including a new control strip when required by the RPR, will be borne by the Contractor.

The RPR may request samples at any time for testing, prior to and during production, to verify the quality of the materials and to ensure conformance with the applicable specifications.

The JMF shall be submitted in writing by the Contractor at least 30 days prior to the start of paving operations. The JMF shall be developed within the same construction season using aggregates proposed for project use.

The JMF shall be dated, and stamped or sealed by the responsible professional Engineer of the laboratory and shall include the following items as a minimum:

- Manufacturer's Certificate of Analysis (COA) for the asphalt binder used in the JMF in accordance with paragraph 401-2.3. Certificate of asphalt performance grade is with modifier already added, if used and must indicate compliance with ASTM D6373. For plant modified asphalt binder, certified test report indicating grade certification of modified asphalt binder.
- Manufacturer's Certificate of Analysis (COA) for the anti-stripping agent if used in the JMF in accordance with paragraph 401-2.4.
- Certified material test reports for the course and fine aggregate and mineral filler in accordance with paragraphs 401-2.1.
- Percent passing each sieve size for individual gradation of each aggregate cold feed and/or hot bin; percent by weight of each cold feed and/or hot bin used; and the total combined gradation in the JMF.
- Specific Gravity and absorption of each coarse and fine aggregate.
- Percent natural sand.
- Percent fractured faces.
- Percent by weight of flat particles, elongated particles, and flat and elongated particles (and criteria).
- Percent of asphalt.
- Number of blows or gyrations
- Laboratory mixing and compaction temperatures.
- Supplier-recommended field mixing and compaction temperatures.
- Plot of the combined gradation on a 0.45 power gradation curve.
- Graphical plots of air voids, voids in the mineral aggregate (VMA), and unit weight versus asphalt content. To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

- Tensile Strength Ratio (TSR).
- Type and amount of Anti-strip agent when used.
- Asphalt Pavement Analyzer (APA) results.
- Date the JMF was developed. Mix designs that are not dated or which are from a prior construction season shall not be accepted.

Table 1. Asphalt Design Criteria

Test Property	Value	Test Method
Number of blows or gyrations	75	
Air voids (%)	3.5	ASTM D3203
Percent voids in mineral aggregate (VMA), minimum	See Table 2	ASTM D6995
Tensile Strength Ratio (TSR)[1]	not less than 80 at a saturation of 70-80%	ASTM D4867
Asphalt Pavement Analyzer (APA)[2,3]	Less than 10 mm @ 4000 passes	AASHTO T340 at 250 psi hose pressure at 64°C test temperature

[1] Test specimens for TSR shall be compacted at 7 ± 1.0 % air voids. In areas subject to freeze-thaw, use freeze-thaw conditioning in lieu of moisture conditioning per ASTM D4867.

[2] AASHTO T340 at 100 psi hose pressure at 64°C test temperature may be used in the interim. If this method is used the required Value shall be less than 5 mm @ 8000 passes

[3] Where APA not available , use Hamburg Wheel test (AASHTO T-324) 10mm @ 20,000 passes at 50°C.

The mineral aggregate shall be of such size that the percentage composition by weight, as determined by laboratory sieves, will conform to the gradation or gradations specified in Table 2 when tested in accordance with ASTM C136 and ASTM C117.

The gradations in Table 2 represent the limits that shall determine the suitability of aggregate for use from the sources of supply; be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve, or vice versa.

Table 2. Aggregate - Asphalt Pavements

Sieve Size	Percentage by Weight Passing Sieve
1 inch (25.0 mm)	100
3/4 inch (19.0 mm)	100
1/2 inch (12.5 mm)	90-100
3/8 inch (9.5 mm)	72-88
No. 4 (4.75 mm)	53-73
No. 8 (2.36 mm)	38-60
No. 16 (1.18 mm)	26-48
No. 30 (600 µm)	18-38
No. 50 (300 µm)	11-27
No. 100 (150 µm)	6-18
No. 200 (75 µm)	3-6
Minimum Voids in Mineral Aggregate (VMA)[1]	15.0
Asphalt Percent:	
Stone or gravel	5.0-7.5
Slag	6.5-9.5
Recommended Minimum Construction Lift Thickness	2 inch

[1]To achieve minimum VMA during production, the mix design needs to account for material breakdown during production.

The aggregate gradations shown are based on aggregates of uniform specific gravity. The percentages passing the various sieves shall be corrected when aggregates of varying specific gravities are used, as indicated in the Asphalt Institute MS-2 Mix Design Manual, 7th Edition.

401-3.4 Reclaimed asphalt pavement (RAP). RAP shall not be used.

401-3.5 Control Strip. Full production shall not begin until an acceptable control strip has been constructed and accepted in writing by the RPR**.** The Contractor shall prepare and place a quantity of asphalt according to the JMF. The underlying grade or pavement structure upon which the control strip is to be constructed shall be the same as the remainder of the course represented by the control strip.

The Contractor will not be allowed to place the control strip until the Contractor quality control program (CQCP), showing conformance with the requirements of paragraph 401-5.1, has been accepted, in writing, by the RPR.

The control strip will consist of at least 250 tons (227 metric tons) or 1/2 sublot, whichever is greater. The control strip shall be placed in two lanes of the same width and depth to be used in production with a longitudinal cold joint. The cold joint must be cut back in accordance with paragraph 401-4.14 using the same procedure that will be used during production. The cold joint for the control strip will be an exposed construction joint at least four (4) hours old or when the mat has cooled to less than 160°F (71°C). The

equipment used in construction of the control strip shall be the same type, configuration and weight to be used on the project.

The control strip will be considered acceptable by the RPR if the gradation, asphalt content, and VMA are within the action limits specified in paragraph 401-5.5a; and Mat density greater than or equal to 94.5%, air voids 3.5% +/- 1%, and joint density greater than or equal to 92.5%.

If the control strip is unacceptable, necessary adjustments to the JMF, plant operation, placing procedures, and/or rolling procedures shall be made and another control strip shall be placed. Unacceptable control strips shall be removed at the Contractor's expense.

The control strip will be considered one lot for payment based upon the average of a minimum of 3 samples (no sublots required for control strip). Payment will only be made for an acceptable control strip in accordance with paragraph 401-8.1 using a lot pay factor equal to 100.

CONSTRUCTION METHODS

401-4.1 Weather limitations. The asphalt shall not be placed upon a wet surface or when the surface temperature of the underlying course is less than specified in Table 4. The temperature requirements may be waived by the RPR, if requested; however, all other requirements including compaction shall be met.

Table 4. Surface Temperature Limitations of Underlying Course

Mat Thickness	Base Temperature (Minimum)	
	°F	°C
3 inches (7.5 cm) or greater	40 [1]	4
Greater than 2 inches (50 mm) but less than 3 inches (7.5 cm)	45	7

401-4.2 Asphalt plant. Plants used for the preparation of asphalt shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M156 including the following items.

a. Inspection of plant. The RPR, or RPR's authorized representative, shall have access, at all times, to all areas of the plant for checking adequacy of equipment; inspecting operation of the plant: verifying weights, proportions, and material properties; and checking the temperatures maintained in the preparation of the mixtures.

b. Storage bins and surge bins. The asphalt mixture stored in storage and/or surge bins shall meet the same requirements as asphalt mixture loaded directly into trucks. Asphalt mixture shall not be stored in storage and/or surge bins for a period greater than twelve (12) hours. If the RPR determines there is an excessive heat loss, segregation, or oxidation of the asphalt mixture due to temporary storage, temporary storage shall not be allowed.

401-4.3 Aggregate stockpile management. Aggregate stockpiles shall be constructed in a manner that prevents segregation and intermixing of deleterious materials. Aggregates from different sources shall be stockpiled, weighed and batched separately at the asphalt batch plant. Aggregates that have become segregated or mixed with earth or foreign material shall not be used.

A continuous supply of materials shall be provided to the work to ensure continuous placement.

401-4.4 Hauling equipment. Trucks used for hauling asphalt shall have tight, clean, and smooth metal beds. To prevent the asphalt from sticking to the truck beds, the truck beds shall be lightly coated with a minimum amount of paraffin oil, lime solution, or other material approved by the RPR. Petroleum products shall not be used for coating truck beds. Each truck shall have a suitable cover to protect the mixture from adverse weather. When necessary, to ensure that the mixture will be delivered to the site at the specified temperature, truck beds shall be insulated or heated and covers shall be securely fastened.

401-4.4.1 Material transfer vehicle (MTV). Material transfer vehicles are not required.

401-4.5 Asphalt pavers. Asphalt pavers shall be self-propelled with an activated heated screed, capable of spreading and finishing courses of asphalt that will meet the specified thickness, smoothness, and grade. The paver shall have sufficient power to propel itself and the hauling equipment without adversely affecting the finished surface. The asphalt paver shall be equipped with a control system capable of automatically maintaining the specified screed grade and elevation.

If the spreading and finishing equipment in use leaves tracks or indented areas, or produces other blemishes in the pavement that are not satisfactorily corrected by the scheduled operations, the use of such equipment shall be discontinued.

The paver shall be capable of paving to a minimum width specified in paragraph 401-4.12.

401-4.6 Rollers. The number, type, and weight of rollers shall be sufficient to compact the asphalt to the required density while it is still in a workable condition without crushing of the aggregate, depressions or other damage to the pavement surface. Rollers shall be in good condition, clean, and capable of operating at slow speeds to avoid displacement of the asphalt. All rollers shall be specifically designed and suitable for compacting asphalt concrete and shall be properly used. Rollers that impair the stability of any layer of a pavement structure or underlying soils shall not be used.

401-4.7 Density device. The Contractor shall have on site a density gauge during all paving operations in order to assist in the determination of the optimum rolling pattern, type of roller and frequencies, as well as to monitor the effect of the rolling operations during production paving. The Contractor shall supply a qualified technician during all paving operations to calibrate the gauge and obtain accurate density readings for all new asphalt. These densities shall be supplied to the RPR upon request at any time during construction. No separate payment will be made for supplying the density gauge and technician.

401-4.8 Preparation of asphalt binder. The asphalt binder shall be heated in a manner that will avoid local overheating and provide a continuous supply of the asphalt binder to the mixer at a uniform temperature. The temperature of unmodified asphalt binder delivered to the mixer shall be sufficient to provide a suitable viscosity for adequate coating of the aggregate particles, but shall not exceed 325°F (160°C) when added to the aggregate. The temperature of modified asphalt binder shall be no more than 350°F (175°C) when added to the aggregate.

401-4.9 Preparation of mineral aggregate. The aggregate for the asphalt shall be heated and dried. The maximum temperature and rate of heating shall be such that no damage occurs to the aggregates. The temperature of the aggregate and mineral filler shall not exceed 350°F (175°C) when the asphalt binder is added. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by overheating. The temperature shall not be lower than is required to obtain complete coating and uniform distribution on the aggregate particles and to provide a mixture of satisfactory workability.

401-4.10 Preparation of Asphalt mixture. The aggregates and the asphalt binder shall be weighed or metered and mixed in the amount specified by the JMF. The combined materials shall be mixed until the aggregate obtains a uniform coating of asphalt binder and is thoroughly distributed throughout the mixture. Wet mixing time shall be the shortest time that will produce a satisfactory mixture, but not less than 25 seconds for batch plants. The wet mixing time for all plants shall be established by the Contractor,

based on the procedure for determining the percentage of coated particles described in ASTM D2489, for each individual plant and for each type of aggregate used. The wet mixing time will be set to achieve 95% of coated particles. For continuous mix plants, the minimum mixing time shall be determined by dividing the weight of its contents at operating level by the weight of the mixture delivered per second by the mixer. The moisture content of all asphalt upon discharge shall not exceed 0.5%.

401-4.11 Application of Tack Coat. Immediately before placing the asphalt mixture, the underlying course shall be cleaned of all dust and debris.

A tack coat shall be applied in accordance with Item P-603 to all vertical and horizontal asphalt and concrete surfaces prior to placement of the first and each subsequent lift of asphalt mixture.

401-4.12 Laydown plan, transporting, placing, and finishing. Prior to the placement of the asphalt, the Contractor shall prepare a laydown plan with the sequence of paving lanes and width to minimize the number of cold joints; the location of any temporary ramps; laydown temperature; and estimated time of completion for each portion of the work (milling, paving, rolling, cooling, etc.). The laydown plan and any modifications shall be approved by the RPR.

Deliveries shall be scheduled so that placing and compacting of asphalt is uniform with minimum stopping and starting of the paver. Hauling over freshly placed material shall not be permitted until the material has been compacted, as specified, and allowed to cool to approximately ambient temperature. The Contractor, at their expense, shall be responsible for repair of any damage to the pavement caused by hauling operations.

Contractor shall survey each lift of asphalt surface course and certify to RPR that every lot of each lift meets the grade tolerances of paragraph 401-6.2d before the next lift can be placed.

Edges of existing asphalt pavement abutting the new work shall be saw cut and the cut off material and laitance removed. Apply a tack coat in accordance with P-603 before new asphalt material is placed against it.

The speed of the paver shall be regulated to eliminate pulling and tearing of the asphalt mat. Placement of the asphalt mix shall begin along the centerline of a crowned section or on the high side of areas with a one way slope unless shown otherwise on the laydown plan as accepted by the RPR. The asphalt mix shall be placed in consecutive adjacent lanes having a minimum width of 12.5 feet (m) except where edge lanes require less width to complete the area. Additional screed sections attached to widen the paver to meet the minimum lane width requirements must include additional auger sections to move the asphalt mixture uniformly along the screed extension.

The longitudinal joint in one course shall offset the longitudinal joint in the course immediately below by at least one foot (30 cm); however, the joint in the surface top course shall be at the centerline of crowned pavements. Transverse joints in one course shall be offset by at least 10 feet (3 m) from transverse joints in the previous course. Transverse joints in adjacent lanes shall be offset a minimum of 10 feet (3 m). On areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the asphalt may be spread and luted by hand tools.

The RPR may at any time, reject any batch of asphalt, on the truck or placed in the mat, which is rendered unfit for use due to contamination, segregation, incomplete coating of aggregate, or overheated asphalt mixture. Such rejection may be based on only visual inspection or temperature measurements. In the event of such rejection, the Contractor may take a representative sample of the rejected material in the presence of the RPR, and if it can be demonstrated in the laboratory, in the presence of the RPR, that such material was erroneously rejected, payment will be made for the material at the contract unit price.

Areas of segregation in the surface course, as determined by the RPR, shall be removed and replaced at the Contractor's expense. The area shall be removed by saw cutting and milling a minimum of the construction lift thickness as specified in paragraph 401-3.3, Table 2 for the approved mix design. The area to be removed and replaced shall be a minimum width of the paver and a minimum of 10 feet (3 m) long.

401-4.13 Compaction of asphalt mixture. After placing, the asphalt mixture shall be thoroughly and uniformly compacted by self-propelled rollers. The surface shall be compacted as soon as possible when the asphalt has attained sufficient stability so that the rolling does not cause undue displacement, cracking or shoving. The sequence of rolling operations and the type of rollers used shall be at the discretion of the Contractor. The speed of the roller shall, at all times, be sufficiently slow to avoid displacement of the hot mixture and be effective in compaction. Any surface defects and/or displacement occurring as a result of the roller, or from any other cause, shall be corrected at the Contractor's expense.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until the surface is of uniform texture, true to grade and cross-section, and the required field density is obtained. To prevent adhesion of the asphalt to the roller, the wheels shall be equipped with a scraper and kept moistened with water as necessary.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with approved power tampers.

Any asphalt that becomes loose and broken, mixed with dirt, contains check-cracking, or in any way defective shall be removed and replaced with fresh hot mixture and immediately compacted to conform to the surrounding area. This work shall be done at the Contractor's expense. Skin patching shall not be allowed.

401-4.14 Joints. The formation of all joints shall be made to ensure a continuous bond between the courses and obtain the required density. All joints shall have the same texture as other sections of the course and meet the requirements for smoothness and grade.

The roller shall not pass over the unprotected end of the freshly laid asphalt except when necessary to form a transverse joint. When necessary to form a transverse joint, it shall be made by means of placing a bulkhead or by tapering the course. The tapered edge shall be cut back to its full depth and width on a straight line to expose a vertical face prior to placing the adjacent lane. In both methods, all contact surfaces shall be coated with an asphalt tack coat before placing any fresh asphalt against the joint.

Longitudinal joints which have been left exposed for more than four (4) hours; the surface temperature has cooled to less than 175°F (80°C**)**; or are irregular, damaged, uncompacted or otherwise defective shall be cut back with a cutting wheel or pavement saw a maximum of 3 inches (75 mm) to expose a clean, sound, uniform vertical surface for the full depth of the course. All cutback material and any laitance produced from cutting joints shall be removed from the project. Asphalt tack coat in accordance with P-603 shall be applied to the clean, dry joint prior to placing any additional fresh asphalt against the joint. The cost of this work shall be considered incidental to the cost of the asphalt.

401-4.15 Saw-cut grooving. Saw-cut grooving is not required.

401-4.16 Diamond grinding. Diamond grinding shall be completed prior to pavement grooving. Diamond grinding shall be accomplished by sawing with saw blades impregnated with industrial diamond abrasive.

Diamond grinding shall be performed with a machine designed specifically for diamond grinding capable of cutting a path at least 3 feet (0.9 m) wide. The saw blades shall be 1/8-inch (3-mm) wide with a sufficient number of blades to create grooves between 0.090 and 0.130 inches (2 and 3.5 mm) wide; and peaks and ridges approximately 1/32 inch (1 mm) higher than the bottom of the grinding cut. The actual

number of blades will be determined by the Contractor and depend on the hardness of the aggregate. Equipment or grinding procedures that cause ravels, aggregate fractures, spalls or disturbance to the pavement will not be permitted. Contractor shall demonstrate to the RPR that the grinding equipment will produce satisfactory results prior to making corrections to surfaces. Grinding will be tapered in all directions to provide smooth transitions to areas not requiring grinding. The slurry resulting from the grinding operation shall be continuously removed and the pavement left in a clean condition. The Contractor shall apply a surface treatment per P-608 to all areas that have been subject to grinding.

401-4.17 Nighttime paving requirements. The Contractor shall provide adequate lighting during any nighttime construction. A lighting plan shall be submitted by the Contractor and approved by the RPR prior to the start of any nighttime work. All work shall be in accordance with the approved CSPP and lighting plan.

CONTRACTOR QUALITY CONTROL (CQC)

401-5.1 General. The Contractor shall develop a Contractor Quality Control Program (CQCP) in accordance with Item C-100. No partial payment will be made for materials without an approved CQCP.

401-5.2 Contractor quality control (QC) facilities. The Contractor shall provide or contract for testing facilities in accordance with Item C-100. The RPR shall be permitted unrestricted access to inspect the Contractor's QC facilities and witness QC activities. The RPR will advise the Contractor in writing of any noted deficiencies concerning the QC facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to be adversely affecting the test results, the incorporation of the materials into the work shall be suspended immediately and will not be permitted to resume until the deficiencies are satisfactorily corrected.

401-5.3 Contractor QC testing. The Contractor shall perform all QC tests necessary to control the production and construction processes applicable to these specifications and as set forth in the approved CQCP. The testing program shall include, but not necessarily be limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, field compaction, and surface smoothness. A QC Testing Plan shall be developed as part of the CQCP.

a. Asphalt content. A minimum of two tests shall be performed per day in accordance with ASTM D6307 or ASTM D2172 for determination of asphalt content. When using ASTM D6307, the correction factor shall be determined as part of the first test performed at the beginning of plant production; and as part of every tenth test performed thereafter. The asphalt content for the day will be determined by averaging the test results.

b. Gradation. Aggregate gradations shall be determined a minimum of twice per day from mechanical analysis of extracted aggregate in accordance with ASTM D5444, ASTM C136, and ASTM C117.

c. Moisture content of aggregate. The moisture content of aggregate used for production shall be determined a minimum of once per day in accordance with ASTM C566.

d. Moisture content of asphalt. The moisture content shall be determined once per day in accordance with AASHTO T329 or ASTM D1461.

e. Temperatures. Temperatures shall be checked, at least four times per day, at necessary locations to determine the temperatures of the dryer, the asphalt binder in the storage tank, the asphalt at the plant, and the asphalt at the job site.

f. In-place density monitoring. The Contractor shall conduct any necessary testing to ensure that the specified density is being achieved. A nuclear gauge may be used to monitor the pavement density in accordance with ASTM D2950.

g. Smoothness for Contractor Quality Control.

The Contractor shall perform smoothness testing in transverse and longitudinal directions daily to verify that the construction processes are producing pavement with variances less than ¼ inch in 12 feet, identifying areas that may pond water which could lead to hydroplaning of aircraft. If the smoothness criteria is not met, appropriate changes and corrections to the construction process shall be made by the Contractor before construction continues

The Contractor may use a 12-foot (3.7 m) "straightedge, a rolling inclinometer meeting the requirements of ASTM E2133 or rolling external reference device that can simulate a 12-foot (3.7m) straightedge approved by the RPR. Straight-edge testing shall start with one-half the length of the straightedge at the edge of pavement section being tested and then moved ahead one-half the length of the straightedge for each successive measurement. Testing shall be continuous across all joints. The surface irregularity shall be determined by placing the freestanding (unleveled) straightedge on the pavement surface and allowing it to rest upon the two highest spots covered by its length, and measuring the maximum gap between the straightedge and the pavement surface in the area between the two high points. If the rolling inclinometer or external reference device is used, the data may be evaluated using either the FAA profile program, ProFAA, or FHWA ProVal, using the 12-foot straightedge simulation function.

Smoothness readings shall not be made across grade changes or cross slope transitions. The transition between new and existing pavement shall be evaluated separately for conformance with the plans.

(1) Transverse measurements. Transverse measurements shall be taken for each day's production placed. Transverse measurements shall be taken perpendicular to the pavement centerline each 50 feet (15 m) or more often as determined by the RPR. The joint between lanes shall be tested separately to facilitate smoothness between lanes.

(2) Longitudinal measurements. Longitudinal measurements shall be taken for each day's production placed. Longitudinal tests shall be parallel to the centerline of paving; at the center of paving lanes when widths of paving lanes are less than 20 feet (6 m); and at the third points of paving lanes when widths of paving lanes are 20 ft (6 m) or greater. When placement abuts previously placed material the first measurement shall start with one half the length of the straight edge on the previously placed material.

Deviations on the final surface course in either the transverse or longitudinal direction that will trap water greater than 1/4 inch (6 mm) shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing the surface course to full depth. Grinding shall be tapered in all directions to provide smooth transitions to areas not requiring grinding. All areas in which diamond grinding has been performed shall be subject to the final pavement thickness tolerances specified in paragraph 401-6.1d(3). Areas that have been ground shall be sealed with a surface treatment in accordance with Item P-608. To avoid the surface treatment creating any conflict with runway or taxiway markings, it may be necessary to seal a larger area.

Control charts shall be kept to show area of each day's placement and the percentage of corrective grinding required. Corrections to production and placement shall be initiated when corrective grinding is required. If the Contractor's machines and/or methods produce significant areas that need corrective actions in excess of 10 percent of a day's production, production shall be stopped until corrective measures are implemented by the Contractor.

h. Grade. Grade shall be evaluated daily to allow adjustments to paving operations when grade measurements do not meet specifications. As a minimum, grade shall be evaluated prior to and after the placement of the first lift and after placement of the surface lift.

Measurements will be taken at appropriate gradelines (as a minimum at center and edges of paving lane) and longitudinal spacing as shown on cross-sections and plans. The final surface of the pavement will not vary from the gradeline elevations and cross-sections shown on the plans by more than 1/2 inch (12 mm) vertically and 0.1 feet (30 mm) laterally. The documentation will be provided by the Contractor to the RPR within 24 hours.

Areas with humps or depressions that exceed grade or smoothness criteria and that retain water on the surface must be ground off provided the course thickness after grinding is not more than 1/2 inch (12 mm) less than the thickness specified on the plans. Grinding shall be in accordance with paragraph 401-4.16.

The Contractor shall repair low areas or areas that cannot be corrected by grinding by removal of deficient areas to the depth of the final course plus ½ inch and replacing with new material. Skin patching is not allowed.

401-5.4 Sampling. When directed by the RPR, the Contractor shall sample and test any material that appears inconsistent with similar material being sampled, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. All sampling shall be in accordance with standard procedures specified.

401-5.5 Control charts. The Contractor shall maintain linear control charts for both individual measurements and range (i.e. difference between highest and lowest measurements) for aggregate gradation, asphalt content, and VMA. The VMA for each day will be calculated and monitored by the QC laboratory.

Control charts shall be posted in a location satisfactory to the RPR and kept current. As a minimum, the control charts shall identify the project number, the contract item number, the test number, each test parameter, the Action and Suspension Limits applicable to each test parameter, and the Contractor's test results. The Contractor shall use the control charts as part of a process control system for identifying potential problems and assignable causes before they occur. If the Contractor's projected data during production indicates a problem and the Contractor is not taking satisfactory corrective action, the RPR may suspend production or acceptance of the material.

a. Individual measurements. Control charts for individual measurements shall be established to maintain process control within tolerance for aggregate gradation, asphalt content, and VMA. The control charts shall use the job mix formula target values as indicators of central tendency for the following test parameters with associated Action and Suspension Limits:

Control Chart Limits for Individual Measurements

Sieve	Action Limit	Suspension Limit
3/4 inch (19.0 mm)	±6%	±9%
1/2 inch (12.5 mm)	±6%	±9%
3/8 inch (9.5 mm)	±6%	±9%
No. 4 (4.75 mm)	±6%	±9%
No. 16 (1.18 mm)	±5%	±7.5%
No. 50 (300 µm)	±3%	±4.5%
No. 200 (75 µm)	±2%	±3%
Asphalt Content	±0.45%	±0.70%
Minimum VMA	-0.5%	-1.0%

b. Range. Control charts shall be established to control gradation process variability. The range shall be plotted as the difference between the two test results for each control parameter. The Suspension Limits specified below are based on a sample size of n = 2. Should the Contractor elect to perform more than two tests per lot, the Suspension Limits shall be adjusted by multiplying the Suspension Limit by 1.18 for n = 3 and by 1.27 for n = 4.

Control Chart Limits Based on Range

Sieve	Suspension Limit
1/2 inch (12.5 mm)	11%
3/8 inch (9.5 mm)	11%
No. 4 (4.75 mm)	11%
No. 16 (1.18 mm)	9%
No. 50 (300 µm)	6%
No. 200 (75 µm)	3.5%
Asphalt Content	0.8%

c. Corrective Action. The CQCP shall indicate that appropriate action shall be taken when the process is believed to be out of tolerance. The Plan shall contain rules to gauge when a process is out of control and detail what action will be taken to bring the process into control. As a minimum, a process shall be deemed out of control and production stopped and corrective action taken, if:

(1) One point falls outside the Suspension Limit line for individual measurements or range; or

(2) Two points in a row fall outside the Action Limit line for individual measurements.

401-5.6 QC reports. The Contractor shall maintain records and shall submit reports of QC activities daily, in accordance with Item C-100.

MATERIAL ACCEPTANCE

401-6.1 Acceptance sampling and testing. Unless otherwise specified, all acceptance sampling and testing necessary to determine conformance with the requirements specified in this section will be performed by the RPR at no cost to the Contractor except that coring **as** required in this section shall be completed and paid for by the Contractor.

a. Quality assurance (QA) testing laboratory. The QA testing laboratory performing these acceptance tests will be accredited in accordance with ASTM D3666. The QA laboratory accreditation will be current and listed on the accrediting authority's website. All test methods required for acceptance sampling and testing will be listed on the lab accreditation. **b. Lot size.** A standard lot will be equal to one day's production divided into approximately equal sublots of between 400 to 600 tons. When only one or two sublots are produced in a day's production, the sublots will be combined with the production lot from the previous or next day.

Where more than one plant is simultaneously producing asphalt for the job, the lot sizes will apply separately for each plant.

c. Asphalt air voids. Plant-produced asphalt will be tested for air voids on a sublot basis.

(1) Sampling. Material from each sublot shall be sampled in accordance with ASTM D3665. Samples shall be taken from material deposited into trucks at the plant or at the job site in accordance with ASTM D979. The sample of asphalt may be put in a covered metal tin and placed in an oven for not less than 30 minutes nor more than 60 minutes to maintain the material at or above the compaction temperature as specified in the JMF.

(2) Testing. Air voids will be determined for each sublot in accordance with ASTM D3203 for a set of three compacted specimens prepared in accordance with ASTM D6925.

d. In-place asphalt mat and joint density. Each sublot will be tested for in-place mat and joint density as a percentage of the theoretical maximum density (TMD).

(1) Sampling. The Contractor will cut minimum 5 inch (125 mm) diameter samples in accordance with ASTM D5361. The Contractor shall furnish all tools, labor, and materials for cleaning, and filling the cored pavement. Laitance produced by the coring operation shall be removed immediately after coring, and core holes shall be filled within one day after sampling in a manner acceptable to the RPR.

(2) Bond. Each lift of asphalt shall be bonded to the underlying layer. If cores reveal that the surface is not bonded, additional cores shall be taken as directed by the RPR to determine the extent of unbonded areas. Unbonded areas shall be removed by milling and replaced at no additional cost as directed by the RPR.

(3) Thickness. Thickness of each lift of surface course will be evaluated by the RPR for compliance to the requirements shown on the plans after any necessary corrections for grade. Measurements of thickness will be made using the cores extracted for each sublot for density measurement. The maximum allowable deficiency at any point will not be more than 1/4 inch (6 mm) less than the thickness indicated for the lift. Average thickness of lift, or combined lifts, will not be less than the indicated thickness. Where the thickness tolerances are not met, the lot or sublot shall be corrected by the Contractor at his expense by removing the deficient area and replacing with new pavement. The Contractor, at his expense, may take additional cores as approved by the RPR to circumscribe the deficient area.

(4) Mat density. One core shall be taken from each sublot. Core locations will be determined by the RPR in accordance with ASTM D3665. Cores for mat density shall not be taken closer than one foot

(30 cm) from a transverse or longitudinal joint. The bulk specific gravity of each cored sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each sublot sample by the TMD for that sublot.

(5) Joint density. One core centered over the longitudinal joint shall be taken for each sublot that has a longitudinal joint. Core locations will be determined by the RPR in accordance with ASTM D3665. The bulk specific gravity of each core sample will be determined in accordance with ASTM D2726. The percent compaction (density) of each sample will be determined by dividing the bulk specific gravity of each joint density sample by the average TMD for the lot. The TMD used to determine the joint density at joints formed between lots will be the lower of the average TMD values from the adjacent lots.

401-6.2 Acceptance criteria.

a. General. Acceptance will be based on the implementation of the Contractor Quality Control Program (CQCP) and the following characteristics of the asphalt and completed pavements: air voids, mat density, joint density, grade and Profilograph roughness**.**

b. Air Voids and Mat density. Acceptance of each lot of plant produced material for mat density and air voids will be based on the percentage of material within specification limits (PWL). If the PWL of the lot equals or exceeds 90%, the lot will be acceptable. Acceptance and payment will be determined in accordance with paragraph 401-8.1.

c. Joint density. Acceptance of each lot of plant produced asphalt for joint density will be based on the PWL. If the PWL of the lot is equal to or exceeds 90%, the lot will be considered acceptable. If the PWL is less than 90%, the Contractor shall evaluate the reason and act accordingly. If the PWL is less than 80%, the Contractor shall cease operations and until the reason for poor compaction has been determined. If the PWL is less than 71%, the pay factor for the lot used to complete the joint will be reduced by five (5) percentage points. This lot pay factor reduction will be incorporated and evaluated in accordance with paragraph 401-8.1.

d. Grade. The final finished surface of the pavement shall be surveyed to verify that the grade elevations and cross-sections shown on the plans do not deviate more than 1/2 inch (12 mm) vertically or 0.1 feet (30 mm) laterally.

Cross-sections of the pavement shall be taken at a minimum 50-foot (15-m) longitudinal spacing, at all longitudinal grade breaks, and at start and end of each lane placed. Minimum cross-section grade points shall include grade at centerline, ± 10 feet of centerline, and edge of taxiway pavement.

The survey and documentation shall be stamped and signed by a licensed surveyor. Payment for sublots that do not meet grade for over 25% of the sublot shall not be more than 95%.

e. Profilograph roughness for QA Acceptance. The final profilograph shall be the full length of the project to facilitate testing of roughness between lots. The Contractor, in the presence of the RPR shall perform a profilograph roughness test on the completed project with a profilograph meeting the requirements of ASTM E1274 or a Class I inertial profiler meeting ASTM E950. Data and results shall be provided within 48 hrs of profilograph roughness tests.

The pavement shall have an average profile index less than 15 inches per mile per 1/10 mile. The equipment shall utilize electronic recording and automatic computerized reduction of data to indicate “must grind” bumps and the Profile Index for the pavement using a 0.2-inch (5 mm) blanking band. The bump template must span one inch (25 mm) with an offset of 0.4 inches (10 mm). The profilograph must be calibrated prior to use and operated by a factory or State DOT approved, trained operator. Profilograms shall be recorded on a longitudinal scale of one inch (25 mm) equals 25 feet (7.5 m) and a vertical scale of one inch (25 mm) equals one inch (25 mm). Profilograph shall be performed one foot right and left of project centerline and 15 feet (4.5 m) right and left of project centerline. Any areas that

indicate “must grind” shall be corrected with diamond grinding per paragraph 401-4.16 or by removing and replacing full depth of surface course. as directed by the RPR. Where corrections are necessary, a second profilograph run shall be performed to verify that the corrections produced an average profile index of 15 inches per mile per 1/10 mile or less.

401-6.3 Percentage of material within specification limits (PWL). The PWL will be determined in accordance with procedures specified in Item C-110. The specification tolerance limits (L) for lower and (U) for upper are contained in Table 5.

Table 5. Acceptance Limits for Air Voids and Density

Test Property	Pavements Specification Tolerance Limits	
	L	**U**
Air Voids Total Mix (%)	2.0	5.0
Surface Course Mat Density (%)	92.8	**-**
Joint density (%)	90.5	--

a. Outliers. All individual tests for mat density and air voids will be checked for outliers (test criterion) in accordance with ASTM E178, at a significance level of 5%. Outliers will be discarded, and the PWL will be determined using the remaining test values. The criteria in Table 5 is based on production processes which have a variability with the following standard deviations: Surface Course Mat Density (%), 1.30; Base Course Mat Density (%), 1.55; Joint Density (%), 1.55.

The Contractor should note that (1) 90 PWL is achieved when consistently producing a surface course with an average mat density of at least 94.5% with 1.30% or less variability, (2) 90 PWL is achieved when consistently producing a base course with an average mat density of at least 94.0% with 1.55% or less variability, and (3) 90 PWL is achieved when consistently producing joints with an average joint density of at least 92.5% with 1.55% or less variability.

401-6.4 Resampling pavement for mat density.

a. General. Resampling of a lot of pavement will only be allowed for mat density, and then, only if the Contractor requests same, in writing, within 48 hours after receiving the written test results from the RPR. A retest will consist of all the sampling and testing procedures contained in paragraphs 401-6.1d and 401-6.2b. Only one resampling per lot will be permitted.

(1) A redefined PWL will be calculated for the resampled lot. The number of tests used to calculate the redefined PWL will include the initial tests made for that lot plus the retests.

(2) The cost for resampling and retesting shall be borne by the Contractor.

b. Payment for resampled lots. The redefined PWL for a resampled lot will be used to calculate the payment for that lot in accordance with Table 6.

c. Outliers. Check for outliers in accordance with ASTM E178, at a significance level of 5%.

METHOD OF MEASUREMENT

401-7.1 Measurement. Asphalt shall be measured by the number of tons of asphalt used in the accepted work. Batch weights or truck scale weights will be used to determine the basis for the tonnage.

BASIS OF PAYMENT

401-8.1 Payment. Payment for a lot of asphalt meeting all acceptance criteria as specified in paragraph 401-6.2 shall be made based on results of tests for mat density and air voids. Payment for acceptable lots shall be adjusted according to paragraph 401-8.1c for mat density and air voids; and paragraph 401-6.2c for joint density, subject to the limitation that:

a. The total project payment for plant mix asphalt pavement shall not exceed 100 percent of the product of the contract unit price and the total number of tons (kg) of asphalt used in the accepted work.

b. The price shall be compensation for furnishing all materials, for all preparation, mixing, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

c. Basis of adjusted payment. The pay factor for each individual lot shall be calculated in accordance with Table 6. A pay factor shall be calculated for both mat density and air voids. The lot pay factor shall be the higher of the two values when calculations for both mat density and air voids are 100% or higher. The lot pay factor shall be the product of the two values when only one of the calculations for either mat density or air voids is 100% or higher. The lot pay factor shall be the lower of the two values when calculations for both mat density and air voids are less than 100%. If PWL for joint density is less than 71% then the lot pay factor shall be reduced by 5% but be no higher than 95%.

For each lot accepted, the adjusted contract unit price shall be the product of the lot pay factor for the lot and the contract unit price. Payment shall be subject to the total project payment limitation specified in paragraph 401-8.1a. Payment in excess of 100% for accepted lots of asphalt shall be used to offset payment for accepted lots of asphalt pavement that achieve a lot pay factor less than 100%.

Payment for sublots which do not meet grade in accordance with paragraph 401-6.2d after correction for over 25% of the sublot shall be reduced by 5%.

Table 6. Price adjustment schedule[1]

Percentage of material within specification limits (PWL)	Lot pay factor (percent of contract unit price)
96 – 100	106
90 – 95	PWL + 10
75 – 89	0.5 PWL + 55
55 – 74	1.4 PWL – 12
Below 55	Reject [2]

[1] Although it is theoretically possible to achieve a pay factor of 106% for each lot, actual payment above 100% shall be subject to the total project payment limitation specified in paragraph 401-8.1a.

[2] The lot shall be removed and replaced. However, the RPR may decide to allow the rejected lot to remain. In that case, if the RPR and Contractor agree in writing that the lot shall not be removed, it shall be paid for at 50% of the contract unit price and the total project payment shall be reduced by the amount withheld for the rejected lot.

d. Profilograph Roughness. The Contractor will receive full payment when the profilograph average profile index is in accordance with paragraph 401-6.2e. When the final average profile index for the entire length of pavement does not exceed 15 inches per mile per 1/10 mile, payment will be made at the contract unit price for the completed pavement.

401-8.1 Payment.

Payment will be made under:

Item P-401.01	Asphalt Surface Course - per ton

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C29	Standard Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate
ASTM C88	Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
ASTM C117	Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
ASTM C127	Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate
ASTM C131	Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C142	Standard Test Method for Clay Lumps and Friable Particles in Aggregates
ASTM C566	Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying
ASTM D75	Standard Practice for Sampling Aggregates
ASTM D242	Standard Specification for Mineral Filler for Bituminous Paving Mixtures
ASTM D946	Standard Specification for Penetration-Graded Asphalt Cement for Use in Pavement Construction
ASTM D979	Standard Practice for Sampling Asphalt Paving Mixtures
ASTM D1073	Standard Specification for Fine Aggregate for Asphalt Paving Mixtures
ASTM D1188	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Coated Samples
ASTM D2172	Standard Test Method for Quantitative Extraction of Bitumen from Asphalt Paving Mixtures
ASTM D1461	Standard Test Method for Moisture or Volatile Distillates in Asphalt Paving Mixtures

ASTM D2041	Standard Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures
ASTM D2419	Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate
ASTM D2489	Standard Practice for Estimating Degree of Particle Coating of Bituminous-Aggregate Mixtures
ASTM D2726	Standard Test Method for Bulk Specific Gravity and Density of Non-Absorptive Compacted Bituminous Mixtures
ASTM D2950	Standard Test Method for Density of Bituminous Concrete in Place by Nuclear Methods
ASTM D3203	Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures
ASTM D3381	Standard Specification for Viscosity-Graded Asphalt Cement for Use in Pavement Construction
ASTM D3665	Standard Practice for Random Sampling of Construction Materials
ASTM D3666	Standard Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials
ASTM D4318	Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
ASTM D4552	Standard Practice for Classifying Hot-Mix Recycling Agents
ASTM D4791	Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate
ASTM D4867	Standard Test Method for Effect of Moisture on Asphalt Concrete Paving Mixtures
ASTM D5361	Standard Practice for Sampling Compacted Asphalt Mixtures for Laboratory Testing
ASTM D5444	Standard Test Method for Mechanical Size Analysis of Extracted Aggregate
ASTM D5821	Standard Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate
ASTM D6084	Standard Test Method for Elastic Recovery of Bituminous Materials by Ductilometer
ASTM D6307	Standard Test Method for Asphalt Content of Hot Mix Asphalt by Ignition Method
ASTM D6373	Standard Specification for Performance Graded Asphalt Binder
ASTM D6752	Standard Test Method for Bulk Specific Gravity and Density of Compacted Bituminous Mixtures Using Automatic Vacuum Sealing Method

ASTM D6925	Standard Test Method for Preparation and Determination of the Relative Density of Hot Mix Asphalt (HMA) Specimens by Means of the SuperPave Gyratory Compactor.
ASTM D6926	Standard Practice for Preparation of Bituminous Specimens Using Marshall Apparatus
ASTM D6927	Standard Test Method for Marshall Stability and Flow of Bituminous Mixtures
ASTM D6995	Standard Test Method for Determining Field VMA based on the Maximum Specific Gravity of the Mix (Gmm)
ASTM E11	Standard Specification for Woven Wire Test Sieve Cloth and Test Sieves
ASTM E178	Standard Practice for Dealing with Outlying Observations
ASTM E1274	Standard Test Method for Measuring Pavement Roughness Using a Profilograph
ASTM E950	Standard Test Method for Measuring the Longitudinal Profile of Traveled Surfaces with an Accelerometer Established Inertial Profiling Reference
ASTM E2133	Standard Test Method for Using a Rolling Inclinometer to Measure Longitudinal and Transverse Profiles of a Traveled Surface

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M156	Standard Specification for Requirements for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
AASHTO T329	Standard Method of Test for Moisture Content of Hot Mix Asphalt (HMA) by Oven Method
AASHTO T324	Standard Method of Test for Hamburg Wheel-Track Testing of Compacted Asphalt Mixtures
AASHTO T 340	Standard Method of Test for Determining the Rutting Susceptibility of Hot Mix Asphalt (APA) Using the Asphalt Pavement Analyzer (APA)

Asphalt Institute (AI)

Asphalt Institute Handbook MS-26, Asphalt Binder

Asphalt Institute MS-2 Mix Design Manual, 7th Edition

AI State Binder Specification Database

Federal Highway Administration (FHWA)

Long Term Pavement Performance Binder Program

Advisory Circulars (AC)

AC 150/5320-6	Airport Pavement Design and Evaluation

FAA Orders

5300.1	Modifications to Agency Airport Design, Construction, and Equipment Standards

Software

FAARFIELD

END OF ITEM P-401

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Item P-600 Riprap

DESCRIPTION

600-1.1. This item shall consist of furnishing required materials and constructing riprap areas for slopes, aprons, channels, inlets, outlets, plunge pools, and headwalls in accordance with these specifications at the locations shown in the plans. This item shall include any excavation, grading, and / or backfill required to construct riprap areas, the placement of specified geotextile fabric linings, and placement of stone riprap and all incidentals necessary to complete the item to the satisfaction of the Engineer.

MATERIALS

600 -2.1. Filter Fabric The geotextile fabric to be installed under riprap areas as shown on the construction drawings shall be an 8 oz. non-woven needle-punched geotextile fabric, Mirafi 180N as manufactured by TenCate or approved equal. The geotextiles shall be furnished in a protective wrapping which shall protect the fabric from ultraviolet radiation and from abrasion due to shipping and handling. Fabric shall be furnished in rolls with minimum 15 ft. widths.

600-2.2. Riprap Stone Riprap stone shall be sound durable rock which is angular in shape and free from overburden, shale, spoil, and organic materials and shall meet the material requirements and gradation of Section 583 of the New Hampshire Department of Transportation's Standard Specifications, paragraph 2.1. Round stones, boulders, sandstone, or similar soft stone or relatively thin slabs are not acceptable. The various classes of stone (size) shall be as shown on the drawings for culvert inlets and outlets and for drainage channels. Where no size is given, the minimum allowable d_{50} diameter shall be 12 inches, at a minimum thickness of 2 times the d_{50} rock size.

CONSTRUCTION METHODS

600-3.1 Preparation. The Contractor shall excavate or fill as necessary to construct riprap areas to meet the slopes, grades and alignments indicated on the construction drawings. Excavation and embankment shall meet the requirements of Item P-152, although no separate or additional payment shall be made for any excavation or fill materials or labor needed for the construction of riprap areas.

600-3.2 Subgrade. The subgrade to receive fill shall be rolled smooth and shall not contain holes greater than 3 inches in depth and shall not have any protruding stones which could damage the fabric to be placed over it.

600-3.3 Placing Filter Fabric. Fabric shall be placed over the prepared subgrade layer immediately after it is completed. Fabric shall be placed starting at the bottom of the apron or plunge pool working up the longitudinal slope. Fabric shall be placed so that the long dimension of the fabric is parallel to the main direction of flow. Fabric shall be lapped a minimum of two (2) feet or as indicated on the plans, with the top layer of all overlaps ending on the downhill side.

Fabric torn during placement shall be patched with overlaps of at least three feet in all directions from the damaged areas. Fabric shall be protected from ultraviolet damage caused by excessive exposure to sunlight

while being stored on the jobsite or prior to the placement of stone.

Costs for furnishing and installing geotextile fabric shall be incidental to and included in the cost for the riprap.

600-3.4 Placing Riprap Stone. Riprap stones shall be individually placed from the toe of the slope upward with close joints set perpendicular to the slope with large stone at the toe of the slope. Open joints will be chinked in with successively smaller stones until the riprap becomes stable with no movement of stones when the entire layer is walked on.

Stone shall be carefully placed over the completed fabric in such a manner as not to damage stone or fabric. No stone shall be dropped more than one (1) foot onto the fabric. Any damage to fabric which results will require that stone be completely removed to the extent necessary to allow the overlaid fabric to overlap the damaged sections of fabric by a minimum of three (3) foot in all directions. The finished surface shall be uniform in appearance and parallel to and within four (4) inches of line and grade shown on the construction drawings.

METHOD OF MEASUREMENT

600-4.1 The quantity of riprap shall be the number of square yards of fabric and stone placed to the specified depth at locations indicated on the construction drawings, completed and accepted by the Engineer. Separate measurements shall be made for each of the various classes of riprap.

BASIS OF PAYMENT

600-5.1 Payment for riprap will be made at the contract unit price per square yard of riprap installed in place by the Contractor and accepted by the Engineer. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item.

Payment will be made under:

Item P-600.01	Riprap Class I (d_{50}=6”)	-- per Square Yard
Item P-600.02	Riprap Class III (d_{50}=12”)	-- per Square Yard
Item P-600.03	Riprap Class V (d_{50}=18”)	-- per Square Yard

REFERENCES

New Hampshire Department of Transportation, Standard Specifications, Section 583 - Riprap

END OF ITEM P-600

Item P-603 Emulsified Asphalt Tack Coat

DESCRIPTION

603-1.1 This item shall consist of preparing and treating an asphalt or concrete surface with asphalt material in accordance with these specifications and in reasonably close conformity to the lines shown on the plans.

MATERIALS

603-2.1 Asphalt materials. The asphalt material shall be an emulsified asphalt as specified in ASTM D3628 as an asphalt application for tack coat appropriate to local conditions. The emulsified asphalt shall not be diluted. The Contractor shall provide a copy of the manufacturer's Certificate of Analysis (COA) for the asphalt material to the Resident Project Representative (RPR) before the asphalt material is applied for review and acceptance. The furnishing of COA for the asphalt material shall not be interpreted as a basis for final acceptance. The manufacturer's COA may be subject to verification by testing the material delivered for use on the project.

CONSTRUCTION METHODS

603-3.1 Weather limitations. The tack coat shall be applied only when the existing surface is dry and the atmospheric temperature is 50°F (10°C) or above; the temperature has not been below 35°F (2°C) for the 12 hours prior to application; and when the weather is not foggy or rainy. The temperature requirements may be waived when directed by the RPR.

603-3.2 Equipment. The Contractor shall provide equipment for heating and applying the emulsified asphalt material. The emulsion shall be applied with a manufacturer-approved computer rate-controlled asphalt distributor. The equipment shall be in good working order and contain no contaminants or diluents in the tank. Spray bar tips must be clean, free of burrs, and of a size to maintain an even distribution of the emulsion. Any type of tip or pressure source is suitable that will maintain predetermined flow rates and constant pressure during the application process with application speeds under eight (8) miles per hour (13 km per hour) or seven (700) feet per minute (213 m per minute).

The equipment will be tested under pressure for leaks and to ensure proper set-up before use to verify truck set-up (via a test-shot area), including but not limited to, nozzle tip size appropriate for application, spray-bar height and pressure and pump speed, evidence of triple-overlap spray pattern, lack of leaks, and any other factors relevant to ensure the truck is in good working order before use.

The distributor truck shall be equipped with a minimum 12-foot (3.7-m) spreader spray bar with individual nozzle control with computer-controlled application rates. The distributor truck shall have an easily accessible thermometer that constantly monitors the temperature of the emulsion, and have an operable mechanical tank gauge that can be used to cross-check the computer accuracy. If the distributor is not equipped with an operable quick shutoff valve, the prime operations shall be started and stopped on building paper.

The distributor truck shall be equipped to effectively heat and mix the material to the required temperature prior to application as required. Heating and mixing shall be done in accordance with the manufacturer's recommendations. Do not overheat or over mix the material.

The distributor shall be equipped with a hand sprayer.

Asphalt distributors must be calibrated annually in accordance with ASTM D2995. The Contractor must furnish a current calibration certification for the asphalt distributor truck from any State or other agency as approved by the RPR.

A power broom and/or power blower suitable for cleaning the surfaces to which the asphalt tack coat is to be applied shall be provided.

603-3.3 Application of emulsified asphalt material. The emulsified asphalt shall not be diluted. Immediately before applying the emulsified asphalt tack coat, the full width of surface to be treated shall be swept with a power broom and/or power blower to remove all loose dirt and other objectionable material.

The emulsified asphalt material shall be uniformly applied with an asphalt distributor at the rates appropriate for the conditions and surface specified in the table below. The type of asphalt material and application rate shall be approved by the RPR prior to application.

Emulsified Asphalt

Surface Type	Residual Rate, gal/SY (L/square meter)	Emulsion Application Bar Rate, gal/SY (L/square meter)
New asphalt	0.02-0.05 (0.09-0.23)	0.03-0.07 (0.13-0.32)
Existing asphalt	0.04-0.07 (0.18-0.32)	0.06-0.11 (0.27-0.50)
Milled Surface	0.04-0.08 (0.18-0.36)	.0.06-0.12 (0.27-0.54)
Concrete	0.03-0.05 (0.13-0.23)	0.05-0.08 (0.23-0.36)

After application of the tack coat, the surface shall be allowed to cure without being disturbed for the period of time necessary to permit drying and setting of the tack coat. This period shall be determined by the RPR. The Contractor shall protect the tack coat and maintain the surface until the next course has been placed. When the tack coat has been disturbed by the Contractor, tack coat shall be reapplied at the Contractor's expense.

603-3.4 Freight and waybills The Contractor shall submit waybills and delivery tickets, during progress of the work. Before the final statement is allowed, file with the RPR certified waybills and certified delivery tickets for all emulsified asphalt materials used in the construction of the pavement covered by the contract. Do not remove emulsified asphalt material from storage until the initial outage and temperature measurements have been taken. The delivery or storage units will not be released until the final outage has been taken.

METHOD OF MEASUREMENT

603-4.1 The emulsified asphalt material for tack coat shall be measured by the gallon. Volume shall be corrected to the volume at 60°F (16°C) in accordance with ASTM D1250. The emulsified asphalt material paid for will be the measured quantities used in the accepted work, provided that the measured quantities are not 10% over the specified application rate. Any amount of emulsified asphalt material more than 10% over the specified application rate for each application will be deducted from the

measured quantities, except for irregular areas where hand spraying of the emulsified asphalt material is necessary. Water added to emulsified asphalt will not be measured for payment.

BASIS OF PAYMENT

603.5-1 Payment shall be made at the contract unit price per gallon of emulsified asphalt material. This price shall be full compensation for furnishing all materials, for all preparation, delivery, and application of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-603.01	Emulsified Asphalt Tack Coat - per gallon

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D1250	Standard Guide for Use of the Petroleum Measurement Tables
ASTM D2995	Standard Practice for Estimating Application Rate and Residual Application Rate of Bituminous Distributors
ASTM D3628	Standard Practice for Selection and Use of Emulsified Asphalts

END ITEM P-603

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Item P-605 Joint Sealants for Pavements

DESCRIPTION

605-1.1 This item shall consist of providing and installing a resilient and adhesive joint sealing material capable of effectively sealing joints in pavement; joints between different types of pavements; and cracks in existing pavement.

MATERIALS

605-2.1 Joint sealants. Joint sealant materials shall meet the requirements of ASTM D6690.

Each lot or batch of sealant shall be delivered to the jobsite in the manufacturer's original sealed container. Each container shall be marked with the manufacturer's name, batch or lot number, the safe heating temperature, and shall be accompanied by the manufacturer's certification stating that the sealant meets the requirements of this specification.

605-2.2 Backer rod. The material furnished shall be a compressible, non-shrinking, non-staining, non-absorbing material that is non-reactive with the joint sealant in accordance with ASTM D5249. The backer-rod material shall be 25% ± 5 % larger in diameter than the nominal width of the joint.

605-2.3 Bond breaking tapes. Provide a bond breaking tape or separating material that is a flexible, non-shrinkable, non-absorbing, non-staining, and non-reacting adhesive-backed tape. The material shall have a melting point at least 5°F (3°C) greater than the pouring temperature of the sealant being used when tested in accordance with ASTM D789. The bond breaker tape shall be approximately 1/8 inch (3 mm) wider than the nominal width of the joint and shall not bond to the joint sealant.

CONSTRUCTION METHODS

605-3.1 Time of application. Joints shall be sealed as soon after completion of the curing period as feasible and before the pavement is opened to traffic, including construction equipment. The pavement temperature shall be 50°F (10°C) and rising at the time of application of the poured joint sealing material. Do not apply sealant if moisture is observed in the joint.

605-3.2 Equipment. Machines, tools, and equipment used in the performance of the work required by this section shall be approved before the work is started and maintained in satisfactory condition at all times. Submit a list of proposed equipment to be used in performance of construction work including descriptive data, 30 days prior to use on the project.

a. Tractor-mounted routing tool. Not Used.

b. Concrete saw. Provide a self-propelled power saw, with water-cooled diamond or abrasive saw blades, for cutting joints to the depths and widths specified.

c. Sandblasting equipment. Sandblasting is not allowed.

d. Waterblasting equipment. The Contractor must demonstrate waterblasting equipment including the pumps, hose, guide and nozzle size, under job conditions, before approval in accordance with paragraph 605-3.3. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

e. Hand tools. Not Used.

f. Hot-poured sealing equipment. The unit applicators used for heating and installing ASTM D6690 joint sealant materials shall be mobile and shall be equipped with a double-boiler, agitator-type kettle with an oil medium in the outer space for heat transfer; a direct-connected pressure-type extruding device with a nozzle shaped for inserting in the joint to be filled; positive temperature devices for controlling the temperature of the transfer oil and sealant; and a recording type thermometer for indicating the temperature of the sealant. The applicator unit shall be designed so that the sealant will circulate through the delivery hose and return to the inner kettle when not in use.

605-3.3 Preparation of joints. Pavement joints for application of material in this specification must be dry, clean of all scale, dirt, dust, curing compound, and other foreign matter. The Contractor shall demonstrate, in the presence of the RPR, that the method cleans the joint and does not damage the joint.

a. Sawing. All joints shall be sawed in accordance with specifications and plan details. Immediately after sawing the joint, the resulting slurry shall be completely removed from joint and adjacent area by flushing with a jet of water, and by use of other tools as necessary.

b. Sealing. Immediately before sealing, the joints shall be thoroughly cleaned of all remaining laitance, curing compound, filler, protrusions of hardened concrete, old sealant and other foreign material from the sides and upper edges of the joint space to be sealed. Cleaning shall be accomplished by tractor-mounted routing equipment, concrete saw or a waterblaster as specified in paragraph 605-3.2. The newly exposed concrete joint faces and the pavement surface extending a minimum of 1/2 inch (12 mm) from the joint edge shall be sandblasted clean. Sandblasting shall be accomplished in a minimum of two passes. One pass per joint face with the nozzle held at an angle directly toward the joint face and not more than 3 inches (75 mm) from it. After final cleaning and immediately prior to sealing, blow out the joints with compressed air and leave them completely free of debris and water. The joint faces shall be surface dry when the seal is applied.

c. Backer Rod. When the joint opening is of a greater depth than indicated for the sealant depth, plug or seal off the lower portion of the joint opening using a backer rod in accordance with paragraph 605-2.2 to prevent the entrance of the sealant below the specified depth. Take care to ensure that the backer rod is placed at the specified depth and is not stretched or twisted during installation.

d. Bond-breaking tape. Where inserts or filler materials contain bitumen, or the depth of the joint opening does not allow for the use of a backup material, insert a bond-separating tape breaker in accordance with paragraph 605-2.3 to prevent incompatibility with the filler materials and three-sided adhesion of the sealant. Securely bond the tape to the bottom of the joint opening so it will not float up into the new sealant.

605-3.4 Installation of sealants. Joints shall be inspected for proper width, depth, alignment, and preparation, and shall be approved by the RPR before sealing is allowed. Sealants shall be installed in accordance with the following requirements:

Immediately preceding, but not more than 50 feet (15 m) ahead of the joint sealing operations, perform a final cleaning with compressed air. Fill the joints from the bottom up to 1/4 inch (±1/16 inch (2 mm) below the top of pavement surface; or bottom of groove for grooved pavement. Remove and discard

excess or spilled sealant from the pavement by approved methods. Install the sealant in such a manner as to prevent the formation of voids and entrapped air. In no case shall gravity methods or pouring pots be used to install the sealant material. Traffic shall not be permitted over newly sealed pavement until authorized by the RPR. When a primer is recommended by the manufacturer, apply it evenly to the joint faces in accordance with the manufacturer's instructions. Check the joints frequently to ensure that the newly installed sealant is cured to a tack-free condition within the time specified.

605-3.5 Inspection. The Contractor shall inspect the joint sealant for proper rate of cure and set, bonding to the joint walls, cohesive separation within the sealant, reversion to liquid, entrapped air and voids. Sealants exhibiting any of these deficiencies at any time prior to the final acceptance of the project shall be removed from the joint, wasted, and replaced as specified at no additional cost to the airport.

605-3.6 Clean-up. Upon completion of the project, remove all unused materials from the site and leave the pavement in a clean condition.

METHOD OF MEASUREMENT

605-4.1 Joint sawing and sealing between new asphalt pavement and existing asphalt pavement shall be measured by the linear foot of sealant in place, completed, and accepted. All other required joint sawing and sealing shall not be measured for payment and shall be considered incidental to Item P-401.

BASIS OF PAYMENT

605-5.1 Payment for joint sawing and sealing shall be made at the contract unit price per linear foot. The price shall be full compensation for furnishing all materials, for all preparation, delivering, and placing of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item P-605.01	Joint Sawing and Sealing - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D789	Standard Test Method for Determination of Relative Viscosity of Polyamide (PA)
ASTM D5249	Standard Specification for Backer Material for Use with Cold- and Hot-Applied Joint Sealants in Portland-Cement Concrete and Asphalt Joints
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt

Advisory Circulars (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids

END ITEM P-605

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Item P-610 Concrete for Miscellaneous Structures

DESCRIPTION

610-1.1 This item shall consist of concrete and reinforcement, as shown on the plans, prepared and constructed in accordance with these specifications. This specification shall be used for all concrete other than airfield pavement which are cast-in-place.

MATERIALS

610-2.1 General. Only approved materials, conforming to the requirements of these specifications, shall be used in the work. Materials may be subject to inspection and tests at any time during their preparation or use. The source of all materials shall be approved by the Resident Project Representative (RPR) before delivery or use in the work. Representative preliminary samples of the materials shall be submitted by the Contractor, when required, for examination and test. Materials shall be stored and handled to ensure preservation of their quality and fitness for use and shall be located to facilitate prompt inspection. All equipment for handling and transporting materials and concrete must be clean before any material or concrete is placed in them.

The use of pit-run aggregates shall not be permitted unless the pit-run aggregate has been screened and washed, and all fine and coarse aggregates stored separately and kept clean. The mixing of different aggregates from different sources in one storage stockpile or alternating batches of different aggregates shall not be permitted.

a. Reactivity. Fine aggregate and coarse aggregates to be used in all concrete shall have been tested separately within six months of the project in accordance with ASTM C1260. Test results shall be submitted to the RPR. The aggregate shall be considered innocuous if the expansion of test specimens, tested in accordance with ASTM C1260, does not exceed 0.08% at 14 days (16 days from casting). If the expansion either or both test specimen is greater than 0.08% at 14 days, but less than 0.20%, a minimum of 25% of Type F fly ash, or between 40% and 55% of slag cement shall be used in the concrete mix.

If the expansion is greater than 0.20%, the aggregates shall not be used, and test results for other aggregates must be submitted for evaluation; or aggregates that meet P-501 reactivity test requirements may be utilized.

610-2.2 Coarse aggregate. The coarse aggregate for concrete shall meet the requirements of ASTM C33 and the requirements of Table 4, Class Designation 5S; and the grading requirements shown below, as required for the project.

Coarse Aggregate Grading Requirements

Maximum Aggregate Size	ASTM C33, Table 3 Grading Requirements (Size No.)
¾ inch (19 mm)	**67**
½ inch (12.5 mm)	7

610-2.2.1 Coarse Aggregate susceptibility to durability (D) cracking. Not used.

610-2.3 Fine aggregate. The fine aggregate for concrete shall meet all fine aggregate requirements of ASTM C33.

610-2.4 Cement. Cement shall conform to the requirements of ASTM C150 Type I.

610-2.5 Cementitious materials.

a. Fly ash. Fly ash shall meet the requirements of ASTM C618, with the exception of loss of ignition, where the maximum shall be less than 6%. Fly ash shall have a Calcium Oxide (CaO) content of less than 15% and a total available alkali content less than 3% per ASTM C311. Fly ash produced in furnace operations using liming materials or soda ash (sodium carbonate) as an additive shall not be acceptable. The Contractor shall furnish the previous three most recent, consecutive ASTM C618 reports for each source of fly ash proposed in the concrete mix, and shall furnish each additional report as they become available during the project. The reports can be used for acceptance or the material may be tested independently by the RPR.

b. Slag cement (ground granulated blast furnace (GGBF)). Slag cement shall conform to ASTM C989, Grade 100 or Grade 120. Slag cement shall be used only at a rate between 25% and 55% of the total cementitious material by mass.

610-2.6 Water. Water used in mixing or curing shall be from potable water sources. Other sources shall be tested in accordance with ASTM C1602 prior to use.

610-2.7 Admixtures. The Contractor shall submit certificates indicating that the material to be furnished meets all of the requirements indicated below. In addition, the RPR may require the Contractor to submit complete test data from an approved laboratory showing that the material to be furnished meets all of the requirements of the cited specifications. Subsequent tests may be made of samples taken by the RPR from the supply of the material being furnished or proposed for use on the work to determine whether the admixture is uniform in quality with that approved.

a. Air-entraining admixtures. Air-entraining admixtures shall meet the requirements of ASTM C260 and shall consistently entrain the air content in the specified ranges under field conditions. The air-entrainment agent and any water reducer admixture shall be compatible.

b. Water-reducing admixtures. Water-reducing admixture shall meet the requirements of ASTM C494, Type A, B, or D. ASTM C494, Type F and G high range water reducing admixtures and ASTM C1017 flowable admixtures shall not be used.

c. Other chemical admixtures. The use of set retarding, and set-accelerating admixtures shall be approved by the RPR. Retarding shall meet the requirements of ASTM C494, Type A, B, or D and set-accelerating shall meet the requirements of ASTM C494, Type C. Calcium chloride and admixtures containing calcium chloride shall not be used.

610-2.8 Premolded joint material. Premolded joint material for expansion joints shall meet the requirements of ASTM D1751**.**

610-2.9 Joint filler. The filler for joints shall meet the requirements of Item P-605, unless otherwise specified.

610-2.10 Steel reinforcement. Reinforcing shall consist of Welded Steel Wire Fabric conforming to the requirements of ASTM A1064, ASTM A884**.**

610-2.11 Materials for curing concrete. Curing materials shall conform to ASTM C309.

CONSTRUCTION METHODS

610-3.1 General. The Contractor shall furnish all labor, materials, and services necessary for, and incidental to, the completion of all work as shown on the drawings and specified here. All machinery and equipment used by the Contractor on the work, shall be of sufficient size to meet the requirements of the work. All work shall be subject to the inspection and approval of the RPR.

610-3.2 Concrete Mixture. The concrete shall develop a compressive strength of 4000 psi in 28 days as determined by test cylinders made in accordance with ASTM C31 and tested in accordance with ASTM C39. The concrete shall contain not less than 470 pounds of cementitious material per cubic yard (280 kg per cubic meter). The water cementitious ratio shall not exceed 0.45 by weight. The air content of the concrete shall be 5% +/- 1.2% as determined by ASTM C231 and shall have a slump of not more than 4 inches (100 mm) as determined by ASTM C143.

610-3.3 Mixing. Concrete may be mixed at the construction site, at a central point, or wholly or in part in truck mixers. The concrete shall be mixed and delivered in accordance with the requirements of ASTM C94 or ASTM C685.

The concrete shall be mixed only in quantities required for immediate use. Concrete shall not be mixed while the air temperature is below 40°F (4°C) without the RPRs approval. If approval is granted for mixing under such conditions, aggregates or water, or both, shall be heated and the concrete shall be placed at a temperature not less than 50°F (10°C) nor more than 100°F (38°C). The Contractor shall be held responsible for any defective work, resulting from freezing or injury in any manner during placing and curing, and shall replace such work at his expense.

Retempering of concrete by adding water or any other material is not permitted.

The rate of delivery of concrete to the job shall be sufficient to allow uninterrupted placement of the concrete.

610-3.4 Forms. Concrete shall not be placed until all the forms and reinforcements have been inspected and approved by the RPR. Forms shall be of suitable material and shall be of the type, size, shape, quality, and strength to build the structure as shown on the plans. The forms shall be true to line and grade and shall be mortar-tight and sufficiently rigid to prevent displacement and sagging between supports. The surfaces of forms shall be smooth and free from irregularities, dents, sags, and holes. The Contractor shall be responsible for their adequacy.

The internal form ties shall be arranged so no metal will show in the concrete surface or discolor the surface when exposed to weathering when the forms are removed. All forms shall be wetted with water or with a non-staining mineral oil, which shall be applied immediately before the concrete is placed. Forms shall be constructed so they can be removed without injuring the concrete or concrete surface.

610-3.5 Placing reinforcement. All reinforcement shall be accurately placed, as shown on the plans, and shall be firmly held in position during concrete placement. Bars shall be fastened together at intersections. The reinforcement shall be supported by approved metal chairs. Shop drawings, lists, and bending details shall be supplied by the Contractor when required.

610-3.6 Embedded items. Before placing concrete, all embedded items shall be firmly and securely fastened in place as indicated. All embedded items shall be clean and free from coating, rust, scale, oil, or any foreign matter. The concrete shall be spaded and consolidated around and against embedded items. The embedding of wood shall not be allowed.

610-3.7 Concrete Consistency. The Contractor shall monitor the consistency of the concrete delivered to the project site; collect each batch ticket; check temperature; and perform slump tests on each truck at the project site in accordance with ASTM C143.

610-3.8 Placing concrete. All concrete shall be placed during daylight hours, unless otherwise approved. The concrete shall not be placed until the depth and condition of foundations, the adequacy of forms and falsework, and the placing of the steel reinforcing have been approved by the RPR. Concrete shall be placed as soon as practical after mixing, but in no case later than one (1) hour after water has been added to the mix. The method and manner of placing shall avoid segregation and displacement of the reinforcement. Troughs, pipes, and chutes shall be used as an aid in placing concrete when necessary. The concrete shall not be dropped from a height of more than 5 feet (1.5 m). Concrete shall be deposited as nearly as practical in its final position to avoid segregation due to rehandling or flowing. Do not subject concrete to procedures which cause segregation. Concrete shall be placed on clean, damp surfaces, free from running water, or on a properly consolidated soil foundation.

610-3.9 Vibration. Vibration shall follow the guidelines in American Concrete Institute (ACI) Committee 309R, Guide for Consolidation of Concrete.

610-3.10 Joints. Joints shall be constructed as indicated on the plans.

610-3.11 Finishing. All exposed concrete surfaces shall be true, smooth, and free from open or rough areas, depressions, or projections. All concrete horizontal plane surfaces shall be brought flush to the proper elevation with the finished top surface struck-off with a straightedge and floated.

610-3.12 Curing and protection. All concrete shall be properly cured in accordance with the recommendations in American Concrete Institute (ACI) 308R, Guide to External Curing of Concrete. The concrete shall be protected from damage until project acceptance.

610-3.13 Cold weather placing. When concrete is placed at temperatures below 40°F (4°C), follow the cold weather concreting recommendations found in ACI 306R, Cold Weather Concreting.

610-3.14 Hot weather placing. When concrete is placed in hot weather greater than 85ºF (30 ºC), follow the hot weather concreting recommendations found in ACI 305R, Hot Weather Concreting.

QUALITY ASSURANCE (QA)

610-4.1 Quality Assurance sampling and testing. Concrete for each day's placement will be accepted on the basis of the compressive strength specified in paragraph 610-3.2. The RPR will sample the concrete in accordance with ASTM C172; test the slump in accordance with ASTM C143; test air content in accordance with ASTM C231; make and cure compressive strength specimens in accordance with ASTM C31; and test in accordance with ASTM C39. The QA testing agency will meet the requirements of ASTM C1077.

The Contractor shall provide adequate facilities for the initial curing of cylinders.

610-4.2 Defective work. Any defective work that cannot be satisfactorily repaired as determined by the RPR, shall be removed and replaced at the Contractor's expense. Defective work includes, but is not limited to, uneven dimensions, honeycombing and other voids on the surface or edges of the concrete.

METHOD OF MEASUREMENT

610-5.1 Concrete shall be considered incidental and no separate measurement shall be made of concrete complete in place and accepted.

BASIS OF PAYMENT

610-6.1 Concrete shall be considered incidental and no separate payment shall be made.

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A184	Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A704	Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement
ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
ASTM A775	Standard Specification for Epoxy-Coated Steel Reinforcing Bars
ASTM A884	Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement
ASTM A934	Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars
ASTM A1064	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
ASTM C33	Standard Specification for Concrete Aggregates
ASTM C39	Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
ASTM C94	Standard Specification for Ready-Mixed Concrete
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C114	Standard Test Methods for Chemical Analysis of Hydraulic Cement
ASTM C136	Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
ASTM C143	Standard Test Method for Slump of Hydraulic-Cement Concrete
ASTM C150	Standard Specification for Portland Cement
ASTM C171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C172	Standard Practice for Sampling Freshly Mixed Concrete

ASTM C231	Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
ASTM C260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C309	Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
ASTM C311	Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use in Portland-Cement Concrete
ASTM C494	Standard Specification for Chemical Admixtures for Concrete
ASTM C618	Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
ASTM C666	Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
ASTM C685	Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing
ASTM C989	Standard Specification for Slag Cement for Use in Concrete and Mortars
ASTM C1017	Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
ASTM C1077	Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation
ASTM C1157	Standard Performance Specification for Hydraulic Cement
ASTM C1260	Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar-Bar Method)
ASTM C1365	Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis
ASTM C1602	Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete
ASTM D1751	Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Asphalt Types)
ASTM D1752	Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction

American Concrete Institute (ACI)

ACI 305R	Hot Weather Concreting
ACI 306R	Cold Weather Concreting
ACI 308R	Guide to External Curing of Concrete
ACI 309R	Guide for Consolidation of Concrete

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Item P-620 Runway and Taxiway Marking

DESCRIPTION

620-1.1 This item shall consist of the preparation and painting of numbers, markings, and stripes on the surface of runways, taxiways, and aprons, in accordance with these specifications and at the locations shown on the plans, or as directed by the Resident Project Representative (RPR). The terms “paint” and “marking material” as well as “painting” and “application of markings” are interchangeable throughout this specification.

MATERIALS

620-2.1 Materials acceptance. The Contractor shall furnish manufacturer’s certified test reports, for materials shipped to the project. The certified test reports shall include a statement that the materials meet the specification requirements. This certification along with a copy of the paint manufacturer’s surface preparation; marking materials, including adhesion, flow promoting and/or floatation additive; and application requirements must be submitted and approved by the Resident Project Representative (RPR) prior to the initial application of markings. The reports can be used for material acceptance or the RPR may perform verification testing. The reports shall not be interpreted as a basis for payment. The Contractor shall notify the RPR upon arrival of a shipment of materials to the site. All material shall arrive in sealed containers that are easily quantifiable for inspection by the RPR.

620-2.2 Marking materials.

Table 1. Marking Materials

Paint[1]				**Glass Beads**[2]	
Type	**Color**	**Fed Std. 595 Number**	**Application Rate Maximum**	**Type**	**Application Rate Minimum**
Waterborne Type II	White	37925	115 ft^2/gal	Type III	10 lb/gal
Waterborne Type II	Yellow	33538 or 33655	115 ft^2/gal	Type III	10 lb/gal
Waterborne Type II	Red	31136	115 ft^2/gal	Type I	5 lb/gal
Waterborne Type II	Black	37038	115 ft^2/gal	N/A	N/A

[1] See paragraph 620-2.2a

[2] See paragraph 620-2.2b

a. Paint. Paint shall be waterborne in accordance with the requirements of this paragraph. Paint colors shall comply with Federal Standard No. 595. The first application of pavement markings shall be applied at 50% of the specified application rate.

b. Waterborne

. Paint shall meet the requirements of Federal Specification TT-P-1952F, Type II. The non-volatile portion of the vehicle for all paint types shall be composed of a 100% acrylic polymer as determined by infrared spectral analysis.

c. Reflective media. Glass beads for white and yellow paint shall meet the requirements for Federal Specification TT-B-1325D Type III. Glass beads shall not be applied with the first application of pavement markings.

Glass beads for red and pink paint shall meet the requirements for Type I, Gradation A.

Glass beads shall be treated with all compatible coupling agents recommended by the manufacturers of the paint and reflective media to ensure adhesion and embedment.

Glass beads shall not be used in black and green paint.

Type III glass beads shall not be used in red and pink paint.

CONSTRUCTION METHODS

620-3.1 Weather limitations. Painting shall only be performed when the surface is dry, and the ambient temperature and the pavement surface temperature meet the manufacturer's recommendations in accordance with paragraph 620-2.1. Painting operations shall be discontinued when the ambient or surface temperatures does not meet the manufacturer's recommendations. Markings shall not be applied when the wind speed exceeds 10 mph unless windscreens are used to shroud the material guns. Markings shall not be applied when weather conditions are forecasts to not be within the manufacturers' recommendations for application and dry time.

620-3.2 Equipment. Equipment shall include the apparatus necessary to properly clean the existing surface, a mechanical marking machine, a bead dispensing machine, and such auxiliary hand-painting equipment as may be necessary to satisfactorily complete the job.

The mechanical marker shall be an atomizing spray-type or airless type marking machine with automatic glass bead dispensers suitable for application of traffic paint. It shall produce an even and uniform film thickness and appearance of both paint and glass beads at the required coverage and shall apply markings of uniform cross-sections and clear-cut edges without running or spattering and without over spray. The marking equipment for both paint and beads shall be calibrated daily.

620-3.3 Preparation of surfaces. Immediately before application of the paint, the surface shall be dry and free from dirt, grease, oil, laitance, or other contaminates that would reduce the bond between the paint and the pavement. Use of any chemicals or impact abrasives during surface preparation shall be approved in advance by the RPR. After the cleaning operations, sweeping, blowing, or rinsing with pressurized water shall be performed to ensure the surface is clean and free of grit or other debris left from the cleaning process.

a. Preparation of new pavement surfaces. The area to be painted shall be cleaned by broom, blower, water blasting, or by other methods approved by the RPR to remove all contaminants, including PCC curing compounds, minimizing damage to the pavement surface.

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface. The removal area may need to be larger than the area of the markings to

eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

c. Preparation of pavement markings prior to remarking. Prior to remarking existing markings, loose existing markings must be removed minimizing damage to the pavement surface, with a method approved by the RPR. After removal, the surface shall be cleaned of all residue or debris.

Prior to the application of markings, the Contractor shall certify in writing that the surface is dry and free from dirt, grease, oil, laitance, or other foreign material that would prevent the bond of the paint to the pavement or existing markings. This certification along with a copy of the paint manufactures application and surface preparation requirements must be submitted to the RPR prior to the initial application of markings.

620-3.4 Layout of markings. The proposed markings shall be laid out in advance of the paint application. The locations of markings to receive glass beads shall be shown on the plans.

620-3.5 Application. All markings shall be applied in two separate applications. The first (initial) application shall be applied after paving operations and prior to reopening the area to air traffic. The second (permanent) application shall be applied after new pavement surfaces have been allowed to cure for a period of not less than 30 days. This 30-day period shall elapse between placement of surface course or seal coat and application of the permanent paint markings. Paint shall be applied at the locations and to the dimensions and spacing shown on the plans. Paint shall not be applied until the layout and condition of the surface has been approved by the RPR. Initial paint markings shall be applied prior to opening paved surface to traffic and be applied at 50% of the specified application rate and shall **not** include glass beads or black borders. Permanent application shall be applied at 100% of the specified application rate and shall include glass beads and black borders.

The edges of the markings shall not vary from a straight line more than 1/2 inch (12 mm) in 50 feet (15 m), and marking dimensions and spacing shall be within the following tolerances:

Marking Dimensions and Spacing Tolerance

Dimension and Spacing	Tolerance
36 inch (910 mm) or less	±1/2 inch (12 mm)
greater than 36 inch to 6 feet (910 mm to 1.85 m)	±1 inch (25 mm)
greater than 6 feet to 60 feet (1.85 m to 18.3 m)	±2 inch (50 mm)
greater than 60 feet (18.3 m)	±3 inch (76 mm)

The paint shall be mixed in accordance with the manufacturer's instructions and applied to the pavement with a marking machine at the rate shown in Table 1. The addition of thinner will not be permitted.

Glass beads shall be distributed upon the marked areas at the locations shown on the plans to receive glass beads immediately after application of the paint. A dispenser shall be furnished that is properly designed for attachment to the marking machine and suitable for dispensing glass beads. Glass beads shall be applied at the rate shown in Table 1. Glass beads shall not be applied to black paint or green paint. Glass beads shall adhere to the cured paint or all marking operations shall cease until corrections are made. Different bead types shall not be mixed. Regular monitoring of glass bead embedment and distribution should be performed.

620-3.6 Application--preformed thermoplastic airport pavement markings.

Preformed thermoplastic pavement markings not used.

620-3.7 Control strip. Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall demonstrate the surface preparation method and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

620-3.8 Retro-reflectance. Not used.

620-3.9 Protection and cleanup. After application of the markings, all markings shall be protected from damage until dry. All surfaces shall be protected from excess moisture and/or rain and from disfiguration by spatter, splashes, spillage, or drippings. The Contractor shall remove from the work area all debris, waste, loose reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the RPR. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and federal environmental statutes and regulations.

METHOD OF MEASUREMENT

620-4.1 The quantity of marking removal shall be measured by the number of square feet of markings removed**.**

620-4.2 The quantity of surface preparation shall be measured by the number of square feet for each type of surface preparation specified in paragraph 620-3.3. The quantity of surface preparation shall be based on the number of square feet of initial and permanent markings applied to the prepared surface.

620-4.3 The quantity of initial and permanent markings shall be measured by the number of square feet of painting**.**

620-4.4 The quantity of reflective media shall be measured by the number of square feet of reflective media.

BASIS OF PAYMENT

620-5.1 This price shall be full compensation for furnishing all materials and for all labor, equipment, tools, and incidentals necessary to complete the item complete in place and accepted by the RPR in accordance with these specifications.

620-5.2 Payment for marking removal shall be made at the contract unit price for by the number of square feet of painting.

620-5.3 Payment for surface preparation shall be made at the contract price for the number of square feet for each type of surface preparation specified in paragraph 620-3.3. Payment for surface preparation shall be based on the number of square feet of markings applied to the prepared surface.

620-5.4 Payment for markings shall be made at the contract price for by the number of square feet of painting.

620-5.5 Payment for reflective media shall be made at the contract unit price for the number of square feet of reflective media.

Payment will be made under:

Item P-620.01	Removal of Markings - per square foot
Item P-620.02	Surface Preparation Prior to First (Initial) Application of Markings – per square foot
Item P-620.03	Surface Preparation Prior to Second (Permanent) Application of Markings – per square foot
Item P-620.04	First (Initial) Application of Markings – per square foot
Item P-620.05	Second (Permanent) Application of Markings - per square foot
Item P-620.06	Reflective Media, Type III, for Second (Permanent) Application of Markings - per square foot
Item P-620.07	Reflective Media, Type I, Gradation A, for Second (Permanent) Application of Markings - per square foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D476	Standard Classification for Dry Pigmentary Titanium Dioxide Products
ASTM D968	Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive
ASTM D1652	Standard Test Method for Epoxy Content of Epoxy Resins
ASTM D2074	Standard Test Method for Total, Primary, Secondary, and Tertiary Amine Values of Fatty Amines by Alternative Indicator Method
ASTM D2240	Standard Test Method for Rubber Property - Durometer Hardness
ASTM D7585	Standard Practice for Evaluating Retroreflective Pavement Markings Using Portable Hand-Operated Instruments
ASTM E303	Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
ASTM E1710	Standard Test Method for Measurement of Retroreflective Pavement Marking Materials with CEN-Prescribed Geometry Using a Portable Retroreflectometer
ASTM E2302	Standard Test Method for Measurement of the Luminance Coefficient Under Diffuse Illumination of Pavement Marking Materials Using a Portable Reflectometer

ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials

Code of Federal Regulations (CFR)

40 CFR Part 60, Appendix A-7, Method 24	Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings
29 CFR Part 1910.1200	Hazard Communication

Federal Specifications (FED SPEC)

FED SPEC TT-B-1325D	Beads (Glass Spheres) Retro-Reflective
FED SPEC TT-P-1952F	Paint, Traffic and Airfield Marking, Waterborne
FED STD 595	Colors used in Government Procurement

Commercial Item Description

A-A-2886B	Paint, Traffic, Solvent Based

Advisory Circulars (AC)

AC 150/5340-1	Standards for Airport Markings
AC 150/5320-12	Measurement, Construction, and Maintenance of Skid Resistant Airport Pavement Surfaces

END OF ITEM P-620

Item F-162 Chain-Link Fence

DESCRIPTION

162-1.1 This item shall consist of furnishing and erecting a chain-link fence in accordance with these specifications, the details shown on the plans, and in conformity with the lines and grades shown on the plans or established by the RPR.

MATERIALS

162-2.1 Fabric. The fabric shall be woven with a 9-gauge galvanized steel wire in a 2-inch (50 mm) mesh and shall meet the requirements of ASTM A392, Class

162-2.2 Barbed wire. Barbed wire shall be 2-strand 12-1/2-gauge zinc-coated wire with 4-point barbs and shall conform to the requirements of ASTM A 121, Class 3 Chain-Link Fence grade.

162-2.3 Posts, rails, and braces. Line posts, rails, and braces shall conform to the requirements of ASTM F1043 or ASTM F1083 as follows:

- Galvanized tubular steel pipe shall conform to the requirements of Group IA, (Schedule 40) coatings conforming to Type A, or Group IC (High Strength Pipe), External coating Type B, and internal coating Type B or D.

Posts, rails, and braces, with the exception of galvanized steel conforming to ASTM F1043 or ASTM F1083, Group 1A, Type A, or aluminum alloy, shall demonstrate the ability to withstand testing in salt spray in accordance with ASTM B117 as follows:

- External: 1,000 hours with a maximum of 5% red rust.
- Internal: 650 hours with a maximum of 5% red rust.

The dimensions of the posts, rails, and braces shall be in accordance with Tables I through VI of Federal Specification RR-F-191/3.

162-2.4 Gates. Gate frames shall consist of galvanized steel pipe and shall conform to the specifications for the same material under paragraph 162-2.3. The fabric shall be of the same type material as used in the fence.

162-2.5 Wire ties and tension wires. Wire ties for use in conjunction with a given type of fabric shall be of the same material and coating weight identified with the fabric type. Tension wire shall be 7-gauge marcelled steel wire with the same coating as the fabric type and shall conform to ASTM A824.

All material shall conform to Federal Specification RR-F-191/4.

162-2.6 Miscellaneous fittings and hardware. Miscellaneous steel fittings and hardware for use with zinc-coated steel fabric shall be of commercial grade steel or better quality, wrought or cast as appropriate to the article, and sufficient in strength to provide a balanced design when used in conjunction with fabric posts, and wires of the quality specified herein. All steel fittings and hardware shall be protected with a zinc coating applied in conformance with ASTM A153.Barbed wire support arms shall withstand a load of 250 pounds (113 kg) applied vertically to the outermost end of the arm.

162-2.7 Concrete. Concrete shall have a minimum 28-day compressive strength of 3000 psi (2670 kPa).

162-2.8 Marking. Each roll of fabric shall carry a tag showing the kind of base metal (steel, aluminum, or aluminum alloy number), kind of coating, the gauge of the wire, the length of fencing in the roll, and the name of the manufacturer. Posts, wire, and other fittings shall be identified as to manufacturer, kind of base metal (steel, aluminum, or aluminum alloy number), and kind of coating.

CONSTRUCTION METHODS

162-3.1 General. The fence shall be constructed in accordance with the details on the plans and as specified here using new materials. All work shall be performed in a workmanlike manner satisfactory to the RPR. The Contractor shall layout the fence line based on the plans. The Contractor shall span the opening below the fence with barbed wire at all locations where it is not practical to conform the fence to the general contour of the ground surface because of natural or manmade features such as drainage ditches. The new fence shall be permanently tied to the terminals of existing fences as shown on the plans. The Contractor shall stake down the woven wire fence at several points between posts as shown on the plans.

The Contractor shall arrange the work so that construction of the new fence will immediately follow the removal of existing fences. The length of unfenced section at any time shall not exceed 300 feet (90 m). The work shall progress in this manner and at the close of the working day the newly constructed fence shall be tied to the existing fence.

162-3.2 Clearing fence line. Clearing shall consist of the removal of all stumps, brush, rocks, trees, or other obstructions that will interfere with proper construction of the fence. Stumps within the cleared area of the fence shall be grubbed or excavated. The bottom of the fence shall be placed a uniform distance above ground, as specified in the plans. When shown on the plans or as directed by the RPR, the existing fences which interfere with the new fence location shall be removed by the Contractor as a part of the construction work unless such removal is listed as a separate item in the bid schedule. All holes remaining after post and stump removal shall be refilled with suitable soil, gravel, or other suitable material and compacted with tampers.

The cost of removing and disposing of the material shall not constitute a pay item and shall be considered incidental to fence construction.

162-3.3 Installing posts. All posts shall be set in concrete at the required dimension and depth and at the spacing shown on the plans.

The concrete shall be thoroughly compacted around the posts by tamping or vibrating and shall have a smooth finish slightly higher than the ground and sloped to drain away from the posts. All posts shall be set plumb and to the required grade and alignment. No materials shall be installed on the posts, nor shall the posts be disturbed in any manner within seven (7) days after the individual post footing is completed.

Should rock be encountered at a depth less than the planned footing depth, a hole 2 inches (50 mm) larger than the greatest dimension of the posts shall be drilled to a depth of 12 inches (300 mm). After the posts are set, the remainder of the drilled hole shall be filled with grout, composed of one part Portland cement and two parts mortar sand. Any remaining space above the rock shall be filled with concrete in the manner described above.

In lieu of drilling, the rock may be excavated to the required footing depth. No extra compensation shall be made for rock excavation.

162-3.4 Installing top rails. The top rail shall be continuous and shall pass through the post tops. The coupling used to join the top rail lengths shall allow for expansion.

162-3.5 Installing braces. Horizontal brace rails, with diagonal truss rods and turnbuckles, shall be installed at all terminal posts.

162-3.6 Installing fabric. The wire fabric shall be firmly attached to the posts and braced as shown on the plans. All wire shall be stretched taut and shall be installed to the required elevations. The fence shall generally follow the contour of the ground, with the bottom of the fence fabric no less than one inch (25 mm) or more than 4 inches (100 mm) from the ground surface. Grading shall be performed where necessary to provide a neat appearance.

At locations of small natural swales or drainage ditches and where it is not practical to have the fence conform to the general contour of the ground surface, longer posts may be used and multiple strands of barbed wire stretched to span the opening below the fence. The vertical clearance between strands of barbed wire shall be 6 inches (150 mm) or less.

162-3.7 Electrical grounds. Not used

162-3.8 Cleaning up. The Contractor shall remove from the vicinity of the completed work all tools, buildings, equipment, etc., used during construction. All disturbed areas shall be seeded per T-901.

METHOD OF MEASUREMENT

162-4.1 Chain-link fence will be measured for payment by the linear foot (meter). Measurement will be along the top of the fence from center to center of end posts, excluding the length occupied by gate openings.

162-4.2 Gates will be measured as complete units.

BASIS OF PAYMENT

162-5.1 Payment for chain-link fence will be made at the contract unit price per linear foot.

162-5.2 Payment for temporary construction access gates will be made at the contract unit price for each gate.

The price shall be full compensation for furnishing all materials, and for all preparation, removal of existing fence and guardrail prior to installation, erection, and installation of these materials, and for all labor equipment, tools, and incidentals necessary to complete the item. The price shall also include all labor, equipment, tools and incidentals necessary for removal of the temporary gate and fencing, and re-installation of existing fencing and guardrail when temporary construction access is no longer needed.

Payment will be made under:

Item F-162.01	Chain-Link Fence - per linear foot
Item F-162.02	Temporary Construction Access Gates - per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A121	Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A153	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A392	Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric
ASTM A491	Standard Specification for Aluminum-Coated Steel Chain-Link Fence Fabric
ASTM A824	Standard Specification for Metallic-Coated Steel Marcelled Tension Wire for Use with Chain Link Fence
ASTM B117	Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM F668	Standard Specification for Polyvinyl Chloride (PVC), Polyolefin and other Organic Polymer Coated Steel Chain-Link Fence Fabric
ASTM F1043	Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	Standard Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures
ASTM F1183	Standard Specification for Aluminum Alloy Chain Link Fence Fabric
ASTM F1345	Standard Specification for Zinc 5% Aluminum-Mischmetal Alloy Coated Steel Chain-Link Fence Fabric
ASTM G152	Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G154	Standard Practice for Operating Fluorescent Ultraviolet (UV) Lamp Apparatus for Exposure of Nonmetallic Materials
ASTM G155	Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials

Federal Specifications (FED SPEC)

FED SPEC RR-F-191/3	Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FED SPEC RR-F-191/4	Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

FAA Standard

FAA-STD-019	Lightning and Surge Protection, Grounding, Bonding and Shielding Requirements for Facilities and Electronic Equipment

FAA Orders

5300.38	AIP Handbook

END OF ITEM F-162

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Item D-701 Pipe for Storm Drains and Culverts

DESCRIPTION

701-1.1 This item shall consist of the construction of pipe culverts and storm drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

701-2.1 Materials shall meet the requirements shown on the plans and specified below. Underground piping and components used in drainage systems for terminal and aircraft fueling ramp drainage shall be noncombustible and inert to fuel in accordance with National Fire Protection Association (NFPA) 415.

701-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements:

AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
ASTM C1479	Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations
ASTM C1840	Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe

701-2.3 Concrete. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi (13.8 MPa) at 28 days and conform to the requirements of ASTM C94.

701-2.4 Rubber gaskets. Rubber gaskets for rigid pipe shall conform to the requirements of ASTM C443. Rubber gaskets for PVC pipe, polyethylene, and polypropylene pipe shall conform to the requirements of ASTM F477. Rubber gaskets for zinc-coated steel pipe and precoated galvanized pipe shall conform to the requirements of ASTM D1056, for the “RE” closed cell grades. Rubber gaskets for steel reinforced thermoplastic ribbed pipe shall conform to the requirements of ASTM F477.

701-2.5 Joint mortar. Pipe joint mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

701-2.6 Joint fillers. Not used.

701-2.7 Plastic gaskets. Not used.

701-2.8. Controlled low-strength material (CLSM). Not used.

701-2.9 Precast box culverts. Manufactured in accordance with and conforming to ASTM C1433.

701-2.10 Precast concrete pipe. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or American Concrete Pipe Association QCast Plant Certification program.

CONSTRUCTION METHODS

701-3.1 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but it shall not be less than the external diameter of the pipe plus 12 inches (300 mm) on each side. The trench walls shall be approximately vertical.

The Contractor shall comply with all current federal, state and local rules and regulations governing the safety of men and materials during the excavation, installation and backfilling operations. Specifically, the Contractor shall observe that all requirements of the Occupational Safety and Health Administration (OSHA) relating to excavations, trenching and shoring are strictly adhered to. The width of the trench shall be sufficient to permit satisfactorily jointing of the pipe and thorough compaction of the bedding material under the pipe and backfill material around the pipe, but it shall not be greater than the widths shown on the plans trench detail.

Where rock, hardpan, or other unyielding material is encountered, the Contractor shall remove it from below the foundation grade for a depth of at least 8 inch (200 mm) or 1/2 inch (12 mm) for each foot of fill over the top of the pipe (whichever is greater) but for no more than three-quarters of the nominal diameter of the pipe. The excavation below grade should be filled with granular material to form a uniform foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

The excavation for pipes placed in embankment fill shall not be made until the embankment has been completed to a height above the top of the pipe as shown on the plans.

701-3.2 Bedding. The bedding surface for the pipe shall provide a foundation of uniform density to support the pipe throughout its entire length.

a. Rigid pipe. The pipe bedding shall be constructed uniformly for the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 in when the bedding thickness is less than 6 inches, and 1-1/2 in when the bedding thickness is greater than 6 inches. Bedding shall be loosely placed uncompacted material under the middle third of the pipe prior to placement of the pipe.

b. Flexible pipe. For flexible pipe, the bed shall be roughly shaped to fit the pipe, and a bedding blanket of sand or fine granular material shall be provided as follows:

Flexible Pipe Bedding

Pipe Corrugation Depth		Minimum Bedding Depth	
inch	**mm**	**inch**	**mm**
1/2	12	1	25
1	25	2	50
2	50	3	75
2-1/2	60	3-1/2	90

c. Other pipe materials. For PVC, polyethylene, polypropylene, or fiberglass pipe, the bedding material shall consist of coarse sands and gravels with a maximum particle size of 3/4 inches (19 mm). For pipes installed under paved areas, no more than 12% of the material shall pass the No. 200 (0.075 mm) sieve. For all other areas, no more than 50% of the material shall pass the No. 200 (0.075 mm) sieve. The bedding shall have a thickness of at least 6 inches (150 mm) below the bottom of the pipe and extend up around the pipe for a depth of not less than 50% of the pipe's vertical outside diameter.

701-3.3 Laying pipe. The pipe laying shall begin at the lowest point of the trench and proceed upgrade. The lower segment of the pipe shall be in contact with the bedding throughout its full length. Bell or groove ends of rigid pipes and outside circumferential laps of flexible pipes shall be placed facing upgrade.

Paved or partially lined pipe shall be placed so that the longitudinal center line of the paved segment coincides with the flow line.

Elliptical and elliptically reinforced concrete pipes shall be placed with the manufacturer's reference lines designating the top of the pipe within five degrees of a vertical plane through the longitudinal axis of the pipe.

701-3.4 Joining pipe. Joints shall be made with (1) cement mortar, (2) cement grout, (3) rubber gaskets, (4) plastic gaskets, (5) coupling bands.

Mortar joints shall be made with an excess of mortar to form a continuous bead around the outside of the pipe and shall be finished smooth on the inside. Molds or runners shall be used for grouted joints to retain the poured grout. Rubber ring gaskets shall be installed to form a flexible watertight seal.

a. Concrete pipe. Concrete pipe may be either bell and spigot or tongue and groove. Pipe sections at joints shall be fully seated and the inner surfaces flush and even. Concrete pipe joints shall be sealed with butyl mastic meeting ASTM C990 or mortar when soil tight joints are required. Joints shall be thoroughly wetted before applying mortar or grout.

b. Metal pipe. Metal pipe shall be firmly joined by form-fitting bands conforming to the requirements of ASTM A760 for steel pipe and AASHTO M196 for aluminum pipe.

c. PVC, Polyethylene, or Polypropylene pipe. Joints for PVC, Polyethylene, or Polypropylene pipe shall conform to the requirements of ASTM D3212 when leak resistant joints are required. Joints for PVC and Polyethylene pipe shall conform to the requirements of AASHTO M304 when soil tight joints are required. Fittings for polyethylene pipe shall conform to the requirements of AASHTO M252 or ASTM M294. Fittings for polypropylene pipe shall conform to ASTM F2881, ASTM F2736, or ASTM F2764.

d. Fiberglass pipe. Joints and fittings shall be as detailed on the plans and in accordance with the manufacturer's recommendations. Joints shall meet the requirements of ASTM D4161 for flexible elastomeric seals.

701-3.5 Embedment and Overfill. Pipes shall be inspected before any fill material is placed; any pipes found to be out of alignment, unduly settled, or damaged shall be removed and re-laid or replaced at the Contractor's expense.

701-3.5-1 Embedment Material Requirements

a. Concrete Pipe. Embedment material and compaction requirements shall be in accordance with the applicable Type of Standard Installation (Types 1, 2, 3, or 4) per ASTM C1479. If a concrete cradle or CLSM embedment material is used, it shall conform to the plan details.

b. Plastic and fiberglass Pipe. Embedment material shall meet the requirements of ASTM D3282, A-1, A-2-4, A-2-5, or A-3. Embedment material shall be free of organic material, stones larger than 1.5 inches in the greatest dimension, or frozen lumps. Embedment material shall extend to 12 inches above the top of the pipe.

c. Metal Pipe. Embedment material shall be granular as specified in the contract document and specifications, and shall be free of organic material, rock fragments larger than 1.5 inches in the greatest dimension and frozen lumps. As a minimum, backfill materials shall meet the requirements of ASTM D3282, A-1, A-2, or A-3. Embedment material shall extend to 12 inches above the top of the pipe.

701-3.5-2 Placement of Embedment Material

The embedment material shall be compacted in layers not exceeding 6 inches (150 mm) on each side of the pipe and shall be brought up one foot (30 cm) above the top of the pipe or to natural ground level, whichever is greater. Thoroughly compact the embedment material under the haunches of the pipe without displacing the pipe. Material shall be brought up evenly on each side of the pipe for the full length of the pipe.

When the top of the pipe is above the top of the trench, the embedment material shall be compacted in layers not exceeding 6 inches (150 mm) and shall be brought up evenly on each side of the pipe to one foot (30 cm) above the top of the pipe. All embedment material shall be compacted to a density required under Item P-152.

Concrete cradles and flowable fills, such as controlled low strength material (CLSM) or controlled density fill (CDF), may be used for embedment provided adequate flotation resistance can be achieved by restraints, weighing, or placement technique.

It shall be the Contractor's responsibility to protect installed pipes and culverts from damage due to construction equipment operations. The Contractor shall be responsible for installation of any extra strutting or backfill required to protect pipes from the construction equipment.

701-3.6 Overfill

Pipes shall be inspected before any overfill is in place. Any pipes found to be out of alignment, unduly settled, or damaged shall be removed and relaid or replaced at the Contractor's expense. Evaluation of any damage to RCP shall be evaluated based on AASHTO R73.

Overfill material shall be place and compacted in layers as required to achieve compaction to at least 95 percent standard proctor per ASTM D698. The soil shall contain no debris, organic matter, frozen material, or stones with a diameter greater than one half the thickness of the compacted layers being placed.

701-3.7 Inspection Requirements

An initial post installation inspection shall be performed by the RPR no sooner than 30 days after completion of installation and final backfill. Clean or flush all lines prior to inspection.

Use a camera with lighting suitable to allow a clear picture of the entire periphery of the pipe interior. Center the camera in the pipe both vertically and horizontally and be able to pan and tilt to a 90 degree angle with the axis of the pipe rotating 360 degrees. Use equipment to move the camera through the pipe that will not obstruct the camera's view or interfere with proper documentation of the pipe's condition. The video image shall be clear, focused, and relatively free from roll, static, or other image distortion qualities that would prevent the reviewer from evaluating the condition of the pipe.

Reinforced concrete pipe shall be inspected, evaluated, and reported on in accordance with ASTM C1840, "Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe." Any issues reported shall include still photo and video documentation. The zoom ratio shall be provided for all still or video images that document any issues of concern by the inspection firm.

Flexible pipes shall be inspected for rips, tears, joint separations, soil migration, cracks, localized buckling, settlement, alignment, and deflection. Determine whether the allowable deflection has been exceeded by use of a laser profiler for internal pipe diameters of 48 inches or less, or direct measurement for internal pipe diameters greater than 48 inches. Laser profile equipment shall utilize low barrel distortion video equipment. Deflection of installed pipe shall not exceed the limits provided in the table below, as a percentage of the average inside diameter of the pipe.

Maximum Allowable Pipe Deflection

Type of Pipe	Maximum Allowable Deflection (%)
Corrugated Metal Pipe	5
Concrete Lined CMP	3
Thermoplastic Pipe	5
Fiberglass	5

If deflection readings in excess of the allowable deflection are obtained, remove the pipe with excessive deflection and replace with new pipe. Isolated areas may exceed allowable by 2.5% with concurrence of RPR. Repair or replace any pipe with cracks exhibiting displacement across the crack, bulges, creases, tears, spalls, or delaminations. The report for flexible pipe shall include as a minimum, the deflection results and final post installation inspection report. The inspection report shall include: a copy of all video taken, pipe location identification, equipment used for inspection, inspector name, deviation from design line and grade, and inspector's notes.

701-3.8 Restoration outside limits of grading. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration outside limits of grading shall include topsoiling, fertilizing, liming, seeding, and mulching shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration outside the limits of grading shall be considered incidental to the respective D-701 pay items. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found to the satisfaction of the RPR. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

701-3.9 Pipe Connections to Structures. Where required to connect existing pipe to new structure, the Contractor shall sawcut the existing pipe and install a new section of pipe of sufficient length (5' min.)

with a watertight coupling connection as shown on the drawings. Mortar as directed under item D-751 shall be placed around the connection of the new section of pipe to the structure to form a leakproof, tight and neat connection.

Where required to connect new pipe to existing structures, the Contractor shall core a hole of the appropriate size in the existing structure at the location and elevation shown on the plans. Method of cutting hole in structure must be approved by the RPR prior to cutting. New pipe connection shall be grouted with a water-tight non-shrink, high-strength grout.

METHOD OF MEASUREMENT

701-4.1 The length of pipe shall be measured in linear feet (m) of pipe in place, completed, and accepted. It shall be measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. Each class, types and size of pipe shall be measured separately. All fittings, including flared ends, shall be included in the footage as typical pipe sections in the pipe being measured.

701-4.2 Connection of new pipe to existing structures shall be considered incidental to the cost of the pipe and shall not be measured separately for payment. Connection of existing pipe to new structures shall be considered incidental to the cost of the new structure under D-751 and shall not be measured separately for payment.

BASIS OF PAYMENT

701-5.0 These prices shall fully compensate the Contractor for furnishing all materials and for all preparation, excavation, and installation, backfill and compaction of these materials; and for all labor, equipment, tools, and incidentals necessary to complete the item.

701-5.1 Payment will be made at the contract unit price per linear foot (meter) for each class and size of pipe.

Payment will be made under:

Item 701-5.1	15-inch Class V RCP Pipe per linear foot
Item 701-5.2	18-inch Class V RCP Pipe per linear foot
Item 701-5.3	21-inch Class V RCP Pipe per linear foot
Item 701-5.4	24-inch Class V RCP Pipe per linear foot
Item 701-5.5	30-inch Class V RCP Pipe per linear foot
Item 701-5.6	48-inch Class V RCP Pipe per linear foot
Item 701-5.7	54-inch Class V RCP Pipe per linear foot
Item 701-5.8	6-inch HDPE Pipe per linear foot
Item 701-5.9	8-inch HDPE Pipe per linear foot

Item 701-5.10	12-inch HDPE Pipe per linear foot
Item 701-5.11	15-inch HDPE Pipe per linear foot
Item 701-5.12	24-inch HDPE Pipe per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M167	Standard Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M190	Standard Specification for Bituminous-Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M219	Standard Specification for Corrugated Aluminum Alloy Structural Plate for Field-Bolted Pipe, Pipe-Arches, and Arches
AASHTO M243	Standard Specification for Field Applied Coating of Corrugated Metal Structural Plate for Pipe, Pipe-Arches, and Arches
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) Diameter

ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A761	Standard Specification for Corrugated Steel Structural Plate, Zinc Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM A849	Standard Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe
ASTM B745	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
ASTM C14	Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe

ASTM C76	Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
ASTM C94	Standard Specification for Ready Mixed Concrete
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C506	Standard Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe
ASTM C507	Standard Specification for Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe
ASTM C655	Standard Specification for Reinforced Concrete D-Load Culvert, Storm Drain and Sewer Pipe
ASTM C990	Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
ASTM C1433	Standard Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers
ASTM D1056	Standard Specification for Flexible Cellular Materials Sponge or Expanded Rubber
ASTM D3034	Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings
ASTM D3212	Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals
ASTM D3262	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D3282	Standard Practice for Classification of Soils and Soil-Aggregate Mixtures for Highway Construction Purposes
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM D6690	Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F667	Standard Specification for 3 through 24 in. Corrugated Polyethylene Pipe and Fittings
ASTM F714	Standard Specification for Polyethylene (PE) Plastic Pipe (DR PR) Based on Outside Diameter
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter

ASTM F894	Standard Specification for Polyethylene (PE) Large Diameter Profile Wall Sewer and Drain Pipe
ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2435	Standard Specification for Steel Reinforced Polyethylene (PE) Corrugated Pipe
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage
ASTM F2736	Standard Specification for 6 to 30 in. (152 to 762 mm) Polypropylene (PP) Corrugated Single Wall Pipe and Double Wall Pipe
ASTM F2764	Standard Specification for 30 to 60 in. (750 to 1500 mm) Polypropylene (PP) Triple Wall Pipe and Fittings for Non-Pressure Sanitary Sewer Applications
ASTM F2881	Standard Specification for 12 to 60 in. (300 to 1500 mm) Polypropylene (PP) Dual Wall Pipe and Fittings for Non-Pressure Storm Sewer Applications

National Fire Protection Association (NFPA)

NFPA 415	Standard on Airport Terminal Buildings, Fueling Ramp Drainage, and Loading Walkways

END ITEM D-701

Item D-705 Pipe Underdrains for Airports

DESCRIPTION

705-1.1 This item shall consist of the construction of pipe drains in accordance with these specifications and in reasonably close conformity with the lines and grades shown on the plans.

MATERIALS

705-2.1 General. Materials shall meet the requirements shown on the plans and specified below.

705-2.2 Pipe. The pipe shall be of the type called for on the plans or in the proposal and shall be in accordance with the following appropriate requirements.

AASHTO M252 Standard Specification for Corrugated Polyethylene Drainage Pipe

705-2.3 Joint mortar. Pipe joint mortar shall consist of one part by volume of Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

705-2.4 Elastomeric seals. Elastomeric seals shall conform to the requirements of ASTM F477.

705-2.5 Porous backfill. Porous backfill shall be free of clay, humus, or other objectionable matter, and shall conform to the gradation in Table 1 when tested in accordance with ASTM C136.

Table 1. Gradation of Porous Backfill

Sieve Designation (square openings)	Percentage by Weight Passing Sieves
	Porous Material No. 2
1-1/2 inch (37.5 mm)	100
1 inch (25.0 mm)	90-100
3/8 inch (9.5 mm)	25-60
No. 4 (4.75 mm)	5-40
No. 8 (2.36 mm)	0-20
No. 16 (1.18 mm)	
No. 50 (300 µm)	
No. 100 (150 µm)	

705-2.6 Granular material. Granular material used for backfilling shall conform to the requirements of ASTM D2321 for Class IA, IB, or II materials.

705-2.7 Filter fabric. The filter fabric shall conform to the requirements of AASHTO M288 Class 2 or equivalent.

Table 2. Fabric Properties

Fabric Property	Test Method	Test Requirement
Grab Tensile Strength, lbs	ASTM D4632	125 min
Grab Tensile Elongation %	ASTM D4632	50 min
Burst Strength, psi	ASTM D3785	125 min
Trapezoid Tear Strength, lbs	ASTM D4533	55 min
Puncture Strength, lbs	ASTM D4833	40 min
Abrasion, lbs	ASTM D4886	15 max loss
Equivalent Opening Size	ASTM D4751	70-100
Permittivity sec^{-1}	ASTM D4491	0.80
Accelerated Weathering (UV Stability) (Strength Retained - %)	ASTM D4355 *(500 hrs exposure)	70

705-2.8 Controlled low-strength material (CLSM). CLSM is not used.

705-2.9 Cleanouts. Underdrain cleanouts shall be made of materials as shown on the plans.

CONSTRUCTION METHODS

705-3.1 Equipment. All equipment required for the construction of pipe underdrains shall be on the project, in good working condition, and approved by the RPR before construction is permitted to start.

705-3.2 Excavation. The width of the pipe trench shall be sufficient to permit satisfactory jointing of the pipe and thorough tamping of the bedding material under and around the pipe, but shall not be less than the external diameter of the pipe plus 6 inches (150 mm) on each side of the pipe. The trench walls shall be approximately vertical.

Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 4 inches (100 mm). The excavation below grade shall be backfilled with selected fine compressible material, such as silty clay or loam, and lightly compacted in layers not over 6 inches (150 mm) in uncompacted depth to form a uniform but yielding foundation.

Where a firm foundation is not encountered at the grade established, due to soft, spongy, or other unstable soil, the unstable soil shall be removed and replaced with approved granular material for the full trench width. The RPR shall determine the depth of removal necessary. The granular material shall be compacted to provide adequate support for the pipe.

Excavated material not required or acceptable for backfill shall be disposed of by the Contractor as directed by the RPR. The excavation shall not be carried below the required depth; if this occurs, the trench shall be backfilled at the Contractor’s expense with material approved by the RPR and compacted to the density of the surrounding material.

The pipe bedding shall be constructed uniformly over the full length of the pipe barrel, as required on the plans. The maximum aggregate size shall be 1 inch when the bedding thickness is less than 6 inches, and 1-1/2 inch when the bedding thickness is greater than 6 inches.Bedding shall be loosely placed, uncompacted material under the middle third of the pipe prior to placement of the pipe.

The Contractor shall do trench bracing, sheathing, or shoring necessary to perform and protect the excavation as required for safety and conformance to federal, state and local laws. Unless otherwise provided, the bracing, sheathing, or shoring shall be removed by the Contractor after the backfill has reached at least 12 inches (300 mm) over the top of the pipe. The sheathing or shoring shall be pulled as the granular backfill is placed and compacted to avoid any unfilled spaces between the trench wall and the backfill material. The cost of bracing, sheathing, or shoring, and the removal of same, shall be included in the unit price bid per foot (meter) for the pipe.

705-3.3 Laying and installing pipe.

a. Concrete pipe. The laying of the pipe in the finished trench shall be started at the lowest point and proceed upgrade. When bell and spigot pipe is used, the bells shall be laid upgrade. If tongue and groove pipe is used, the groove end shall be laid upgrade. Holes in perforated pipe shall be placed down, unless otherwise shown on the plans. The pipe shall be firmly and accurately set to line and grade so that the invert will be smooth and uniform. Pipe shall not be laid on frozen ground.

Pipe which is not true in alignment, or which shows any settlement after laying, shall be taken up and re-laid by the Contractor at no additional expense. Making adjustments in grade by exerting force on the barrel of the pipe with excavating equipment, by lifting and dropping the pipe, or by lifting the pipe and packing bedding material under it shall be prohibited. If the installed pipe section is not to grade, the pipe section shall be completely removed, the grade corrected, and the pipe rejoined."

b. Metal pipe. The metal pipe shall be laid with the separate sections joined firmly together with bands, with outside laps of circumferential joints pointing upgrade, and with longitudinal laps on the sides. Any metal in the pipe or bands that is not protected thoroughly by galvanizing shall be coated with a suitable asphaltum paint.

During installation, the asphalt-protected pipe shall be handled without damaging the asphalt coating. Any breaks in the bitumen or treatment of the pipe shall be refilled with the type and kind of bitumen used in coating the pipe originally.

c. PVC, fiberglass, or polyethylene pipe. PVC or polyethylene pipe shall be installed in accordance with the requirements of ASTM D2321. Perforations shall meet the requirements of AASHTO M252 or AASHTO M294 Class 2, unless otherwise indicated on the plans. The pipe shall be laid accurately to line and grade. Fiberglass per ASTM D3839 Standard Guide for Underground Installation of "Fiberglass" (Glass-Fiber Reinforced Thermosetting-Resin) Pipe.

d. All types of pipe. The upgrade end of pipelines, not terminating in a structure, shall be plugged or capped as approved by the RPR.

Unless otherwise shown on the plans, a 4-inch (100 mm) bed of granular backfill material shall be spread in the bottom of the trench throughout the entire length under all perforated pipe underdrains.

Pipe outlets for the underdrains shall be constructed when required or shown on the plans. The pipe shall be laid with tight-fitting joints. Porous backfill is not required around or over pipe outlets for underdrains. All connections to other drainage pipes or structures shall be made as required and in a satisfactory manner. If connections are not made to other pipes or structures, the outlets shall be protected and constructed as shown on the plans.

e. Filter fabric. The filter fabric shall be installed in accordance with the manufacturer's recommendations, or in accordance with the AASHTO M288 Appendix, unless otherwise shown on the plans.

705-3.4 Mortar. The mortar shall be of the desired consistency for caulking and filling the joints of the pipe and for making connections to other pipes or to structures. Mortar that is not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted.

705-3.5 Joints in concrete pipe. When open or partly open joints are required or specified, they shall be constructed as indicated on the plans. The pipe shall be laid with the ends fitted together as designed. If bell and spigot pipe is used, mortar shall be placed along the inside bottom quarter of the bell to center the following section of pipe.

The open or partly open joints shall be surrounded with granular material meeting requirements of porous backfill No. 2 in Table 1 or as indicated on the plans. This backfill shall be placed so its thickness will be not less than 3 inches (75 mm) nor more than 6 inches (150 mm), unless otherwise shown on the plans.

When the original material excavated from the trench is impervious, commercial concrete sand or granular material meeting requirements of porous backfill No. 1 shall surround porous backfill No. 2 (Table 1), as shown on the plans or as directed by the RPR.

When the original material excavated from the trench is pervious and suitable, it may be used as backfill in lieu of porous backfill No. 1, when indicated on the plans or as directed by the RPR.

705-3.6 Embedment and Backfill

a. Earth. All trenches and excavations shall be backfilled soon after the pipes are installed, unless additional protection of the pipe is directed. The embedment material shall be select material from excavation or borrow and shall be approved by the RPR. The select material shall be placed on each side of the pipe out to a distance of the nominal pipe diameter and one foot (30 cm) over the top of the pipe and shall be readily compacted. It shall not contain stones 3 inches (75 mm) or larger in size, frozen lumps, chunks of highly plastic clay, or any other material that is objectionable to the RPR. The material shall be moistened or dried, as required to aid compaction. Placement of the embedment material shall not cause displacement of the pipe. Thorough compaction under the haunches and along the sides to the top of the pipe shall be obtained.

The embedment material shall be placed in loose layers not exceeding 6 inches (150 mm) in depth under and around the pipe. Backfill material over the pipe shall be placed in lifts not exceeding 8 inches (200 mm). Successive layers shall be added and thoroughly compacted by hand and pneumatic tampers, approved by the RPR, until the trench is completely filled and brought to the planned elevation. Embedment and backfilling shall be done to avoid damaging top or side of the pipe.

In embankments and other unpaved areas, the backfill shall be compacted per Item P-152 to the density required for embankments in unpaved areas. Under paved areas, the subgrade and any backfill shall be compacted per Item P-152 to the density required for embankments for paved areas.

b. Granular backfill. When granular backfill is required, placement in the trench and about the pipe shall be as shown on the plans. The granular backfill shall not contain an excessive amount of foreign matter, nor shall soil from the sides of the trench or from the soil excavated from the trench be allowed to filter into the granular backfill. When required by the RPR, a template shall be used to properly place and separate the two sizes of backfill. The backfill shall be placed in loose layers not exceeding 6 inches (150 mm) in depth. The granular backfill shall be compacted by hand and pneumatic tampers to the requirements as given for embankment. Backfilling shall be done to avoid damaging top or side pressure on the pipe. The granular backfill shall extend to the elevation of the trench or as shown on the plans.

When perforated pipe is specified, granular backfill material shall be placed along the full length of the pipe. The position of the granular material shall be as shown on the plans. If the original material excavated from the trench is pervious and suitable, it shall be used in lieu of porous backfill No. 1.

If porous backfill is placed in paved or adjacent to paved areas before grading or subgrade operations is completed, the backfill material shall be placed immediately after laying the pipe. The depth of the granular backfill shall be not less than 12 inches (300 mm), measured from the top of the underdrain. During subsequent construction operations, a minimum depth of 12 inches (300 mm) of backfill shall be maintained over the underdrains. When the underdrains are to be completed, any unsuitable material shall be removed exposing the porous backfill. Porous backfill containing objectionable material shall be removed and replaced with suitable material. The cost of removing and replacing any unsuitable material shall be at the Contractor's expense.

If a granular subbase blanket course is used which extends several feet beyond the edge of paving to the outside edge of the underdrain trench, the granular backfill material over the underdrains shall be placed in the trench up to an elevation of 2 inches (50 mm) above the bottom surface of the granular subbase blanket course. Immediately prior to the placing of the granular subbase blanket course, the Contractor shall blade this excess trench backfill from the top of the trench onto the adjacent subgrade where it can be incorporated into the granular subbase blanket course. Any unsuitable material that remains over the underdrain trench shall be removed and replaced. The subbase material shall be placed to provide clean contact between the subbase material and the underdrain granular backfill material for the full width of the underdrain trench.

c. Controlled low-strength material (CLSM). `CLSM is not used.`

705-3.7 Flexible Pipe Ring Deflection. Not used.

705-3.8 Connections. When the plans call for connections to existing or proposed pipe or structures, these connections shall be watertight and made to obtain a smooth uniform flow line throughout the drainage system.

705-3.9 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, soil, and rubbish from the site. Surplus soil may be deposited in embankments, shoulders, or as directed by the RPR. Except for paved areas of the airport, the Contractor shall restore all disturbed areas to their original condition.

705-3.10 Removal of Underdrain Pipe and Cleanouts. Remove the underdrain pipe and cleanouts as indicated on the plans. The pipe and cleanouts shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 100% of ASTM D698.

Existing pipes and pipe openings in structures to remain after pipe removal shall be permanently plugged to prevent entry of soil materials and groundwater. Existing pipes to remain shall be plugged with PVC plugs. Existing pipe openings in structures should be plugged with non-shrink concrete grout. All plugs shall be watertight and capable of withstanding all internal and external pressures without leakage.

705-3.11 Lighting System Drain Pipe. Lighting system drain pipes from the light bases shown on the plans shall be connected to the nearest drainage structure, drain pipe, or underdrain pipe that achieves positive draining. Any connection that deviates from what is shown on the plan shall require the approval of the RPR. All coring, fittings, and connections required to connect the lighting system drain pipe to the storm drainage system shall be considered incidental to the linear foot price of the lighting system drain pipe.

METHOD OF MEASUREMENT

705-4.1 The length of pipe shall be the number of linear feet (meters) of pipe underdrains in place, completed, and approved; measured along the centerline of the pipe from end or inside face of structure to the end or inside face of structure, whichever is applicable. The several classes, types, and sizes shall be measured separately. All fittings shall be included in the footage as typical pipe sections in the pipeline being measured.

705-4.2 The quantity of pipe underdrains shall be made at the contract unit price per linear foot (meter) complete, including porous backfill and filter fabric.

705-4.3 The quantity of underdrain cleanouts to be paid shall be the number of each, installed, complete with access structures and fittings as shown on the plans, complete, in place, in accordance with the dimensions and locations shown and accepted by the RPR.

705-4.4 Adjustment of existing underdrain cleanouts shall be measured by each structure adjusted in accordance with the plans and details, completed, and approved.

705-4.5 The length of existing underdrain pipe removed shall be measured in linear feet of pipe removed, including underdrain cleanouts requiring removal, backfilled, plugged, disposed of off-site, completed, and approved. It shall be measured along the centerline of the pipe from end of inside face to the structure to the end of inside face of structure.

BASIS OF PAYMENT

705-5.1 Payment will be made at the contract unit price per linear foot (meter) for pipe underdrains of the type, class, and size designated.

705-5.2 Pipe underdrains, Complete. Pipe underdrains, complete (including porous backfill and filter fabric) shall be made at the contract unit price per linear foot (meter) complete (including porous backfill and filter fabric.

These prices shall be full compensation for furnishing all materials and for all preparation, excavation, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

705-5.3 Underdrain Cleanouts. Payment will be made at the contract unit price per each for underdrain pipe cleanout installed. This price shall be full compensation for furnishing all materials including pipe risers, connections, concrete collars, frame and cover, and for all preparation, and installation of the materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

705-5.4 Cleanout Adjustment. Payment will be made at the contract unit price per each for existing underdrain pipe cleanout adjusted. This price shall be full compensation for furnishing all materials and for all preparation, and installation of the materials and for all labor, equipment, tools, and incidentals necessary to complete the item.

705-5.5 Removal of Underdrain Pipe and Cleanouts. Payment will be made at the contract unit price per linear foot for underdrain pipe removed regardless of pipe size and material, including removal and disposal of filter fabric and cleanouts. The price shall be full compensation for furnishing all materials and for all preparation, excavation, suitable backfill material, plugging, backfilling, disposal of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

705-5.6 Lighting System Drainpipe. Payment for lighting system drainpipe shall be made at the contract unit price per linear foot installed. These prices shall be full compensation for furnishing all materials and for all preparation, excavation, connections to existing or proposed pipe or structures, and

installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item D-705.01	Removal of Underdrain Pipe and Cleanouts - per linear foot
Item D-705.02	6-inch Underdrain Pipe - per linear foot
Item D-705.03	Underdrain Cleanout - per each
Item D-705.04	Existing Underdrain Cleanout Adjustment - per each
Item D-705.05	2” Schedule 40 PVC Lighting System Drain Pipe - per linear foot
Item D-705.06	2” Schedule 80 PVC Lighting System Drain Pipe - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A760	Standard Specification for Corrugated Steel Pipe, Metallic Coated for Sewers and Drains
ASTM A762	Standard Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains
ASTM C136	Standard Test Method for Sieve or Screen Analysis of Fine and Coarse Aggregates
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C444	Standard Specification for Perforated Concrete Pipe
ASTM C654	Standard Specification for Porous Concrete Pipe
ASTM D2321	Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications
ASTM D3262	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Sewer Pipe
ASTM D4161	Standard Specification for "Fiberglass" (Glass-Fiber Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals
ASTM F477	Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
ASTM F758	Standard Specification for Smooth Wall Poly (Vinyl Chloride) (PVC) Plastic Underdrain Systems for Highway, Airport, and Similar Drainage
ASTM F794	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe & Fittings Based on Controlled Inside Diameter

ASTM F949	Standard Specification for Poly (Vinyl Chloride) (PVC) Corrugated Sewer Pipe with a Smooth Interior and Fittings
ASTM F2562	Specification for Steel Reinforced Thermoplastic Ribbed Pipe and Fittings for Non-Pressure Drainage and Sewerage

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M190	Standard Specification for Bituminous - Coated Corrugated Metal Culvert Pipe and Pipe Arches
AASHTO M196	Standard Specification for Corrugated Aluminum Pipe for Sewers and Drains
AASHTO M252	Standard Specification for Corrugated Polyethylene Drainage Pipe
AASHTO M288	Standard Specification for Geotextile Specification for Highway Applications
AASHTO M294	Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter
AASHTO M304	Standard Specification for Poly (Vinyl Chloride) (PVC) Profile Wall Drain Pipe and Fittings Based on Controlled Inside Diameter
AASHTO MP20	Standard Specification for Steel-Reinforced Polyethylene (PE) Ribbed Pipe, 300- to 900-mm (12- to 36-in.) diameter
AASHTO	Standard Specifications for Highway Bridges

END OF ITEM D-705

Item D-751 Manholes, Catch Basins, Inlets and Inspection Holes

DESCRIPTION

751-1.1 This item shall consist of construction of manholes, catch basins, inlets, and inspection holes, in accordance with these specifications, at the specified locations and conforming to the lines, grades, and dimensions shown on the plans or required by the RPR.

MATERIALS

751-2.1 Brick. The brick shall conform to the requirements of ASTM C32, Grade MS.

751-2.2 Mortar. Mortar shall consist of one part Portland cement and two parts sand. The cement shall conform to the requirements of ASTM C150, Type I. The sand shall conform to the requirements of ASTM C144.

751-2.3 Concrete. Plain and reinforced concrete used in structures, connections of pipes with structures, and the support of structures or frames shall conform to the requirements of Item P-610.

751-2.4 Precast concrete pipe manhole rings. Precast concrete pipe manhole rings shall conform to the requirements of ASTM C478. Unless otherwise specified, the risers and offset cone sections shall have an inside diameter of not less than 36 inches (90 cm) nor more than 48 inches (120 cm). There shall be a gasket between individual sections and sections cemented together with mortar on the inside of the manhole. Gaskets shall conform to the requirements of ASTM C443.

751-2.5 Corrugated metal. Corrugated metal shall conform to the requirements of American Association of State Highway and Transportation Officials (AASHTO) M36.

751-2.6 Frames, covers, and grates. The castings shall conform to one of the following requirements:

a. ASTM A48, Class 35B: Gray iron castings

b. ASTM A47: Malleable iron castings

c. ASTM A27: Steel castings

d. ASTM A283, Grade D: Structural steel for grates and frames

e. ASTM A536, Grade 65-45-12: Ductile iron castings

f. ASTM A897: Austempered ductile iron castings

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings, aircraft gear configuration and/or direct loading, specified. All castings shall be heavy duty and meet AASHTO M306.

Each frame and cover or grate unit shall be provided with fastening members to prevent it from being dislodged by traffic but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

751-2.7 Steps. The steps or ladder bars shall be gray or malleable cast iron or galvanized steel. The steps shall be the size, length, and shape shown on the plans and those steps that are not galvanized shall be given a coat of asphalt paint, when directed.

751-2.8 Precast inlet structures. Manufactured in accordance with and conforming to ASTM C913.

CONSTRUCTION METHODS

751-3.1 Unclassified excavation.

a. The Contractor shall excavate for structures and footings to the lines and grades or elevations, shown on the plans, or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown. The elevations of the bottoms of footings, as shown on the plans, shall be considered as approximately only; and the RPR may direct, in writing, changes in dimensions or elevations of footings necessary for a satisfactory foundation.

b. Boulders, logs, or any other objectionable material encountered in excavation shall be removed. All rock or other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped, or serrated, as directed by the RPR. All seams or crevices shall be cleaned out and grouted. All loose and disintegrated rock and thin strata shall be removed. Where concrete will rest on a surface other than rock, the bottom of the excavation shall not be disturbed and excavation to final grade shall not be made until immediately before the concrete or reinforcing is placed.

c. The Contractor shall do all bracing, sheathing, or shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheathing, or shoring shall be included in the unit price bid for the structure.

d. All bracing, sheathing, or shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall not disturb or damage finished masonry. The cost of removal shall be included in the unit price bid for the structure.

e. After excavation is completed for each structure, the Contractor shall notify the RPR. No concrete or reinforcing steel shall be placed until the RPR has approved the depth of the excavation and the character of the foundation material.

751-3.2 Brick structures.

a. Foundations. A prepared foundation shall be placed for all brick structures after the foundation excavation is completed and accepted. Unless otherwise specified, the base shall consist of reinforced concrete mixed, prepared, and placed in accordance with the requirements of Item P-610.

b. Laying brick. All brick shall be clean and thoroughly wet before laying so that they will not absorb any appreciable amount of additional water at the time they are laid. All brick shall be laid in freshly made mortar. Mortar not used within 45 minutes after water has been added shall be discarded. Retempering of mortar shall not be permitted. An ample layer of mortar shall be spread on the beds and a shallow furrow shall be made in it that can be readily closed by the laying of the brick. All bed and head joints shall be filled solid with mortar. End joints of stretchers and side or cross joints of headers shall be fully buttered with mortar and a shoved joint made to squeeze out mortar at the top of the joint. Any bricks that may be loosened after the mortar has taken its set, shall be removed, cleaned, and re-laid with fresh mortar. No broken or chipped brick shall be used in the face, and no spalls or bats shall be used except where necessary to shape around irregular openings or edges; in which case, full bricks shall be placed at ends or corners where possible, and the bats shall be used in the interior of the course. In making closures, no piece of brick shorter than the width of a whole brick shall be used; and wherever practicable, whole brick shall be used and laid as headers.

c. Joints. All joints shall be filled with mortar at every course Exterior faces shall be laid up in advance of backing. Exterior faces shall be plastered or parged with a coat of mortar not less than 3/8 inch (9 mm) thick before the backing is laid up. Prior to parging, all joints on the back of face courses shall be cut flush. Unless otherwise noted, joints shall be not less than 1/4 inch (6 mm) nor more than 1/2 inch (12 mm) wide and the selected joint width shall be maintained uniform throughout the work.

d. Pointing. Face joints shall be neatly struck, using the weather-struck joint. All joints shall be finished properly as the laying of the brick progresses. When nails or line pins are used, the holes shall be immediately plugged with mortar and pointed when the nail or pin is removed.

e. Cleaning. Upon completion of the work all exterior surfaces shall be thoroughly cleaned by scrubbing and washing with water. If necessary to produce satisfactory results, cleaning shall be done with a 5% solution of muriatic acid which shall then be rinsed off with liberal quantities of water.

f. Curing and cold weather protection. The brick masonry shall be protected and kept moist for at least 48 hours after laying the brick. Brick masonry work or pointing shall not be done when there is frost on the brick or when the air temperature is below 50°F (10°C) unless the Contractor has, on the project ready to use, suitable covering and artificial heating devices necessary to keep the atmosphere surrounding the masonry at a temperature of not less than 60°F (16°C) for the duration of the curing period.

751-3.3 Concrete structures. Concrete structures which are to be cast-in-place within the project boundaries shall be built on prepared foundations, conforming to the dimensions and shape indicated on the plans. The construction shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

All invert channels shall be constructed and shaped accurately to be smooth, uniform, and cause minimum resistance to flowing water. The interior bottom shall be sloped to the outlet.

751-3.4 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program.

Precast concrete structures shall conform to ASTM C478. Precast concrete structures shall be constructed on prepared or previously placed slab foundations conforming to the dimensions and locations shown on the plans. All precast concrete sections necessary to build a completed structure shall be furnished. The different sections shall fit together readily. Joints between precast concrete risers and tops shall be full-bedded in cement mortar and shall: (1) be smoothed to a uniform surface on both interior and exterior of the structure or (2) utilize a rubber gasket per ASTM C443. The top of the upper precast concrete section shall be suitably formed and dimensioned to receive the metal frame and cover or grate, or other cap, as required. Provision shall be made for any connections for lateral pipe, including drops and leads that may be installed in the structure. The flow lines shall be smooth, uniform, and cause minimum resistance to flow. The metal or metal encapsulated steps that are embedded or built into the side walls shall be aligned and placed in accordance to ASTM C478. When a metal ladder replaces the steps, it shall be securely fastened into position.

751-3.5 Corrugated metal structures. Corrugated metal structures shall be prefabricated. All standard or special fittings shall be furnished to provide pipe connections or branches with the correct dimensions and of sufficient length to accommodate connecting bands. The fittings shall be welded in place to the metal structures. The top of the metal structure shall be designed so that either a concrete slab or metal collar may be attached to allow the fastening of a standard metal frame and grate or cover. Steps or ladders shall be furnished as shown on the plans. Corrugated metal structures shall be constructed on

prepared foundations, conforming to the dimensions and locations as shown on the plans. When indicated, the structures shall be placed on a reinforced concrete base.

751-3.6 Inlet and outlet pipes. Inlet and outlet pipes shall extend through the walls of the structures a sufficient distance beyond the outside surface to allow for connections. They shall be cut off flush with the wall on the inside surface of the structure, unless otherwise directed. For concrete or brick structures, mortar shall be placed around these pipes to form a tight, neat connection.

751-3.7 Placement and treatment of castings, frames, and fittings. All castings, frames, and fittings shall be placed in the positions indicated on the plans or as directed by the RPR, and shall be set true to line and elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

When frames or fittings are placed on previously constructed masonry, the bearing surface of the masonry shall be brought true to line and grade and shall present an even bearing surface so the entire face or back of the unit will come in contact with the masonry. The unit shall be set in mortar beds and anchored to the masonry as indicated on the plans or as directed by the RPR. All units shall set firm and secure.

After the frames or fittings have been set in final position, the concrete or mortar shall be allowed to harden for seven (7) days before the grates or covers are placed and fastened down.

751-3.8 Installation of steps. The steps shall be installed as indicated on the plans or as directed by the RPR. When the steps are to be set in concrete, they shall be placed and secured in position before the concrete is placed. When the steps are installed in brick masonry, they shall be placed as the masonry is being built. The steps shall not be disturbed or used until the concrete or mortar has hardened for at least seven (7) days. After seven (7) days, the steps shall be cleaned and painted, unless they have been galvanized.

When steps are required with precast concrete structures they shall meet the requirements of ASTM C478. The steps shall be cast into the side of the sections at the time the sections are manufactured or set in place after the structure is erected by drilling holes in the concrete and cementing the steps in place.

When steps are required with corrugated metal structures, they shall be welded into aligned position at a vertical spacing of 12 inches (300 mm).

Instead of steps, prefabricated ladders may be installed. For brick or concrete structures, the ladder shall be held in place by grouting the supports in drilled holes. For metal structures, the ladder shall be secured by welding the top support to the structure and grouting the bottom support into drilled holes in the foundation or as directed by the RPR.

751-3.9 Backfilling.

a. After a structure has been completed, the area around it shall be backfilled with approved material, in horizontal layers not to exceed 8 inches (200 mm) in loose depth, and compacted to the density required in Item P-152. Each layer shall be deposited evenly around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

b. Backfill shall not be placed against any structure until approved by the RPR. For concrete structures, approval shall not be given until the concrete has been in place seven (7) days, or until tests establish that the concrete has attained sufficient strength to withstand any pressure created by the backfill and placing methods.

c. Backfill shall not be measured for direct payment. Performance of this work shall be considered an obligation of the Contractor covered under the contract unit price for the structure involved.

751-3.10 Cleaning and restoration of site. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, or as approved by the RPR. The Contractor shall restore all disturbed areas to their original condition. The Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

751-3.11 Structure Adjustments. Where shown on the plans within proposed work areas, or as directed by the RPR, existing catch basins or manhole frames and covers shall be adjusted in elevation. Adjustment of the structure frame shall be accomplished by complete removing existing brick and mortar beneath the existing frame and providing new layers of brick and mortar and/or precast rings to the proposed elevation, in accordance with the details in the plans.

751-3.12 Replacement of Frame and Grate/Cover. At locations as directed by the RPR, existing frames and grates/covers shall be replaced and adjusted to grade accordingly. Adjustment of the new frame shall be accomplished by complete removing existing brick and mortar beneath the existing frame and providing new layers of brick and mortar and/or precast rings to the proposed elevation, in accordance with the details in the plans. New frame and grate/cover shall match that shown on the proposed manhole / catch basin details on the plans as appropriate.

METHOD OF MEASUREMENT

751-4.1 Manholes, catch basins, inlets, and inspection holes shall be measured by the unit.

751-4.2 Adjustment of existing storm drain structures shall be measured by each structure adjusted, completed, and approved.

751-4.3 Replacement of frame and grate shall be measured by each frame and grate/cover replaced, completed, and approved.

BASIS OF PAYMENT

751-5.1 The accepted quantities of manholes, catch basins, inlets, and inspection holes will be paid for at the contract unit price per each in place when completed. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; furnishing and installation of such specials and connections to pipes and other structures as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the structure. This price shall include survey of existing drainage structures to verify existing pipe type, size, and inverts. The survey shall include all existing drainage structures shown on the plans to be replaced or to receive new pipes including all adjacent structures upstream and downstream from these structures.

751-5.2 The accepted quantities of drainage structures adjusted will be paid for at the contract unit price per each unit, completed, and approved. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials; incidentals as may be required to complete the item; and for all labor equipment, tools and incidentals necessary to complete the structure adjustment.

751-5.3 The accepted quantities of existing frame and grate/cover replacement will be paid for at the contract unit price per each frame and grate/cover installed at locations directed by the RPR. This price shall be full compensation for furnishing all materials and for all preparation, excavation, demolition and removal of existing brick and mortar, furnishing and installing new brick and mortar and/or precast rings, backfilling and surface restoration, and for all labor equipment, tools, materials and incidentals necessary to complete the replacement of the frame and grate/cover.

Payment will be made under:

Item D-751-5.1	Manholes, 5-Foot Dia. - per each
Item D-751-5.2	Manholes, 6-Foot Dia. - per each
Item D-751-5.3	Manholes, 8-Foot Dia. - per each
Item D-751-5.4	Catch Basins, 4-Foot Dia. - per each
Item D-751-5.5	Catch Basins, 6-Foot Dia. - per each
Item D-751-5.6	Catch Basins 7-Foot Dia. – per each
Item D-751-5.7	Catch Basins 8-Foot Dia. – per each
Item D-751-6.0	Existing Drainage Structure Adjustment - per each
Item D-751-7.0	Replacement of Frame and Grate - per each
Item D-751-8.0	Outlet Control Structure and Trashrack, 4-Foot Dia. - per each
Item D-751-9.0	Outlet Control Structure and Trashrack, 6-Foot Dia. - per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A897	Standard Specification for Austempered Ductile Iron Castings

ASTM C32	Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale)
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C443	Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
ASTM C478	Standard Specification for Precast Reinforced Concrete Manhole Sections
ASTM C913	Standard Specification for Precast Concrete Water and Wastewater Structures.

American Association of State Highway and Transportation Officials (AASHTO)

AASHTO M36	Standard Specification for Corrugated Steel Pipe, Metallic-Coated, for Sewers and Drains

END OF ITEM D-751

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Item D-771 Sand Filters

DESCRIPTION

771-1.1. This item shall consist of the construction of sand filters in accordance with these specifications and Volume 2 of the New Hampshire Department of Environmental Services' Stormwater Manual, Chapter 4a *Surface Sand Filters*, at the specified locations and conforming to the lines, grades, depth and dimensions shown on the plans or required by the RPR based on field conditions.

MATERIALS

771-2.1. Filter Fabric shall be non-woven filter fabric Class "C" geotextile or better and meet ASTM D-751 (puncture strength - 125 lb.), ASTM D-1117 (Mullen Burst Strength - 400 psi), ASTM D-1682 (tensile strength - 300 lb.).

771-2.2. Impermeable Liner (if shown on the plans) shall be ultraviolet resistant, have a minimum thickness of 30 mil, and meet ASTM D 751 (thickness), ASTM D 412 (tensile strength 1,100 lb., elongation 200%), ASTM D 624 (tear resistance - 150 lb./in), and ASTM D 471 (water adsorption: +8 to - 2% mass).

771-2.3. Sand Filter Material shall be a mixture of loamy coarse sand, and moderately fine shredded bark or wide fiber mulch at the proportions shown on the plans.

771-2.4. Topsoil shall be in accordance with Section T-905 of these specifications.

771-2.5. Underdrain Gravel shall be washed and meet AASHTO-M-43, 0.25" to 0.75" diameter.

771-2.6. Underdrain Pipe shall be 6-inch (main line) and 4-inch (cross drain) diameter perforated PVC Schedule 40 pipe (M 278 OR F758, Type PS 28).

771-2.7. Turf Reinforcement Mat for use over earthen berms shall be Tencate Mirafi TM13C or approved equal.

CONSTRUCTION METHODS

771-3.1 General. Upon completion of the sand filter construction, heavy equipment and traffic shall be restricted from traveling over the sand filter footprint to minimize compaction of the topsoil layer. Absolutely no runoff is to enter the sand filter until all contributing drainage areas have been stabilized. Construct upstream diversion berms or ditches as directed by the RPR to accommodate project phasing.

771-3.2 Excavation. Excavate the sand filter to the design dimensions. Excavation must be free of standing water. Excavated materials shall be placed away from the excavation sides to enhance stability of excavation wall. Excavated materials shall be placed downstream of the sand filter, to minimize redeposit of the material during runoff events. Large tree roots and protruding objects must be trimmed flush with the excavation walls

in order to prevent puncturing or tearing of the impermeable liner during subsequent installation procedures.

771-3.3 Placing Perimeter Filter Fabric. The perimeter filter fabric shall interface between the excavation side walls and the underdrain and filter layers. The width of the liner must include sufficient material to conform to excavation irregularities and be trimmed to the top of the sand filter layer. Sand piles or other anchoring objects should be placed on the fabric at the edge of the excavation to keep the fabric open during windy periods. When overlaps are required between rolls, a minimum of 2 feet overlap is required.

771-3.4 Placing Underdrain Gravel and Underdrain. The stone aggregate should be placed in a maximum loose lift thickness of 12 inches and compacted using a plate compactor. A minimum of 3 inches of gravel shall be placed over underdrain pipes; no minimum required underneath pipes.

Care shall be exercised to prevent natural or fill soils from intermixing with the sand or stone aggregate. All contaminated sand or stone aggregate shall be removed and replaced with uncontaminated sand or stone aggregate.

771-3.5 Placing Pea Gravel Separation Media. A layer of pea gravel shall be placed after completion of the underdrain gravel blanket material and shall interface between the sand filter layer and underdrain gravel.

771-3.6 Placing Sand Filter Material. Place sand filter layer in a uniform layer. The final thickness of the sand filter layer shall be as indicated on the Contract Drawings. The top 6 inches shall be mixed by rototilling with 50% by volume of T-905 topsoil.

771-3.7 Observation Riser. Observation risers are to consist of 6-inch diameter perforated PVC pipe with a cap set in concrete collar. Wells shall be spaced as indicated on the Contract Drawings. The pipe shall have a plastic collar with ribs to prevent rotation when removing the cap. The depth to the invert shall be marked on the lid. The pipe shall be oriented vertically within the sand and gravel layers of the sandfilter.

771-3.6 Cleaning And Restoration Of Site. After the work is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Topsoiling, seeding, and mulch shall be paid for under their respective bid items. After all work is completed, the Contractor shall remove all tools and equipment, leaving the entire site free, clear, and in good condition.

METHOD OF MEASUREMENT

771-4.1 The quantity of Sand Filters, completed or installed shall be measured by the square yard of sand filter constructed, measured horizontally at finished grade.

BASIS OF PAYMENT

771-5.1 The accepted quantities of Sand Filters will be paid for at the contract price per square yard of Sand Filter complete and in place. This price shall be full compensation for furnishing all materials, including filter fabric, turf reinforcement mat, observation risers, underdrain piping, cleanouts and gravel, sand filter material, topsoil and wetland seed, and for all preparation, excavation, backfilling, and placing of the materials; furnishing and installation of such specials and other appurtenances as may be required to complete the item as shown on the plans; and for all labor equipment, tools and incidentals necessary to complete the sand filters.

Payment will be made under:

Item D-771.01	Surface Sand Filter	-- per Square Yard

REFERENCES

New Hampshire Stormwater Manual, Volume 2: Chapter 4a Surface Sand Filter

END OF ITEM D-771

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Item T-901 Seeding

DESCRIPTION

901-1.1 This item shall consist of soil preparation, seeding related operations including liming, fertilizing, and re-fertilizing the areas shown on the plans or as directed by the RPR in accordance with these specifications.

MATERIALS

901-2.1 Seed. The species and application rates of grass, legume, and cover-crop seed furnished shall be those stipulated herein. Seed shall conform to the requirements of Federal Specification JJJ-S-181, Federal Specification, Seeds, Agricultural.

Seed shall be furnished separately or in mixtures in standard containers labeled in conformance with the Agricultural Marketing Service (AMS) Seed Act and applicable state seed laws with the seed name, lot number, net weight, percentages of purity and of germination and hard seed, and percentage of maximum weed seed content clearly marked for each kind of seed. The Contractor shall furnish the RPR duplicate signed copies of a statement by the vendor certifying that each lot of seed has been tested by a recognized laboratory for seed testing within six (6) months of date of delivery. This statement shall include: name and address of laboratory, date of test, lot number for each kind of seed, and the results of tests as to name, percentages of purity and of germination, and percentage of weed content for each kind of seed furnished, and, in case of a mixture, the proportions of each kind of seed. Wet, moldy, or otherwise damaged seed will be rejected.

Seed to be applied shall be Endophyte Enhanced Airport Mixture which is as follows:

Seed Properties and Rate of Application

Seed	Rate of Application lb/acre (% of mix.)
Kentucky 31 Tall Fescue	70.0 (31%)
Viking H20 Hard Fescue	70.0 (31%)
Ambrose Chewing Fescue	70.0 (31%)

Seed	**Rate of Application lb/acre (% of mix.)**
Top Gun Perennial Ryegrass	18.0% (7%)
TOTAL RATE	228 lbs./acre

Seeding shall be performed during the period between **April 1st to June 1st** and **August 15th to October 14th** inclusive, unless otherwise approved by the RPR.

901-2.2 Lime. Lime shall be applied to the soil if the pH is less than 5.5**.** Lime shall be ground limestone containing not less than 85% of total carbonates, and shall be ground to such fineness that 90% will pass through a No. 20 (850 µm) mesh sieve and 50% will pass through a No. 100 (150 µm) mesh sieve. Coarser material will be acceptable, providing the rates of application are increased to provide not less than the minimum quantities and depth specified in the special provisions on the basis of the two sieve requirements above. Dolomitic lime or a high magnesium lime shall contain at least 10% of magnesium oxide. . All liming materials shall conform to the requirements of ASTM C602.

Table 1 – Lime Application Rate

Existing Soil pH	Limestone to be added	
	Tons/Acre	Pounds/Cubic Yard
4.0 – 4.4	3	12
4.5 – 4.9	2	8
5.0 – 5.4	1	4

901-2.3 Fertilizer. Fertilizer shall be standard commercial fertilizers supplied separately or in mixtures containing the percentages of total nitrogen, available phosphoric acid, and water-soluble potash. They shall be applied at the rate and to the depth specified, and shall meet the requirements of applicable state laws. They shall be furnished in standard containers with name, weight, and guaranteed analysis of contents clearly marked thereon. No cyanamide compounds or hydrated lime shall be permitted in mixed fertilizers.

The fertilizers may be supplied in one of the following forms:

a. A dry, free-flowing fertilizer suitable for application by a common fertilizer spreader;

b. A finely-ground fertilizer soluble in water, suitable for application by power sprayers; or

c. A granular or pellet form suitable for application by blower equipment.

Fertilizers shall be commercial fertilizer and shall be spread at the rates shown in Table 2.

Table 2 – Fertilizer Information

Percent of Nutrients			
Initial	Refertilization	Min. Application Rate (Lbs. per 1000 Sq. Ft.)	Measurement Factor
10-10-10		20.0	1.0
15-15-15		13.4	1.5
19-19-19		10.5	1.9
	10-3-6	20.0	1.0
	12-2-8	16.7	1.2
	12-4-8	16.7	1.2

901-2.4 Soil for repairs. The soil for fill and topsoiling of areas to be repaired shall be at least of equal quality to that which exists in areas adjacent to the area to be repaired. The soil shall be relatively free from large stones, roots, stumps, or other materials that will interfere with subsequent sowing of seed, compacting, and establishing turf, and shall be approved by the RPR before being placed.

CONSTRUCTION METHODS

901-3.1 Advance preparation and cleanup. After grading of areas has been completed and before applying fertilizer and ground limestone, areas to be seeded shall be raked or otherwise cleared of stones larger than 2 inches (50 mm) in any diameter, sticks, stumps, and other debris that might interfere with sowing of seed, growth of grasses, or subsequent maintenance of grass-covered areas. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer and ground limestone, the Contractor shall repair such damage include filling gullies, smoothing irregularities, and repairing other incidental damage.

An area to be seeded shall be considered a satisfactory seedbed without additional treatment if it has recently been thoroughly loosened and worked to a depth of not less than 5 inches (125 mm) as a result of grading operations and, if immediately prior to seeding, the top 3 inches (75 mm) of soil is loose, friable, reasonably free from large clods, rocks, large roots, or other undesirable matter, and if shaped to the required grade.

When the area to be seeded is sparsely sodded, weedy, barren and unworked, or packed and hard, any grass and weeds shall first be cut or otherwise satisfactorily disposed of, and the soil then scarified or otherwise loosened to a depth not less than 5 inches (125 mm). Clods shall be broken and the top 3 inches

(75 mm) of soil shall be worked into a satisfactory seedbed by discing, or by use of cultipackers, rollers, drags, harrows, or other appropriate means.

901-3.2 Dry application method.

a. Liming. Lime shall be applied separately and prior to the application of any fertilizer or seed and only on seedbeds that have previously been prepared as described above. The lime shall then be worked into the top 3 inches (75 mm) of soil after which the seedbed shall again be properly graded and dressed to a smooth finish.

b. Fertilizing. Following advance preparations and cleanup fertilizer shall be uniformly spread at the rate that will provide not less than the minimum quantity stated in paragraph 901-2.3.

c. Seeding. Grass seed shall be sown at the rate specified in paragraph 901-2.1 immediately after fertilizing. The fertilizer and seed shall be raked within the depth range stated in the special provisions. Seeds of legumes, either alone or in mixtures, shall be inoculated before mixing or sowing, in accordance with the instructions of the manufacturer of the inoculant. When seeding is required at other than the seasons shown on the plans or in the special provisions, a cover crop shall be sown by the same methods required for grass and legume seeding.

d. Rolling. After the seed has been properly covered, the seedbed shall be immediately compacted by means of an approved lawn roller, weighing 40 to 65 pounds per foot (60 to 97 kg per meter) of width for clay soil (or any soil having a tendency to pack), and weighing 150 to 200 pounds per foot (223 to 298 kg per meter) of width for sandy or light soils.

901-3.3 Wet application method.

a. General. The Contractor may elect to apply seed and fertilizer (and lime, if required) by spraying them on the previously prepared seedbed in the form of an aqueous mixture and by using the methods and equipment described herein. The rates of application shall be as specified in the special provisions.

b. Spraying equipment. The spraying equipment shall have a container or water tank equipped with a liquid level gauge calibrated to read in increments not larger than 50 gallons (190 liters) over the entire range of the tank capacity, mounted so as to be visible to the nozzle operator. The container or tank shall also be equipped with a mechanical power-driven agitator capable of keeping all the solids in the mixture in complete suspension at all times until used.

The unit shall also be equipped with a pressure pump capable of delivering 100 gallons (380 liters) per minute at a pressure of 100 lb / sq inches (690 kPa). The pump shall be mounted in a line that will recirculate the mixture through the tank whenever it is not being sprayed from the nozzle. All pump passages and pipe lines shall be capable of providing clearance for 5/8 inch (16 mm) solids. The power unit for the pump and agitator shall have controls mounted so as to be accessible to the nozzle operator. There shall be an indicating pressure gauge connected and mounted immediately at the back of the nozzle.

The nozzle pipe shall be mounted on an elevated supporting stand in such a manner that it can be rotated through 360 degrees horizontally and inclined vertically from at least 20 degrees below to at least 60 degrees above the horizontal. There shall be a quick-acting, three-way control valve connecting the recirculating line to the nozzle pipe and mounted so that the nozzle operator can control and regulate the amount of flow of mixture delivered to the nozzle. At least three different types of nozzles shall be supplied so that mixtures may be properly sprayed over distance varying from 20 to 100 feet (6 to 30 m). One shall be a close-range ribbon nozzle, one a medium-range ribbon nozzle, and one a long-range jet nozzle. For case of removal and cleaning, all nozzles shall be connected to the nozzle pipe by means of quick-release couplings.

In order to reach areas inaccessible to the regular equipment, an extension hose at least 50 feet (15 m) in length shall be provided to which the nozzles may be connected.

c. Mixtures. Lime, if required, shall be applied separately, in the quantity specified, prior to the fertilizing and seeding operations. Not more than 220 pounds (100 kg) of lime shall be added to and mixed with each 100 gallons (380 liters) of water. Seed and fertilizer shall be mixed together in the relative proportions specified, but not more than a total of 220 pounds (100 kg) of these combined solids shall be added to and mixed with each 100 gallons (380 liters) of water.

All water used shall be obtained from fresh water sources and shall be free from injurious chemicals and other toxic substances harmful to plant life. The Contractor shall identify to the RPR all sources of water at least two (2) weeks prior to use. The RPR may take samples of the water at the source or from the tank at any time and have a laboratory test the samples for chemical and saline content. The Contractor shall not use any water from any source that is disapproved by the RPR following such tests.

All mixtures shall be constantly agitated from the time they are mixed until they are finally applied to the seedbed. All such mixtures shall be used within two (2) hours from the time they were mixed or they shall be wasted and disposed of at approved locations.

d. Spraying. Lime, if required, shall be sprayed only upon previously prepared seedbeds. After the applied lime mixture has dried, the lime shall be worked into the top 3 inches (75 mm), after which the seedbed shall again be properly graded and dressed to a smooth finish.

Mixtures of seed and fertilizer shall only be sprayed upon previously prepared seedbeds on which the lime, if required, shall already have been worked in. The mixtures shall be applied by means of a high-pressure spray that shall always be directed upward into the air so that the mixtures will fall to the ground like rain in a uniform spray. Nozzles or sprays shall never be directed toward the ground in such a manner as might produce erosion or runoff.

Particular care shall be exercised to ensure that the application is made uniformly and at the prescribed rate and to guard against misses and overlapped areas. Proper predetermined quantities of the mixture in accordance with specifications shall be used to cover specified sections of known area.

Checks on the rate and uniformity of application may be made by observing the degree of wetting of the ground or by distributing test sheets of paper or pans over the area at intervals and observing the quantity of material deposited thereon.

On surfaces that are to be mulched as indicated by the plans or designated by the RPR, seed and fertilizer applied by the spray method need not be raked into the soil or rolled. However, on surfaces on which mulch is not to be used, the raking and rolling operations will be required after the soil has dried.

901-3.4 Maintenance of seeded areas. The Contractor shall protect seeded areas against traffic or other use by warning signs or barricades, as approved by the RPR. Surfaces gullied or otherwise damaged following seeding shall be repaired by regrading and reseeding as directed. The Contractor shall mow, water as directed, and otherwise maintain seeded areas in a satisfactory condition until final inspection and acceptance of the work.

When either the dry or wet application method outlined above is used for work done out of season, it will be required that the Contractor establish a good stand of grass of uniform color and density to the satisfaction of the RPR. A grass stand shall be considered adequate when bare spots are one square foot (0.01 sq m) or less, randomly dispersed, and do not exceed 3% of the area seeded.

METHOD OF MEASUREMENT

901-4.1 The quantity of seeding to be paid for shall be the number of units 1,000 square feet measured on the ground surface, completed and accepted.

BASIS OF PAYMENT

901-5.1 Payment shall be made at the contract unit price per 1,000 square feet or fraction thereof, which price and payment shall be full compensation for furnishing and placing all material and for all labor, equipment, tools, and incidentals necessary to complete the work prescribed in this item.

Payment will be made under:

Item T-901.01	Seeding - per 1,000 square feet (MSF)

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C602	Standard Specification for Agricultural Liming Materials

Federal Specifications (FED SPEC)

FED SPEC	JJJ-S-181, Federal Specification, Seeds, Agricultural

Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-901

Item T-905 Topsoil

DESCRIPTION

905-1.1 This item shall consist of preparing the ground surface for topsoil application, removing topsoil from designated stockpiles or areas to be stripped on the site or from approved sources off the site, and placing and spreading the topsoil on prepared areas in accordance with this specification at the locations shown on the plans or as directed by the RPR.

MATERIALS

905-2.1 Topsoil. Topsoil shall be the surface layer of soil with no admixture of refuse or any material toxic to plant growth, and it shall be reasonably free from subsoil and stumps, roots, brush, stones (2 inches (50 mm) or more in diameter), and clay lumps or similar objects. Brush and other vegetation that will not be incorporated with the soil during handling operations shall be cut and removed. Ordinary sod and herbaceous growth such as grass and weeds are not to be removed, but shall be thoroughly broken up and intermixed with the soil during handling operations. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means, shall be removed. The topsoil or soil mixture, unless otherwise specified or approved, shall have a pH range of approximately 5.5 pH to 7.6 pH, when tested in accordance with the methods of testing of the Association of Official Agricultural Chemists in effect on the date of invitation of bids. The organic content shall be not less than 3% nor more than 20% as determined by the wet-combustion method (chromic acid reduction). There shall be not less than 20% nor more than 80% of the material passing the 200 mesh (75 μm) sieve as determined by the wash test in accordance with ASTM C117.

Natural topsoil may be amended by the Contractor with approved materials and methods to meet the above specifications.

905-2.2 Inspection and tests. Within 10 days following acceptance of the bid, the RPR shall be notified of the source of topsoil to be furnished by the Contractor. The topsoil shall be inspected to determine if the selected soil meets the requirements specified and to determine the depth to which stripping will be permitted. At this time, the Contractor may be required to take representative soil samples from several locations within the area under consideration and to the proposed stripping depths, for testing purposes as specified in paragraph 905-2.1.

CONSTRUCTION METHODS

905-3.1 General. Areas to be topsoiled shall be shown on the plans. If topsoil is available on the site, the location of the stockpiles or areas to be stripped of topsoil and the stripping depths shall be shown on the plans.

Suitable equipment necessary for proper preparation and treatment of the ground surface, stripping of topsoil, and for the handling and placing of all required materials shall be on hand, in good condition, and approved by the RPR before the various operations are started.

905-3.2 Preparing the ground surface. Immediately prior to dumping and spreading the topsoil on any area, the surface shall be loosened by discs or spike-tooth harrows, or by other means approved by the RPR, to a minimum depth of 2 inches (50 mm) to facilitate bonding of the topsoil to the covered subgrade soil. The surface of the area to be topsoiled shall be cleared of all stones larger than 2 inches (50 mm) in any diameter and all litter or other material which may be detrimental to proper bonding, the rise of capillary moisture, or the proper growth of the desired planting. Limited areas, as shown on the plans, which are too compact to respond to these operations shall receive special scarification.

Grades on the area to be topsoiled, which have been established by others as shown on the plans, shall be maintained in a true and even condition. Where grades have not been established, the areas shall be smooth-graded and the surface left at the prescribed grades in an even and compacted condition to prevent the formation of low places or pockets where water will stand.

905-3.3 Obtaining topsoil. Prior to the stripping of topsoil from designated areas, any vegetation, briars, stumps and large roots, rubbish or stones found on such areas, which may interfere with subsequent operations, shall be removed using methods approved by the RPR. Heavy sod or other cover, which cannot be incorporated into the topsoil by discing or other means shall be removed.

When suitable topsoil is available on the site, the Contractor shall remove this material from the designated areas and to the depth as directed by the RPR. The topsoil shall be spread on areas already tilled and smooth-graded, or stockpiled in areas approved by the RPR. Any topsoil stockpiled by the Contractor shall be rehandled and placed without additional compensation. Any topsoil that has been stockpiled on the site by others, and is required for topsoil purposes, shall be removed and placed by the Contractor. The sites of all stockpiles and areas adjacent thereto which have been disturbed by the Contractor shall be graded if required and put into a condition acceptable for seeding.

When suitable topsoil is secured off the airport site, the Contractor shall locate and obtain the supply, subject to the approval of the RPR. The Contractor shall notify the RPR sufficiently in advance of operations in order that necessary measurements and tests can be made. The Contractor shall remove the topsoil from approved areas and to the depth as directed. The topsoil shall be hauled to the site of the work and placed for spreading, or spread as required. Any topsoil hauled to the site of the work and stockpiled shall be rehandled and placed without additional compensation.

905-3.4 Placing topsoil. The topsoil shall be evenly spread on the prepared areas to a uniform depth of 2 inches (50 mm) after compaction, unless otherwise shown on the plans or stated in the special provisions. Spreading shall not be done when the ground or topsoil is frozen, excessively wet, or otherwise in a condition detrimental to the work. Spreading shall be carried on so that turfing operations can proceed with a minimum of soil preparation or tilling.

After spreading, any large, stiff clods and hard lumps shall be broken with a pulverizer or by other effective means, and all stones or rocks (2 inches (50 mm) or more in diameter), roots, litter, or any foreign matter shall be raked up and disposed of by the Contractor. after spreading is completed, the topsoil shall be satisfactorily compacted by rolling with a cultipacker or by other means approved by the RPR. The compacted topsoil surface shall conform to the required lines, grades, and cross-sections. Any topsoil or other dirt falling upon pavements as a result of hauling or handling of topsoil shall be promptly removed.

METHOD OF MEASUREMENT

905-4.1 Topsoil shall be measured by the number of cubic yards of topsoil measured in its final position, as accepted by the RPR, regardless of whether it was obtained from on-site or off-site resources.

BASIS OF PAYMENT

905-5.1 Payment will be made at the contract unit price per cubic yard for topsoil . This price shall be full compensation for furnishing all materials and for all preparation, placing, and spreading of the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-905.01	Topsoil - per cubic yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM C117	Materials Finer than 75 μm (No. 200) Sieve in Mineral Aggregates by Washing

Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-905

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Item T-908 Mulching

DESCRIPTION

908-1.1 This item shall consist of furnishing, hauling, placing, and securing mulch on surfaces indicated on the plans or designated by the RPR.

MATERIALS

908-2.1 Mulch material. Acceptable mulch shall be the materials listed below or any approved locally available material that is similar to those specified. Mulch shall be free from noxious weeds, mold, and other deleterious materials. Mulch materials, which contain matured seed of species that would volunteer and be detrimental to the proposed overseeding, or to surrounding farm land, will not be acceptable. Straw or other mulch material which is fresh and/or excessively brittle, or which is in such an advanced stage of decomposition as to smother or retard the planted grass, will not be acceptable.

a. Hay. Not Used.

b. Straw. Not Used.

c. Hay mulch containing seed. Not Used.

d. Manufactured mulch. Cellulose-fiber or wood-pulp mulch shall be products commercially available for use in spray applications.

e. Asphalt binder. Not Used.

908-2.2 Inspection. The RPR shall be notified of sources and quantities of mulch materials available and the Contractor shall furnish him with representative samples of the materials to be used 30 days before delivery to the project. These samples may be used as standards with the approval of the RPR and any materials brought on the site that do not meet these standards shall be rejected.

CONSTRUCTION METHODS

908-3.1 Mulching. Before spreading mulch, all large clods, stumps, stones, brush, roots, and other foreign material shall be removed from the area to be mulched. Mulch shall be applied immediately after seeding. The spreading of the mulch may be by hand methods, blower, or other mechanical methods, provided a uniform covering is obtained.

Mulch material shall be furnished, hauled, and evenly applied on the area shown on the plans or designated by the RPR. Straw or hay shall be spread over the surface to a uniform thickness at the rate of 2 to 3 tons per acre (1800 - 2700 kg per acre) to provide a loose depth of not less than 1-1/2 inches (38 cm) nor more than 3 inches (75 mm). Other organic material shall be spread at the rate directed by the RPR. Mulch may be blown on the slopes and the use of cutters in the equipment for this purpose will be permitted to the extent that at least 95% of the mulch in place on the slope shall be 6 inches (150 mm) or more in length. When mulches applied by the blowing method are cut, the loose depth in place shall be not less than one inch (25 mm) nor more than 2 inches (50 mm).

908-3.2 Securing mulch. The mulch shall be held in place by light discing, a very thin covering of topsoil, pins, stakes, wire mesh, asphalt binder, or other adhesive material approved by the RPR. Where mulches have been secured by either of the asphalt binder methods, it will not be permissible to walk on the slopes after the binder has been applied. When an application of asphalt binder material is used to secure the mulch, the Contractor must take every precaution to guard against damaging or disfiguring structures or property on or adjacent to the areas worked and will be held responsible for any such damage resulting from the operation.

If the "peg and string" method is used, the mulch shall be secured by the use of stakes or wire pins driven into the ground on 5-foot (1.5-m) centers or less. Binder twine shall be strung between adjacent stakes in straight lines and crisscrossed diagonally over the mulch, after which the stakes shall be firmly driven nearly flush to the ground to draw the twine down tight onto the mulch.

908-3.3 Care and repair.

a. The Contractor shall care for the mulched areas until final acceptance of the project. Care shall consist of providing protection against traffic or other use by placing warning signs, as approved by the RPR, and erecting any barricades that may be shown on the plans before or immediately after mulching has been completed on the designated areas.

b. The Contractor shall be required to repair or replace any mulch that is defective or becomes damaged until the project is finally accepted. When, in the judgment of the RPR, such defects or damages are the result of poor workmanship or failure to meet the requirements of the specifications, the cost of the necessary repairs or replacement shall be borne by the Contractor.

c. If the "asphalt spray" method is used, all mulched surfaces shall be sprayed with asphalt binder material so that the surface has a uniform appearance. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons (32 liters) per 1,000 square feet (100 sq m), or as directed by the RPR, with a minimum of 6 gallons (24 liters) and a maximum of 10 gallons (40 liters) per 1,000 square feet (100 sq m) depending on the type of mulch and the effectiveness of the binder securing it. Asphalt binder material may be sprayed on the mulched slope areas from either the top or the bottom of the slope. An approved spray nozzle shall be used. The nozzle shall be operated at a distance of not less than 4 feet (1.2 m) from the surface of the mulch and uniform distribution of the asphalt material shall be required. A pump or an air compressor of adequate capacity shall be used to ensure uniform distribution of the asphalt material.

d. If the "asphalt mix" method is used, the mulch shall be applied by blowing, and the asphalt binder material shall be sprayed into the mulch as it leaves the blower. The binder shall be uniformly applied to the mulch at the rate of approximately 8 gallons (32 liters) per 1,000 square feet (100 sq m) or as directed by the RPR, with a minimum of 6 gallons (24 liters) and a maximum of 10 gallons (40 liters) per 1,000 square feet (100 sq m) depending on the type of mulch and the effectiveness of the binder securing it.

METHOD OF MEASUREMENT

908-4.1 Mulching shall be measured in square yards on the basis of the actual surface area acceptably mulched.

BASIS OF PAYMENT

908-5.1 Payment will be made at the contract unit price per square yard for mulching. The price shall be full compensation for furnishing all materials and for placing and anchoring the materials, and for all labor, equipment, tools, and incidentals necessary to complete the item.

Payment will be made under:

Item T-908.01	Mulching - per square yard

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM International (ASTM)

ASTM D977	Standard Specification for Emulsified Asphalt

Advisory Circulars (AC)

AC 150/5200-33	Hazardous Wildlife Attractants on or Near Airports

FAA/United States Department of Agriculture

Wildlife Hazard Management at Airports, A Manual for Airport Personnel

END OF ITEM T-908

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Item L-108 Underground Power Cable for Airports

DESCRIPTION

108-1.1 This item shall consist of furnishing and installing power cables that are direct buried and furnishing and/or installing power cables within conduit or duct banks per these specifications at the locations shown on the plans. It includes excavation and backfill of trench for direct-buried cables only. Also included are the installation of counterpoise wires, ground wires, ground rods and connections, cable splicing, cable marking, cable testing, and all incidentals necessary to place the cable in operating condition as a completed unit to the satisfaction of the RPR. This item shall not include the installation of duct banks or conduit, trenching and backfilling for duct banks or conduit, or furnishing or installation of cable for FAA owned/operated facilities.

EQUIPMENT AND MATERIALS

108-2.1 General.

a. Airport lighting equipment and materials covered by advisory circulars (AC) shall be approved under the Airport Lighting Equipment Certification Program per AC 150/5345-53, current version.

b. All other equipment and materials covered by other referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification, when requested by the RPR.

c. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

d. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

e. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format. The RPR reserves the right to reject any and all equipment, materials, or procedures that do not meet the system design and the standards and codes, specified in this document.

f. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's

discretion, with no additional cost to the Owner. The Contractor shall maintain a minimum insulation resistance in accordance with paragraph 108-3.10e with isolation transformers connected in new circuits and new segments of existing circuits through the end of the contract warranty period when tested in accordance with AC 150/5340-26, *Maintenance Airport Visual Aid Facilities*, paragraph 5.1.3.1, Insulation Resistance Test.

108-2.2 Cable. Underground cable for airfield lighting facilities (runway and taxiway lights and signs) shall conform to the requirements of AC 150/5345-7, Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits latest edition. Conductors for use on 6.6 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #8 American wire gauge (AWG), L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. Conductors for use on 20 ampere primary airfield lighting series circuits shall be single conductor, seven strand, #6 AWG, L-824 Type C, 5,000 volts, non-shielded, with cross-linked polyethylene insulation. L-824 conductors for use on the L-830 secondary of airfield lighting series circuits shall be sized in accordance with the manufacturer's recommendations. All other conductors shall comply with FAA and National Electric Code (NEC) requirements. Conductor sizes noted above shall not apply to leads furnished by manufacturers on airfield lighting transformers and fixtures.

Wire for electrical circuits up to 600 volts shall comply with Specification L-824 and/or Commercial Item Description A-A-59544A and shall be type THWN-2, 75°C for installation in conduit and RHW-2, 75°C for direct burial installations. Conductors for parallel (voltage) circuits shall be type and size and installed in accordance with NFPA-70, National Electrical Code.

Unless noted otherwise, all 600-volt and less non-airfield lighting conductor sizes are based on a 75°C, THWN-2, 600-volt insulation, copper conductors, not more than three single insulated conductors, in raceway, in free air. The conduit/duct sizes are based on the use of THWN-2, 600-volt insulated conductors. The Contractor shall make the necessary increase in conduit/duct sizes for other types of wire insulation. In no case shall the conduit/duct size be reduced. The minimum power circuit wire size shall be #12 AWG.

Conductor sizes may have been adjusted due to voltage drop or other engineering considerations. Equipment provided by the Contractor shall be capable of accepting the quantity and sizes of conductors shown in the Contract Documents. All conductors, pigtails, cable step-down adapters, cable step-up adapters, terminal blocks and splicing materials necessary to complete the cable termination/splice shall be considered incidental to the respective pay items provided.

Cable type, size, number of conductors, strand and service voltage shall be as specified in the Contract Document.

108-2.3 Bare copper wire (counterpoise, bare copper wire ground and ground rods). Wire for counterpoise or ground installations for airfield lighting systems shall be No. 6 AWG bare solid copper wire for counterpoise and/or No. 6 AWG insulated stranded for grounding bond wire per ASTM B3 and ASTM B8, and shall be bare copper wire. For voltage powered circuits, the equipment grounding conductor shall comply with NEC Article 250.

Ground rods shall be copper or copper-clad steel. The ground rods shall be of the length and diameter specified on the plans, but in no case be less than 10 feet (2.54 m) long and 3/4 inch (19 mm) in diameter.

108-2.4 Cable connections. In-line connections or splices of underground primary cables shall be of the type called for on the plans, and shall be one of the types listed below. No separate payment will be made for cable connections.

a. The cast splice. A cast splice, employing a plastic mold and using epoxy resin equivalent to that manufactured by 3M™ Company, "Scotchcast" Kit No. 82-B, or an approved equivalent, used for potting the splice is acceptable.

b. The field-attached plug-in splice. Field attached plug-in splices shall be installed as shown on the plans. The Contractor shall determine the outside diameter of the cable to be spliced and furnish appropriately sized connector kits and/or adapters. Tape or heat shrink tubing with integral sealant shall be in accordance with the manufacturer's requirements. Primary Connector Kits manufactured by Amerace, "Super Kit", Integro "Complete Kit", or approved equal is acceptable.

c. The factory-molded plug-in splice. Specification for L-823 Connectors, Factory-Molded to Individual Conductors, is acceptable.

d. The taped or heat-shrink splice. Taped splices employing field-applied rubber, or synthetic rubber tape covered with plastic tape is acceptable. The rubber tape should meet the requirements of ASTM D4388 and the plastic tape should comply with Military Specification MIL-I-24391 or Commercial Item Description A-A-55809. Heat shrinkable tubing shall be heavy-wall, self-sealing tubing rated for the voltage of the wire being spliced and suitable for direct-buried installations. The tubing shall be factory coated with a thermoplastic adhesive-sealant that will adhere to the insulation of the wire being spliced forming a moisture- and dirt-proof seal. Additionally, heat shrinkable tubing for multi-conductor cables, shielded cables, and armored cables shall be factory kits that are designed for the application. Heat shrinkable tubing and tubing kits shall be manufactured by Tyco Electronics/ Raychem Corporation, Energy Division, or approved equivalent.

In all the above cases, connections of cable conductors shall be made using crimp connectors using a crimping tool designed to make a complete crimp before the tool can be removed. All L-823/L-824 splices and terminations shall be made per the manufacturer's recommendations and listings.

All connections of counterpoise, grounding conductors and ground rods shall be made by the exothermic process or approved equivalent, except that a light base ground clamp connector shall be used for attachment to the light base. All exothermic connections shall be made per the manufacturer's recommendations and listings.

108-2.5 Splicer qualifications. Every airfield lighting cable splicer shall be qualified in making airport cable splices and terminations on cables rated at or above 5,000 volts AC. The Contractor shall submit to the RPR proof of the qualifications of each proposed cable splicer for the airport cable type and voltage level to be worked on. Cable splicing/terminating personnel shall have a minimum of three (3) years continuous experience in terminating/splicing medium voltage cable.

108-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

108-2.7 Flowable backfill. Flowable material used to backfill trenches for power cable trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

108-2.8 Cable identification tags. Cable identification tags shall be made from a non-corrosive material with the circuit identification stamped or etched onto the tag. The tags shall be of the type as detailed on the plans.

108-2.9 Tape. Electrical tapes shall be Scotch™ Electrical Tapes –Scotch™ 88 (1-1/2 inch (38 mm) wide) and Scotch™ 130C® linerless rubber splicing tape (2-inch (50 mm) wide), as manufactured by the Minnesota Mining and Manufacturing Company (3M™), or an approved equivalent.

108-2.10 Electrical coating. Electrical coating shall be Scotchkote™ as manufactured by 3M™, or an approved equivalent.

108-2.11 Existing circuits. Whenever the scope of work requires connection to an existing circuit, the existing circuit's insulation resistance shall be tested, in the presence of the RPR. The test shall be performed per this item and prior to any activity that will affect the respective circuit. The Contractor shall record the results on forms acceptable to the RPR. When the work affecting the circuit is complete, the circuit's insulation resistance shall be checked again, in the presence of the RPR. The Contractor shall record the results on forms acceptable to the RPR. The second reading shall be equal to or greater than the first reading or the Contractor shall make the necessary repairs to the existing circuit to bring the second reading above the first reading. All repair costs including a complete replacement of the L-823 connectors, L-830 transformers and L-824 cable, if necessary, shall be borne by the Contractor. All test results shall be submitted in the Operation and Maintenance (O&M) Manual.

108-2.12 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) Red (electrical power lines, cables, conduit and lighting cable) with continuous legend tape shall be polyethylene film with a metalized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item. Detectable warning tape for communication cables shall be orange. Detectable warning tape color code shall comply with the APWA Uniform Color Code.

CONSTRUCTION METHODS

108-3.1 General. The Contractor shall install the specified cable at the approximate locations indicated on the plans. Unless otherwise shown on the plans, all cable required to cross under pavements expected to carry aircraft loads shall be installed in concrete encased duct banks. Cable shall be run without splices, from fixture to fixture.

Cable connections between lights will be permitted only at the light locations for connecting the underground cable to the primary leads of the individual isolation transformers. The Contractor shall be responsible for providing cable in continuous lengths for home runs or other long cable runs without connections unless otherwise authorized in writing by the RPR or shown on the plans.

In addition to connectors being installed at individual isolation transformers, L-823 cable connectors for maintenance and test points shall be installed at locations shown on the plans. Cable circuit identification markers shall be installed on both sides of the L-823 connectors installed and on both sides of slack loops where a future connector would be installed.

Provide not less than 3 feet (1 m) of cable slack on each side of all connections, isolation transformers, light units, and at points where cable is connected to field equipment. Where provisions must be made for testing or for future above grade connections, provide enough slack to allow the cable to be extended at least one foot (30 cm) vertically above the top of the access structure. This requirement also applies where primary cable passes through empty light bases, junction boxes, and access structures to allow for future connections, or as designated by the RPR.

Primary airfield lighting cables installed shall have cable circuit identification markers attached on both sides of each L-823 connector and on each airport lighting cable entering or leaving cable access points, such as manholes, hand holes, pull boxes, junction boxes, etc. Markers shall be of sufficient length for imprinting the cable circuit identification legend on one line, using letters not less than 1/4 inch (6 mm) in size. The cable circuit identification shall match the circuits noted on the construction plans.

108-3.2 Installation in duct banks or conduits. This item includes the installation of the cable in duct banks or conduit per the following paragraphs. The maximum number and voltage ratings of cables installed in each single duct or conduit, and the current-carrying capacity of each cable shall be per the latest version of the National Electric Code, or the code of the local agency or authority having jurisdiction.

The Contractor shall make no connections or splices of any kind in cables installed in conduits or duct banks.

Unless otherwise designated in the plans, where ducts are in tiers, use the lowest ducts to receive the cable first, with spare ducts left in the upper levels. Check duct routes prior to construction to obtain assurance that the shortest routes are selected and that any potential interference is avoided.

Duct banks or conduits shall be installed as a separate item per Item L-110, Airport Underground Electrical Duct Banks and Conduit. The Contractor shall run a mandrel through duct banks or conduit prior to installation of cable to ensure that the duct bank or conduit is open, continuous and clear of debris. The mandrel size shall be compatible with the conduit size. The Contractor shall swab out all conduits/ducts and clean light bases, manholes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed, the light bases and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, light bases, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be re-cleaned at the Contractor's expense. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

The cable shall be installed in a manner that prevents harmful stretching of the conductor, damage to the insulation, or damage to the outer protective covering. The ends of all cables shall be sealed with moisture-seal tape providing moisture-tight mechanical protection with minimum bulk, or alternately, heat shrinkable tubing before pulling into the conduit and it shall be left sealed until connections are made. Where more than one cable is to be installed in a conduit, all cable shall be pulled in the conduit at the same time. The pulling of a cable through duct banks or conduits may be accomplished by hand winch or power winch with the use of cable grips or pulling eyes. Maximum pulling tensions shall not exceed the cable manufacturer's recommendations. A non-hardening cable-pulling lubricant recommended for the type of cable being installed shall be used where required.

The Contractor shall submit the recommended pulling tension values to the RPR prior to any cable installation. If required by the RPR, pulling tension values for cable pulls shall be monitored by a dynamometer in the presence of the RPR. Cable pull tensions shall be recorded by the Contractor and reviewed by the RPR. Cables exceeding the maximum allowable pulling tension values shall be removed and replaced by the Contractor at the Contractor's expense.

The manufacturer's minimum bend radius or NEC requirements (whichever is more restrictive) shall apply. Cable installation, handling and storage shall be per manufacturer's recommendations. During cold weather, particular attention shall be paid to the manufacturer's minimum installation temperature. Cable shall not be installed when the temperature is at or below the manufacturer's minimum installation temperature. At the Contractor's option, the Contractor may submit a plan, for review by the RPR, for heated storage of the cable and maintenance of an acceptable cable temperature during installation when temperatures are below the manufacturer's minimum cable installation temperature.

Cable shall not be dragged across base can or manhole edges, pavement or earth. When cable must be coiled, lay cable out on a canvas tarp or use other appropriate means to prevent abrasion to the cable jacket.

108-3.3 Installation of direct-buried cable in trenches. Unless otherwise specified, the Contractor shall not use a cable plow for installing the cable. Cable shall be unreeled uniformly in place alongside or in the trench and shall be carefully placed along the bottom of the trench. The cable shall not be unreeled and pulled into the trench from one end. Slack cable sufficient to provide strain relief shall be placed in the trench in a series of S curves. Sharp bends or kinks in the cable shall not be permitted.

Where cables must cross over each other, a minimum of 3 inches (75 mm) vertical displacement shall be provided with the topmost cable depth at or below the minimum required depth below finished grade.

a. Trenching. Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored. Trenches for cables may be excavated manually or with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of surface is disturbed. Graders shall not be used to excavate the trench with their blades. The bottom surface of trenches shall be essentially smooth and free from coarse aggregate. Unless otherwise specified, cable trenches shall be excavated to a minimum depth of 18 inches (0.5 m) below finished grade per NEC Table 300.5, except as follows:

- When off the airport or crossing under a roadway or driveway, the minimum depth shall be 36 inches (91 cm) unless otherwise specified.
- Minimum cable depth when crossing under a railroad track, shall be 42 inches (1 m) unless otherwise specified.

The Contractor shall excavate all cable trenches to a width not less than 6 inches (150 mm). Unless otherwise specified on the plans, all cables in the same location and running in the same general direction shall be installed in the same trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required cable depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill material may alternatively be used.

Duct bank or conduit markers temporarily removed for trench excavations shall be replaced as required.

It is the Contractor’s responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

(1) Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

(2) Trenching, etc., in cable areas shall then proceed, with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair or replacement.

b. Backfilling. After the cable has been installed, the trench shall be backfilled. The first layer of backfill in the trench shall encompass all cables; be 3 inches (75 mm) deep, loose measurement; and shall be either earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. This layer shall not be compacted. The second layer shall be 5 inches (125 mm) deep, loose measurement, and shall contain no particles that would be retained on a one inch (25.0 mm) sieve. The remaining third and subsequent layers of backfill shall not exceed 8 inches (20 cm) of loose measurement and be excavated or imported material and shall not contain stone or aggregate larger than 4 inches (100 mm) maximum diameter.

The second and subsequent layers shall be thoroughly tamped and compacted to at least the density of the adjacent material. If the cable is to be installed in locations or areas where other compaction

requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfill with controlled low strength material (CLSM) in accordance with P-153.

Trenches shall not contain pools of water during backfilling operations. The trench shall be completely backfilled and tamped level with the adjacent surface, except that when turf is to be established over the trench, the backfilling shall be stopped at an appropriate depth consistent with the type of turfing operation to be accommodated. A proper allowance for settlement shall also be provided. Any excess excavated material shall be removed and disposed of per the plans and specifications.

Underground electrical warning (caution) tape shall be installed in the trench above all direct-buried cable. Contractor shall submit a sample of the proposed warning tape for acceptance by the RPR. If not shown on the plans, the warning tape shall be located 6 inches (150 mm) above the direct-buried cable or the counterpoise wire if present. A 3-6 inch (75 - 150 mm) wide polyethylene film detectable tape, with a metalized foil core, shall be installed above all direct buried cable or counterpoise. The tape shall be of the color and have a continuous legend as indicated on the plans. The tape shall be installed 8 inches (200 mm) minimum below finished grade.

c. Restoration. Following restoration of all trenching near airport movement surfaces, the Contractor shall visually inspect the area for foreign object debris (FOD) and remove any that is found. Where soil and sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by work shall be restored to its original condition. The restoration shall include the sodding, topsoiling, fertilizing, liming, seeding, sprigging and/or mulching **as** shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. When trenching is through paved areas, restoration shall be equal to existing conditions. If the cable is to be installed in locations or areas where other compaction requirements are specified (under pavements, embankments, etc.) the backfill compaction shall be backfill with controlled low strength material (CLSM) in accordance with P-153. Restoration shall be considered incidental to the pay item of which it is a component part.

108-3.4 Cable markers for direct-buried cable. The location of direct buried circuits shall be marked by a concrete slab marker, 2 feet (60 cm) square and 4-6 inch (10 - 15 cm) thick, extending approximately one inch (25 mm) above the surface. Each cable run from a line of lights and signs to the equipment vault shall be marked at approximately every 200 feet (61 m) along the cable run, with an additional marker at each change of direction of cable run. All other direct-buried cable shall be marked in the same manner. Cable markers shall be installed directly above the cable. The Contractor shall impress the word “CABLE” and directional arrows on each cable marking slab. The letters shall be approximately 4 inches (100 mm) high and 3 inches (75 mm) wide, with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep. Stencils shall be used for cable marker lettering; no hand lettering shall be permitted.

At the location of each underground cable connection/splice, except at lighting units, or isolation transformers, a concrete marker slab shall be installed to mark the location of the connection/splice. The Contractor shall impress the word “SPLICE” on each slab. The Contractor also shall impress additional circuit identification symbols on each slab as directed by the RPR. All cable markers and splice markers shall be painted international orange. Paint shall be specifically manufactured for uncured exterior concrete. After placement, all cable or splice markers shall be given one coat of high-visibility aviation orange paint as approved by the RPR. Furnishing and installation of cable markers is incidental to the respective cable pay item.

108-3.5 Splicing. Connections of the type shown on the plans shall be made by experienced personnel regularly engaged in this type of work and shall be made as follows:

a. Cast splices. These shall be made by using crimp connectors for jointing conductors. Molds shall be assembled, and the compound shall be mixed and poured per the manufacturer's instructions and to the satisfaction of the RPR.

b. Field-attached plug-in splices. These shall be assembled per the manufacturer's instructions. These splices shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint or (3) On connector kits equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

c. Factory-molded plug-in splices. These shall be made by plugging directly into mating connectors. The joint where the connectors come together shall be finished by one of the following methods: (1) Wrapped with at least one layer of rubber or synthetic rubber tape and one layer of plastic tape, one-half lapped, extending at least 1-1/2 inches (38 mm) on each side of the joint. (2) Covered with heat shrinkable tubing with integral sealant extending at least 1-1/2 inches (38 mm) on each side of the joint. or (3) On connector kits so equipped with water seal flap; roll-over water seal flap to sealing position on mating connector.

d. Taped or heat-shrink splices. A taped splice shall be made in the following manner:

Bring the cables to their final position and cut so that the conductors will butt. Remove insulation and jacket allowing for bare conductor of proper length to fit compression sleeve connector with 1/4 inch (6 mm) of bare conductor on each side of the connector. Prior to splicing, the two ends of the cable insulation shall be penciled using a tool designed specifically for this purpose and for cable size and type. Do not use emery paper on splicing operation since it contains metallic particles. The copper conductors shall be thoroughly cleaned. Join the conductors by inserting them equidistant into the compression connection sleeve. Crimp conductors firmly in place with crimping tool that requires a complete crimp before tool can be removed. Test the crimped connection by pulling on the cable. Scrape the insulation to assure that the entire surface over which the tape will be applied (plus 3 inches (75 mm) on each end) is clean. After scraping, wipe the entire area with a clean lint-free cloth. Do not use solvents.

Apply high-voltage rubber tape one-half lapped over bare conductor. This tape should be tensioned as recommended by the manufacturer. Voids in the connector area may be eliminated by highly elongating the tape, stretching it just short of its breaking point. The manufacturer's recommendation for stretching tape during splicing shall be followed. Always attempt to exactly half-lap to produce a uniform buildup. Continue buildup to 1-1/2 times cable diameter over the body of the splice with ends tapered a distance of approximately one inch (25 mm) over the original jacket. Cover rubber tape with two layers of vinyl pressure-sensitive tape one-half lapped. Do not use glyptol or lacquer over vinyl tape as they react as solvents to the tape. No further cable covering, or splice boxes are required.

Heat shrinkable tubing shall be installed following manufacturer's instructions. Direct flame heating shall not be permitted unless recommended by the manufacturer. Cable surfaces within the limits of the heat-shrink application shall be clean and free of contaminates prior to application.

e. Assembly. Surfaces of equipment or conductors being terminated or connected shall be prepared in accordance with industry standard practice and manufacturer's recommendations. All surfaces to be connected shall be thoroughly cleaned to remove all dirt, grease, oxides, nonconductive films, or other foreign material. Paints and other nonconductive coatings shall be removed to expose base metal. Clean all surfaces at least 1/4 inch (6.4 mm) beyond all sides of the larger bonded area on all mating surfaces. Use a joint compound suitable for the materials used in the connection. Repair painted/coated surface to original condition after completing the connection.

108-3.6 Bare counterpoise wire installation for lightning protection and grounding. If shown on the plans or included in the job specifications, bare solid #6 AWG copper counterpoise wire shall be installed for lightning protection of the underground cables. The RPR shall select one of two methods of lightning protection for the airfield lighting circuit based upon sound engineering practice and lightning strike density.

a. Equipotential. – may be used by the RPR for areas that have high rates of lightning strikes. The counterpoise size is determined by the RPR. The equipotential method is applicable to all airfield lighting systems; i.e. runway, taxiway, apron – touchdown zone, centerline, edge, threshold and approach lighting systems. The equipotential method is also successfully applied to provide lightning protection for power, signal and communication systems. The light bases, counterpoise, etc – all components - are bonded together and bonded to the vault power system ground loop/electrode.

Counterpoise wire shall be installed in the same trench for the entire length of buried cable, conduits and duct banks that are installed to contain airfield cables. The counterpoise is centered over the cable/conduit/duct to be protected.

The counterpoise conductor shall be installed no less than 8 inches (200 mm) minimum or 12 inches (300 mm) maximum above the raceway or cable to be protected, except as permitted below:

(1) The minimum counterpoise conductor height above the raceway or cable to be protected shall be permitted to be adjusted subject to coordination with the airfield lighting and pavement designs.

(2) The counterpoise conductor height above the protected raceway(s) or cable(s) shall be calculated to ensure that the raceway or cable is within a 45-degree area of protection, (45 degrees on each side of vertical creating a 90 degree angle).

The counterpoise conductor shall be bonded to each metallic light base, mounting stake, and metallic airfield lighting component.

All metallic airfield lighting components in the field circuit on the output side of the constant current regulator (CCR) or other power source shall be bonded to the airfield lighting counterpoise system.

All components rise and fall at the same potential; with no potential difference, no damaging arcing and no damaging current flow.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Equipotential Method of lightning protection.

Reference FAA STD-019E, Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment, Part 4.1.1.7.

b. Isolation – used in areas where lightning strikes are not common. Counterpoise size is selected by the RPR. The isolation method is an alternate method for use only with edge lights installed in turf and stabilized soils and raceways installed parallel to and adjacent to the edge of the pavement. NFPA 780 uses 15 feet to define “adjacent to”.

The counterpoise conductor shall be installed halfway between the pavement edge and the light base, mounting stake, raceway, or cable being protected.

The counterpoise conductor shall be installed 8 inches (203 mm) minimum below grade. The counterpoise is not connected to the light base or mounting stake. An additional grounding electrode is required at each light base or mounting stake. The grounding electrode is bonded to the light base or mounting stake with a 6 AWG solid copper conductor.

See AC 150/5340-30, Design and Installation Details for Airport Visual Aids and NFPA 780, Standard for the Installation of Lightning Protection Systems, Chapter 11, for a detailed description of the Isolation Method of lightning protection.

c. Common Installation requirements**.** When a metallic light base is used, the grounding electrode shall be bonded to the metallic light base or mounting stake with a No. 6 AWG bare, annealed or soft drawn, solid copper conductor.

Grounding electrodes may be rods, ground dissipation plates, radials, or other electrodes listed in the NFPA 70 (NEC) or NFPA 780.

Where raceway is installed by the directional bore, jack and bore, or other drilling method, the counterpoise conductor shall be permitted to be installed concurrently with the directional bore, jack and bore, or other drilling method raceway, external to the raceway or sleeve.

The counterpoise wire shall also be exothermically welded to ground rods installed as shown on the plans but not more than 500 feet (150 m) apart around the entire circuit. The counterpoise system shall be continuous and terminate at the transformer vault or at the power source. It shall be securely attached to the vault or equipment external ground ring or other made electrode-grounding system. The connections shall be made as shown on the plans and in the specifications.

Where an existing airfield lighting system is being extended or modified, the new counterpoise conductors shall be interconnected to existing counterpoise conductors at each intersection of the new and existing airfield lighting counterpoise systems.

d. Parallel Voltage Systems. Provide grounding and bonding in accordance with NFPA 70, National Electrical Code.

108-3.7 Counterpoise installation above multiple conduits and duct banks. Counterpoise wires shall be installed above multiple conduits/duct banks for airfield lighting cables, with the intent being to provide a complete area of protection over the airfield lighting cables. When multiple conduits and/or duct banks for airfield cable are installed in the same trench, the number and location of counterpoise wires above the conduits shall be adequate to provide a complete area of protection measured 45 degrees each side of vertical.

Where duct banks pass under pavement to be constructed in the project, the counterpoise shall be placed above the duct bank. Reference details on the construction plans.

108-3.8 Counterpoise installation at existing duct banks. When airfield lighting cables are indicated on the plans to be routed through existing duct banks, the new counterpoise wiring shall be terminated at ground rods at each end of the existing duct bank where the cables being protected enter and exit the duct bank. The new counterpoise conductor shall be bonded to the existing counterpoise system.

108-3.9 Exothermic bonding. Bonding of counterpoise wire shall be by the exothermic welding process or equivalent method accepted by the RPR. Only personnel experienced in and regularly engaged in this type of work shall make these connections.

Contractor shall demonstrate to the satisfaction of the RPR, the welding kits, materials and procedures to be used for welded connections prior to any installations in the field. The installations shall comply with the manufacturer’s recommendations and the following:

a. All slag shall be removed from welds.

b. Using an exothermic weld to bond the counterpoise to a lug on a galvanized light base is not recommended unless the base has been specially modified. Consult the manufacturer’s installation

directions for proper methods of bonding copper wire to the light base. See AC 150/5340-30 for galvanized light base exception.

c. If called for in the plans, all buried copper and weld material at weld connections shall be thoroughly coated with 6 mm of 3M™ Scotchkote™, or approved equivalent, or coated with coal tar Bitumastic® material to prevent surface exposure to corrosive soil or moisture.

108-3.10 Testing. The Contractor shall furnish all necessary equipment and appliances for testing the airport electrical systems and underground cable circuits before and after installation. The Contractor shall perform all tests in the presence of the RPR. The Contractor shall demonstrate the electrical characteristics to the satisfaction of the RPR. All costs for testing are incidental to the respective item being tested. For phased projects, the tests must be completed by phase. The Contractor must maintain the test results throughout the entire project as well as during the warranty period that meet the following:

a. Earth resistance testing methods shall be submitted to the RPR for approval. Earth resistance testing results shall be recorded on an approved form and testing shall be performed in the presence of the RPR. All such testing shall be at the sole expense of the Contractor.

b. Should the counterpoise or ground grid conductors be damaged or suspected of being damaged by construction activities the Contractor shall test the conductors for continuity with a low resistance ohmmeter. The conductors shall be isolated such that no parallel path exists and tested for continuity. The RPR shall approve of the test method selected. All such testing shall be at the sole expense of the Contractor.

After installation, the Contractor shall test and demonstrate to the satisfaction of the RPR the following:

c. That all affected lighting power and control circuits (existing and new) are continuous and free from short circuits.

d. That all affected circuits (existing and new) are free from unspecified grounds.

e. That the insulation resistance to ground of all new non-grounded high voltage series circuits or cable segments is not less than 50 megohms. Verify continuity of all series airfield lighting circuits prior to energization.

f. That the insulation resistance to ground of all new non-grounded conductors of new multiple circuits or circuit segments is not less than 100 megohms.

g. That all affected circuits (existing and new) are properly connected per applicable wiring diagrams.

h. That all affected circuits (existing and new) are operable. Tests shall be conducted that include operating each control not less than 10 times and the continuous operation of each lighting and power circuit for not less than 1/2 hour.

i. That the impedance to ground of each ground rod does not exceed **25** ohms prior to establishing connections to other ground electrodes. The fall-of-potential ground impedance test shall be used, as described by American National Standards Institute/Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81, to verify this requirement. As an alternate, clamp-on style ground impedance test meters may be used to satisfy the impedance testing requirement. Test equipment and its calibration sheets shall be submitted for review and approval by the RPR prior to performing the testing.

Two copies of tabulated results of all cable tests performed shall be supplied by the Contractor to the RPR. Where connecting new cable to existing cable, insulation resistance tests shall be performed on the new cable prior to connection to the existing circuit.

There are no approved "repair" procedures for items that have failed testing other than complete replacement.

METHOD OF MEASUREMENT

108-4.1 Cable removed from below grade (direct-buried) or removed from duct bank or conduit shall be measured by the number of linear feet. No separate measurement shall be made for the removal of ground wire from duct bank or conduit and this shall be considered incidental to the cable removal item. Multiple cables buried together or installed together in a single conduit or duct shall be measured as one single cable removed.

108-4.2 No separate measurement shall be made for the removal of counterpoise wire and the removal shall be considered incidental to the cable removal line item.

108-4.3 Cable or counterpoise wire installed in trench, duct bank or conduit shall be measured by the number of linear feet (meters) installed and grounding connectors, and trench marking tape ready for operation, and accepted as satisfactory. Separate measurement shall be made for each cable or counterpoise wire installed in trench, duct bank or conduit. The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price for the work. Installation of all cable or counterpoise wire outside the limit of grading shall include topsoil, seed, and mulch to restore trench. Cable and counterpoise slack is considered incidental to this item and shall be included in the Contractor's unit price. No separate measurement or payment shall be made for cable or counterpoise slack.

108-4.**4** No separate payment will be made for ground rods**.**

108-4.5 No separate payment will be made for all conduit used for temporary cable installations above grade.

BASIS OF PAYMENT

108-5.1 Payment will be made at the contract unit price for cable removed from below grade (direct-buried) or removed from duct bank or conduit. This price shall be full compensation for all labor, equipment, tools, and incidentals, necessary to complete this item. The cost of all excavation, backfill, dewatering and restoration regardless of the type of material encountered shall be included in the unit price for the work. Payment shall include trench restoration for removal of cable outside the limits of grading.

108-5.2 Payment shall be made at the contract unit price for cable and bare counterpoise wire installed in trench (direct-buried), or cable and equipment ground installed in duct bank or conduit, in place by the Contractor and accepted by the RPR. This price shall be full compensation for furnishing all materials and for all preparation and installation of these materials, and for all labor, equipment, tools, and incidentals, including ground rods and ground connectors and trench marking tape, necessary to complete this item. Payment shall include trench restoration for trenching outside the limits of grading.

Payment will be made under:

Item L-108-5.1	Removal of Cable from Conduit or Duct Bank - per liner foot
Item L-108-5.2	Removal of Direct-Buried Cable - per liner foot

Item L-108-5.3	No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Trench, Duct Bank or Conduit - per liner foot
Item L-108-5.4	No. 6 AWG, 5 kV, L-824, Type C Cable, Installed in Duct Bank or Conduit - per liner foot
Item L-108-5.5	No. 6 AWG, Solid, Bare Copper Counterpoise Wire, Installed Above the Duct Bank or Conduit, Including Connections/Terminations - per linear foot
Item L-108-5.6	Temporary No. 8 AWG, 5 kV, L-824, Type C Cable, Installed in Conduit – per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description

A-A-59544A	Cable and Wire, Electrical (Power, Fixed Installation)
A-A-55809	Insulation Tape, Electrical, Pressure-Sensitive Adhesive, Plastic

ASTM International (ASTM)

ASTM B3	Standard Specification for Soft or Annealed Copper Wire
ASTM B8	Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft
ASTM B33	Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes
ASTM D4388	Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes

Mil Spec

MIL-PRF-23586F	Performance Specification: Sealing Compound (with Accelerator), Silicone Rubber, Electrical
MIL-I-24391	Insulation Tape, Electrical, Plastic, Pressure Sensitive

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

NFPA-780	Standard for the Installation of Lightning Protection Systems

American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Federal Aviation Administration Standard

FAA STD-019E	Lightning and Surge Protection, Grounding Bonding and Shielding Requirements for Facilities and Electronic Equipment

END OF ITEM L-108

Item L-110 Airport Underground Electrical Duct Banks and Conduits

DESCRIPTION

110-1.1 This item shall consist of underground electrical conduits and duct banks (single or multiple conduits encased in concrete or buried in sand) installed per this specification at the locations and per the dimensions, designs, and details shown on the plans. This item shall include furnishing and installing of all underground electrical duct banks and individual and multiple underground conduits and removal of existing duct banks. It shall also include all turfing trenching, backfilling, removal, and restoration of any paved or turfed areas; concrete encasement, mandrelling, pulling lines, duct markers, plugging of conduits, and the testing of the installation as a completed system ready for installation of cables per the plans and specifications. This item shall also include furnishing and installing conduits and all incidentals for providing positive drainage of the system. Verification of existing ducts is incidental to the pay items provided in this specification.

EQUIPMENT AND MATERIALS

110-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, that comply with these specifications, at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in project that accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section. The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by

the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

110-2.2 Steel conduit. Rigid galvanized steel (RGS) conduit and fittings shall be hot dipped galvanized inside and out and conform to the requirements of Underwriters Laboratories Standards 6, 514B, and 1242. All RGS conduits or RGS elbows installed below grade, in concrete, permanently wet locations or other similar environments shall be painted with a 10-mil thick coat of asphaltum sealer or shall have a factory-bonded polyvinyl chloride (PVC) cover. Any exposed galvanizing or steel shall be coated with 10 mils of asphaltum sealer. When using PVC coated RGS conduit, care shall be exercised not to damage the factory PVC coating. Damaged PVC coating shall be repaired per the manufacturer's written instructions. In lieu of PVC coated RGS, corrosion wrap tape shall be permitted to be used where RGS is in contact with direct earth."

110-2.3 Plastic conduit. Plastic conduit and fittings-shall conform to the following requirements:

- UL 514B covers W-C-1094-Conduit fittings all types, classes 1 thru 3 and 6 thru 10.
- UL 514C covers W-C-1094- all types, Class 5 junction box and cover in plastic (PVC).
- UL 651 covers W-C-1094-Rigid PVC Conduit, types I and II, Class 4.
- UL 651A covers W-C-1094-Rigid PVC Conduit and high-density polyethylene (HDPE) Conduit type III and Class 4.

Underwriters Laboratories Standards UL-651 and Article 352 of the current National Electrical Code shall be one of the following, as shown on the plans:

a. Type I–Schedule 40 and Schedule 80 PVC suitable for underground use either direct-buried or encased in concrete.

b. Type II–Schedule 40 PVC suitable for either above ground or underground use.

c. Type III – Schedule 80 PVC suitable for either above ground or underground use either direct-buried or encased in concrete.

d. Type III –HDPE pipe, minimum standard dimensional ratio (SDR) 11, suitable for placement with directional boring under pavement.

The type of solvent cement shall be as recommended by the conduit/fitting manufacturer.

110-2.4 Split conduit. Split conduit shall be pre-manufactured for the intended purpose and shall be made of steel or plastic.

110-2.5 Conduit spacers. Conduit spacers shall be prefabricated interlocking units manufactured for the intended purpose. They shall be of double wall construction made of high grade, high density polyethylene complete with interlocking cap and base pads. They shall be designed to accept No. 4 reinforcing bars installed vertically.

110-2.6 Concrete. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures.

110-2.7 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another RPR approved third party certification program. Precast concrete structures shall conform to ASTM C478.

110-2.8 Flowable backfill. Flowable material used to back fill conduit and duct bank trenches shall conform to the requirements of Item P-153, Controlled Low Strength Material.

110-2.9 Detectable warning tape. Plastic, detectable, American Public Works Association (APWA) red (electrical power lines, cables, conduit and lighting cable), orange (telephone/fiber optic cabling) with continuous legend magnetic tape shall be polyethylene film with a metallized foil core and shall be 3-6 inches (75-150 mm) wide. Detectable tape is incidental to the respective bid item.

CONSTRUCTION METHODS

110-3.1 General. The Contractor shall install underground duct banks and conduits at the approximate locations indicated on the plans. The RPR shall indicate specific locations as the work progresses, if required to differ from the plans. Duct banks and conduits shall be of the size, material, and type indicated on the plans or specifications. Where no size is indicated on the plans or in the specifications, conduits shall be not less than 2 inches (50 mm) inside diameter or comply with the National Electrical Code based on cable to be installed, whichever is larger. All duct bank and conduit lines shall be laid so as to grade toward access points and duct or conduit ends for drainage. Unless shown otherwise on the plans, grades shall be at least 3 inches (75 mm) per 100 feet (30 m). On runs where it is not practicable to maintain the grade all one way, the duct bank and conduit lines shall be graded from the center in both directions toward access points or conduit ends, with a drain into the storm drainage system. Pockets or traps where moisture may accumulate shall be avoided. Under pavement, the top of the duct bank shall not be less than 18 inches (0.5 m) below the subgrade; in other locations, the top of the duct bank or underground conduit shall be not less than 18 inches (0.5 m) below finished grade.

The Contractor shall mandrel each individual conduit whether the conduit is direct-buried or part of a duct bank. An iron-shod mandrel, not more than 1/4 inch (6 mm) smaller than the bore of the conduit shall be pulled or pushed through each conduit. The mandrel shall have a leather or rubber gasket slightly larger than the conduit hole.

The Contractor shall swab out all conduits/ducts and clean base can, manhole, pull boxes, etc., interiors immediately prior to pulling cable. Once cleaned and swabbed the light bases, manholes, pull boxes, etc., and all accessible points of entry to the duct/conduit system shall be kept closed except when installing cables. Cleaning of ducts, base cans, manholes, etc., is incidental to the pay item of the item being cleaned. All raceway systems left open, after initial cleaning, for any reason shall be recleaned at the Contractor’s expense. All accessible points shall be kept closed when not installing cable. The Contractor shall verify existing ducts proposed for use in this project as clear and open. The Contractor shall notify the RPR of any blockage in the existing ducts.

For pulling the permanent wiring, each individual conduit, whether the conduit is direct-buried or part of a duct bank, shall be provided with a 200-pound (90 kg) test polypropylene pull rope. The ends shall be secured and sufficient length shall be left in access points to prevent it from slipping back into the conduit. Where spare conduits are installed, as indicated on the plans, the open ends shall be plugged with removable tapered plugs, designed for this purpose.

All conduits shall be securely fastened in place during construction and shall be plugged to prevent contaminants from entering the conduits. Any conduit section having a defective joint shall not be installed. Ducts shall be supported and spaced apart using approved spacers at intervals not to exceed 5 feet (1.5 m).

Unless otherwise shown on the plans, concrete encased duct banks shall be used when crossing under pavements expected to carry aircraft loads, such as runways, taxiways, taxilanes, ramps and aprons. When under paved shoulders and other paved areas, conduit and duct banks shall be encased using flowable fill for protection.

All conduits within concrete encasement of the duct banks shall terminate with female ends for ease in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Where turf is well established and the sod can be removed, it shall be carefully stripped and properly stored.

Trenches for conduits and duct banks may be excavated manually or with mechanical trenching equipment unless in pavement, in which case they shall be excavated with mechanical trenching equipment. Walls of trenches shall be essentially vertical so that a minimum of shoulder surface is disturbed. Blades of graders shall not be used to excavate the trench.

When rock is encountered, the rock shall be removed to a depth of at least 3 inches (75 mm) below the required conduit or duct bank depth and it shall be replaced with bedding material of earth or sand containing no mineral aggregate particles that would be retained on a 1/4-inch (6.3 mm) sieve. Flowable backfill may alternatively be used.

Underground electrical warning (Caution) tape shall be installed in the trench above all underground duct banks and conduits in unpaved areas. Contractor shall submit a sample of the proposed warning tape for approval by the RPR. If not shown on the plans, the warning tape shall be located 6 inches above the duct/conduit or the counterpoise wire if present.

Joints in plastic conduit shall be prepared per the manufacturer’s recommendations for the particular type of conduit. Plastic conduit shall be prepared by application of a plastic cleaner and brushing a plastic solvent on the outside of the conduit ends and on the inside of the couplings. The conduit fitting shall then be slipped together with a quick one-quarter turn twist to set the joint tightly. Where more than one conduit is placed in a single trench, or in duct banks, joints in the conduit shall be staggered a minimum of 2 feet (60 cm).

Changes in direction of runs exceeding 10 degrees, either vertical or horizontal, shall be accomplished using manufactured sweep bends.

Whether or not specifically indicated on the drawings, where the soil encountered at established duct bank grade is an unsuitable material, as determined by the RPR, the unsuitable material shall be removed per Item P-152 and replaced with suitable material. Additional duct bank supports shall be installed, as approved by the RPR.

All excavation shall be unclassified and shall be considered incidental to Item L-110. Dewatering necessary for duct installation, and erosion per federal, state, and local requirements is incidental to Item L-110.

Unless otherwise specified, excavated materials that are deemed by the RPR to be unsuitable for use in backfill or embankments shall be removed and disposed of offsite.

Any excess excavation shall be filled with suitable material approved by the RPR and compacted per Item P-152.

It is the Contractor’s responsibility to locate existing utilities within the work area prior to excavation. Where existing active cables) cross proposed installations, the Contractor shall ensure that these cables are adequately protected. Where crossings are unavoidable, no splices will be allowed in the existing cables, except as specified on the plans. Installation of new cable where such crossings must occur shall proceed as follows:

a. Existing cables shall be located manually. Unearthed cables shall be inspected to assure absolutely no damage has occurred.

b. Trenching, etc., in cable areas shall then proceed with approval of the RPR, with care taken to minimize possible damage or disruption of existing cable, including careful backfilling in area of cable.

In the event that any previously identified cable is damaged during the course of construction, the Contractor shall be responsible for the complete repair.

110-3.2 Duct banks. Unless otherwise shown in the plans, duct banks shall be installed so that the top of the concrete envelope is not less than 18 inches (0.5 m) below the bottom of the base or stabilized base course layers where installed under runways, taxiways, aprons, or other paved areas, and not less than 18 inches (0.5 m) below finished grade where installed in unpaved areas.

Unless otherwise shown on the plans, duct banks under paved areas shall extend at least 3 feet (1 m) beyond the edges of the pavement or 3 feet (1 m) beyond any under drains that may be installed alongside the paved area. Trenches for duct banks shall be opened the complete length before concrete is placed so that if any obstructions are encountered, provisions can be made to avoid them. Unless otherwise shown on the plans, all duct banks shall be placed on a layer of concrete not less than 3 inches (75 mm) thick prior to its initial set. The Contractor shall space the conduits not less than 3 inches (75 mm) apart (measured from outside wall to outside wall). All such multiple conduits shall be placed using conduit spacers applicable to the type of conduit. As the conduit laying progresses, concrete shall be placed around and on top of the conduits not less than 3 inches (75 mm) thick unless otherwise shown on the plans. All conduits shall terminate with female ends for ease of access in current and future use. Install factory plugs in all unused ends. Do not cover the ends or plugs with concrete.

Conduits forming the duct bank shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth prior to placing the concrete encasement. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

When specified, the Contractor shall reinforce the bottom side and top of encasements with steel reinforcing mesh or fabric or other approved metal reinforcement. When directed, the Contractor shall supply additional supports where the ground is soft and boggy, where ducts cross under roadways, or where shown on the plans. Under such conditions, the complete duct structure shall be supported on reinforced concrete footings, piers, or piles located at approximately 5-foot (1.5-m) intervals.

All pavement surfaces that are to have ducts installed therein shall be neatly saw cut to form a vertical face. All excavation shall be included in the contract with price for the duct.

Install a plastic, detectable, color as noted, 3 to 6 inches (75 to 150 mm) wide tape, 8 inches (200 mm) minimum below grade above all underground conduit or duct lines not installed under pavement. Utilize the 3-inch (75-mm) wide tape only for single conduit runs. Utilize the 6-inch (150-mm) wide tape for multiple conduits and duct banks. For duct banks equal to or greater than 24 inches (600 mm) in width, utilize more than one tape for sufficient coverage and identification of the duct bank as required.

When existing cables are to be placed in split duct, encased in concrete, the cable shall be carefully located and exposed by hand tools. Prior to being placed in duct, the RPR shall be notified so that he may inspect the cable and determine that it is in good condition. Where required, split duct shall be installed as shown on the drawings or as required by the RPR.

110-3.3 Conduits without concrete encasement. Trenches for single-conduit lines shall be not less than 6 inches (150 mm) nor more than 12 inches (300 mm) wide. The trench for 2 or more conduits installed at the same level shall be proportionately wider. Trench bottoms for conduits without concrete encasement

shall be made to conform accurately to grade so as to provide uniform support for the conduit along its entire length.

Unless otherwise shown on the plans, a layer of fine earth material, at least 4 inches (100 mm) thick (loose measurement) shall be placed in the bottom of the trench as bedding for the conduit. The bedding material shall consist of soft dirt, sand or other fine fill, and it shall contain no particles that would be retained on a 1/4-inch (6.3 mm) sieve. The bedding material shall be tamped until firm. Flowable backfill may alternatively be used.

Unless otherwise shown on plans, conduits shall be installed so that the tops of all conduits within the Airport's secured area where trespassing is prohibited are at least 18 inches (0.5 m) below the finished grade. Conduits outside the Airport's secured area shall be installed so that the tops of the conduits are at least 24 inches (60 cm) below the finished grade per National Electric Code (NEC), Table 300.5.

When two or more individual conduits intended to carry conductors of equivalent voltage insulation rating are installed in the same trench without concrete encasement, they shall be spaced not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and not less than 6 inches (150 mm) apart in a vertical direction. Where two or more individual conduits intended to carry conductors of differing voltage insulation rating are installed in the same trench without concrete encasement, they shall be placed not less than 3 inches (75 mm) apart (measured from outside wall to outside wall) in a horizontal direction and lot less than 6 inches (150 mm) apart in a vertical direction.

Trenches shall be opened the complete length between normal termination points before conduit is installed so that if any unforeseen obstructions are encountered, proper provisions can be made to avoid them.

Conduits shall be installed using conduit spacers. No. 4 reinforcing bars shall be driven vertically into the soil a minimum of 6 inches (150 mm) to anchor the assembly into the earth while backfilling. For this purpose, the spacers shall be fastened down with locking collars attached to the vertical bars. Spacers shall be installed at 5-foot (1.5-m) intervals. Spacers shall be in the proper sizes and configurations to fit the conduits. Locking collars and spacers shall be submitted to the RPR for review prior to use.

110-3.4 Markers. The location of each end and of each change of direction of conduits and duct banks shall be marked by a concrete slab marker 2 feet (60 cm) square and 4 - 6 inches (100 - 150 mm) thick extending approximately one inch (25 mm) above the surface. The markers shall also be located directly above the ends of all conduits or duct banks, except where they terminate in a junction/access structure or building. Each cable or duct run from a line of lights and signs to the equipment vault must be marked at approximately every 200 feet (61 m) along the cable or duct run, with an additional marker at each change of direction of cable or duct run.

The Contractor shall impress the word "DUCT" or "CONDUIT" on each marker slab. Impression of letters shall be done in a manner, approved by the RPR, for a neat, professional appearance. All letters and words must be neatly stenciled. After placement, all markers shall be given one coat of high-visibility orange paint, as approved by the RPR. The Contractor shall also impress on the slab the number and size of conduits beneath the marker along with all other necessary information as determined by the RPR. The letters shall be 4 inches (100 mm) high and 3 inches (75 mm) wide with width of stroke 1/2 inch (12 mm) and 1/4 inch (6 mm) deep or as large as the available space permits. Furnishing and installation of duct markers is incidental to the respective duct pay item.

110-3.5 Backfilling for conduits. For conduits, 8 inches (200 mm) of sand, soft earth, or other fine fill (loose measurement) shall be placed around the conduits ducts and carefully tamped around and over them with hand tampers. The remaining trench shall then be backfilled and compacted per Item P-152 except that material used for back fill shall be select material not larger than 4 inches (100 mm) in diameter.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during back filling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.6 Backfilling for duct banks. After the concrete has cured, the remaining trench shall be backfilled and compacted per Item P-152 “Excavation and Embankment” except that the material used for backfill shall be select material not larger than 4 inches (100 mm) in diameter. In addition to the requirements of Item P-152, where duct banks are installed under pavement, one moisture/density test per lift shall be made for each 250 linear feet (76 m) of duct bank or one work period’s construction, whichever is less.

Flowable backfill may alternatively be used.

Trenches shall not contain pools of water during backfilling operations.

The trench shall be completely backfilled and tamped level with the adjacent surface; except that, where sod is to be placed over the trench, the backfilling shall be stopped at a depth equal to the thickness of the sod to be used, with proper allowance for settlement.

Any excess excavated material shall be removed and disposed of per instructions issued by the RPR.

110-3.7 Restoration. Where sod has been removed, it shall be replaced as soon as possible after the backfilling is completed. All areas disturbed by the work shall be restored to its original condition. The restoration shall include sodding, topsoiling, fertilizing, liming, seeding, sprigging, mulching shown on the plans. The Contractor shall be held responsible for maintaining all disturbed surfaces and replacements until final acceptance. All restoration shall be considered incidental to the respective L-110 pay item. Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

110-3.8 Ownership of removed cable. The Contractor shall retain ownership of all abandoned cables that are removed. All abandoned cables must be removed from the Airport and legally disposed of by the Contractor.

110-3.9 Removal of Conduit and Duct bank. Remove the types of conduits and ductbank including concrete duct markers as indicated on the plans. The conduit and ductbank material shall be legally disposed of off-site in a timely manner following removal. Trenches shall be backfilled with material equal to or better in quality than adjacent embankment. Trenches under paved areas must be compacted to 100% of ASTM D698.

METHOD OF MEASUREMENT

110-4.1 Underground conduits and duct banks removed shall be measured by the linear feet. The cost of all excavation, backfill, dewatering, removal of concrete duct markers, and restoration regardless of the type of material encountered shall be included in the unit price for the work.

110-4.2 Underground conduits and duct banks shall be measured by the linear feet (meter) of conduits and duct banks installed, including encasement, locator tape, trenching and backfill with designated

material, and restoration, and for drain lines, the termination at the drainage structure, all measured in place, completed, and accepted. Separate measurement shall be made for the various types and sizes.

BASIS OF PAYMENT

110-5.1 Payment shall be made at the contract unit price per linear foot for each type and size of conduit and duct bank completed and accepted, including trench and backfill with the designated material, and, for drain lines, the termination at the drainage structure. This price shall be full compensation for removal and disposal of existing duct banks and conduits as shown on the plans, furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary to complete this item per the provisions and intent of the plans and specifications.

Payment will be made under:

Item L-110-5.1	Removal of Electrical Duct Bank - per linear foot
Item L-110-5.2	Removal of Non-Encased Electrical Conduit - per linear foot
Item L-110-5.3	Direct Buried 2” Schedule 40 PVC Electrical Conduit - per linear foot
Item L-110-5.4	Direct Buried 2” Schedule 80 PVC Electrical Conduit - per linear foot
Item L-110-5.5	Concrete Encased Sch. 40 PVC Electrical Duct Bank, 2-Way by 4” - per linear foot

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circular (AC)

AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

ASTM International (ASTM)

ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

Underwriters Laboratories (UL)

UL Standard 6	Electrical Rigid Metal Conduit - Steel
UL Standard 514B	Conduit, Tubing, and Cable Fittings
UL Standard 514C	Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers
UL Standard 1242	Electrical Intermediate Metal Conduit Steel
UL Standard 651	Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings

UL Standard 651A Type EB and A Rigid PVC Conduit and HDPE Conduit

END OF ITEM L-110

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Item L-115 Electrical Manholes and Junction Structures

DESCRIPTION

115-1.1 This item shall consist of electrical manholes and junction structures (hand holes, pull boxes, junction cans, etc.) installed per this specification, at the indicated locations and conforming to the lines, grades and dimensions shown on the plans or as required by the RPR. This item shall include the installation of each electrical manhole and/or junction structures with all associated excavation, backfilling, sheeting and bracing, concrete, reinforcing steel, ladders, appurtenances, testing, dewatering and restoration of surfaces to the satisfaction of the RPR including removal of existing junction structures as shown on the plans.

EQUIPMENT AND MATERIALS

115-2.1 General.

a. All equipment and materials covered by referenced specifications shall be subject to acceptance through manufacturer's certification of compliance with the applicable specification when so requested by the RPR.

b. Manufacturer's certifications shall not relieve the Contractor of the responsibility to provide materials per these specifications. Materials supplied and/or installed that do not comply with these specifications shall be removed (when directed by the RPR) and replaced with materials that comply with these specifications at the Contractor's cost.

c. All materials and equipment used to construct this item shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Submittal data shall be presented in a clear, precise and thorough manner. Original catalog sheets are preferred. Photocopies are acceptable provided they are as good a quality as the original. Clearly and boldly mark each copy to identify products or models applicable to this project. Indicate all optional equipment and delete any non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment to which they apply on each submittal sheet. Markings shall be made bold and clear with arrows or circles (highlighting is not acceptable). The Contractor is solely responsible for delays in the project that may accrue directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications**.** The Contractor's submittals shall be electronically submitted in pdf format, tabbed by specification section**.** The RPR reserves the right to reject any and all equipment, materials or procedures that do not meet the system design and the standards and codes, specified in this document.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from the date of final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

115-2.2 Concrete structures. Concrete shall be proportioned, placed, and cured per Item P-610, Concrete for Miscellaneous Structures. Cast-in-place concrete structures shall be as shown on the plans.

115-2.3 Precast concrete structures. Precast concrete structures shall be furnished by a plant meeting National Precast Concrete Association Plant Certification Program or another engineer approved third party certification program. Provide precast concrete structures where shown on the plans.

Precast concrete structures shall be an approved standard design of the manufacturer. Precast units shall have mortar or bitumastic sealer placed between all joints to make them watertight. The structure shall be designed to withstand AASHTO HS-20 loads, unless otherwise shown on the plans. Openings or knockouts shall be provided in the structure as detailed on the plans.

Threaded inserts and pulling eyes shall be cast in as shown on the plans.

If the Contractor chooses to propose a different structural design, signed and sealed shop drawings, design calculations, and other information requested by the RPR shall be submitted by the Contractor to allow for a full evaluation by the RPR. The RPR shall review per the process defined in the General Provisions.

115-2.4 Junction boxes. Junction boxes shall be L-867 Class 1 (non-load bearing) or L-868 Class 1 (load bearing) airport light bases that are encased in concrete. The light bases shall have a L-894 blank cover, gasket, and stainless steel hardware. All bolts, studs, nuts, lock washers, and other similar fasteners used for the light fixture assemblies must be fabricated from 316L (equivalent to EN 1.4404), 18-8, 410, or 416 stainless steel. If 18-8, 410, or 416 stainless steel is utilized it shall be passivated and be free from any discoloration. Covers shall be 3/8-inch (9-mm) thickness for L-867 and 3/4-inch (19-mm) thickness for L-868. All junction boxes shall be provided with both internal and external ground lugs.

115-2.5 Mortar. The mortar shall be composed of one part of cement and two parts of mortar sand, by volume. The cement shall be per the requirements in ASTM C150, Type I. The sand shall be per the requirements in ASTM C144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15% of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C206. Water shall be potable, reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product.

115-2.6 Concrete. All concrete used in structures shall conform to the requirements of Item P-610, Concrete for Miscellaneous Structures.

115-2.7 Frames and covers. The frames shall conform to one of the following requirements:

a. ASTM A48 Gray iron castings

b. ASTM A47 Malleable iron castings

c. ASTM A27 Steel castings

d. ASTM A283, Grade D Structural steel for grates and frames

e. ASTM A536 Ductile iron castings

f. ASTM A897 Austempered ductile iron castings

All castings shall be heavy duty and meet AASHTO M306

All castings or structural steel units shall conform to the dimensions shown on the plans and shall be designed to support the loadings specified.

Each frame and cover unit shall be provided with fastening members to prevent it from being dislodged by traffic, but which will allow easy removal for access to the structure.

All castings shall be thoroughly cleaned. After fabrication, structural steel units shall be galvanized to meet the requirements of ASTM A123.

Each cover shall have the word “ELECTRIC” or other approved designation cast on it. Each frame and cover shall be as shown on the plans or approved equivalent. No cable notches are required.

Each manhole shall be provided with a “DANGER -- PERMIT-REQUIRED CONFINED SPACE, DO NOT ENTER” safety warning sign as detailed in the Contract Documents and in accordance with OSHA 1910.146 (c)(2).

115-2.8 Ladders. Ladders, if specified, shall be galvanized steel or as shown on the plans.

115-2.9 Reinforcing steel. All reinforcing steel shall be deformed bars of new billet steel meeting the requirements of ASTM A615, Grade 60.

115-2.10 Bedding/special backfill. Bedding or special backfill shall be as shown on the plans.

115-2.11 Flowable backfill. Flowable material used to backfill shall conform to the requirements of Item P-153, Controlled Low Strength Material.

115-2.12 Cable trays. Cable trays shall be of plastic. Cable trays shall be located as shown on the plans.

115-2.13 Plastic conduit. Plastic conduit shall comply with Item L-110, Airport Underground Electrical Duct Banks and Conduits.

115-2.14 Conduit terminators. Conduit terminators shall be pre-manufactured for the specific purpose and sized as required or as shown on the plans.

115-2.15 Pulling-in irons. Pulling-in irons shall be manufactured with 7/8-inch (22 mm) diameter hot-dipped galvanized steel or stress-relieved carbon steel roping designed for concrete applications (7 strand, 1/2-inch (12 mm) diameter with an ultimate strength of 270,000 psi (1862 MPa)). Where stress-relieved carbon steel roping is used, a rustproof sleeve shall be installed at the hooking point and all exposed surfaces shall be encapsulated with a polyester coating to prevent corrosion.

115-2.16 Ground rods. Ground rods shall be one piece, copper or copper clad steel**.** The ground rods shall be of the length and diameter specified on the plans, but in no case shall they be less than 8 feet (2.4 m) long nor less than 5/8 inch (16 mm) in diameter.

CONSTRUCTION METHODS

115-3.1 Unclassified excavation. It is the Contractor’s responsibility to locate existing utilities within the work area prior to excavation. Damage to utility lines, through lack of care in excavating, shall be repaired or replaced to the satisfaction of the RPR without additional expense to the Owner.

The Contractor shall perform excavation for structures and structure footings to the lines and grades or elevations shown on the plans or as staked by the RPR. The excavation shall be of sufficient size to permit the placing of the full width and length of the structure or structure footings shown.

All excavation shall be unclassified and shall be considered incidental to Item L-115. Dewatering necessary for structure installation and erosion per federal, state, and local requirements is incidental to Item L-115.

Boulders, logs and all other objectionable material encountered in excavation shall be removed. All rock and other hard foundation material shall be cleaned of all loose material and cut to a firm surface either level, stepped or serrated, as directed by the RPR. All seams, crevices, disintegrated rock and thin strata shall be removed. When concrete is to rest on a surface other than rock, special care shall be taken not to disturb the bottom of the excavation. Excavation to final grade shall not be made until just before the concrete or reinforcing is to be placed.

The Contractor shall provide all bracing, sheeting and shoring necessary to implement and protect the excavation and the structure as required for safety or conformance to governing laws. The cost of bracing, sheeting and shoring shall be included in the unit price bid for the structure.

Unless otherwise provided, bracing, sheeting and shoring involved in the construction of this item shall be removed by the Contractor after the completion of the structure. Removal shall be effected in a manner that will not disturb or mar finished masonry. The cost of removal shall be included in the unit price bid for the structure.

After each excavation is completed, the Contractor shall notify the RPR. Structures shall be placed after the RPR has approved the depth of the excavation and the suitability of the foundation material.

Prior to installation the Contractor shall provide a minimum of 6 inches (150 mm) of sand or a material approved by the RPR as a suitable base to receive the structure. The base material shall be compacted and graded level and at proper elevation to receive the structure in proper relation to the conduit grade or ground cover requirements, as indicated on the plans.

115-3.2 Concrete structures. Concrete structures shall be built on prepared foundations conforming to the dimensions and form indicated on the plans. The concrete and construction methods shall conform to the requirements specified in Item P-610. Any reinforcement required shall be placed as indicated on the plans and shall be approved by the RPR before the concrete is placed.

115-3.3 Precast unit installations. Precast units shall be installed plumb and true. Joints shall be made watertight by use of sealant at each tongue-and-groove joint and at roof of manhole. Excess sealant shall be removed and severe surface projections on exterior of neck shall be removed.

115-3.4 Placement and treatment of castings, frames and fittings. All castings, frames and fittings shall be placed in the positions indicated on the Plans or as directed by the RPR and shall be set true to line and to correct elevation. If frames or fittings are to be set in concrete or cement mortar, all anchors or bolts shall be in place and position before the concrete or mortar is placed. The unit shall not be disturbed until the mortar or concrete has set.

Field connections shall be made with bolts, unless indicated otherwise. Welding will not be permitted unless shown otherwise on the approved shop drawings and written approval is granted by the casting manufacturer. Erection equipment shall be suitable and safe for the workman. Errors in shop fabrication or deformation resulting from handling and transportation that prevent the proper assembly and fitting of parts shall be reported immediately to the RPR and approval of the method of correction shall be obtained. Approved corrections shall be made at Contractor’s expense.

Anchor bolts and anchors shall be properly located and built into connection work. Bolts and anchors shall be preset by the use of templates or such other methods as may be required to locate the anchors and anchor bolts accurately.

Pulling-in irons shall be located opposite all conduit entrances into structures to provide a strong, convenient attachment for pulling-in blocks when installing cables. Pulling-in irons shall be set directly into the concrete walls of the structure.

115-3.5 Installation of ladders. Ladders shall be installed such that they may be removed if necessary. Mounting brackets shall be supplied top and bottom and shall be cast in place during fabrication of the structure or drilled and grouted in place after erection of the structure.

115-3.6 Removal of sheeting and bracing. In general, all sheeting and bracing used to support the sides of trenches or other open excavations shall be withdrawn as the trenches or other open excavations are being refilled. That portion of the sheeting extending below the top of a structure shall be withdrawn, unless otherwise directed, before more than 6 inches (150 mm) of material is placed above the top of the

structure and before any bracing is removed. Voids left by the sheeting shall be carefully refilled with selected material and rammed tight with tools especially adapted for the purpose or otherwise as may be approved.

The RPR may direct the Contractor to delay the removal of sheeting and bracing if, in his judgment, the installed work has not attained the necessary strength to permit placing of backfill.

115-3.7 Backfilling. After a structure has been completed, the area around it shall be backfilled in horizontal layers not to exceed 6 inches (150 mm) in thickness measured after compaction to the density requirements in Item P-152. Each layer shall be deposited all around the structure to approximately the same elevation. The top of the fill shall meet the elevation shown on the plans or as directed by the RPR.

Backfill shall not be placed against any structure until approval is given by the RPR. In the case of concrete, such approval shall not be given until tests made by the laboratory under supervision of the RPR establish that the concrete has attained sufficient strength to provide a factor of safety against damage or strain in withstanding any pressure created by the backfill or the methods used in placing it.

Where required, the RPR may direct the Contractor to add, at his own expense, sufficient water during compaction to assure a complete consolidation of the backfill. The Contractor shall be responsible for all damage or injury done to conduits, duct banks, structures, property or persons due to improper placing or compacting of backfill.

115-3.8 Connection of duct banks. To relieve stress of joint between concrete-encased duct banks and structure walls, reinforcement rods shall be placed in the structure wall and shall be formed and tied into duct bank reinforcement at the time the duct bank is installed.

115-3.9 Grounding. A ground rod shall be installed in the floor of all concrete structures so that the top of rod extends 6 inches (150 mm) above the floor. The ground rod shall be installed within one foot (30 cm) of a corner of the concrete structure. Ground rods shall be installed prior to casting the bottom slab. Where the soil condition does not permit driving the ground rod into the earth without damage to the ground rod, the Contractor shall drill a 4-inch (100 mm) diameter hole into the earth to receive the ground rod. The hole around the ground rod shall be filled throughout its length, below slab, with Portland cement grout. Ground rods shall be installed in precast bottom slab of structures by drilling a hole through bottom slab and installing the ground rod. Bottom slab penetration shall be sealed watertight with Portland cement grout around the ground rod.

A grounding bus of 4/0 bare stranded copper shall be exothermically bonded to the ground rod and loop the concrete structure walls. The ground bus shall be a minimum of one foot (30 cm) above the floor of the structure and separate from other cables. No. 2 American wire gauge (AWG) bare copper pigtails shall bond the grounding bus to all cable trays and other metal hardware within the concrete structure. Connections to the grounding bus shall be exothermic. If an exothermic weld is not possible, connections to the grounding bus shall be made by using connectors approved for direct burial in soil or concrete per UL 467. Hardware connections may be mechanical, using a lug designed for that purpose.

115-3.10 Cleanup and repair. After erection of all galvanized items, damaged areas shall be repaired by applying a liquid cold-galvanizing compound per MIL-P-21035. Surfaces shall be prepared and compound applied per the manufacturer’s recommendations.

Prior to acceptance, the entire structure shall be cleaned of all dirt and debris.

115-3.11 Restoration. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt and rubbish from the site. The Contractor shall restore all disturbed areas equivalent to or better than their original condition. All sodding, grading and restoration shall be considered incidental to the respective Item L-115 pay item.

The Contractor shall grade around structures as required to provide positive drainage away from the structure.

Areas with special surface treatment, such as roads, sidewalks, or other paved areas shall have backfill compacted to match surrounding areas, and surfaces shall be repaired using materials comparable to original materials.

Following restoration of all trenching near airport movement surfaces, the Contractor shall thoroughly visually inspect the area for foreign object debris (FOD), and remove any such FOD that is found. This FOD inspection and removal shall be considered incidental to the pay item of which it is a component part.

After all work is completed, the Contractor shall remove all tools and other equipment, leaving the entire site free, clear and in good condition.

115-3.12 Inspection. Prior to final approval, the electrical structures shall be thoroughly inspected for conformance with the plans and this specification. Any indication of defects in materials or workmanship shall be further investigated and corrected. The earth resistance to ground of each ground rod shall not exceed 25 ohms. Each ground rod shall be tested using the fall-of-potential ground impedance test per American National Standards Institute / Institute of Electrical and Electronic Engineers (ANSI/IEEE) Standard 81. This test shall be performed prior to establishing connections to other ground electrodes.

115-3.13 Manhole elevation adjustments. The Contractor shall adjust the tops of existing manholes in areas designated in the Contract Documents to the new elevations shown. The Contractor shall be responsible for determining the exact height adjustment required to raise or lower the top of each manhole to the new elevations. The existing top elevation of each manhole to be adjusted shall be determined in the field and subtracted/added from the proposed top elevation.

The Contractor shall remove/extend the existing top section or ring and cover on the manhole structure or manhole access. The Contractor shall install precast concrete sections or grade rings of the required dimensions to adjust the manhole top to the new proposed elevation or shall cut the existing manhole walls to shorten the existing structure, as required by final grades. The Contractor shall reinstall the manhole top section or ring and cover on top and check the new top elevation.

The Contractor shall construct a concrete slab around the top of adjusted structures located in graded areas that are not to be paved. The concrete slab shall conform to the dimensions shown on the plans.

115-3.14 Duct extension to existing ducts. Where existing concrete encased ducts are to be extended, the duct extension shall be concrete encased plastic conduit. The fittings to connect the ducts together shall be standard manufactured connectors designed and approved for the purpose. The duct extensions shall be installed according to the concrete encased duct detail and as shown on the plans.

METHOD OF MEASUREMENT

115-4.1 Electrical manholes, handholes and junction structures shall be measured by each unit completed in place and accepted. The following items shall be included in the price of each unit: All required excavation and dewatering; sheeting and bracing; all required backfilling with on-site materials; restoration of all surfaces and finished grading and turfing; all required connections; temporary cables and connections; and ground rod testing.

115-4.2 Manhole, handhole, and junction structure elevation adjustments shall be measured by the completed unit installed, in place, completed, and accepted. Separate measurement shall not be made for the various types and sizes.

BASIS OF PAYMENT

115-5.1 The accepted quantity of electrical manholes, handholes and junction structures shall be paid for at the Contract unit price per each, complete and in place. This price shall be full compensation for furnishing all materials and for all preparation, excavation, backfilling and placing of the materials, furnishing and installation of appurtenances and connections to duct banks and other structures as may be required to complete the item as shown on the plans and for all labor, equipment, tools and incidentals necessary to complete the structure.

115-5.2 Payment shall be made at the contract unit price for manhole, handhole and junction structure elevation adjustments. This price shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools, and incidentals necessary, including but not limited to, spacers, concrete, rebar, dewatering, excavating, backfill, topsoil, sodding and pavement restoration, where required, to complete this item as shown in the plans and to the satisfaction of the RPR.

Payment will be made under:

Item L-115-5.1	Removal of Electrical Junction Structure - per each
Item L-115-5.2	L-868 Electrical Junction Structure - per each
Item L-115-5.3	Precast Electrical Handhole, 3’ x 3’ – per each

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

American National Standards Institute / Insulated Cable Engineers Association (ANSI/ICEA)

ANSI/IEEE STD 81	IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System

Advisory Circular (AC)

AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-53	Airport Lighting Equipment Certification Program

Commercial Item Description (CID)

A-A 59544	Cable and Wire, Electrical (Power, Fixed Installation)

ASTM International (ASTM)

ASTM A27	Standard Specification for Steel Castings, Carbon, for General Application
ASTM A47	Standard Specification for Ferritic Malleable Iron Castings

ASTM A48	Standard Specification for Gray Iron Castings
ASTM A123	Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products
ASTM A283	Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A615	Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
ASTM A897	Standard Specification for Austempered Ductile Iron Castings
ASTM C144	Standard Specification for Aggregate for Masonry Mortar
ASTM C150	Standard Specification for Portland Cement
ASTM C206	Standard Specification for Finishing Hydrated Lime

FAA Engineering Brief (EB)

EB #83	In Pavement Light Fixture Bolts

Mil Spec

MIL-P-21035	Paint High Zinc Dust Content, Galvanizing Repair

National Fire Protection Association (NFPA)

NFPA-70	National Electrical Code (NEC)

END OF ITEM L-115

Item L-125 Installation of Airport Lighting Systems

DESCRIPTION

125-1.1 This item shall consist of airport lighting systems furnished and installed in accordance with this specification, the referenced specifications, and the applicable advisory circulars (ACs). The systems shall be installed at the locations and in accordance with the dimensions, design, and details shown in the plans. This item shall include the furnishing of all equipment, materials, services, and incidentals necessary to place the systems in operation as completed units to the satisfaction of the RPR.

EQUIPMENT AND MATERIALS

125-2.1 General.

a. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specifications shall be certified under the Airport Lighting Equipment Certification Program in accordance with AC 150/5345-53, current version. FAA certified airfield lighting shall be compatible with each other to perform in compliance with FAA criteria and the intended operation. If the Contractor provides equipment that does not performs as intended because of incompatibility with the system, the Contractor assumes all costs to correct the system for to operate properly.

b. Manufacturer's certifications shall not relieve the Contractor of their responsibility to provide materials in accordance with these specifications and acceptable to the RPR. Materials supplied and/or installed that do not comply with these specifications shall be removed, when directed by the RPR and replaced with materials, which do comply with these specifications, at the sole cost of the Contractor.

c. All materials and equipment used shall be submitted to the RPR for approval prior to ordering the equipment. Submittals consisting of marked catalog sheets or shop drawings shall be provided. Clearly mark each copy to identify pertinent products or models applicable to this project. Indicate all optional equipment and delete non-pertinent data. Submittals for components of electrical equipment and systems shall identify the equipment for which they apply on each submittal sheet. Markings shall be clearly made with arrows or circles (highlighting is not acceptable). The Contractor shall be responsible for delays in the project accruing directly or indirectly from late submissions or resubmissions of submittals.

d. The data submitted shall be sufficient, in the opinion of the RPR, to determine compliance with the plans and specifications. The Contractor's submittals shall be submitted in electronic PDF format, tabbed by specification section. The RPR reserves the right to reject any or all equipment, materials or procedures, which, in the RPR’s opinion, does not meet the system design and the standards and codes, specified herein.

e. All equipment and materials furnished and installed under this section shall be guaranteed against defects in materials and workmanship for a period of at least twelve (12) months from final acceptance by the Owner. The defective materials and/or equipment shall be repaired or replaced, at the Owner's discretion, with no additional cost to the Owner.

EQUIPMENT AND MATERIALS

125-2.2 Conduit/Duct. Conduit shall conform to Specification Item L-110 Airport Underground Electrical Duct Banks and Conduits.

125-2.3 Cable and Counterpoise. Cable and Counterpoise shall conform to Item L-108 Underground Power Cable for Airports.

125-2.4 Tape. Rubber and plastic electrical tapes shall be Scotch Electrical Tape Numbers 23 and 88 respectively, as manufactured by 3M Company or an approved equal.

125-2.5 Cable Connections. Cable Connections shall conform to Item L-108 Installation of Underground Cable for Airports.

125-2.6 Retroreflective Markers. Not required.

125-2.7 Runway and Taxiway Lights. Runway and taxiway lights shall conform to the requirements of AC 150/5345-46, latest edition. Lamps shall be of size and type indicated, or as required by fixture manufacturer for each lighting fixture required under this contract. Filters shall be of colors conforming to the specification for the light concerned or to the standard referenced.

Lights

Type	Class	Mode	Style	Option	Base	Filter	Transformer	Notes
L-862	2	1	N/A	4	L-867	W/W	L-830	30” Height, Quartz Lamp, Base Mounted
L-861T(L)	2	1	N/A	4	L-867	Blue	L-830	30” Height, LED Lamp, Artic Kit, Base Mounted
L-861T(L)	2	1	N/A	4	30” Angle Iron Stake	Blue	L-830	30” Height, LED Lamp, Artic Kit, Stake Mounted

125-2.8 Runway and Taxiway Signs. Runway and Taxiway Guidance Signs should conform to the requirements of AC 150/5345-44, latest edition.

Signs

Type	Size	Style	Class	Mode	Notes
L-858Y	1	2/3	2	2	LED
L-858R	1	2/3	2	2	LED

125-2.9 Runway End Identifier Light (REIL). Not required.

125-2.10 Precision Approach Path Indicator (PAPI). Not required.

125-2.11 Circuit Selector Cabinet. Not required.

125-2.12 Light Base and Transformer Housings. Light Base and Transformer Housings should conform to the requirements of AC 150/5345-42, latest edition. Light bases shall be Type L-867 or L-868, Class 1A, Size B shall be provided as indicated or as required to accommodate the fixture or device installed thereon. Base plates, cover plates, and adapter plates shall be provided to accommodate various sizes of fixtures.

125-2.13 Isolation Transformers. Isolation Transformers shall be Type L-830, size as required for each installation. Transformer shall conform to AC 150/5345-47, latest edition.

INSTALLATION

125-3.1 Installation. The Contractor shall furnish, install, connect and test all equipment, accessories, conduit, cables, wires, buses, grounds and support items necessary to ensure a complete and operable airport lighting system as specified here and shown in the plans.

The equipment installation and mounting shall comply with the requirements of the National Electrical Code and state and local code agencies having jurisdiction.

The Contractor shall install the specified equipment in accordance with the applicable advisory circulars and the details shown on the plans.

125-3.2 Testing. All lights shall be fully tested by continuous operation for not less than 24 hours as a completed system prior to acceptance. The test shall include operating the constant current regulator in each step not less than 10 times at the beginning and end of the 24-hour test. The fixtures shall illuminate properly during each portion of the test.

125-3.3 Shipping and Storage. Equipment shall be shipped in suitable packing material to prevent damage during shipping. Store and maintain equipment and materials in areas protected from weather and physical damage. Any equipment and materials, in the opinion of the RPR, damaged during construction or storage shall be replaced by the Contractor at no additional cost to the owner. Painted or galvanized surfaces that are damaged shall be repaired in accordance with the manufacturer’s recommendations.

125-3.4 Elevated and In-pavement Lights. Water, debris, and other foreign substances shall be removed prior to installing fixture base and light.

A jig or holding device shall be used when installing each light fixture to ensure positioning to the proper elevation, alignment, level control, and azimuth control. Light fixtures shall be oriented with the light

beams parallel to the runway or taxiway centerline and facing in the required direction. The outermost edge of fixture shall be level with the surrounding pavement. Surplus sealant or flexible embedding material shall be removed. The holding device shall remain in place until sealant has reached its initial set.

125-3.5 Removal of Existing Taxiway and Runway Edge Lights. The Contractor shall remove the existing taxiway and runway edge light fixtures, mounting stakes, base cans, cover plates, fixture stems, corresponding isolation transformers, and ancillary materials as indicated on the plans. The existing underground lighting cables and connectors shall be removed and disposed of off airport property. Any base cans not needed to be reinstalled shall be removed and disposed of off airport property. The removed fixtures, mounting stakes, cover plates, fixture stems and isolation transformers shall be protected from damage by the Contractor. Any damage to a fixture, mounting stake, or isolation transformer shall be repaired/replaced by the Contractor at their own expense as directed by the RPR.

The Contractor shall turn over to the Airport all fixtures, mounting stakes, and isolation transformers removed that are not needed for reinstallation at other locations on the airfield as shown in the plans. The Contractor shall transport these items and shall carefully offload and stack them at a location on the airport as designated by the Airport Manager. The Contractor shall repair/replace any damage resulting from transporting, offloading, or stacking these items as directed by the RPR. Any items deemed not worth saving by the Airport Manager shall be removed and disposed of off airport property by the Contractor at no additional expense. Airport Manager/Airport Maintenance representative shall inspect all removed fixtures and signs prior to project completion to ensure proper removal of all materials and equipment off Airport property.

125-3.6 Removal of Existing Illuminated Airfield Signs. The Contractor shall remove the existing airfield signs, concrete bases, associated junction cans, corresponding isolation transformers, and ancillary materials as indicated on the plans. The existing sign bases, junction cans, underground lighting cables and connectors shall be removed and disposed of off airport property. The removed signs and isolation transformers shall be protected from damage by the Contractor. Any damage to a sign or isolation transformer shall be repaired/replaced by the Contractor at their own expense as directed by the RPR. The Contractor shall transport these items and shall carefully offload and stack them at a location on the airport as designated by the Airport Manager. The Contractor shall repair/replace any damage resulting from transporting, offloading, or stacking these items as directed by the RPR. Any items deemed not worth saving by the Airport Manager shall be removed and disposed of off airport property by the Contractor at no additional expense.

125-3.7 Conversion of Existing Taxiway Edge Lights to LED. As noted in the contract plans, some of the existing Taxiway edge light fixtures are to be removed and replaced with their LED counterpart. At these locations, the Contractor shall remove the taxiway edge light fixture, isolation transformer, fixture stem, cover plate and mounting bolts/hardware. Existing fixtures and isolation transformers shall be returned to the Airport. The Contractor shall provide new LED Taxiway edge light fixture, isolation transformer, fixture stem and cover plate on the existing light base can with new bolts and locking washers. All new taxiway fixtures shall have the same overall fixture height as those along the same segment of Taxiway pavement.

METHOD OF MEASUREMENT

125-4.1 Runway and Taxiway lights will be measured by the number of each type installed as completed units in place, ready for operation, and accepted by the RPR. Guidance signs will be measured by the number of each type and size installed as completed units, in place, ready for operation, and accepted by the RPR.

125-4.2 Existing taxiway edge lights removed will be measured by the number of fixtures removed as completed units including the removal of the existing mounting stake or base can and isolation transformer, accepted by the RPR. There is no separate payment for the delivery, offloading, and stacking of the removed fixtures, mounting stakes, and isolation transformers to an on-airport storage location or for disposal off airport property of any items deemed not worth saving by the Airport Manager. These costs shall be considered incidental to the cost of the removal of the edge lights.

125-4.3 Existing illuminated airfield signs removed will be measured by the number of signs removed as completed units including the removal of the existing sign bases, associated junction cans and isolation transformers, accepted by the RPR. This shall also include all materials and labor required for backfill and restoration of existing turf in the location where the sign is demolished. There is no separate payment for the delivery, offloading, and stacking of the removed signs and isolation transformers to an on-airport storage location or for disposal off airport property of any items deemed not worth saving by the Airport Manager. This cost shall be considered incidental to the cost of the removal of the illuminated airfield signs.

BASIS OF PAYMENT

125-5.1 Payment shall be made at the Contract unit price for each complete Runway or Taxiway light or guidance sign installed by the Contractor and accepted by the RPR. This payment shall be full compensation for furnishing all materials and for all preparation, assembly, and installation of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

125-5.2 Payment shall be made at the Contract unit price for each existing Taxiway or Runway edge light removed by the Contractor and accepted by the RPR. This payment shall be full compensation for furnishing all materials and for all preparation, assembly, and removal of these materials, and for all labor, equipment, tools and incidentals necessary to complete this item.

Payment will be made under:

Item L-125-5.1	Removal of Existing Elevated Taxiway Edge Light – per each
Item L-125-5.2	Removal of Existing Runway Edge Light – per each
Item L-125-5.3	Removal of Existing Illuminated Airfield Sign – per each
Item L-125-5.4	L-862 Base Mounted Runway Edge Light – per each
Item L-125-5.5	L-861T(L) LED Base Mounted Taxiway Edge Light – per each
Item L-125-5.6	L-861T(L) LED Stake Mounted Taxiway Edge Light – per each
Item L-125-5.7	Convert Existing L-861T Elevated Taxiway Edge Light with New LED Fixture on Existing Base Can – per each
Item L-125-5.8	L-858(L) LED Size 1, Class 2 Illuminated Airfield Guidance Sign – per each
Item L-125-5.9	Airfield Lighting Spare Parts – $10,000 allowance

REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

Advisory Circulars (AC)

AC 150/5340-18	Standards for Airport Sign Systems
AC 150/5340-26	Maintenance of Airport Visual Aid Facilities
AC 150/5340-30	Design and Installation Details for Airport Visual Aids
AC 150/5345-5	Circuit Selector Switch
AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits
AC 150/5345-26	Specification for L-823 Plug and Receptacle, Cable Connectors
AC 150/5345-28	Precision Approach Path Indicator (PAPI) Systems
AC 150/5345-42	Specification for Airport Light Bases, Transformer Housings, Junction Boxes, and Accessories
AC 150/5345-44	Specification for Runway and Taxiway Signs
AC 150/5345-46	Specification for Runway and Taxiway Light Fixtures
AC 150/5345-47	Specification for Series to Series Isolation Transformers for Airport Lighting Systems
AC 150/5345-51	Specification for Discharge-Type Flashing Light Equipment
AC 150/5345-53	Airport Lighting Equipment Certification Program

Engineering Brief (EB)

EB No. 67	Light Sources Other than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures

END OF ITEM L-125

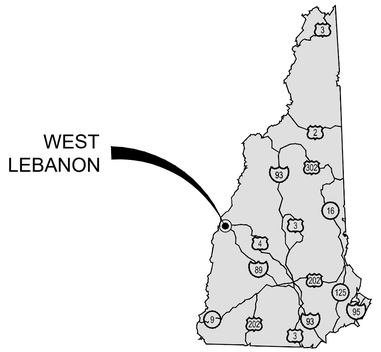
Stantec

LEBANON MUNICIPAL AIRPORT
WEST LEBANON, NEW HAMPSHIRE

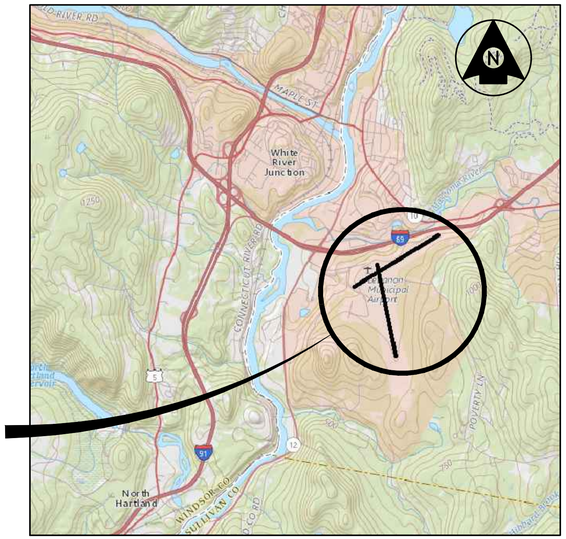
EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

(VOLUME 1)

ISSUED FOR BID
JANUARY 31, 2024



LOCATION MAP



VICINITY MAP
NOT TO SCALE

DRAWING INDEX		
SHEET NO.	DWG. NO.	SHEET TITLE
1	T001	TITLE SHEET
2	G001	GENERAL SITE PLAN
3	G002	GENERAL NOTES
4	G100	OVERALL PHASING AND SAFETY PLAN
5	G101	PHASING AND SAFETY PLAN NOTES AND DETAILS
6	G201	PHASING AND SAFETY PLAN - 1
7	G202	PHASING AND SAFETY PLAN - 2
8	G203	PHASING AND SAFETY PLAN - 3
9	G204	PHASING AND SAFETY PLAN - 4
10	G205	PHASING AND SAFETY PLAN - 5
11	G206	PHASING AND SAFETY PLAN - 6
12	G207	PHASING AND SAFETY PLAN - 7
13	V101	EXISTING CONDITIONS PLAN - 1
14	V102	EXISTING CONDITIONS PLAN - 2
15	V103	EXISTING CONDITIONS PLAN - 3
16	V104	EXISTING CONDITIONS PLAN - 4
17	V105	EXISTING CONDITIONS PLAN - 5
18	C101	LAYOUT & ALIGNMENT PLAN - 1
19	C102	LAYOUT & ALIGNMENT PLAN - 2
20	C103	LAYOUT & ALIGNMENT PLAN - 3
21	C104	LAYOUT & ALIGNMENT PLAN - 4
22	C105	LAYOUT & ALIGNMENT PLAN - 5
23	C201	PROFILES - 1
24	C202	PROFILES - 2
25	C203	PROFILES - 3
26	C301	GRADING PLAN - 1
27	C302	GRADING PLAN - 2
28	C303	GRADING PLAN - 3
29	C304	GRADING PLAN - 4
30	C305	GRADING PLAN - 5
31	C401	SPOT GRADE PLAN - 1
32	C402	SPOT GRADE PLAN - 2
33	C411	TYPICAL SECTIONS - 1
34	C412	TYPICAL SECTIONS - 2
35	C413	TYPICAL SECTIONS - 3
36	C501	DRAINAGE & EROSION CONTROL PLAN - 1
37	C502	DRAINAGE & EROSION CONTROL PLAN - 2
38	C503	DRAINAGE & EROSION CONTROL PLAN - 3
39	C504	DRAINAGE & EROSION CONTROL PLAN - 4
40	C505	DRAINAGE & EROSION CONTROL PLAN - 5
41	C506	DRAINAGE & EROSION CONTROL PLAN - 6
42	C511	DRAINAGE PIPE & STRUCTURE SCHEDULE - 1
43	C512	DRAINAGE PIPE & STRUCTURE SCHEDULE - 2
44	C601	DRAINAGE & EROISION NOTES & DETAILS - 1
45	C602	DRAINAGE & EROISION NOTES & DETAILS - 2
46	C603	DRAINAGE & EROISION NOTES & DETAILS - 3
47	C604	DRAINAGE & EROISION NOTES & DETAILS - 4
48	C605	DRAINAGE & EROSION NOTES & DETAILS - 5
49	C611	CIVIL & MISCELLANEOUS DETAILS
50	C701	MARKING PLAN - 1
51	C702	MARKING PLAN - 2
52	C711	MARKING DETAILS
53	E001	ELECTRICAL LEGEND & GENERAL NOTES
54	E101	LIGHTING AND SIGNAGE PLAN - 1
55	E102	LIGHTING AND SIGNAGE PLAN - 2
56	E103	LIGHTING AND SIGNAGE PLAN - 3
57	E201	TEMPORARY LIGHTING PLAN
58	E501	LIGHTING & SIGNAGE DETAILS - 1
59	E502	LIGHTING & SIGNAGE DETAILS - 2
60	E503	LIGHTING & SIGNAGE DETAILS - 3
61	E601	FIXTURE AND SIGNAGE SCHEDULE
62	X101	CROSS SECTIONS - 1
63	X102	CROSS SECTIONS - 2
64	X103	CROSS SECTIONS - 3
65	X104	CROSS SECTIONS - 4
66	X105	CROSS SECTIONS - 5
67	X106	CROSS SECTIONS - 6
68	X107	CROSS SECTIONS - 7
69	X108	CROSS SECTIONS - 8
70	X109	CROSS SECTIONS - 9
71	X110	CROSS SECTIONS - 10
72	X111	CROSS SECTIONS - 11
73	X112	CROSS SECTIONS - 12
74	X113	CROSS SECTIONS - 13
75	X114	CROSS SECTIONS - 14
76	X115	CROSS SECTIONS - 15
77	X116	CROSS SECTIONS - 16
78	X117	CROSS SECTIONS - 17
79	X118	CROSS SECTIONS - 18

ORIGINAL SHEET - ANSI D

WILDLIFE PROTECTION NOTES:

- ALL OBSERVATIONS OF THREATENED OR ENDANGERED SPECIES SHALL BE REPORTED IMMEDIATELY TO THE NEW HAMPSHIRE FISH AND GAME DEPARTMENT NONGAME AND ENDANGERED WILDLIFE ENVIRONMENTAL REVIEW PROGRAM BY PHONE AT 603-271-2461 AND BY EMAIL AT NHFGREVIEW@WILDLIFE.NH.GOV. EMAIL SUBJECT LINE: NHB22-3194, RUNWAY 36 AND TAXIWAY 'A' EXTENSION, WILDLIFE SPECIES OBSERVATION.
- PHOTOGRAPHS OF THE OBSERVED SPECIES AND NEARBY ELEMENTS OF HABITAT OR AREAS OF LAND DISTURBANCE SHALL BE PROVIDED TO NHF&G IN DIGITAL FORMAT AT THE ABOVE EMAIL ADDRESS FOR VERIFICATION AS FEASIBLE;
- IN THE EVENT A THREATENED OR ENDANGERED SPECIES IS OBSERVED ON THE PROJECT SITE DURING THE TERM OF THE PERMIT, THE SPECIES SHALL NOT BE DISTURBED, HANDLED, OR HARMED IN ANY WAY PRIOR TO CONSULTATION WITH NHF&G AND IMPLEMENTATION OF CORRECTIVE ACTIONS RECOMMENDED BY NHF&G, IF ANY, TO ASSURE THE PROJECT DOES NOT APPRECIABLY JEOPARDIZE THE CONTINUED EXISTENCE OF THREATENED AND ENDANGERED SPECIES AS DEFINED IN FIS 1002.04
- THE NHF&G, INCLUDING ITS EMPLOYEES AND AUTHORIZED AGENTS, SHALL HAVE ACCESS TO THE PROPERTY DURING THE TERM OF THE PERMIT.

LEGEND

- AIRPORT PROPERTY LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- OFZ — RUNWAY OBSTACLE FREE ZONE
- LOC — LOCALIZER CRITICAL AREA
- TOFA — TAXIWAY OBJECT FREE AREA
- PROPOSED LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT
- EXISTING ASPHALT PAVEMENT TO BE RECONSTRUCTED
- PROPOSED GRAVEL ROAD
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- CONTRACTOR'S PRIMARY HAUL ROUTE
- CONTRACTOR'S PRIMARY STAGING AREA

AIRPORT PROPERTY LINE
EXISTING TAXIWAY A2 TO BE REMOVED AND REPLACED WITH TURF
PROPOSED LOCALIZER RELOCATION (ADD-ALTERNATE #2) SEE VOLUME 2 DRAWINGS
PROPOSED TAXIWAY A TO BE RECONSTRUCTED/EXTENDED (2,382 L.F. X 35FT.)
EXISTING GRAVEL ROAD TO BE REMOVED AND REPLACED WITH TURF (ADD-ALTERNATE #1)
TAXILANE PAVEMENT TO BE REPAIRED AT END OF PROJECT AFTER ALL HAULING OPERATIONS ARE COMPLETE
PROPOSED LIMIT OF GRADING (ADD-ALTERNATE #1)
PROPOSED LIMIT OF GRADING
GATE 2
EXISTING GLIDE SLOPE
EXISTING ELECTRICAL VAULT
EAST RAMP
RUNWAY 18-36
TAXIWAY A1
TAXIWAY A
WEST RAMP
TAXIWAY B2
TAXIWAY B1
GATE A
TERMINAL BUILDING
GATE M
AIRPORT PARKING LOT
AIR TRAFFIC CONTROL TOWER
NORTH RAMP
SOUTH RAMP
ECHO RAMP
S.T.O.L.
GATE P
EXISTING RUNWAY 36 PAPI TO REMAIN
GATE N
EXISTING GATE 0-1
EXISTING ELECTRIC AIRFIELD ACCESS GATE 'O' CARD ACCESS REQUIRED
AIRPARK ROAD
COMMERCE AVE
EXISTING LOCALIZER TO BE RELOCATED (ADD-ALTERNATE #2) SEE VOLUME 2 DRAWINGS
EXISTING DME TO BE RELOCATED (ADD-ALTERNATE #2) SEE VOLUME 2 DRAWINGS
EXISTING LOCALIZER SHELTER BUILDING TO BE REMOVED (ADD-ALTERNATE #2) SEE VOLUME 2 DRAWINGS
EXISTING AIRFIELD ACCESS GATE 1
PROPOSED LOCALIZER CRITICAL AREA TO BE RE-GRADED (ADD ALTERNATE #1)
PROPOSED GRAVEL ROAD (ADD-ALTERNATE #1)
PROPOSED NEW LOCALIZER SHELTER BUILDING & RELOCATED DME ANTENNA (ADD-ALTERNATE #2) SEE VOLUME 2 DRAWINGS
CONTRACTOR SHALL INSTALL TEMPORARY CONSTRUCTION ACCESS GATE WITHIN EXISTING CHAIN LINK FENCE AND PROVIDE PADLOCK. GATE SHALL BE REMOVED AT END OF PROJECT AND FENCING SHALL BE REPLACED TO REFLECT ITS EXISTING CONDITION
PROPOSED CONTRACTOR STAGING AREA
INTERSTATE 89
TAXIWAY B
TAXIWAY B4
TAXIWAY B3
RUNWAY 7-25
OFZ
LOC
TOFA

N

0 300' 600'

Stantec

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Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID M. ZAZZARO 13257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
GENERAL SITE PLAN

Project No.
179450522

Drawing No.	Sheet	Revision
G001	2 of 79	0

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ORIGINAL SHEET - ANSI D

GENERAL NOTES:

1. **LOWEST BIDDER IN GOOD STANDING WILL BE NOTIFIED IN APRIL 2024 AFTER BID IS CLOSED. THE CONTRACT IS EXPECTED TO BE EXECUTED IN OCTOBER 2024, ONCE FEDERAL AND STATE FUNDING HAS BEEN SECURED.** UPON EXECUTION OF THE CONTRACT, THE CONTRACTOR SHALL EXPEDITE THE SUBMISSION OF SHOP DRAWINGS, ORDERING OF MATERIALS AND MOBILIZATION EFFORTS. **ANTICIPATED NOTICE TO PROCEED FOR CONSTRUCTION IS APPROXIMATELY MAY 1, 2025**.

2. CONTRACT DURATION IS 168 CALENDAR DAYS AND ALL WORK SHALL BE COMPLETED WITHIN THE PROJECT DURATION AND AS DETAILED ON THE "OVERALL PAHSING AND SAFETY PLAN", DRAWING G100.

3. THE CONTRACTOR SHALL SCHEDULE ALL MANPOWER AND EQUIPMENT AND HAVE ALL REQUIRED MATERIALS READILY AVAILABLE TO ENSURE ALL SCHEDULED WORK CAN BE COMPLETED IN ITS ENTIRETY WITHIN THE SPECIFIED TIME FRAMES. SEE TIME FRAMES ON PHASING PLANS.

4. THE CONTRACTOR SHALL MAINTAIN COMMUNICATION AND PROJECT COORDINATION WITH THE RESIDENT PROJECT REPRESENTATIVE (RPR) AND AIRPORT MANAGER AT ALL TIMES.

5. THE CONTRACTOR SHALL PROVIDE A SINGLE POINT OF CONTACT TO THE AIRPORT MANAGER AND THE RPR WHO CAN BE CONTACTED AT ANY TIME (24-HOURS A DAY) THROUGHOUT THE COURSE OF THE CONTRACT. THIS INDIVIDUAL SHALL BE CAPABLE OF COORDINATING AN IMMEDIATE RESPONSE TO CORRECT ANY CONSTRUCTION RELATED ACTIVITY THAT MAY ADVERSELY AFFECT PUBLIC SAFETY.

6. THE CONTRACTOR SHALL COMPLY WITH ALL AIRPORT SECURITY REQUIREMENTS INCLUDING OBTAINING SECURITY BADGES AND ATTENDING AIRFIELD DRIVER AND SECURITY TRAINING OFFERED BY THE AIRPORT FOR OPERATION OF VEHICLES WITHIN THE SECURED AREA OF THE AIRPORT AND THE AOA, AND MAINTAINING A SECURE PERIMETER OF THE AIRPORT WHEN ACCESSING AIRFIELD VEHICLE GATES. BADGE APPLICATIONS COST APPROXIMATELY $40.00, AND THE APPLICATION REQUIRES A BACKGROUND CHECK AND TWO ORIGINAL FORMS OF IDS TO BE PROVIDED IN PERSON. CONTRACTORS ARE SUGGESTED TO START THE BADGING PROCESS AS SOON AS POSSIBLE. ALL EFFORTS ASSOCIATED WITH BADGING AND APPLICABLE APPLICATION COSTS SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT COST. CONTRACTORS ARE RESPONSIBLE FOR CONFIRMING ACTUAL COSTS OF SECURITY BADGE APPLICATION. AT A MINIMUM THE CONTRACTOR'S PROJECT MANAGER, SUPERINTENDENT, FOREMAN, AND ESCORTS AND ALL SUBCONTRACTOR'S SUPERINTENDENTS, FOREMAN AND ESCORTS SHALL OBTAIN SECURITY BADGES AND ATTEND AIRFIELD DRIVING AND SECURITY TRAINING.

7. THE CONTRACTOR COVENANTS AND AGREES THAT THEY AND THEIR SUBCONTRACTORS AND EMPLOYEES WILL PROVIDE AND MAINTAIN A SAFE PLACE TO WORK AND THAT THEY WILL COMPLY WITH ALL LAWS AND REGULATIONS OF ANY GOVERNMENTAL AUTHORITY HAVING JURISDICTION THEREOF, AND THE CONTRACTOR AGREES TO INDEMNIFY, DEFEND AND HOLD HARMLESS THE RPR, OWNER AND OTHERS FROM AND AGAINST ANY LIABILITY, LOSS, DAMAGE OR EXPENSE, INCLUDING ATTORNEY'S FEES, ARISING FROM A FAILURE OR ALLEGED FAILURE ON THE PART OF THE CONTRACTOR, THEIR SUBCONTRACTORS AND THEIR AGENTS AND EMPLOYEES TO PROVE AND MAINTAIN A SAFE PLACE TO WORK AND TO COMPLY WITH ALL LAWS AND REGULATIONS OF ANY GOVERNMENTAL AUTHORITY HAVING JURISDICTION THEREOF. IN ADDITION TO ALL APPLICABLE OSHA SAFETY REQUIREMENTS ALL PERSONNEL SHALL WEAR APPROPRIATE REFLECTIVE SAFETY VESTS AND REQUIRED PERSONAL PROTECTIVE EQUIPMENT (PPE) AT ALL TIMES.

8. AIRCRAFT OPERATING AREAS (AOA), WHICH ARE ALL AREAS WITHIN THE AIRFIELD SECURITY FENCE, SHALL REMAIN ACTIVE THROUGHOUT THE PROJECT. THE CONTRACTOR SHALL PLACE LIGHTED LOW PROFILE BARRICADES, CHANNELIZER CONES AND CONSTRUCTION SAFETY FENCE AT THE LOCATIONS SHOWN ON THE PHASING PLANS AND/OR AS DIRECTED BY THE RPR AND AIRPORT MANAGER. LOW PROFILE BARRICADES OR CONES AS INDICATED ON THE PLANS SHALL BE UTILIZED ON ALL PAVEMENTS ADJACENT TO ALL AREAS WHERE AIRCRAFT ARE OPERATING. CONSTRUCTION SAFETY FENCE SHALL BE UTILIZED ON ALL GRASS AREAS ADJACENT TO ALL AREAS WHERE AIRCRAFT ARE OPERATING.

9. THE CONTRACTOR SHALL REFER TO DIVISION I AND DIVISION II, GENERAL AND SPECIAL PROVISIONS OF THE CONTRACT DOCUMENTS FOR ADDITIONAL SAFETY CONSIDERATIONS.

10. NOTAMS SHALL BE ISSUED BY THE AIRPORT MANAGER AFTER COORDINATING WITH THE RPR. NOTAMS SHALL BE ISSUED FOR WORK ACTIVITIES ON THE AIRFIELD, INCLUDING ALL RUNWAY/TAXIWAY CLOSURES AND RE-OPENINGS. THE CONTRACTOR SHALL COORDINATE SCHEDULED RUNWAY CLOSURES A MINIMUM OF 7 DAYS IN ADVANCE AND TAXIWAY CLOSURES A MINIMUM OF 72 HOURS IN ADVANCE UNLESS OTHERWISE SPECIFIED. ALL OTHER NOTAMS REQUIRE A MINIMUM OF 48 HOURS ADVANCE NOTICE.

11. IF CRANES OR EQUIPMENT OVER 30' IN HEIGHT ARE TO BE UTILIZED FOR THE PROJECT, THE CONTRACTOR IS REQUIRED TO FILE A FAA 7460-1, NOTICE OF PROPOSED CONSTRUCTION AND ALTERATION. THE FAA REVIEW CAN TAKE UP TO 45 DAYS FOR A DETERMINATION. IF THE CONTRACTOR IS UNSURE IF THEY HAVE TO FILE, THE CONTRACTOR SHALL CONTACT THE AIRPORT FOR A DETERMINATION.

12. THE APPROXIMATE LOCATION OF THE CONTRACTOR'S FIELD OFFICE AND STAGING AREA FOR STORING MATERIALS AND PARKING CONSTRUCTION EQUIPMENT IS AS SHOWN ON THE DRAWINGS. THE CONTRACTOR SHALL COORDINATE THE PRECISE LOCATION OF THE CONTRACTOR'S EQUIPMENT STORAGE AREA WITH THE RPR AND AIRPORT MANAGER PRIOR TO THE COMMENCEMENT OF CONSTRUCTION TO ENSURE THE AVAILABILITY OF UTILITIES AND ACCESS. THE ACTUAL SIZE OF THE CONTRACTOR'S STAGING AREA SHALL BE APPROVED BY THE AIRPORT MANAGER AND THE RPR PRIOR TO COMMENCING WITH CONSTRUCTION. THE LOCATION OF ALL CONTRACTOR MATERIAL STOCKPILE AREA(S) SHALL BE APPROVED IN ADVANCE BY THE RPR AND SHALL BE LOCATED OUTSIDE THE ACTIVE RUNWAY AND TAXIWAY OBJECT FREE AREAS. EQUIPMENT AND MATERIAL SHALL REMAIN BELOW THE AIRPORT'S PROTECTED AIRSPACE SURFACES AT ALL TIMES AS DETERMINED BY THE CONTRACTOR'S REGISTERED SURVEYOR AND APPROVED BY THE RPR (WHEN RUNWAYS ARE ACTIVE). THE CONTRACTOR SHALL RESTORE ALL CONTRACTOR STAGING, STORAGE AND EQUIPMENT PARKING AREAS TO THEIR PRE-PROJECT OR IMPROVED CONDITION AT THE COMPLETION OF THE PROJECT WITHOUT ADDITIONAL EXPENSE TO THE OWNER. THIS SHALL INCLUDE AT A MINIMUM, REMOVING DEBRIS, SCARIFYING THE AREA TO LOOSEN COMPACTED MATERIAL, GRADING TO FACILITATE DRAINAGE, PLACING TOPSOIL, SEEDING AND MULCHING. THE CONTRACTOR SHALL DOCUMENT (PHOTOGRAPH/VIDEO) THE CONDITIONS OF ALL PROPOSED STAGING AND STOCKPILE AREAS BY PHOTOGRAPHING AND VIEWING THE AREAS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.

13. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THAT ONLY AUTHORIZED VEHICLES ARE ALLOWED ACCESS THROUGH DESIGNATED AIRFIELD ACCESS GATES FOR THE PROJECT. EXISTING AND TEMPORARY AIRFIELD ACCESS GATES SHALL REMAIN CLOSED AT ALL TIMES TO MAINTAIN A SECURE PERIMETER OF THE AIRPORT. WHEN GATES ARE REQUIRED TO BE OPENED FOR THE PASSAGE OF CONSTRUCTION EQUIPMENT OR VEHICLES, THE CONTRACTOR SHALL CLOSE AND LOCK EACH GATE IMMEDIATELY AFTER USE OR HAVE A FULL-TIME GATE GUARD FOR CONTROLLING ACCESS. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY FOR THE DURATION OF THE PROJECT TO MAINTAIN THE GATES IN GOOD CONDITION, AND REPAIR/REPLACE ANY FENCING OR GATE SYSTEM COMPONENTS AT NO ADDITIONAL COST TO THE OWNER THAT ARE DAMAGED BY THE CONTRACTOR'S ACTIVITIES.

14. THE CONTRACTOR SHALL PROVIDE SUFFICIENT SILTATION CONTROL DEVICES TO ENSURE THAT NO SILT OR OTHER CONSTRUCTION MATERIALS ARE DEPOSITED BEYOND THE PROJECT LIMITS. ALL SILTATION CONTROL DEVICES SHALL BE IN PLACE AND APPROVED BY THE RESIDENT PROJECT REPRESENTATIVE PRIOR TO THE COMMENCEMENT OF EARTHWORK. REFER TO CONTRACT SPECIFICATION C-102 AND THE C-500 SERIES DRAWINGS FOR EROSION CONTROL LAYOUT AND DETAILS.

15. THE CONTRACTOR SHALL LEGALLY DISPOSE OF ALL DEBRIS AND UNSATISFACTORY MATERIALS OFF AIRPORT PROPERTY IN ACCORDANCE WITH FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS AT NO ADDITIONAL COST TO THE OWNER. SUITABLE EXCAVATED SUBBASE AND BASE MATERIAL SHALL BE RE-USED IN EMBANKMENT AREAS.

16. CONTRACTOR VEHICLES AND EQUIPMENT SHALL AT ALL TIMES GIVE WAY TO AIRCRAFT OPERATIONS, SUPPORT VEHICLES, AND EMERGENCY VEHICLES. THE CONTRACTOR'S VEHICLES/EQUIPMENT SHALL NOT ENTER ANY RUNWAY, TAXIWAY OR APRON IN THE AIR OPERATIONS AREA (AOA) AT ANY TIME, WITHOUT PRIOR AUTHORIZATION FROM THE AIRPORT MANAGER AND/OR RPR.

17. THE CONTRACTOR SHALL INSPECT THE WORK AREA AT A MINIMUM AT THE START AND END OF EACH WORK DAY AND VERIFY THAT ALL LIGHTED AND UNLIT RUNWAY CLOSURE MARKERS, CONES, BARRICADES, CONSTRUCTION SAFETY FENCE AND LIGHTS ARE IN PLACE AND IN WORKING ORDER.

18. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THOROUGHLY CLEANING VEHICLE TIRES PRIOR TO THE VEHICLES LEAVING THE WORK AREA. AT THE END OF EACH SHIFT, THE CONTRACTOR AND THE RPR SHALL INSPECT THE ADJACENT ROADWAYS, AS WELL AS PAVED HAUL ROUTES USED BY THE CONTRACTOR WITHIN AIRPORT PROPERTY. THE CONTRACTOR SHALL CLEAN ADJACENT ROADWAYS AS WELL AS PAVED HAUL ROUTES AS NECESSARY OR AS DIRECTED BY THE RPR.

19. APPROXIMATE LOCATION OF HAUL ROUTES ARE SHOWN ON THE PLANS. PORTIONS OF HAUL ROUTES REQUIRE CROSSING ACTIVE TAXIWAYS. CONTRACTOR'S RADIO-EQUIPPED ESCORT SHALL LEAD CONSTRUCTION EQUIPMENT AND VEHICLES TO THE SITE FROM THE SECURITY GATE. SEE SPECIAL PROVISIONS IN DIVISION II OF THE SPECIFICATIONS FOR FURTHER DETAILS. EXACT LOCATION OF HAUL ROUTES SHALL BE DETERMINED IN THE FIELD BY THE AIRPORT OPERATOR AND THE RESIDENT PROJECT REPRESENTATIVE (RPR) IN COORDINATION WITH THE CONTRACTOR. ALL PORTIONS OF HAUL ROUTES SHALL BE CLEARLY MARKED WITH CONES OR WOODEN STAKES AND FLAGGING ON THE AIRFIELD AS DIRECTED BY THE RPR FOR THE DURATION OF THE PROJECT TO ENSURE THAT CONSTRUCTION VEHICLES DO NOT STRAY INTO ACTIVE AIR OPERATIONS AREAS, WETLANDS, OR CREATE UNNECESSARY SOIL DISTURBANCE. IN AREAS WHERE THE HAUL ROUTE PASSES INTO ACTIVE RUNWAY OR TAXIWAY SAFETY AREAS, THE ROUTE SHALL BE MAINTAINED DAILY AND RE-GRADED SUCH THAT WHEEL RUTS ARE REDUCED TO TWO (2) INCHES OR LESS IN DEPTH. ALL NEW AND EXISTING UNDERGROUND CABLES AND STRUCTURES SHALL BE PROTECTED FROM DAMAGE WHERE HAUL ROUTES CROSS OVER CABLES OR STRUCTURES. THE CONTRACTOR SHALL REMOVE AND REPLACE IN KIND ANY CABLES OR STRUCTURES DAMAGED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER. CONTRACTOR'S USE OF HAUL ROUTES SHALL BE AT THE DISCRETION OF THE AIRPORT MANAGER AND/OR THE RPR. THE OWNER RESERVES THE RIGHT TO CHANGE THE HAUL ROUTE AT ANY TIME AT NO ADDITIONAL COST.

20. HAULING ON RUNWAY 18-36 AND RUNWAY 7-25 IS STRICTLY PROHIBITED. CONSTRUCTION ACCESS ONTO RUNWAY 18-36 OR RUNWAY 7-25 EXCLUDING AREA TO BE RECONSTRUCTED SHALL BE LIMITED TO VEHICLES AND EQUIPMENT REQUIRED FOR LINE STRIPING AND SETUP OF RUNWAY CLOSURE MARKERS, CONES AND BARRICADES.

21. TEMPORARY STABILIZED CONSTRUCTION EXITS SHALL BE CONSTRUCTED WHERE HAUL ROUTES MEET WITH EXISTING GRAVEL OR PAVED ROADWAYS TO PREVENT TRACKING OF MUD AND DEBRIS FROM THE PROJECT SITE. TEMPORARY CONSTRUCTION ACCESS ROADS SHALL BE CONSTRUCTED AT LOCATIONS SHOWN ON THE PLANS. TEMPORARY STABILIZED CONSTRUCTION EXITS AND TEMPORARY CONSTRUCTION ACCESS ROADS SHALL BE PAID UNDER ITEM C-102.

22. THE CONTRACTOR IS RESPONSIBLE FOR CONSTRUCTING AND MAINTAINING ALL HAUL ROUTES REQUIRED FOR THE DURATION OF THE PROJECT. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ENSURING THE HAUL ROUTES ARE ADEQUATELY CONSTRUCTED TO THE WIDTH AND STRENGTH NEEDED FOR ALL CONSTRUCTION OPERATIONS. NO SEPARATE PAYMENT SHALL BE MADE FOR HAUL ROUTES AND TEMPORARY ACCESS ROUTES

23. THE CONTRACTOR SHALL PHOTOGRAPH/VIDEO THE ENTIRE SITE, INCLUDING STAGING AREAS, HAUL ROUTES, AND THE AIRPORT ACCESS ROADS TO PROVIDE DOCUMENTATION OF PRE-CONSTRUCTION SITE CONDITIONS. AT THE COMPLETION OF CONSTRUCTION, ALL HAUL ROUTES SHALL BE RETURNED TO THEIR PRE-PROJECT CONDITION BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER. THIS SHALL INCLUDE AT A MINIMUM, REPAIR OR RECONSTRUCTION OF PORTIONS OF EXISTING PAVED RUNWAYS, TAXIWAYS, APRONS, GRAVEL/PAVED ROADWAYS, SCARIFYING, TOPSOILING, SEEDING AND MULCHING HAUL ROUTES IN TURF AREAS, AND SWEEPING OF ALL PAVED SURFACES THAT WERE UTILIZED FOR HAULING. LINE MARKINGS ON PUBLIC ROADWAYS SHALL ALSO BE RESTRIPED IF DAMAGED DURING CONSTRUCTION HAULING OPERATIONS. ALL WORK ASSOCIATED WITH PHOTOGRAPHY/VIDEOTAPING THE SITE, MAINTAINING, AND RESTORING HAUL ROUTES, PUBLIC ROADWAYS, AND ADJACENT AREAS IS CONSIDERED INCIDENTAL TO THE OVERALL PROJECT COST.

24. EXISTING PAVED ACCESS ROADS INDICATED ON THE PLANS TO BE USED AS HAUL ROADS THAT MAY BE UNABLE TO SUPPORT CONSTRUCTION VEHICLES WITHOUT DAMAGE MAY REQUIRE REPAIRS AT THE END OF THE PROJECT AS DETERMINED BY THE RPR AND THE AIRPORT MANAGER. ANY DECISION INVOLVING THE REPAIR OF ACCESS ROADS SHALL BE MADE BY THE AIRPORT MANAGER. ACCESS ROAD REPAIRS SHALL BE COMPLETED IN ACCORDANCE WITH THE ACCESS ROAD REPAIR TYPICAL SECTION(S) PROVIDED IN THE TYPICAL DETAILS IN THE C410 SERIES. THE TYPE AND LIMITS OF REPAIRS SHALL BE DETERMINED BY THE RPR WITH APPROVAL FROM THE AIRPORT MANAGER. NO ACCESS ROADS SHALL BE REPAIRED WITHOUT SPECIFIC APPROVAL IN WRITING FROM THE AIRPORT MANAGER. NO SEPARATE PAYMENT WILL BE MADE FOR ACCESS ROAD REPAIRS. ANY DAMAGE TO EXISTING PAVEMENTS AS A RESULT OF NEGLIGENCE ON THE PART OF THE CONTRACTOR FOR FAILURE TO PROPERLY PROTECT THE ROAD SHALL BE REPAIRED AT NO ADDITIONAL COST TO THE OWNER.

25. THE CONTRACTOR SHALL PROTECT EXISTING IN PAVEMENT LOOP DETECTOR WIRES AT AUTOMATED AIRFIELD SECURITY GATES TO BE UTILIZED FOR CONSTRUCTION ACCESS. LOOP DETECTOR WIRES DAMAGED SHALL BE REPLACED IN THEIR ENTIRETY AT NO ADDITIONAL COST TO THE OWNER. NO SPLICING OF LOOP WIRES WILL BE ACCEPTED.

26. THE CONTRACTOR SHALL PLACE SIGNAGE AT AIRFIELD ACCESS LOCATIONS, LEADING UP TO (WITHIN 1/4 OF A MILE) AND AT LOCATIONS WHERE AIRFIELD ACCESS INTERSECTS WITH EXISTING PUBLIC ROADS OR AS APPROVED BY THE RPR AND AIRPORT MANAGER. THERE WILL BE NO SEPARATE PAYMENT FOR PRODUCING, PLACING, MAINTAINING AND REMOVING SIGNS AND SHALL BE CONSIDERED INCIDENTAL TO THE PROJECT.

27. AT THE COMPLETION OF THE CONTRACT, ALL CONTRACTOR AND SUBCONTRACTOR FACILITIES SHALL BE REMOVED PROMPTLY AND THE AREA LEFT CLEAN AND FREE OF ALL DEBRIS OR SURPLUS MATERIALS. ANY DISTURBED AREAS WITHIN THE SITE (INCLUDING ALL WORK AREAS, HAUL ROUTES, STAGING AREAS, AFFECTED DRAINAGE SWALES & UTILITIES, AND DISTURBED AREAS CAUSED BY THE REMOVAL OF EROSION CONTROL MEASURES) SHALL BE RESTORED TO THEIR ORIGINAL CONDITION AT NO ADDITIONAL EXPENSE TO THE OWNER. FAILURE TO DO SO MAY RESULT IN A DELAY OF PARTIAL/FINAL PAYMENT APPROVAL UNTIL ALL AREAS ARE RESTORED TO THE SATISFACTION OF THE RPR. ALL COSTS ASSOCIATED WITH SITE RESTORATION SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PROJECT ITEMS. EROSION CONTROLS SHALL REMAIN IN PLACE UNTIL GRASS IS ESTABLISHED AS DETERMINED BY THE RPR.

28. CONSTRUCTION VEHICLES MUST BE PARKED WITHIN THE PROJECT LIMITS, HOWEVER NO EQUIPMENT SHALL BE PARKED WITHIN RUNWAY OBJECT FREE AREAS (ROFA) WHEN NOT IN USE. ALL OTHER CONTRACTOR VEHICLES SHALL BE PARKED IN THE STAGING AREA AS SHOWN ON THE PLANS. NO CONTRACTOR EMPLOYEE PARKING SHALL BE ALLOWED IN THE AIRPORT/RESTAURANT PARKING AREA.

29. EQUIPMENT/MATERIAL STOCKPILES SHALL NOT BE PERMITTED OUTSIDE THE CONTRACTOR STAGING AREA. STOCKPILE HEIGHT IS SUBJECT TO THE APPROVAL OF THE RPR AND AIRPORT MANAGER SO AS NOT TO OBSTRUCT AIRSPACE PROTECTED SURFACES.

30. ALL TRENCHES AND EXCAVATIONS WITHIN RUNWAY AND/OR TAXIWAY SAFETY AREAS SHALL BE BACKFILLED AND GRADED WITHIN 2 INCHES OR LESS OF ADJACENT EXISTING GRADES PRIOR TO THE SCHEDULED REOPENING OF THE RUNWAY AND/OR TAXIWAY. THE CONTRACTOR SHALL NOT LEAVE ANY TRENCHES OR OTHER EXCAVATIONS OPEN AT NIGHT, ON WEEKENDS OR AT OTHER TIMES WHEN THE CONTRACTOR IS NOT ON THE SITE WITHOUT PRIOR APPROVAL OF THE RPR. ANY TRENCHES/EXCAVATIONS LEFT UNATTENDED SHALL BE ADEQUATELY PROTECTED, MARKED, AND LIGHTED.

31. PRIOR TO THE COMMENCEMENT OF THE PROJECT, ALL THE CONTRACTOR AND SUBCONTRACTOR'S PERSONNEL SHALL ATTEND A FOREIGN OBJECT DEBRIS (FOD) AND SAFETY PRESENTATION AT THE AIRPORT MANAGER'S OFFICE. ALL ATTENDEES WILL BE REQUIRED TO UNDERSTAND AND COMPLY WITH SAFETY AND SECURITY REQUIREMENTS.

32. THE CONTRACTOR SHALL SUPPLY A DUMPSTER WITH COVER TO KEEP THE CONSTRUCTION SITE FREE OF PAPER, BOXES, AND OTHER DEBRIS WHICH COULD BE BLOWN ONTO THE AOA AND/OR ATTRACT WILDLIFE.

33. THE CONTRACTOR SHALL PAY PARTICULAR ATTENTION TO THE DUST CONTROL REQUIREMENTS OF THIS CONTRACT. THE CONTRACTOR SHALL FURNISH AND OPERATE A MINIMUM OF ONE (1) SELF-PROPELLED VACUUM SWEEPER TO MAINTAIN OPERATIONS OF THE RUNWAYS, TAXIWAYS, APRONS, AND OTHER AIRCRAFT OPERATING AREAS SENSITIVE TO DUST. THE CONTRACTOR SHALL ALSO PROVIDE A WATER TRUCK AND APPLY SUFFICIENT WATER TO CONTROL DUST WITHIN THE WORK AREA AND ENSURE DUST DOES NOT DRIFT INTO AIRCRAFT OPERATING OR PARKING AREAS. THE CONTRACTOR SHALL MAINTAIN ALL PUBLIC ROADS WITHIN 1/2 MILE OF AIRPORT ACCESS ROADS FREE OF DUST AND DEBRIS. THE RPR RESERVES THE RIGHT TO STOP WORK IF NECESSARY IN ORDER TO BRING DUST UNDER CONTROL. FAILURE TO CONTROL THESE ITEMS SHALL RESULT IN SUSPENSION OF PROJECT WORK. NO ADDITIONAL COMPENSATION OR TIME SHALL BE PROVIDED TO THE CONTRACTOR SHOULD LOSS OF PRODUCTIVITY OR DOWN-TIME OCCUR AS A RESULT OF THE RPR LIMITING OR SUSPENDING WORK BECAUSE OF THE CONTRACTOR'S FAILURE TO CONTROL DUST. ADDITIONAL MEASURES MAY BE REQUIRED AS DIRECTED BY THE RPR. ALL COSTS ASSOCIATED WITH PROVIDING AND MAINTAINING A SWEEPER AND WATER TRUCK FOR FOD AND DUST CONTROL SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS CONTRACT ITEMS. THE CONTRACTOR SHALL ALSO BE RESPONSIBLE FOR LOCATING A HYDRANT AND OBTAINING APPROVAL FROM THE LOCAL WATER AUTHORITY FOR ITS USE AND METERING. THE CONTRACTOR IS RESPONSIBLE FOR PAYING FOR ALL WATER USED FOR DUST CONTROL, COMPACTION, AND ANY OTHER GENERAL CONSTRUCTION USE.

34. THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT LOCATIONS AND/OR ELEVATIONS OF EXISTING UNDERGROUND UTILITIES AS SHOWN ON THESE PLANS ARE BASED ON RECORD DRAWINGS AND WERE FIELD SURVEYED FOR CONFIRMATION ONLY WHERE POSSIBLE. THIS INFORMATION IS NOT TO BE RELIED ON AS BEING COMPLETE OR EXACT AND THE CONTRACTOR SHALL FIELD VERIFY ALL INFORMATION PRIOR TO COMMENCEMENT OF THE WORK. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE RPR IN WRITING OF ANY DISCREPANCY DISCOVERED DURING FIELD VERIFICATION.

35. THE CONTRACTOR MUST CALL DIGSAFE AND PROVIDE A UTILITY LOCATING SERVICE TO LOCATE/VERIFY UTILITY LOCATIONS PRIOR TO COMMENCING EXCAVATION. THE CONTRACTOR SHALL ALSO CONTACT THE FAA SSC MANAGER FOR ASSISTANCE IN LOCATING UNDERGROUND FAA UTILITIES PRIOR TO COMMENCING EXCAVATION. ALL EXISTING UTILITIES IN THE VICINITY OF ANY EXCAVATION SHALL BE CLEARLY MARKED ON THE GROUND BY THE CONTRACTOR PRIOR TO BEGINNING EXCAVATION. A MINIMUM OF 72 HOURS NOTICE TO THE RPR, AIRPORT MANAGER AND THE UTILITY COMPANY IS REQUIRED WHEN DISRUPTION OF UTILITIES ARE REQUESTED BY THE CONTRACTOR. ALL COSTS ASSOCIATED WITH LOCATING UTILITIES SHALL BE CONSIDERED INCIDENTAL TO THE VARIOUS PROJECT ITEMS. ANY DAMAGE TO EXISTING UTILITIES BY THE CONTRACTOR SHALL BE REPAIRED OR REPLACED IMMEDIATELY BY THE CONTRACTOR AT NO ADDITIONAL EXPENSE TO THE OWNER.

36. THE CONTRACTOR SHALL HAND DIG WHEN WITHIN THREE (3) FEET OF ANY KNOWN OR SUSPECTED UNDERGROUND UTILITY.

37. THE CONTRACTOR SHALL IMMEDIATELY REPAIR OR REPLACE, AT THEIR OWN EXPENSE, ANY UTILITIES DAMAGED BY THEIR OPERATIONS, AT NO ADDITIONAL COST TO THE OWNER. THE REPAIRS MUST BE INSPECTED AND APPROVED BY THE UTILITY OWNER.

38. CONTRACTOR SHALL PROVIDE QUALITY CONTROL TESTING AND TESTING REPORTS TO THE RPR FOR CONTRACT ITEMS PER THE CONTRACT SPECIFICATIONS.

39. SMOKING IS PROHIBITED ON AIRPORT PROPERTY DURING CONSTRUCTION OPERATIONS.

40. NO TRUCKS SHALL IDLE FOR LONGER THAN FIVE (5) MINUTES AND NO TRUCKS SHALL IDLE BEFORE 7:00 AM OR AFTER 9:00 PM UNLESS APPROVED IN ADVANCE BY THE RPR WHEN PERFORMING NIGHT WORK IN ACCORDANCE WITH THE PHASING PLANS.

41. THE CONTRACTOR SHALL PROVIDE A NEW HAMPSHIRE PROFESSIONAL LAND SURVEYOR (NHPLS) FOR ALL SURVEY LAYOUT, AS-BUILT DATA AND VOLUMETRIC QUANTITY VERIFICATION.

42. REFER TO V100 SERIES AND C100 SERIES FOR SURVEY CONTROL DATA.

43. REFER TO THE OVERALL CONSTRUCTION SAFETY AND PHASING PLAN REPORT, SAFETY AND PHASING NOTES AND DETAILS, AND SAFETY AND PHASING PLANS (G100 AND G200 SERIES), FOR ADDITIONAL INFORMATION REGARDING CONSTRUCTION SAFETY AND PROJECT PHASING.

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Permit-Seal

THE STATE OF NEW HAMPSHIRE — DAVID Z. MARTINEZ — 20577 — LICENSED — PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

GENERAL NOTES

Project No. 179450522

Drawing No. G002 | Sheet 3 of 79 | Revision 0

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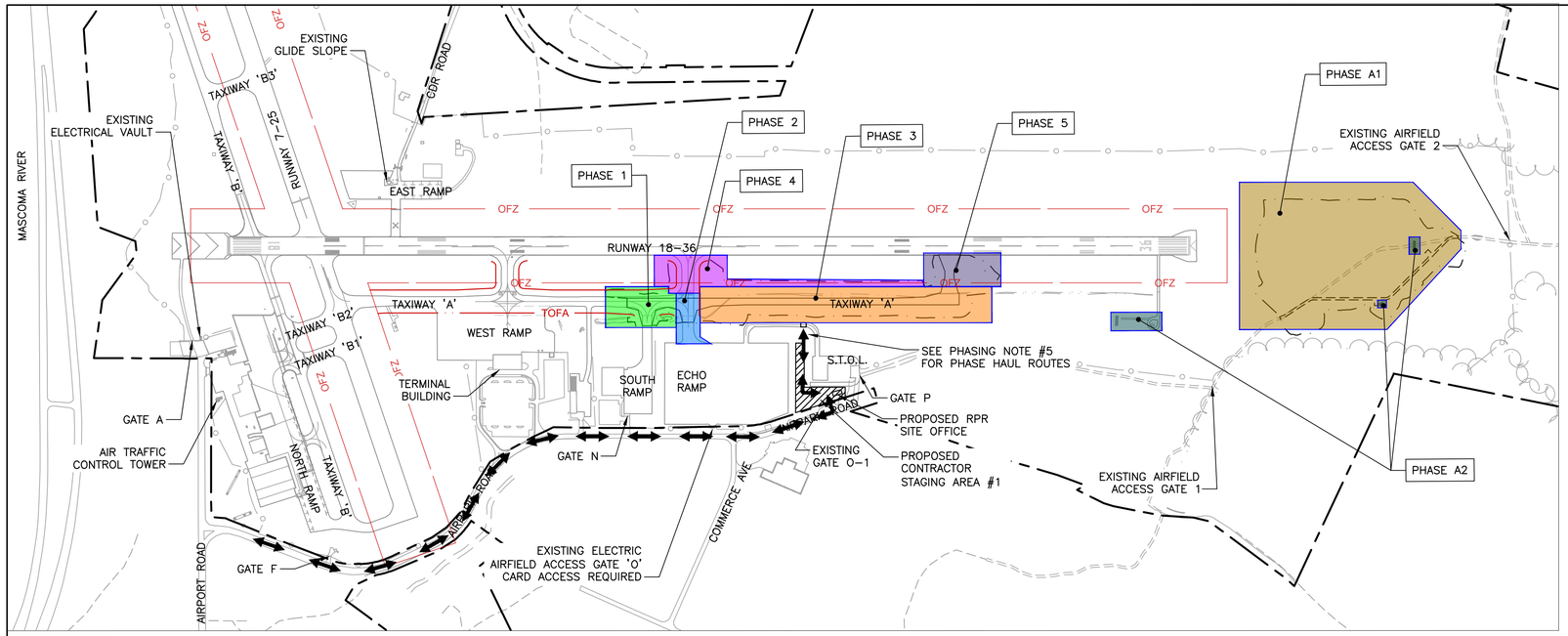
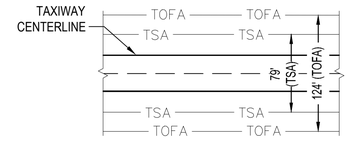
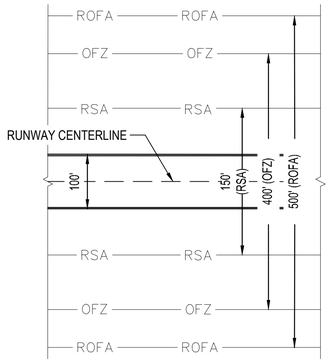




ADG GROUP II TAXIWAY SAFETY AREA (TSA) & TAXIWAY OBJECT FREE AREA (TOFA) REQUIREMENTS

NOT TO SCALE



RUNWAY SAFETY AREA (RSA)
RUNWAY OBSTACLE FREE ZONE (OFZ) &
RUNWAY OBJECT FREE AREA (ROFA) REQUIREMENTS

NOT TO SCALE

OVERALL PHASING NOTES:

1. ANTICIPATED CONTRACT EXECUTION IS APPROXIMATELY OCTOBER 2024.
2. APPROXIMATE NOTICE TO PROCEED FOR CONSTRUCTION IS MAY 1, 2025.
3. FOR SAFETY & PHASING NOTES & DETAILS, SEE G101.
4. FOR DETAILED PHASING PLANS WITH RUNWAY AND TAXIWAY CLOSURES AND CLOSURE SETUPS, SEE G201 TO G207.
5. REFER TO DETAILED PHASING PLANS FOR THE HAUL ROUTE FOR EACH SPECIFIC PHASE.
6. THE CONTRACTOR SHALL NOT BEGIN WORK IN ANY PHASE WITHOUT WRITTEN AUTHORIZATION FROM THE RESIDENT PROJECT REPRESENTATIVE (RPR).
7. PHASES SHALL BE COMPLETED IN SEQUENTIAL ORDER UNLESS OTHERWISE NOTED OR AUTHORIZED BY THE RPR AND THE AIRPORT MANAGER.
8. ONCE A PHASE HAS BEGUN, CONTRACTOR SHALL WORK DILIGENTLY TO COMPLETE ALL REQUIRED WORK UNTIL ALL DISTURBED AREAS WITHIN THE PHASE HAVE BEEN STABILIZED IN ACCORDANCE WITH THE EROSION CONTROL NOTES ON DRAWING C601. CONTRACTOR SHALL MINIMIZE AREAS OF DISTURBANCE THAT HAVE NOT BEEN FULLY STABILIZED WHERE POSSIBLE. EVERY EFFORT SHALL BE MADE TO LIMIT NON-STABILIZED DISTURBED AREAS TO LESS THAN 5 ACRES AS MUCH AS PRACTICABLE. AN ENVIRONMENTAL MONITOR SHALL BE EMPLOYED BY THE ENGINEER AND CONDUCT INSPECTIONS IN ACCORDANCE WITH THE NOTES ON THIS PLAN.
9. EROSION CONTROL MEASURES FOR INDIVIDUAL PHASES SHALL BE INSTALLED PRIOR TO ANY GROUND DISTURBANCE, AND MAINTAINED FOR THE DURATION OF THE PHASE WORK. REFER TO DRAWINGS C501 THROUGH C506 FOR INSTALLATION LOCATIONS, AND DRAWINGS C601 THROUGH C605 FOR SPECIFIC NOTES AND DETAILS.
10. WORK HOURS ARE AS NOTED ON THE INDIVIDUAL PHASING PLANS. ANY CHANGES TO THE WORK SCHEDULE REQUIRES WRITTEN AUTHORIZATION FROM THE RPR. NO WORK SHALL BE PERFORMED ON SUNDAYS.
11. CONSTRUCTION EQUIPMENT SHALL NOT BE PERMITTED ON RUNWAY 7-25 OR RUNWAY 18-36 EXCEPT LINE STRIPING EQUIPMENT AND RUNWAY CLOSURE MARKERS, CONES AND BARRICADES.
12. ALL AIRFIELD LIGHTING CIRCUITS SHALL REMAIN OPERATIONAL BETWEEN DUSK AND DAWN UNLESS OTHERWISE NOTED ON THE INDIVIDUAL PHASING PLANS.
13. CONTRACTOR TO PROVIDE VINYL AND LIGHTED RUNWAY CLOSURE MARKERS

WORK SCHEDULE:

1. WORK IS TO BE COMPLETED WITHIN 168 CALENDAR DAYS FROM THE NOTICE TO PROCEED FOR CONSTRUCTION.
2. PHASE 1 WORK SHALL INCLUDE ALL WORK WITHIN THE PHASE LIMITS UP TO THE ASPHALT PAVEMENT BASE COURSE.
3. PHASE 2 SHALL BE COMPLETED WITHIN 21 DAYS TO MINIMIZE ACCESS RESTRAINTS ON AIRPORT USERS OF THE ECHO RAMP. THE CONTRACTOR SHALL SCHEDULE WORK FORCES ACCORDINGLY.
4. AT THE CONCLUSION OF THE PHASE 2 ASPHALT PAVING BASE COURSE THE CONTRACTOR WILL COMPLETE SURFACE COURSE PAVING FOR PHASE 1 AND 2 OVER 2 DAYS.
5. FORECAST WIND AND WEATHER CONDITIONS SHALL BE MONITORED CONTINUALLY BY THE CONTRACTOR, AND CONSTRUCTION SCHEDULES MODIFIED APPROPRIATELY. WORK MAY BEGIN ON ANY DAY OF THE WEEK UPON APPROVAL BY THE AIRPORT MANAGER AND THE RPR.
6. 42 DAY CLOSURE OF RUNWAY 18-36 – CONTRACTOR IS REQUIRED TO NOTIFY THE AIRPORT MANAGER A MINIMUM OF 7 DAYS PRIOR TO RUNWAY CLOSURE TO ALLOW ENOUGH TIME FOR AIRPORT TO ISSUE A NOTAM. REFER TO CSPP FOR ADDITIONAL DETAILS AND TIMELINE REQUIREMENTS.
7. RUNWAY 18-36 IS REQUIRED TO BE CLOSED FOR PHASES 4 AND 5, AS WELL AS FOR WORK RELATING TO ADD-ALTERNATES #1 AND #2. MAXIMUM RUNWAY CLOSURE PERIOD TO BE NO MORE THAN 42 DAYS FOR ALL WORK. RUNWAY CLOSURE MUST BE COMPLETED IN A SINGLE CONTINUOUS DURATION. THE CONTRACTOR SHALL SCHEDULE WORK FORCES ACCORDINGLY.

LEGEND

- PHASE LIMITS
- CHANNELIZER CONES
- LOW PROFILE BARRICADE
- RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)
- SAFETY FENCE
- PRIMARY HAUL ROUTE
- PHASE HAUL ROUTE
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA

DETAILED PHASING:

REFER TO G200 SERIES DRAWINGS FOR DETAILS OF INDIVIDUAL CONSTRUCTION PHASES (I.E. ASSOCIATED RUNWAY & TAXIWAY CLOSURES, WORK HOURS, HAUL ROUTES, TEMPORARY CIRCUITS, ETC.)

LEGEND

- DAY WORK (COLORS VARY)

ANTICIPATED CONSTRUCTION SEQUENCE: 168 CALENDAR DAYS

MAXIMUM 42 DAY RUNWAY 18-36 CLOSURE

PHASE	DAYS	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18
		M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU
1	42					TEST STRIP (1D)				PAVE SURFACE COURSE									
2	21																		
3	168																		
4	21																		
5	24																		
A1	49																		
A2	28																		

PHASE	DAYS	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24
		M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU	M T W TH F SA SU
1	42						
2	21						
3	168						
4	21						
5	24						
A1	49						
A2	28						

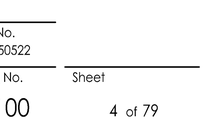
ENVIRONMENTAL MONITORING NOTES:

AN ENVIRONMENTAL MONITOR (EM) WILL BE EMPLOYED BY THE ENGINEER AND WILL COMPLETE INSPECTIONS OF THE PROJECT SITE ON BEHALF OF THE OWNER FOR THE DURATION OF CONSTRUCTION. THE CONTRACTOR SHALL AS AN INCIDENTAL COMPONENT OF THE CONSTRUCTION CONTRACT, ALLOW UNFETTERED ACCESS TO THE WORK AREAS AND ASSIST THE EM AS NEEDED TO COMPLETE ITS INSPECTIONS. WHEN DEFICIENCIES ARE IDENTIFIED BY THE EM, THE CONTRACTOR UNDER DIRECTION OF THE RPR SHALL ADDRESS THE DEFICIENT ITEMS IMMEDIATELY AS NEEDED TO ENSURE THE EROSION AND SEDIMENT CONTROL PLAN FOR THE PROJECT IS FUNCTIONING ADEQUATELY. THIS MAY INCLUDE IMPLEMENTATION OF ADDITIONAL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS DIRECTED BY THE EM AND RPR.

THE ENVIRONMENTAL MONITOR SHALL PROVIDE MONITORING AND REPORTING IN ACCORDANCE WITH REQUIREMENTS SET FORTH BY THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES, CODE OF ADMINISTRATIVE RULES ENV-WQ 1505.03. THE EM SHALL AT A MINIMUM:

1) INSPECT THE PROJECT SITE AT LEAST ONCE EACH WEEK FROM THE START OF TERRAIN ALTERATION ACTIVITIES UNTIL ALL TERRAIN ALTERATION ACTIVITIES ARE COMPLETED AND THE SITE IS STABILIZED;
2) IN ADDITION TO REGULAR WEEKLY INSPECTIONS, INSPECT THE PROJECT SITE DURING ANY RAIN EVENT IN WHICH 0.5 INCH OF PRECIPITATION OR MORE FALLS WITHIN A 24 HOUR PERIOD, PROVIDED THAT IF THE EM IS UNABLE TO BE PRESENT DURING SUCH A STORM, THE MONITOR SHALL INSPECT THE SITE WITHIN 24 HOURS OF THE RAIN EVENT;
3) SUBMIT A WRITTEN REPORT, STAMPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST, TO THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES WITHIN 24 HOURS OF EACH INSPECTION THAT:
   a. DESCRIBES THE PROGRESS OF THE PROJECT, INCLUDING WHETHER ALL CONDITIONS OF THE PERMIT ARE BEING MET AND, IF NOT, WHICH REQUIREMENTS ARE NOT BEING MET;
   b. IF ANY REQUIREMENTS ARE NOT BEING MET, AN EXPLANATION OF THE CORRECTIVE ACTION(S) THAT WILL BE OR ARE BEING TAKEN TO BRING THE PROJECT INTO COMPLIANCE WITH APPLICABLE REQUIREMENTS AND THE DEADLINE BY WHICH SUCH ACTIONS WILL BE COMPLETED; AND
   c. INCLUDES PHOTOGRAPHS OF THE SITE THAT ARE REPRESENTATIVE OF THE PROJECT; AND
4) RETAIN A COPY OF THE REPORT PREPARED PURSUANT TO 3), ABOVE, ON-SITE FOR REVIEW DURING SITE INSPECTIONS BY FEDERAL, STATE, AND LOCAL OFFICIALS.

IT IS FURTHER UNDERSTOOD THAT THE ROUTINE INSPECTION FREQUENCY MAY BE REDUCED FROM ONCE EACH WEEK TO AT LEAST ONCE EACH MONTH IF EITHER: WORK HAS BEEN SUSPENDED AND THE ENTIRE SITE IS STABILIZED; OR RUNOFF IS UNLIKELY BECAUSE THE GROUND IS FROZEN OR COVERED WITH SNOW OR ICE, OR THE PROJECT IS IN AN AREA WHERE FROZEN CONDITIONS ARE ANTICIPATED TO CONTINUE FOR MORE THAN A MONTH.



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Revision	By	Appd.	YY.MM.DD
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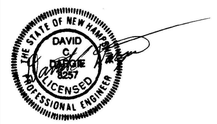

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
OVERALL PHASING AND SAFETY PLAN

Project No.
179450522

Drawing No.	Sheet	Revision
G100	4 of 79	0

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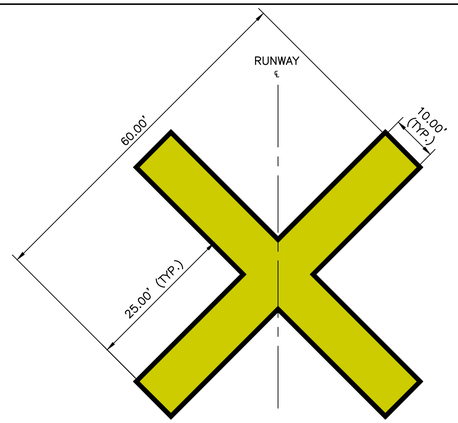
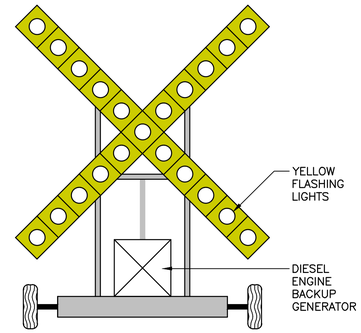
ORIGINAL SHEET - ANSI D

SAFETY AND PHASING NOTES:

1. SAFETY/SECURITY PLAN: THE CONTRACTOR SHALL REVIEW THE OUTLINED REQUIREMENTS AND PROCEDURES CONTAINED IN THE FAA ADVISORY CIRCULAR NO. 150/5370-2G OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION AND A DRAFT COPY OF THE CONSTRUCTION SAFETY AND PHASING PLAN (CSPP) REPORT, A COPY OF THE CSPP REPORT IS INCLUDED IN THE SPECIFICATIONS. THE CONTRACTOR SHALL PREPARE AND SUBMIT FOR APPROVAL A SAFETY PLAN COMPLIANCE DOCUMENT (SPCD) IN ACCORDANCE WITH THE REQUIREMENTS OF AC 150/5370-2G. THE AIRPORT MANAGER AND THE RPR SHALL REVIEW THE CONTRACTOR'S SPCD, AND THEIR WRITTEN APPROVAL OF THE PLAN WILL BE REQUIRED PRIOR TO THE CONTRACTOR'S MOBILIZATION FOR THE PROJECT. THE SPCD SHALL ADDRESS THE FOLLOWING MAJOR ITEMS AT A MINIMUM AS THEY PERTAIN TO THE SCHEDULED WORK EFFORTS:
   - PROCEDURES AND REQUIREMENTS FOR RUNWAY AND TAXIWAY CLOSURES.
   - NOTIFICATION OF SCHEDULED CONSTRUCTION ACTIVITIES.
   - CONSTRUCTION ACTIVITIES WITHIN RUNWAY AND TAXIWAY SAFETY AREAS, OBSTACLE FREE ZONES, AND OTHER AIRPORT OPERATIONAL AREAS.
   - DAILY AIRFIELD AND RADIO COMMUNICATIONS.
   - PLACEMENT OF ALL BARRICADES/CONES.
   - CONSTRUCTION AND PUBLIC ROADWAY SIGNAGE.
   - GATE ACCESS PROCEDURES.
2. SAFETY OFFICER: THE CONTRACTOR SHALL PROVIDE A SAFETY OFFICER/POINT OF CONTACT PERSON WHO CAN BE CONTACTED 24 HOURS A DAY-SEVEN DAYS A WEEK FOR THE DURATION OF THE PROJECT. THIS PERSON SHALL BE RESPONSIBLE FOR TAKING IMMEDIATE ACTION TO CORRECT ANY CONSTRUCTION ACTIVITIES IDENTIFIED AS NOT IN THE BEST INTEREST OF AIRPORT'S SAFE OPERATION AND/OR SECURITY.
3. AT NO TIME SHALL THE CONTRACTOR CROSS/ACCESS ACTIVE RUNWAYS/TAXIWAYS OR STAGE EQUIPMENT IN ACTIVE RUNWAY APPROACHES, THE RUNWAY OBSTACLE FREE ZONE OR TAXIWAY OBJECT FREE AREAS WITHOUT PRIOR COORDINATION WITH THE AIRPORT MANAGER AND THE RPR. CROSSING OF ACTIVE RUNWAYS ARE STRICTLY PROHIBITED. THE CONTRACTOR'S RADIO COMMUNICATIONS PERSONNEL SHALL MONITOR THE FOLLOWING FREQUENCIES:
   - LEBANON TOWER: 125.95 (6:00AM-10:00PM)
   - LEBANON GROUND: 121.6 (6:00AM-10:00PM)
   - LEBANON UNICOM: 122.95 (10:00PM - 6:00AM)
4. THE CONTRACTOR SHALL HAVE ON SITE AT ALL TIMES AT LEAST ONE RADIO EQUIPPED ESCORT VEHICLE WITH QUALIFIED OPERATOR WHO SHALL MONITOR THE RADIO DURING ALL WORKING HOURS. A MINIMUM OF TWO (2) RADIO EQUIPPED CONSTRUCTION SAFETY VEHICLES MANNED WITH QUALIFIED AIRFIELD RADIO COMMUNICATIONS PERSONNEL (ESCORTS) SHALL BE PROVIDED BY THE CONTRACTOR WHEN SCHEDULED ACTIVITIES REQUIRE CONSTRUCTION EQUIPMENT/ACTIVITIES TO CROSS/ACCESS LOCATIONS IN THE AOA (TAXIWAYS, APRONS, RUNWAYS OR WORK WITHIN THE RUNWAY OBSTACLE FREE ZONE, RUNWAY APPROACH SURFACES OR TAXIWAY OBJECT FREE AREA). THE CONTRACTOR SHALL NOTE THAT CROSSING OF ACTIVE RUNWAYS ARE STRICTLY PROHIBITED. AIRFIELD RADIO COMMUNICATIONS PERSONNEL SHALL NOT PERFORM ANY OTHER TASK DURING PERFORMANCE OF THIS DUTY. CONTRACTOR'S RADIO PERSONNEL SHALL BE REQUIRED TO MEET LEBANON'S SAFETY AND SECURITY REQUIREMENTS AND SHALL MAINTAIN PROPER RADIO PROTOCOL. THE CONTRACTOR SHALL PROVIDE ALL APPROVED VEHICLES, RADIOS, EQUIPMENT, PERSONNEL AND PRIOR TRAINING FOR THIS PURPOSE. AT NO TIME SHALL THE CONTRACTOR CROSS/ACCESS ACTIVE RUNWAYS/TAXIWAYS OR STAGE EQUIPMENT IN RUNWAY APPROACHES WITHOUT PRIOR COORDINATION WITH THE AIRPORT MANAGER AND THE RPR.
5. ALL AUTHORIZED CONSTRUCTION VEHICLES SHALL DISPLAY AN ORANGE/WHITE CHECKERED FLAG, SHALL HAVE AN AMBER/YELLOW STROBE BEACON LIGHT ATTACHED TO THE ROOF AND BE CLEARLY IDENTIFIED BY EITHER ASSIGNED INITIALS OR NUMBERS PROMINENTLY DISPLAYED ON EACH SIDE OF VEHICLE. THERE SHALL BE NO SEPARATE PAYMENT FOR PROVIDING FLASHING YELLOW BEACONS, ORANGE/WHITE CHECKERED FLAGS OR VEHICLE DECALS IN ACCORDANCE WITH FAA AC 150/5210-5D.
6. CONSTRUCTION PERSONNEL: ALL PERSONNEL SHALL WEAR APPROPRIATE REFLECTIVE SAFETY VESTS AND CUSTOMARY PERSONAL PROTECTIVE EQUIPMENT (PPE) AT ALL TIMES WHEN WORKING ON THE AIRFIELD AND ADJACENT WORK AREAS. THE CONTRACTOR SHALL MAKE ALL PERSONNEL AWARE OF SAFETY REQUIREMENTS AND THE DANGERS OF WORKING ADJACENT TO ACTIVE AIR OPERATIONAL AREAS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES. THE CONTRACTOR SHALL ENSURE THAT ALL PERSONNEL UNDERSTAND AND COMPLY WITH THE AIRFIELD'S SAFETY/SECURITY REQUIREMENTS AND THE FOREIGN OBJECT DEBRIS (FOD) PROCEDURES.
7. IN THE EVENT OF A CONSTRUCTION ACCIDENT THE CONTRACTOR SHALL CALL 911 AND IMMEDIATELY NOTIFY THE RPR AND THE AIRPORT MANAGER.
8. ANY WORK WITHIN THE OBSTACLE FREE ZONE (OFZ) OF A RUNWAY AS SHOWN ON THE PLANS SHALL REQUIRE A RUNWAY CLOSURE. ALL RUNWAY CLOSURES MUST BE COORDINATED IN WRITING WITH THE AIRPORT MANAGER THROUGH THE RPR A MINIMUM OF 7 DAYS IN ADVANCE.
9. ANY WORK WITHIN THE TAXIWAY OBJECT FREE AREA (TOFA) AS SHOWN ON THE PLANS SHALL REQUIRE A TAXIWAY CLOSURE. ALL TAXIWAY CLOSURES MUST BE COORDINATED IN WRITING WITH THE AIRPORT MANAGER THROUGH THE RPR A MINIMUM OF 72 HOURS IN ADVANCE.
10. PRIOR TO REOPENING ANY RUNWAY OR TAXIWAY PAVEMENTS (INCLUDING DAILY/NIGHTLY CLOSURES):
    - ALL PAVEMENTS SHALL BE CLEANED AND FREE FROM FOD
    - ALL TRENCHES AND EXCAVATIONS ADJACENT TO PAVED SURFACES AND WITHIN RUNWAY/TAXIWAY SAFETY AREAS SHALL BE BACKFILLED AND GRADED TO WITHIN +/- 2 INCHES OF ADJACENT EXISTING GRADES. ALL OTHER TRENCHES SHALL BE PROTECTED AND LIGHTED.
    - THE CONTRACTOR SHALL REQUEST AN INSPECTION OF THE WORK AREA BY THE AIRPORT MANAGER AND THE RPR. THE CONTRACTOR SHALL CORRECT ANY HAZARDS WHICH MAY PRESENT A SAFETY CONCERN TO AIRCRAFT, VEHICLES OR PERSONS AS DETERMINED BY THE AIRPORT MANAGER AND THE RPR.
10. CLOSURE BARRICADES/CONES: ALL REQUIRED LIGHTED SAFETY BARRICADES, LIGHTED CHANNELIZER CONES, FLAGGED STAKES, TRAFFIC CONES, TEMPORARY TRAFFIC SIGNS, COVERED AIRFIELD SIGNS, COVERED AIRFIELD LIGHTING, ETC., SHALL BE IN PLACE PRIOR TO THE COMMENCEMENT OF WORK. THERE SHALL BE NO SEPARATE PAYMENT FOR FURNISHING, PLACING, RELOCATING, MAINTAINING, AND REMOVAL OF THESE AS MAY BE REQUIRED BY THE AIRPORT MANAGER OR THE RPR TO ENSURE SAFETY OVER THE LIFE OF THE PROJECT. THIS WORK SHALL BE INCIDENTAL TO THE PROJECT. NO SEPARATE PAYMENT SHALL BE MADE. AT THE COMPLETION OF THE PROJECT, ALL LIGHTED SAFETY BARRICADES, CHANNELIZER CONES AND SIGNS SHALL BE REMOVED, AND SHALL REMAIN THE PROPERTY OF THE CONTRACTOR. METHODS FOR COVERING AIRFIELD SIGNS AND LIGHTS (BLANK PANELS/LENS, SECURED FABRIC, ETC.) SHALL BE AS APPROVED BY THE RPR. SIGNS IDENTIFIED TO BE COVERED THAT WILL BE REMOVED/REPLACED AS PART OF THIS PROJECT MAY HAVE PANELS OR SIGN REMOVED AT START OF CONSTRUCTION IN LIEU OF COVERING THE SIGN.
11. CLOSURE MARKERS: LIGHTED RUNWAY CLOSURE MARKERS AND VINYL RUNWAY CLOSURE MARKERS SHALL BE IN PLACE, OPERATIONAL AND APPROVED BY THE AIRPORT MANAGER AND RPR PRIOR TO THE COMMENCEMENT OF WORK. THERE SHALL BE NO SEPARATE PAYMENT FOR FURNISHING, PLACING, RELOCATING, MAINTAINING, AND REMOVAL OF THESE AS MAY BE REQUIRED BY THE AIRPORT MANAGER OR THE RPR TO ENSURE SAFETY OVER THE LIFE OF THE PROJECT.
12. MATERIAL STOCKPILING AND EQUIPMENT PARKING: NO MATERIAL SHALL BE STOCKPILED WITHIN THE OBJECT FREE AREA OF AN OPEN RUNWAY OR TAXIWAY. NO EQUIPMENT SHALL BE PARKED WITH AN ACTIVE RUNWAY/TAXIWAY OBJECT FREE AREA WHEN NOT IN USE AND/OR OUTSIDE WORK HOURS.

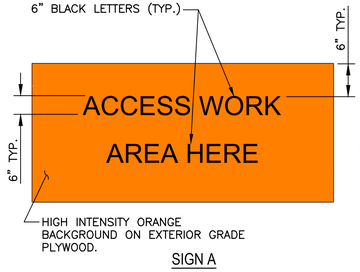


FLAT RUNWAY CLOSURE MARKER
NOT TO SCALE

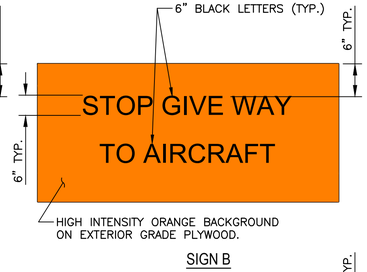


LIGHTED RUNWAY CLOSURE MARKER
NOT TO SCALE

RUNWAY CLOSURE MARKER NOTES:
1. CONTRACTOR SHALL FURNISH RUNWAY CLOSURE MARKERS. ALL COSTS ASSOCIATED WITH FURNISHING, INSTALLING AND MAINTAINING RUNWAY CLOSURE MARKERS SHALL BE INCIDENTAL TO THE VARIOUS CONTRACT PAY ITEMS.
2. FLAT RUNWAY CLOSURE MARKERS SHALL BE USED IN TANDEM WITH PORTABLE ELECTRIC LIGHTED RUNWAY CLOSURE MARKERS DURING DAY CLOSURES AND SHALL BE INSTALLED AT THE EACH END OF THE APPLICABLE CLOSED RUNWAY AS SHOWN ON THE DRAWINGS. DURING NIGHTLY CLOSURES, THE CONTRACTOR SHALL INSTALL ONLY LIGHTED PORTABLE RUNWAY CLOSURE MARKERS.
3. FLAT RUNWAY CLOSURE MARKERS SHALL BE HIGH STRENGTH, YELLOW, REUSABLE CLOSURE MARKERS, SIZED AS SHOWN IN THE DETAIL. MARKERS SHALL BE BALLASTED WITH SAND BAGS OR OTHER BALLASTS THAT DO NOT OBSCURE THE MARKER, AS APPROVED BY THE RPR. MARKERS SHALL BE FAA APPROVED.
4. ALL COSTS ASSOCIATED WITH COORDINATING WITH LEBANON MUNICIPAL AIRPORT, SUPPLYING, HAULING, PLACING, SECURING, CONNECTIONS FOR POWER, MAINTAINING, FUELING AND RELOCATING THESE MARKERS SHALL BE INCIDENTAL TO THE THE VARIOUS CONTRACT PAY ITEMS.
5. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE RUNWAY CLOSURE MARKERS THROUGHOUT THE PROJECT. IF CONTRACTOR IS GOING TO BE OFF SITE THE CONTRACTOR SHALL PROVIDE PERSONNEL TO CHECK OPERATION OF CLOSURE MARKERS DURING THESE PERIODS.



SIGN A



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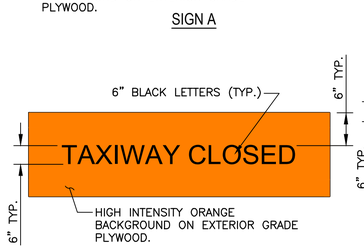

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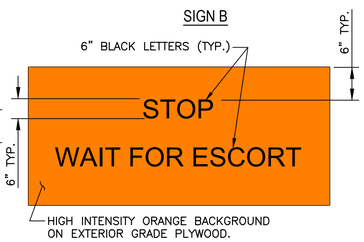
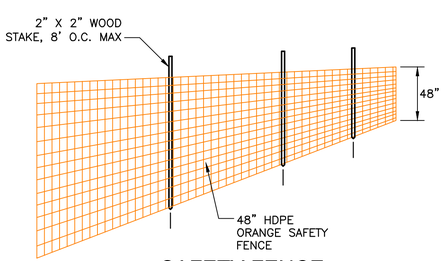


SIGN D

CONSTRUCTION SIGNAGE
NOT TO SCALE

CONSTRUCTION SIGN NOTES:
1. SIGN SHALL CONFORM TO LATEST FHWA "STANDARD HIGHWAY SIGNS"
2. SIGNS SHALL NOT BE MOUNTED HIGHER THAN 4' ABOVE EXISTING GRADE.
3. IF WORKING IN MULTIPLE NON ADJACENT AREAS, THE CONTRACTOR SHALL PROVIDE ANY ADDITIONAL SIGNS REQUIRED AT THEIR OWN EXPENSE. THESE SIGNS SHALL REMAIN THE CONTRACTORS PROPERTY AT THE COMPLETION OF THE PROJECT.
4. THE CONTRACTOR SHALL ANCHOR THE SIGNS TO RESIST JET BLAST AND/OR WIND.
5. ALL COSTS ASSOCIATED WITH FURNISHING, INSTALLING AND MAINTAINING SIGNS SHALL BE INCIDENTAL TO THE VARIOUS CONTRACT PAY ITEMS.
6. REFER TO PHASING PLANS FOR SIGN LOCATIONS.

SAFETY FENCE NOTES:
1. CONTINUOUS SAFETY FENCE TO BE INSTALLED FOR EACH PHASE OF THE PROJECT TO PROVIDE A BARRIER BETWEEN CONSTRUCTION AREAS AND OPERATIONAL AREAS.
2. SAFETY FENCE TO BE INSTALLED AS SHOWN ON THE INDIVIDUAL PHASING PLANS OR AS DIRECTED BY THE RPR.



SAFETY FENCE
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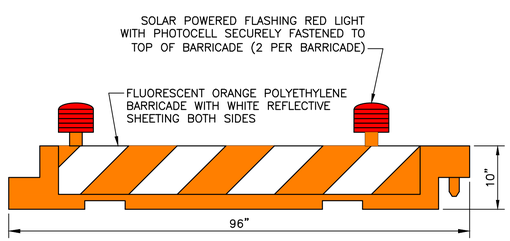
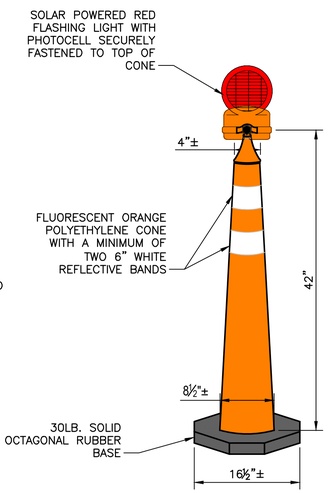


LIGHTED LOW PROFILE BARRICADE
NOT TO SCALE

SAFETY FENCE, LIGHTED CHANNELIZER CONE AND LIGHTED LOW PROFILE BARRICADE NOTES:
1. ALL COSTS ASSOCIATED WITH FURNISHING, INSTALLING AND MAINTAINING SAFETY FENCE, BARRICADES, AND CONES SHALL BE INCIDENTAL TO THE VARIOUS CONTRACT PAY ITEMS.
2. THE LIGHTED SAFETY BARRICADES SHALL BE PLACED WHERE SHOWN ON PLANS AND BE USED WHEN A WORK AREA IS DIRECTLY ADJACENT TO AN ACTIVE TAXIWAY OR RUNWAY TO KEEP AIRCRAFTS AND VEHICLES FROM TRAVELING INTO A WORK AREA.
3. BARRICADES SHALL BE INTERCONNECTED ON AIRFIELD PAVEMENTS AND WITHIN A.O.A.'s. BARRICADE SPACING MAY BE INCREASED TO 4' ON CENTER IN ALL OTHER AREAS UNLESS OTHERWISE DIRECTED BY THE RPR. REFER TO PHASING DRAWINGS G201 THROUGH G207.
4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR RELOCATING AND/OR PROVIDING ADDITIONAL BARRICADES AROUND THE SITE AS NECESSARY TO ACCOMMODATE THE PROPOSED WORK AND IN ACCORDANCE WITH THE PHASING PLANS.
5. THE CONTRACTOR SHALL ENSURE THE CONTINUOUS OPERATION OF ALL LIGHTS FOR THE DURATION OF THE PROJECT. LIGHTS AND BATTERIES SHALL BE REPLACED AS NEEDED.
6. THE BARRICADES SHALL BE FILLED WITH WATER.
7. CHANNELIZER CONES SHALL BE PLACED CONTINUOUSLY AT 4' ON CENTER.



LIGHTED CHANNELIZER CONE
NOT TO SCALE

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Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID C. DEPOE 15257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN NOTES AND DETAILS

Project No.
179450522

Drawing No.	Sheet	Revision
G101	5 of 79	0

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5/28/2024 9:06 AM By: ZACHARY.DONAHEE
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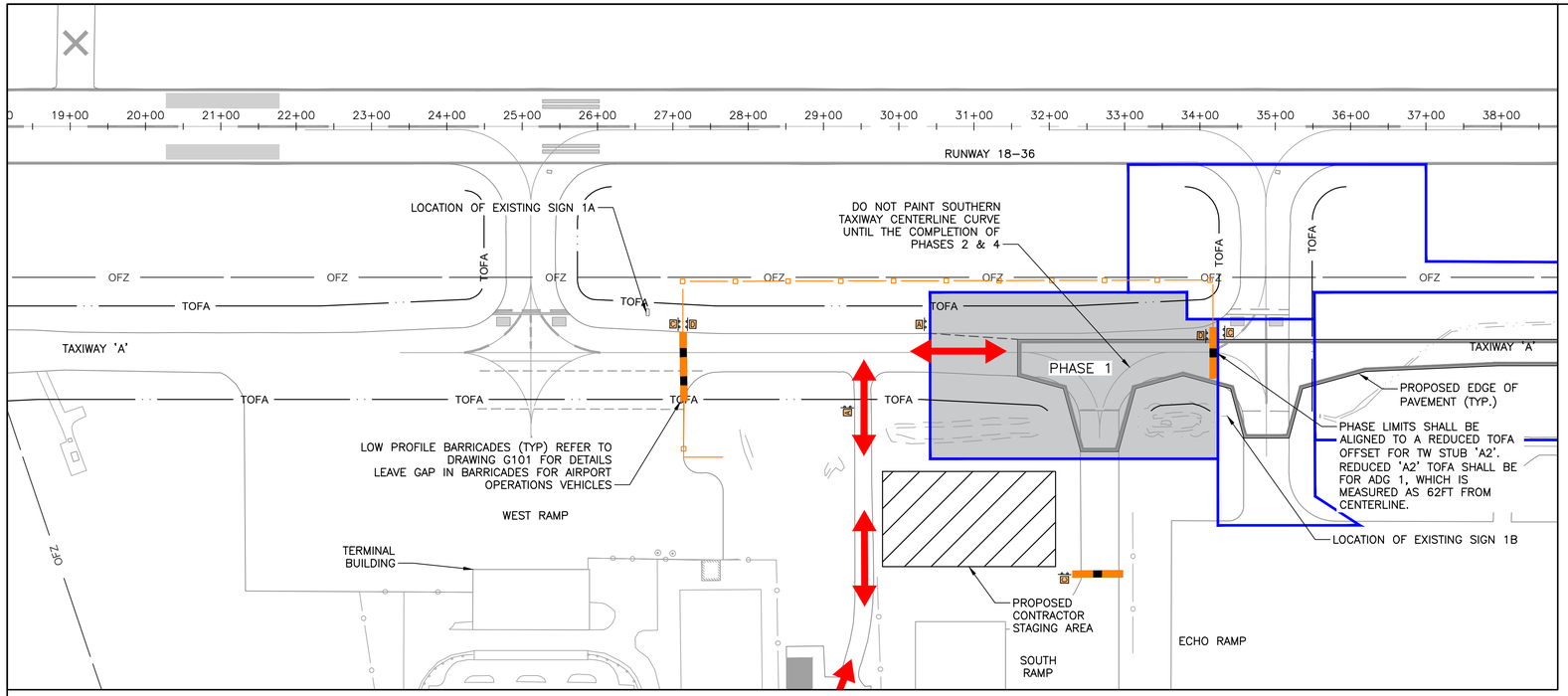


PHASE 1 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 1

DESCRIPTION: TW A RECONSTRUCTION BETWEEN TERMINAL RAMP AND SOUTH RAMP

DURATION: 42 CONSECUTIVE CALENDAR DAYS – DAY WORK

WORK SCHEDULE: MONDAY – FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- TAXIWAY 'A' (TERMINAL RAMP TO SOUTH RAMP).
- ACCESS TO THE MAINTENANCE RAMP AND THE SOUTH RAMP.

MAJOR WORK ITEMS:

CIVIL
- PAVEMENT REMOVAL.
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT CONTROL STRIP – THE CONTRACTOR SHALL NOT COMMENCE ANY OTHER PHASES UNTIL THE CONTROL STRIP HAS BEEN ACCEPTED BY THE RPR.
- ASPHALT MIX PAVEMENT, BASE LIFT ONLY (TOP LIFT SHALL BE PAVED WITH PHASE 2)
- TEMPORARY PAVEMENT MARKINGS.
- TOPSOIL, SEED AND MULCH

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- DEMOLITION OF EXISTING TAXIWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, DUCTBANK, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND HANDHOLES.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

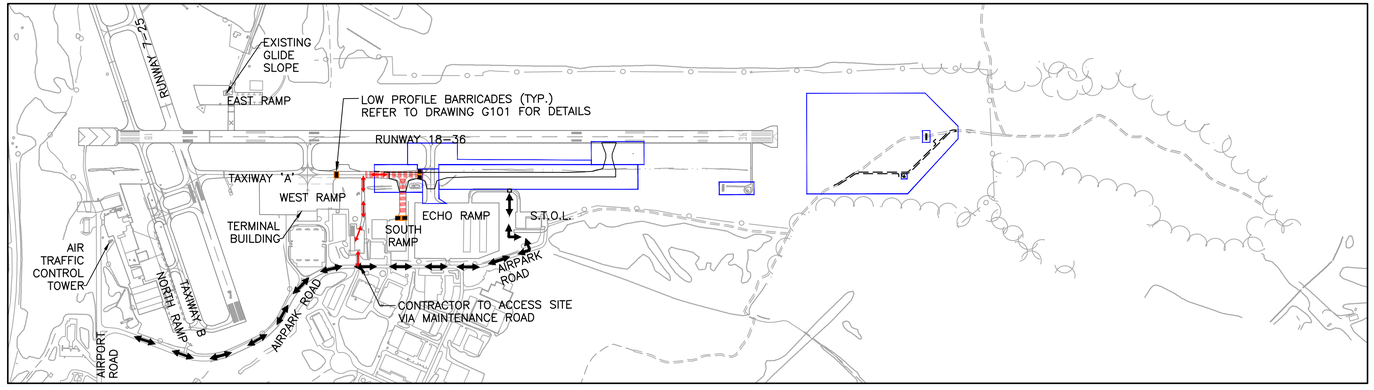
AFFECTED CIRCUITS/NAVAIDS:
- TAXIWAY 'A'.
- CIRCUITS SHALL BE LOOPED OUT AT ISOLATION TRANSFORMER AS SHOWN ON E201 TEMPORARY LIGHTING PLAN TO DE–ENERGIZE CIRCUIT SOUTH OF THIS POINT WHILE MAINTAINING TAXIWAY 'A' AND 'A1' FIXTURES AND SIGNS.
- TW 'A' SIGNAGE AND EDGE LIGHTS FROM THE WEST RAMP TO TW 'A2' SHALL BE COVERED OR REMOVED FROM SERVICE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7–25 SHALL REMAIN OPEN.
- RUNWAY 18–36 SHALL REMAIN OPEN.
- TAXIWAY A CLOSED SOUTH OF WEST RAMP.
- CONTRACTOR TO LEAVE ROOM FOR OPERATIONS VEHICLES TO DRIVE BETWEEN WEST RAMP AND MAINTENANCE BUILDING.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

PHASE 1 SIGN BLACKOUTS

SIGN NUMBER	SIGN LEGEND A
1A	A
1B	A

NOTE:

REFER TO DRAWING E201 FOR TEMPORARY LIGHTING PLAN

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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 1

Project No.
179450522

Drawing No.	Sheet	Revision
G201	6 of 79	0

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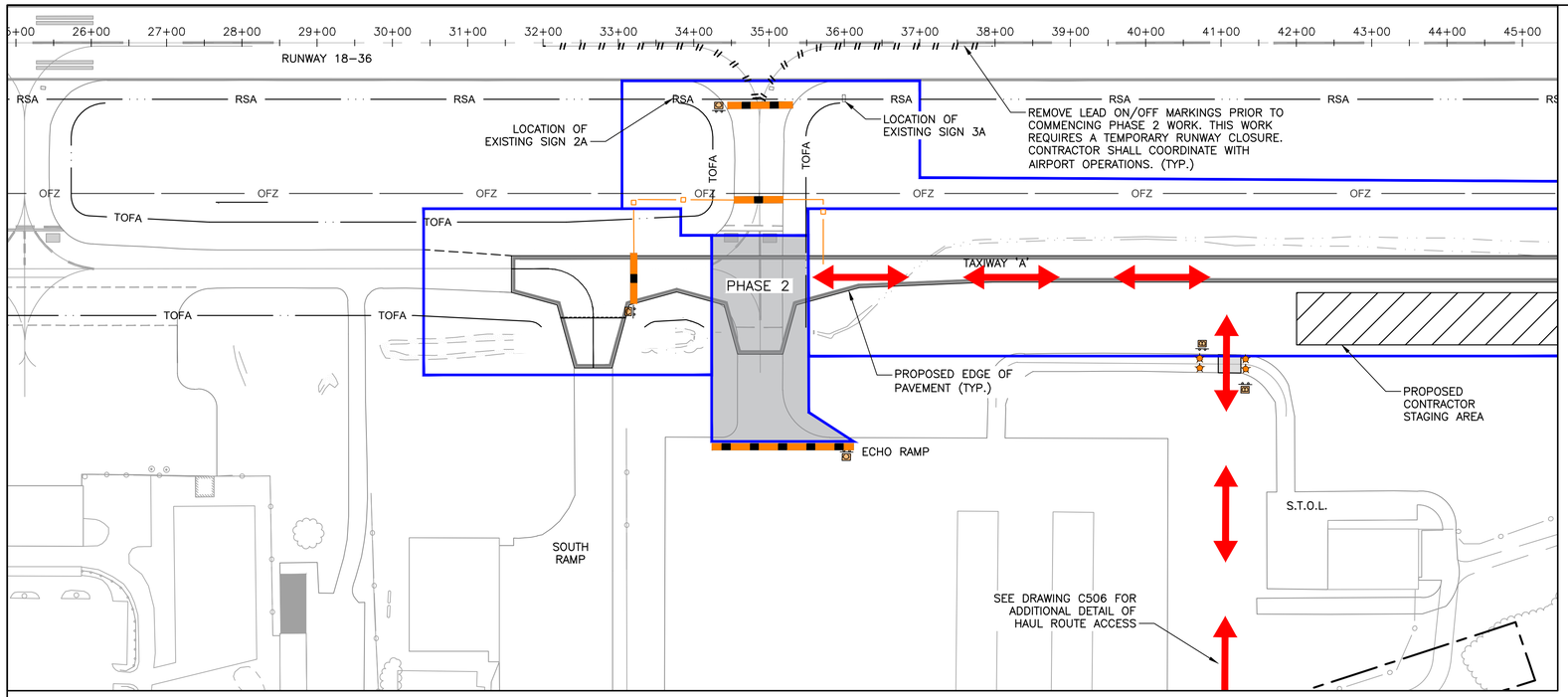


PHASE 2 AREA
SCALE: 1"=100'

0 100' 200'

PHASE 2

DESCRIPTION: TW A RECONSTRUCTION AT ECHO RAMP

DURATION: 21 CONSECUTIVE CALENDAR DAYS – DAY WORK

WORK SCHEDULE: MONDAY – FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- TAXIWAY 'A' (ECHO RAMP INTERSECTION)
- TAXIWAY STUB 'A2'
- RUNWAY 18–36 (TEMPORARY FOR PAVEMENT MARKING REMOVAL)

MAJOR WORK ITEMS:

CIVIL
- PAVEMENT MARKING REMOVAL. (TAXIWAY A2 CENTERLINE REMOVAL WORK REQUIRES TEMPORARY RUNWAY CLOSURE. CONTRACTOR TO COORDINATE WITH AIRPORT OPERATIONS.)
- PAVEMENT REMOVAL.
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL, SEED & MULCH.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- DEMOLITION OF EXISTING TAXIWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, DUCTBANK, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND HANDHOLES.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

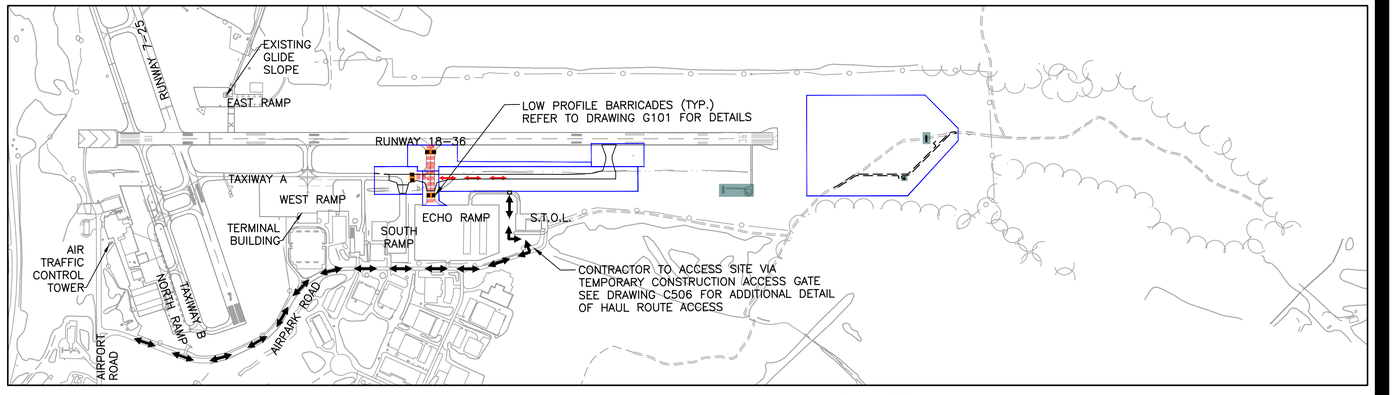
AFFECTED CIRCUITS/NAVAIDS:
- TAXIWAY 'A'.
- TW 'A' SIGNAGE AND EDGE LIGHTS FROM THE SOUTH RAMP TO TW 'A2' SHALL BE INSTALLED PER E201 TEMPORARY LIGHTING PLAN.
- TAXIWAY 'A' SIGNAGE AND EDGE LIGHTS REMAIN OPERATIONAL FROM INTERSECTION WITH THE SOUTH RAMP TO RUNWAY 7–25.
- TW 'A2' SIGNAGE AND EDGE LIGHTS FROM THE ECHO RAMP TO RW 18–36 SHALL BE COVERED OR REMOVED FROM SERVICE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7–25 SHALL REMAIN OPEN.
- RUNWAY 18–36 SHALL REMAIN OPEN.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'

0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

PHASE 2 SIGN BLACKOUTS

SIGN NUMBER	SIGN LEGEND A
2A	A2
3A	A2

NOTE:

REFER TO DRAWING E201 FOR TEMPORARY LIGHTING PLAN

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

PHASING AND SAFETY PLAN - 2

Project No. 179450522

Drawing No.	Sheet	Revision
G202	7 of 79	0

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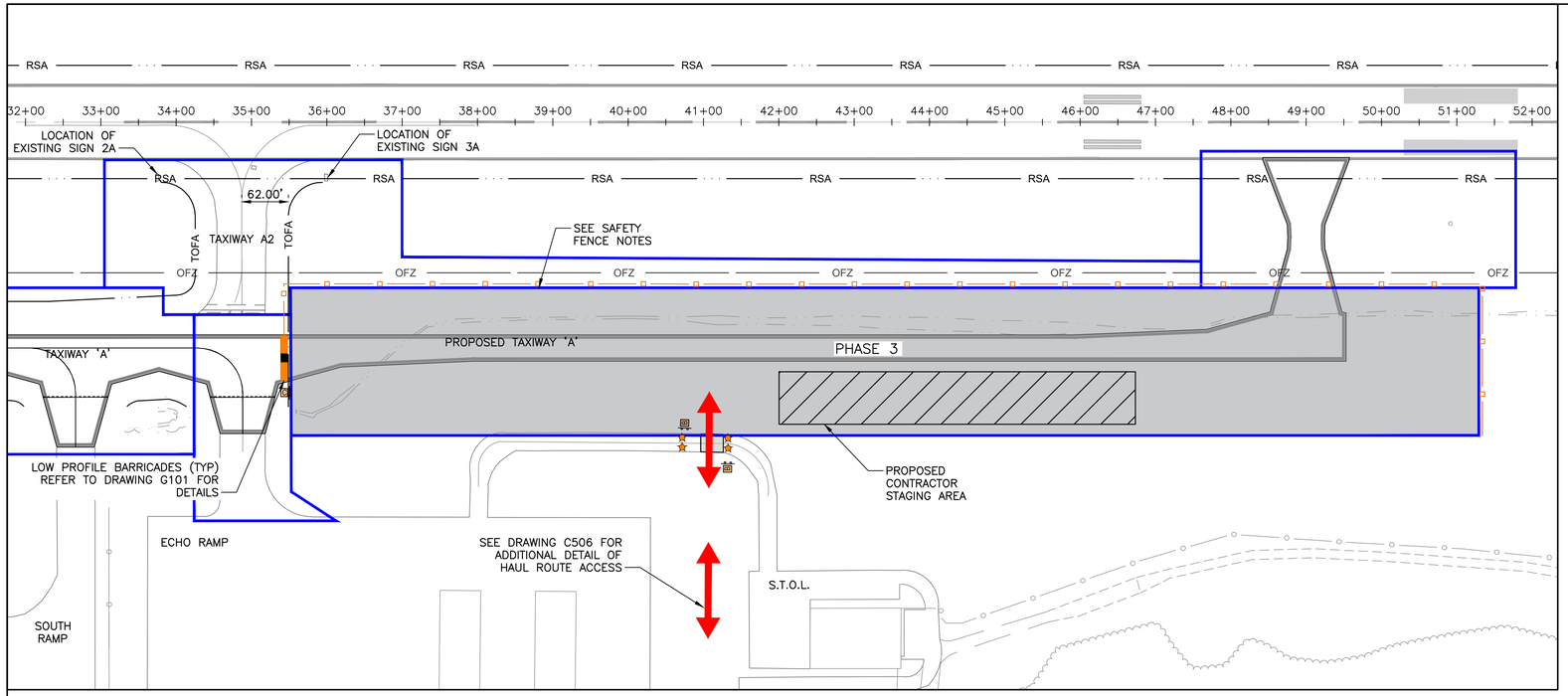


PHASE 3 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 3

DESCRIPTION: EXTENSION OF TW A BETWEEN EXISTING AND NEW TW STUB A2

DURATION: 168 CONSECUTIVE CALENDAR DAYS – DAY WORK

WORK SCHEDULE: MONDAY – FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- NONE.

MAJOR WORK ITEMS:

CIVIL
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL AND SEED.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- MODIFICATION OF EXISTING RUNWAY 36 PAPI POWER FEED.
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND JUNCTION CANS.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

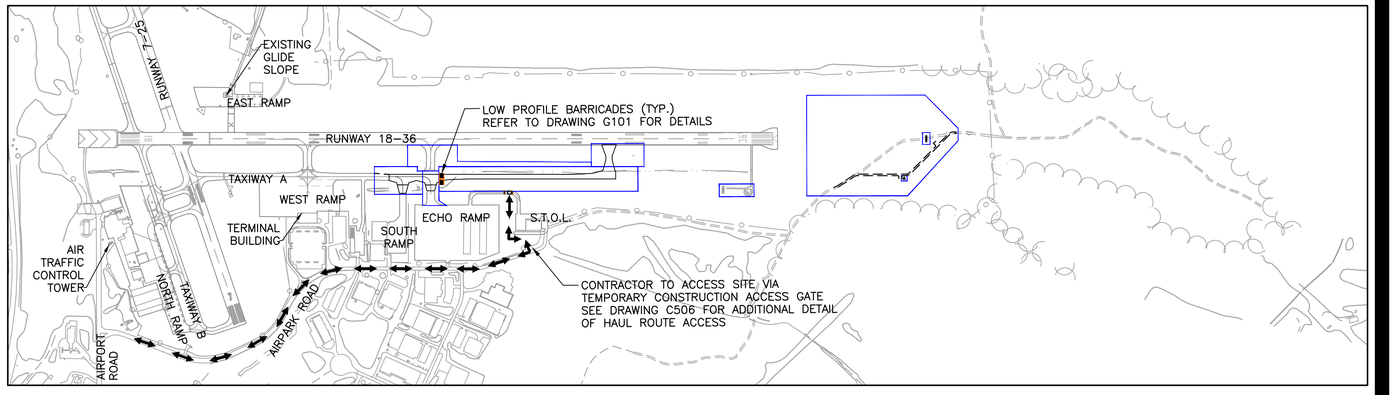
AFFECTED CIRCUITS/NAVAIDS:
- RW 18 LOCALIZER WILL BE SHUT DOWN FOR THE REMAINDER OF THE PROJECT.
- TW 'A' REMAINS OPERATIONAL BETWEEN RW 7–25 AND ECHO RAMP REFER TO E201 TEMPORARY LIGHTING PLAN.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7–25 SHALL REMAIN OPEN.
- RUNWAY 18–36 SHALL REMAIN OPEN.
- AIRPORT TO REQUIRE TENANT ON BLUE HANGAR TO PROVIDE A 30–MIN NOTICE TO CONTRACTOR FOR MOVEMENT. CONTRACTOR TO SWEEP THE TAXILANE AND REMOVE CHANNELIZER CONES ONCE TAXILANE IS CLEAR FOR AIRCRAFT USE. CONTRACTOR TO REPLACE CHANNELIZER CONES ONCE AIRCRAFT HAS CLEARED THE AREA.
- TAXIWAY 'A' BETWEEN THE SOUTH RAMP AND ECHO RAMP WILL OPERATE WITH A REDUCED TOFA OF 62' TO ACCOMMODATE ADG 1.
- SAFETY FENCE SHOWN FOR PHASE 3 IS NOT REQUIRED WHEN PHASE 3 IS CONCURRENT WITH PHASES 4 AND 5. SAFETY FENCE TO BE ERECTED WHEN PHASE 3 WORK IS CONCURRENT WITH ACTIVE RUNWAY 18–36 OPERATIONS.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

PHASING AND SAFETY PLAN - 3

Project No. 179450522

Drawing No. G203 | Sheet 8 of 79 | Revision 0

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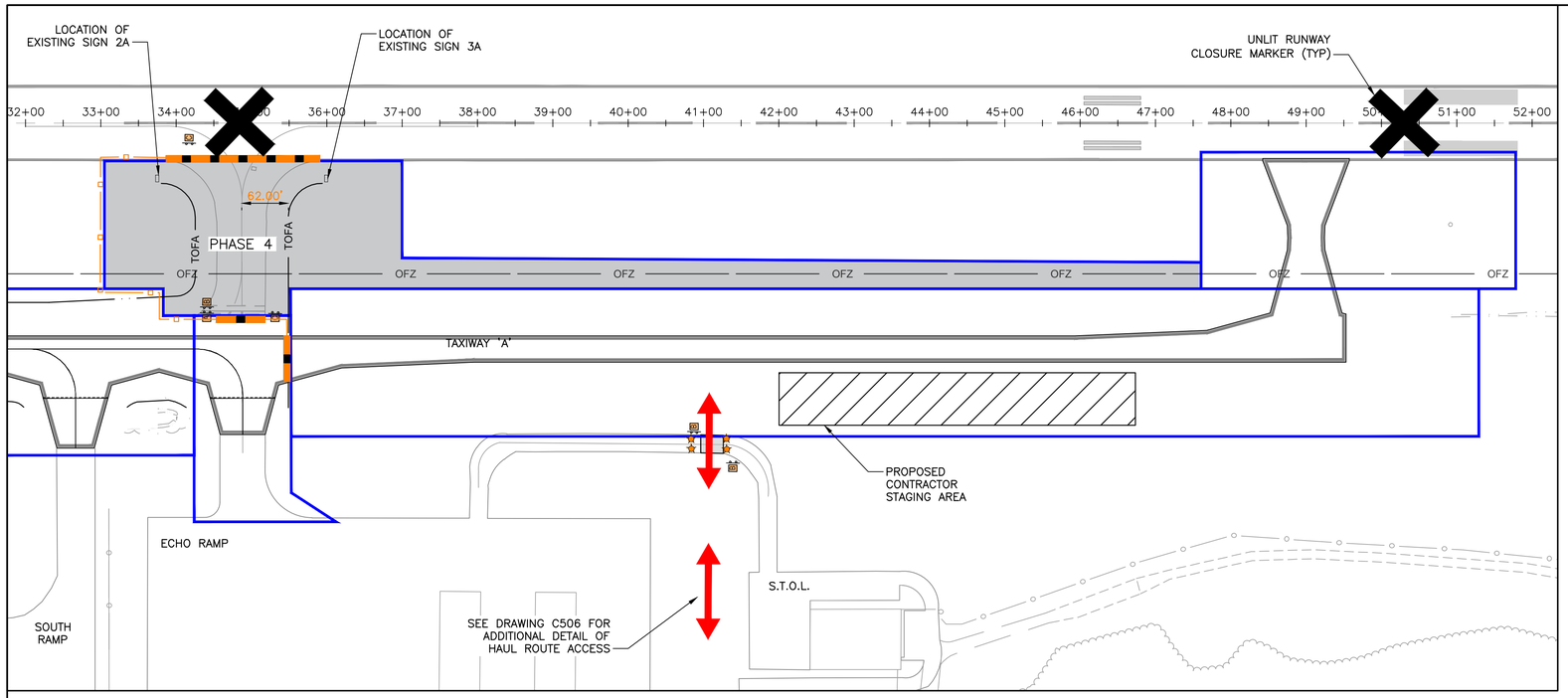


PHASE 4 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 4

DESCRIPTION: DEMOLITION OF EXISTING TW STUB A2 AND INSTALLATION OF DIVERSION SWALE BETWEEN EXISTING & NEW TW STUB A2

DURATION: 21 CONSECUTIVE CALENDAR DAYS – DAY WORK

WORK SCHEDULE: MONDAY – FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18–36.
- TAXIWAY STUB 'A2'.

MAJOR WORK ITEMS:

CIVIL
- PAVEMENT REMOVAL.
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL AND SEED.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- DEMOLITION OF EXISTING RUNWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURE, LIGHT BASE, CONDUIT, CABLE, JUNCTION CANS, AIRFIELD SIGNAGE).
- DEMOLITION OF EXISTING TAXIWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, DUCTBANK, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW RUNWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURE, LIGHT BASE, CONDUIT, CABLE).

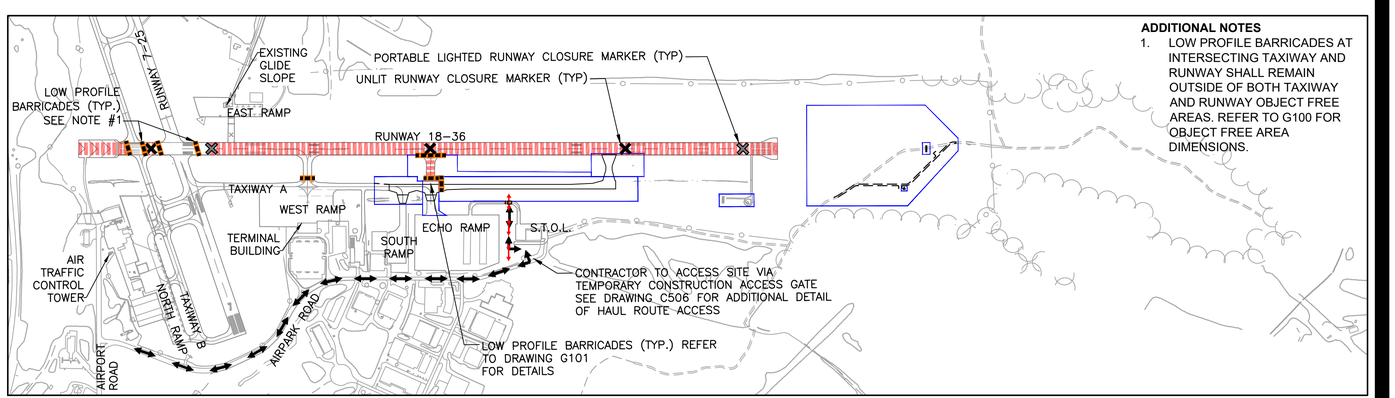
AFFECTED CIRCUITS/NAVAIDS:
- TW 'A2' SIGNAGE AND EDGE LIGHTS FROM THE ECHO RAMP TO RW 18–36 SHALL BE REMOVED FROM SERVICE.
- RW 18 LOCALIZER & GLIDE SLOPE NOT IN SERVICE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7–25 SHALL REMAIN OPEN.
- AIRPORT TO REQUIRE TENANT ON BLUE HANGAR TO PROVIDE A 30–MIN NOTICE TO CONTRACTOR FOR MOVEMENT. CONTRACTOR TO SWEEP THE TAXILANE AND REMOVE CHANNELIZER CONES ONCE TAXILANE IS CLEAR FOR AIRCRAFT USE. CONTRACTOR TO REPLACE CHANNELIZER CONES ONCE AIRCRAFT HAS CLEARED THE AREA.
- TAXIWAY 'A' BETWEEN THE SOUTH RAMP AND ECHO RAMP WILL OPERATE WITH A REDUCED TOFA OF 62' TO ACCOMMODATE ADG 1.

LEGEND

- PHASE LIMITS
- CHANNELIZER CONES
- LOW PROFILE BARRICADE
- RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)
- SAFETY FENCE
- PRIMARY HAUL ROUTE
- PHASE HAUL ROUTE

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

PHASE 4 SIGN BLACKOUTS

SIGN NUMBER	SIGN LEGEND A
2A	A2
3A	A2

NOTE:

REFER TO DRAWING E201 TEMPORARY LIGHTING PLAN

ADDITIONAL NOTES

1. LOW PROFILE BARRICADES AT INTERSECTING TAXIWAY AND RUNWAY SHALL REMAIN OUTSIDE OF BOTH TAXIWAY AND RUNWAY OBJECT FREE AREAS. REFER TO G100 FOR OBJECT FREE AREA DIMENSIONS.

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THE STATE OF NEW HAMPSHIRE DAVID C. DEROSE 12257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 4

Project No.
179450522

Drawing No.	Sheet	Revision
G204	9 of 79	0

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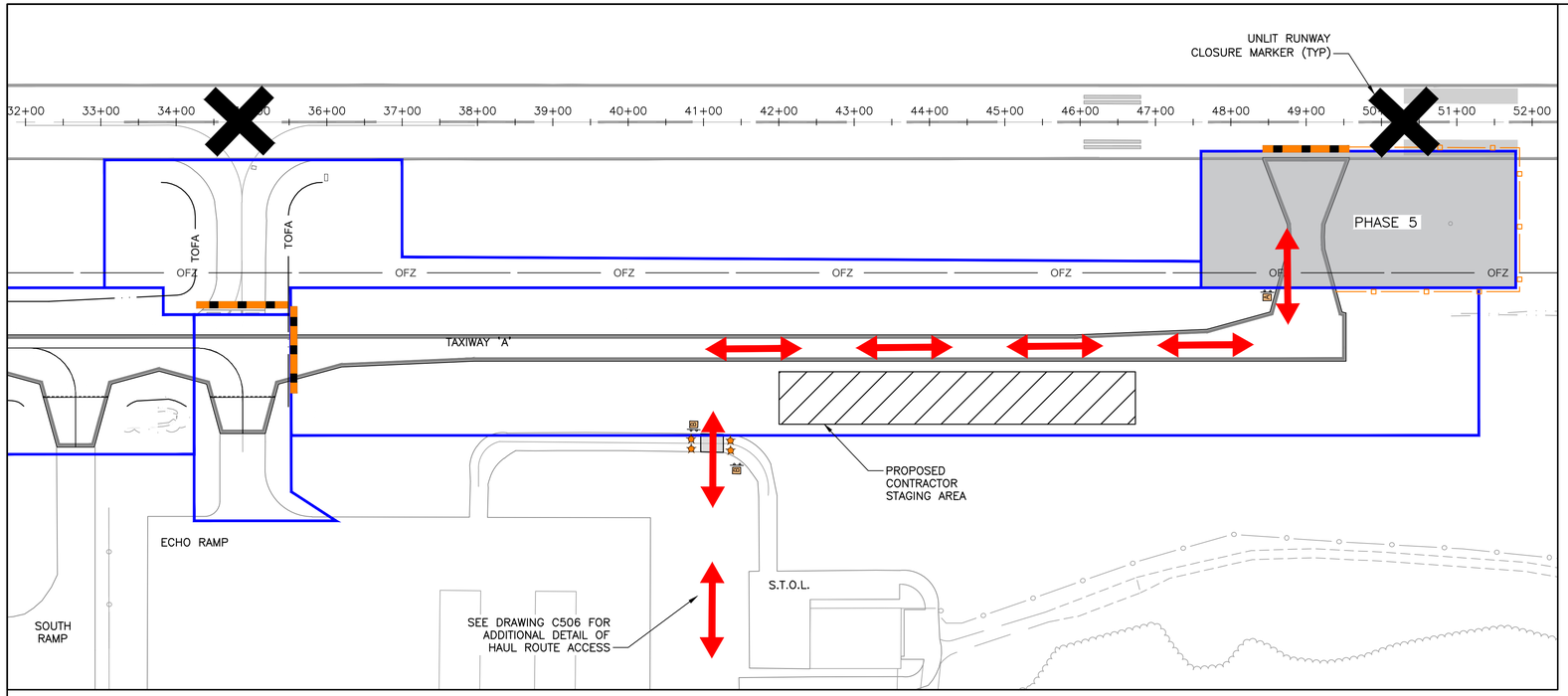


PHASE 5 AREA
SCALE: 1"=100'
0 100' 200'

PHASE 5

DESCRIPTION: NEW TW STUB A2

DURATION: 24 CONSECUTIVE CALENDAR DAYS – DAY WORK

WORK SCHEDULE: MONDAY – FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18–36.
- TAXIWAY STUB 'A1'.
- TAXIWAY STUB 'A2'.

MAJOR WORK ITEMS:

CIVIL
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- ASPHALT MIX PAVEMENT.
- PAVEMENT MARKINGS.
- TOPSOIL, SEED AND MULCH.

STORMWATER
- SAND FILTER.
- UNDERDRAIN SYSTEM.
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- DEMOLITION OF EXISTING RUNWAY EDGE LIGHTING SYSTEM (LIGHT FIXTURE, LIGHT BASE, CONDUIT, CABLE, JUNCTION CANS, AIRFIELD SIGNAGE).
- NEW RUNWAY EDGE LIGHTING SYSTEM (CONDUIT, CABLE).
- NEW TAXIWAY EDGE LIGHTING SYSTEM (LED LIGHT FIXTURES, LIGHT BASES, CONDUIT, CABLE, JUNCTION CANS).
- NEW ELECTRICAL DUCTBANK AND HANDHOLES.
- NEW AIRFIELD GUIDANCE SIGNAGE, FOUNDATIONS, AND JUNCTION CANS.

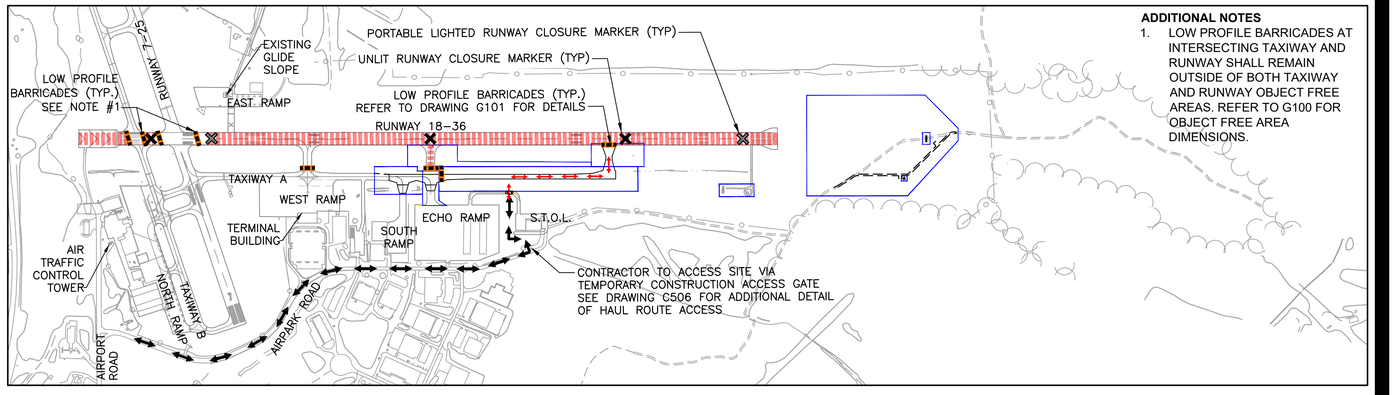
AFFECTED CIRCUITS/NAVAIDS:
- RW 18–36 LIGHTS & PAPIS.
- RW 18 LOCALIZER & GLIDE SLOPE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7–25 SHALL REMAIN OPEN.
- AIRPORT TO REQUIRE TENANT ON BLUE HANGAR TO PROVIDE A 30–MIN NOTICE TO CONTRACTOR FOR MOVEMENT. CONTRACTOR TO SWEEP THE TAXILANE AND REMOVE CHANNELIZER CONES ONCE TAXILANE IS CLEAR FOR AIRCRAFT USE. CONTRACTOR TO REPLACE CHANNELIZER CONES ONCE AIRCRAFT HAS CLEARED THE AREA.

LEGEND

PHASE LIMITS	SAFETY FENCE
CHANNELIZER CONES	PRIMARY HAUL ROUTE
LOW PROFILE BARRICADE	PHASE HAUL ROUTE
RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)	

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

ADDITIONAL NOTES
1. LOW PROFILE BARRICADES AT INTERSECTING TAXIWAY AND RUNWAY SHALL REMAIN OUTSIDE OF BOTH TAXIWAY AND RUNWAY OBJECT FREE AREAS. REFER TO G100 FOR OBJECT FREE AREA DIMENSIONS.

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

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0 ISSUED FOR BID	DMZ	LAM	24.01.31

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Permit-Seal

THE STATE OF NEW HAMPSHIRE
DAVID M. ZIZMANN
12257
LICENSED
PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 5

Project No.
179450522

Drawing No.	Sheet	Revision
G205	10 of 79	0

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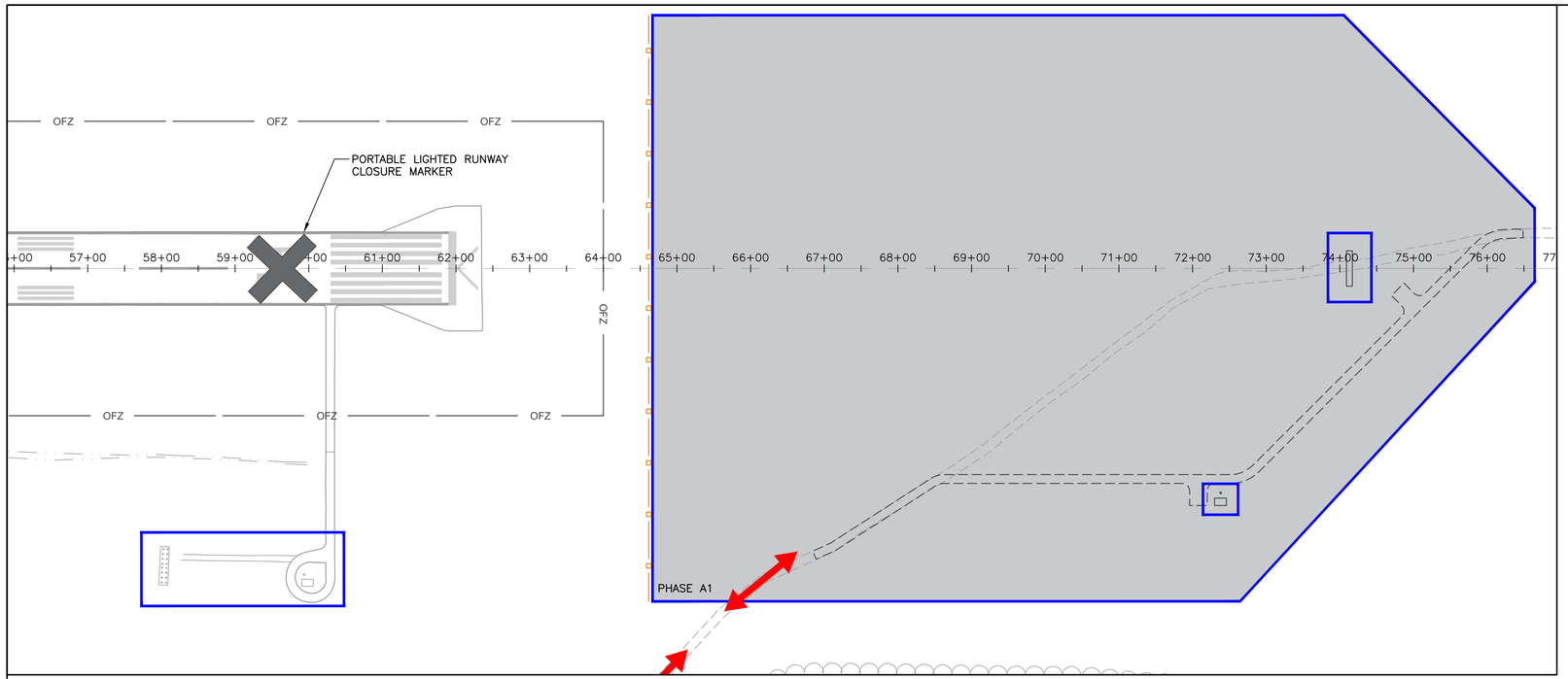
2/28/2024 1:09 PM By: Zizmann, Dominic

ORIGINAL SHEET - ANSI D



PHASE A1 AREA
SCALE: 1"=100'
0 100' 200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

LEGEND

- PHASE LIMITS
- CHANNELIZER CONES
- LOW PROFILE BARRICADE
- RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)
- SAFETY FENCE
- PRIMARY HAUL ROUTE
- PHASE HAUL ROUTE

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.

PHASE A1

DESCRIPTION: LOCALIZER CRITICAL AREA GRADING (ADD-ALTERNATE #1)

DURATION: 49 CONSECUTIVE CALENDAR DAYS – DAY WORK

WORK SCHEDULE: MONDAY – FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18–36.

MAJOR WORK ITEMS:

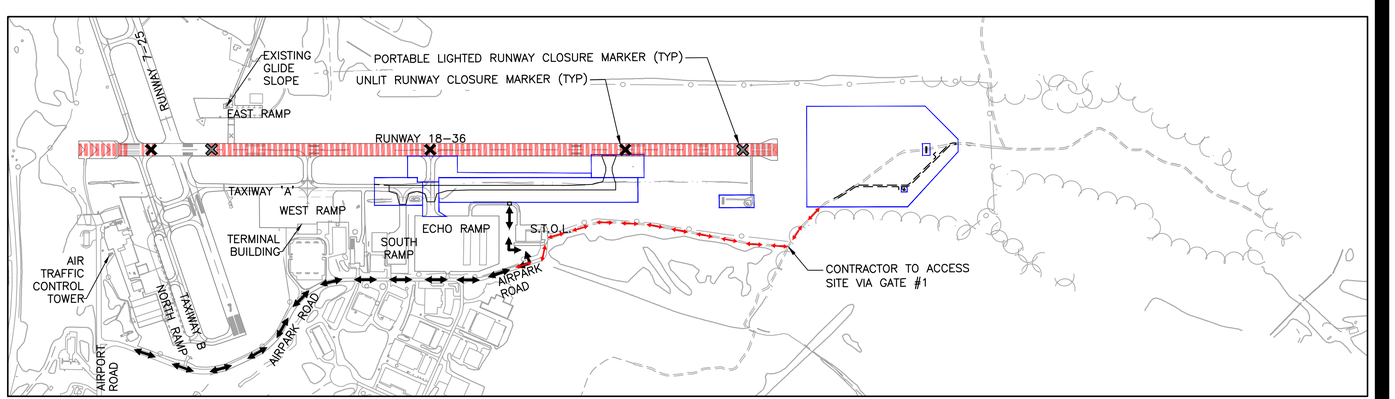
CIVIL
- GRADING AND EXCAVATION.
- PLACING AND COMPACTING SUBBASE AND BASE.
- TOPSOIL AND SEED.

STORMWATER
- CATCH BASINS.
- RCP PIPE.

ELECTRICAL
- NONE.

AFFECTED CIRCUITS/NAVAIDS:
- RW 18–36 LIGHTS & PAPIS.
- RW 18 LOCALIZER & GLIDE SLOPE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7–25 SHALL REMAIN OPEN.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

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THE STATE OF NEW HAMPSHIRE DAVID C. DEROSE 12257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 6

Project No.
179450522

Drawing No.	Sheet	Revision
G206	11 of 79	0

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02/6/2024 1:11 PM By: ZACCARIA, DANIELLE

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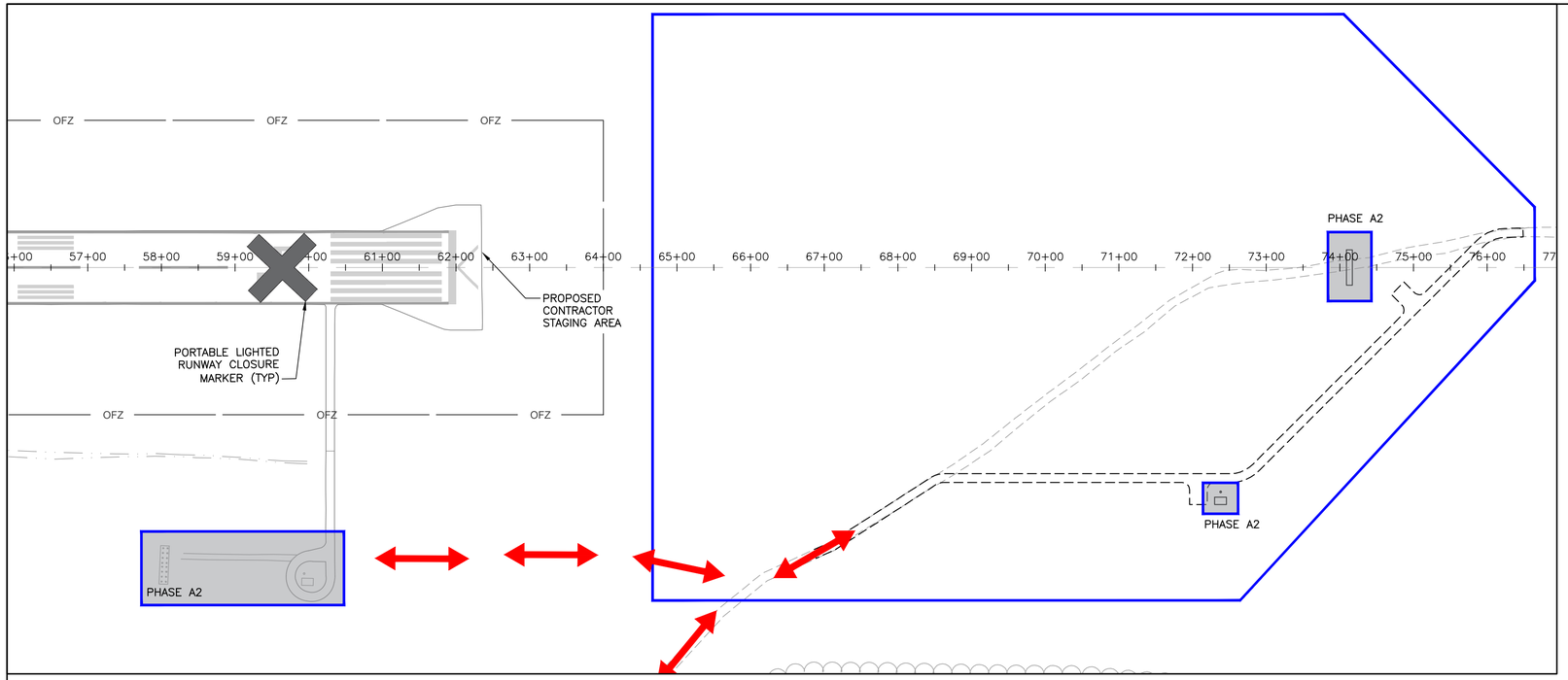


PHASE A2 AREAS
SCALE: 1"=100'
0 100' 200'

SIGN LEGEND

A	ACCESS WORK AREA HERE
B	STOP GIVE WAY TO AIRCRAFT
C	TAXIWAY CLOSED
D	STOP WAIT FOR ESCORT

NOTE:

REFER TO DRAWING G101 FOR SIGN DETAILS

LEGEND

- PHASE LIMITS
- CHANNELIZER CONES
- LOW PROFILE BARRICADE
- RUNWAY/TAXIWAY CLOSURE(S) (REFER TO KEY PLAN BELOW)
- SAFETY FENCE
- PRIMARY HAUL ROUTE
- PHASE HAUL ROUTE

NOTE: ACCESS ROUTES ARE SUBJECT TO CHANGE BASED ON PREVAILING WIND AND RUNWAY CONFIGURATION IN USE. ACCESS ROUTES ARE DESIGNATED BY LEBANON OPERATIONS TO AVOID CROSSING ACTIVE RUNWAYS AND MINIMIZE CROSSINGS OF ACTIVE TAXI ROUTES. USE OF ALTERNATE ROUTE(S) SHALL NOT BE CONSIDERED A VALID REASON FOR ANY CLAIM FOR EXTRA TIME OR COMPENSATION.

PHASE A2

DESCRIPTION: EXISTING LOCALIZER DISMANTLING & RELOCATION PER VOLUME II DRAWINGS (ADD–ALTERNATE #2)

DURATION: 28 CONSECUTIVE CALENDAR DAYS – DAY WORK

WORK SCHEDULE: MONDAY – FRIDAY: 7:00 AM TO 5:00 PM
SATURDAY: 7:00 AM TO 3:00 PM
SUNDAY: NO WORK

CONCURRENT PHASES: N/A

CLOSURES:
- RUNWAY 18–36.

MAJOR WORK ITEMS:

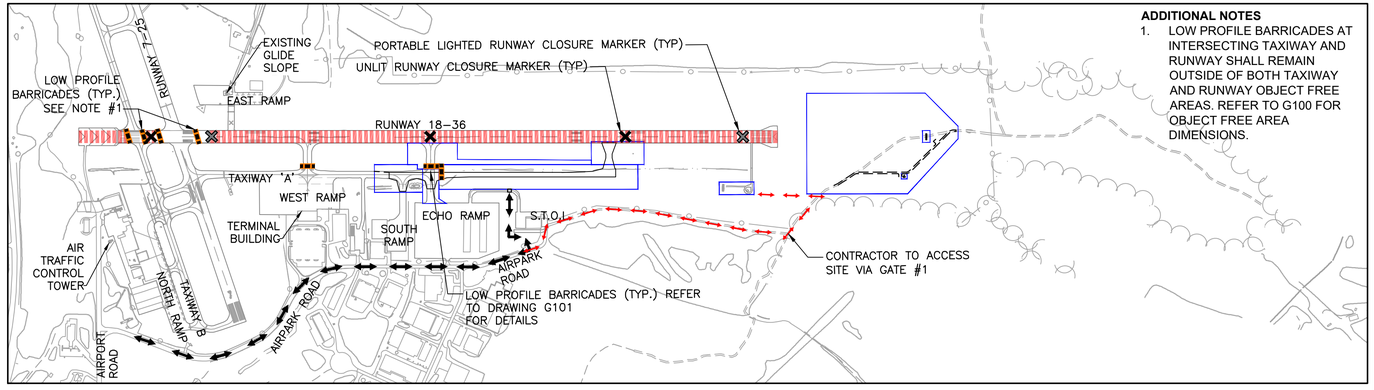
CIVIL
- INSTALLATION OF CONCRETE FOUNDATIONS FOR LOCALIZER ARRAY, LOCALIZER SHELTER BUILDING, AND DME AS SPECIFIED IN THE VOL II DRAWINGS.

STORMWATER
- NONE.

ELECTRICAL
- DISMANTLING OF EXISTING LOCALIZER ANTENNA ARRAY AND DME EQUIPMENT AS SPECIFIED IN THE VOL II DRAWINGS.
- REMOVAL OF EXISTING LOCALIZER SHELTER AS SPECIFIED IN THE VOL II DRAWINGS.
- INSTALLATION OF LOCALIZER ARRAY, DME AND NEW LOCALIZER SHELTER PRE–FABRICATED BUILDING, ALONG WITH ELECTRICAL REQUIRED AND SPECIFIED IN THE VOL II DRAWINGS.

AFFECTED CIRCUITS/NAVAIDS:
- RW 18–36 LIGHTS & PAPIS.
- RW 18 LOCALIZER & GLIDE SLOPE.

ADDITIONAL NOTES AND REQUIREMENTS
- RUNWAY 7–25 SHALL REMAIN OPEN.



KEY PLAN
SCALE: 1"=600'
0 600' 1200'

ADDITIONAL NOTES
1. LOW PROFILE BARRICADES AT INTERSECTING TAXIWAY AND RUNWAY SHALL REMAIN OUTSIDE OF BOTH TAXIWAY AND RUNWAY OBJECT FREE AREAS. REFER TO G100 FOR OBJECT FREE AREA DIMENSIONS.

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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
PHASING AND SAFETY PLAN - 7

Project No.
179450522

Drawing No.	Sheet	Revision
G207	12 of 79	0

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2/28/2024 1:09 PM By: Zdanion, Dominic

ORIGINAL SHEET - ANSI D

EXISTING EDGE OF PAVEMENT

IRPMS
N: 410200.44
E: 815154.90
EL: 551.66

RUNWAY 18–36

EXISTING CATCH BASINS

EXISTING RUNWAY LIGHT (TYP.)

EXISTING EDGE OF PAVEMENT

EXISTING TAXIWAY 'A2'

IRPMS
N: 409674.16
E: 814980.21
EL: 565.78

EXISTING TAXIWAY EDGE LIGHT (TYP.)

EXISTING CATCH BASIN TO REMAIN

EXISTING EDGE OF PAVEMENT

EXISTING TAXIWAY EDGE LIGHT (TYP.)

PROPOSED FULL DEPTH ASPHALT PAVEMENT

EXISTING TAXIWAY MARKINGS (TYP.)

STA. 226+68.42

EXISTING GRANITE STATE ELECTRIC HIGH VOLTAGE POWERLINE TO REMAIN UNDISTURBED

WEST RAMP

EXISTING EDGE OF PAVEMENT

MAINTENANCE ACCESS ROAD

EXISTING EDGE OF PAVEMENT

SOUTH RAMP

SOUTH RAMP TAXILANE

ECHO RAMP TAXILANE

EXISTING EDGE OF PAVEMENT

EXISTING EDGE OF PAVEMENT

N: 409924.73
E: 814548.88

N: 409711.14
E: 814611.34

ECHO RAMP

MATCH LINE – SEE DRAWING NO. V102

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT
- PROPOSED GRAVEL ROAD
- LIMIT OF GRADING

N

0 40' 80'

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THE STATE OF NEW HAMPSHIRE DAVID C. DUBOIS 15257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

EXISTING CONDITIONS PLAN - 1

Project No.		
1794505222		
Drawing No.	Sheet	Revision
V101	13 of 79	0

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2/29/2024 8:48 AM By: Kavanagh, Alexandra

ORIGINAL SHEET - ANSI D

EXISTING EDGE OF PAVEMENT

IRPMS
N: 408686.43
E: 815457.81
EL: 577.76

EXISTING RUNWAY MARKINGS (TYP.)

37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00

RUNWAY 18–36

EXISTING RUNWAY LIGHT (TYP.)

EXISTING CATCH BASIN

EXISTING EDGE OF PAVEMENT

EXISTING FAA ELECTRICAL FOR LOCALIZER AND PAPI

OFZ

MATCH LINE – SEE DRAWING NO. V101

MATCH LINE – SEE DRAWING NO. V103

PROPOSED TAXIWAY 'A'

PROPOSED TAXIWAY 'A' ALIGNMENT

237+00 238+00 239+00 240+00 241+00 242+00 243+00 244+00 245+00 246+00

EXISTING TAXILANE BETWEEN ECHO RAMP AND BLUE HANGAR

ECHO RAMP

BLUE HANGAR

INV.=565.13

INV.=565.25

INV.=567.90

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT
- PROPOSED GRAVEL ROAD
- LIMIT OF GRADING

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12/27/2024 8:49 AM By: Kavanagh, Alexandra

ORIGINAL SHEET - ANSI D

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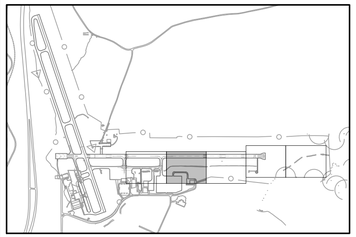

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

EXISTING CONDITIONS PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
V102	14 of 79	0

EXISTING EDGE OF PAVEMENT

IRPMS
N: 407927.23
E: 815613.38
EL: 589.48

47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00

403+00

RUNWAY 18–36

EXISTING EDGE OF PAVEMENT

EXISTING RUNWAY LIGHT (TYP.)

402+00

401+00

EXISTING 4–BOX PAPI

EXISTING PAPI POWER RACK

EXISTING FAA ELECTRICAL FOR PAPI AND LOCALIZER

OFZ

LOC

247+00 248+00 249+00 250+00 251+00 252+00 253+00 254+00 255+00

400+00

PROPOSED TAXIWAY 'A'

PROPOSED TAXIWAY 'A' ALIGNMENT

N: 407783.21
E: 815224.28

MATCH LINE – SEE DRAWING NO. V102

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT
- PROPOSED GRAVEL ROAD
- LIMIT OF GRADING

N

0 40' 80'

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THE STATE OF NEW HAMPSHIRE DAVID C. DEPOE 15257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
EXISTING CONDITIONS PLAN - 3

Project No.
179450522

Drawing No.	Sheet	Revision
V103	15 of 79	0

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05/24/2024 8:49 AM By: Kavanagh, Alexandra

ORIGINAL SHEET - ANSI D

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT
- PROPOSED GRAVEL ROAD
- LIMIT OF GRADING

IRPMS
N: 407359.62
E: 815729.70
EL: 589.71

EXISTING RUNWAY LIGHT (TYP.)

EXISTING RUNWAY MARKINGS (TYP.)

PROPOSED LOCALIZER CRITICAL AREA TO BE REGRADED (ADD-ALTERNATE #1)

RUNWAY 18-36

MAGF SO CHEV
N: 407157.75
E: 815658.71
EL: 0.00

58+00 59+00 60+00 61+00 62+00 63+00 64+00 65+00 66+00 67+00

OFZ

FUTURE TAXIWAY 'A3'

EXISTING LOCALIZER ACCESS ROAD

MATCH LINE - SEE DRAWING NO. V103

MATCH LINE - SEE DRAWING NO. V105

LOC

EXISTING FAA ELECTRICAL FOR LOCALIZER

EXISTING EDGE OF PAVEMENT

SD 24" RCP

CBR
R=591.99
A=583.99
B=584.14

CBR
R=594.92
A=587.72
B=587.67

EXISTING LOCALIZER ARRAY, SEE VOLUME 2 DRAWINGS FOR REQUIRED WORK UNDER THIS CONTRACT

DISK LEBE
N: 407280.34
E: 815266.55
EL: 601.29

EXISTING DME, SEE VOLUME 2 DRAWINGS FOR REQUIRED WORK UNDER THIS CONTRACT

EXISTING LOCALIZER SHELTER, SEE VOLUME 2 DRAWINGS FOR REQUIRED WORK UNDER THIS CONTRACT

FUTURE TAXIWAY 'A'

EXISTING GRAVEL ROAD

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12/9/2024 8:49 AM By: Kavanagh, Alexandria

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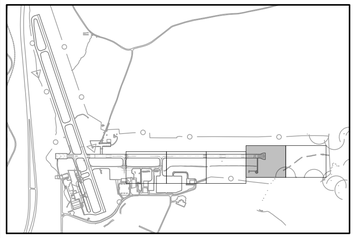

KEY MAP

N

0 40' 80'

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THE STATE OF NEW HAMPSHIRE DAVID C. DEMIZE 6257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

EXISTING CONDITIONS PLAN - 4
(ADD-ALTERNATE #1)

Project No.
179450522

Drawing No.	Sheet	Revision
V104	16 of 79	0

PROPOSED LOCALIZER CRITICAL AREA TO BE REGRADED (ADD–ALTERNATE #1)

PROPOSED LOCALIZER ANTENNA (ADD–ALTERNATE #2)

EXISTING GRAVEL ROAD

68+00 69+00 70+00 71+00 72+00 73+00 74+00 75+00 76+00 77+00 78+00

MATCH LINE – SEE DRAWING NO. V104

EXISTING GRAVEL ROAD

PROPOSED GRAVEL ROAD (ADD–ALTERNATE #1)

PROPOSED DME ANTENNA (ADD–ALTERNATE #2)

PROPOSED LOCALIZER SHELTER (ADD–ALTERNATE #2)

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT
- PROPOSED GRAVEL ROAD
- LIMIT OF GRADING

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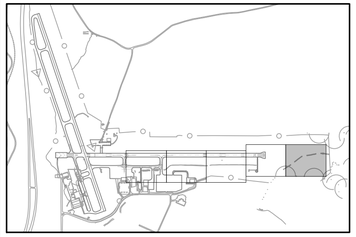

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

By	Appd.	YY.MM.DD

SEB	DCD	DMZ
Dwn.	Chkd.	Dsgn.

Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID M. ZIMMERMAN 15057 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

EXISTING CONDITIONS PLAN - 5
(ADD ALT #1)

Project No.
179450522

Drawing No.	Sheet	Revision
V105	17 of 79	0

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2/9/2024 8:49 AM By: Kavanagh, Alexandra

ORIGINAL SHEET - ANSI D

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- RSA — RUNWAY SAFETY AREA
- ROFA — RUNWAY OBJECT FREE AREA
- OFZ — RUNWAY OBSTACLE FREE ZONE
- LOC — LOCALIZER CRITICAL AREA
- TSA — TAXIWAY SAFETY AREA
- TOFA — TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- (L1) LINE SEGMENT NUMBER
- (C1) CURVE SEGMENT NUMBER

IRPMS
N: 410200.44
E: 815154.90
EL: 551.66

RUNWAY 18–36 ALIGNMENT

RUNWAY 18–36

EXISTING EDGE OF PAVEMENT

EXISTING EDGE OF PAVEMENT (TYP.)

100.00'

150.00'

200.00'

250.00'

300.00'

EXISTING TAXIWAY 'A'2 BITUMINOUS PAVEMENT TO BE REMOVED AND REPLACED WITH TURF

EXISTING TAXIWAY 'A2'

PROPOSED LIMIT OF GRADING (TYP.)

EXISTING PAVEMENT TO BE REMOVED AND REPLACED WITH TURF

EXISTING PAVEMENT TO BE RECONSTRUCTED (TYP.)

EXISTING EDGE OF PAVEMENT (TYP.)

PROPOSED EDGE OF PAVEMENT (TYP.)

IRPMS
N: 409674.16
E: 814980.21
EL: 565.78

EXISTING EDGE OF PAVEMENT (TYP.)

MATCH LINE – SEE DRAWING NO. C102

TAXIWAY A
STA: 230+41.53
O/S: 25.47' L
N: 410196.71
E: 814755.52

TAXIWAY A
STA: 231+58.00
O/S: 17.50' L
N: 410081.02
E: 814771.11

STA: 231+58.00
N: 410077.50
E: 814753.97

STA. 232+66.47 (TAXIWAY A) =
STA. 612+31.58 (SOUTH RAMP)
N: 409971.24
E: 814775.75

STA. 234+88.26 (TAXIWAY A) =
STA. 622+13.30 (ECHO RAMP)
N: 409753.97
E: 814820.29

39.50'

62.00'

PROPOSED FULL DEPTH PAVEMENT (TYP.)

TAXIWAY 'A'

L201

MEET EXISTING SAW AND SEAL JOINT (TYP.) SEE ASPHALT JOINT DETAIL ON C611

612+00

622+00

TAXIWAY A
STA: 231+58.00
O/S: 31.32' R
N: 410071.21
E: 814723.29

PROPOSED EDGE OF PAVEMENT (TYP.)

EXISTING EDGE OF PAVEMENT (TYP.)

SOUTH RAMP
STA: 611+83.70
O/S: 47.88' L
N: 410008.53
E: 814719.22

SOUTH RAMP
STA: 611+00.00
O/S: 25.00' L
N: 409969.31
E: 814641.83

MAINTENANCE ACCESS ROAD

EXISTING EDGE OF PAVEMENT

WEST RAMP

MEET EXISTING SAW AND SEAL JOINT (TYP.) SEE ASPHALT JOINT DETAIL ON C611

SOUTH RAMP TAXILANE

611+00

610+00

(L611)

STA: 611+00.00
N: 409944.81
E: 814646.85

EXISTING EDGE OF PAVEMENT (TYP.)

SOUTH RAMP

TAXIWAY A
STA: 233+77.36
O/S: 30.66' R
N: 409856.45
E: 814767.99

SOUTH RAMP
STA: 611+83.70
O/S: 47.88' R
N: 409914.71
E: 814738.46

SOUTH RAMP
STA: 611+00.00
O/S: 25.00' R
N: 409920.32
E: 814651.87

ECHO RAMP
STA: 621+65.41
O/S: 47.88' L
N: 409791.27
E: 814763.76

ECHO RAMP
STA: 620+99.90
O/S: 29.99' L
N: 409760.58
E: 814703.18

EXISTING PAVEMENT TO BE RECONSTRUCTED (TYP.)

ECHO RAMP TAXILANE

621+00

620+00

(L621)

TAXIWAY A
STA: 236+19.76
O/S: 25.02' R
N: 409620.12
E: 814822.19

ECHO RAMP
STA: 621+65.41
O/S: 47.88' R
N: 409697.45
E: 814782.99

ECHO RAMP
STA: 621+00.00
O/S: 30.00' R
N: 409701.83
E: 814715.32

MEET EXISTING SAW AND SEAL JOINT (TYP.) SEE ASPHALT JOINT DETAIL ON C611

STA: 621+00.00
N: 409731.22
E: 814709.30

EXISTING EDGE OF PAVEMENT (TYP.)

ECHO RAMP

SOUTH RAMP

ALIGNMENT LINE DATA							
SEGMENT	START STATION	START NORTH	START EAST	END STATION	END NORTH	END EAST	BEARING
L201	215+79.32	411624.02	814436.94	255+00.00	407783.21	815224.28	S11° 35' 05.41"E
L611	610+00.00	409924.73	814548.88	612+31.58	409971.24	814775.75	N78° 24' 54.59"E
L621	620+00.00	409711.14	814611.34	622+13.30	409753.97	814820.29	N78° 24' 54.59"E

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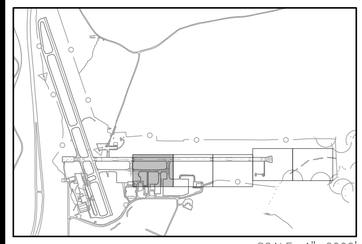

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

By	Appd.	YY.MM.DD

ABC	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID M. DEROSE 15577 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LAYOUT & ALIGNMENT PLAN - 1

Project No.
179450522

Drawing No.
C101

Sheet
19 of 79

Revision
0

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03/28/2024 1:14:1 AM By: Zaccaro, Dominic

ORIGINAL SHEET - ANSI D

IRPMS
N: 408686.43
E: 815457.81
EL: 577.76

RUNWAY 18–36 ALIGNMENT

RUNWAY 18–36

RUNWAY 18–36

37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00

100.00'
150.00'
200.00'
250.00'
300.00'

RSA

EXISTING EDGE OF PAVEMENT (TYP.)

LOC

EXISTING LOCALIZER CRITICAL AREA (TYP.)

PROPOSED LIMIT OF GRADING (TYP.)

OFZ

TOFA

ROFA

TSA

MATCH LINE – SEE DRAWING NO. C101

MATCH LINE – SEE DRAWING NO. C103

TAXIWAY A
STA: 245+92.86
O/S: 17.50' L
N: 408675.38
E: 815059.26

PROPOSED EDGE OF PAVEMENT (TYP.)

237+00 238+00 239+00 240+00 241+00 242+00 243+00 244+00 245+00 246+00

L201

PROPOSED TAXIWAY 'A'

35.00'
79.00'
124.00'

TAXIWAY A
STA: 237+95.39
O/S: 17.50' R
N: 409449.58
E: 814864.82

PROPOSED FULL DEPTH PAVEMENT (TYP.)

125'±

STA: 240+96.39
O/S: 113.84' R
N: 409135.37
E: 814830.89

STA: 241+26.39
O/S: 114.45' R
N: 409105.86
E: 814836.32

30.00'

24.00'

TAXILANE PAVEMENT TO BE REPAIRED AT END OF PROJECT AFTER ALL HAULING OPERATIONS ARE COMPLETE

MEET EXISTING SAW AND SEAL JOINT (TYP.) SEE ASPHALT JOINT DETAIL ON C611

TAXILANE BETWEEN ECHO RAMP AND BLUE HANGAR

TAXIWAY A
STA: 240+96.39
O/S: 137.82' R
N: 409130.55
E: 814807.40

TAXIWAY A
STA: 241+26.39
O/S: 138.33' R
N: 409101.06
E: 814812.93

EXISTING EDGE OF PAVEMENT (TYP.)

ECHO RAMP

ALIGNMENT LINE DATA							
SEGMENT	START STATION	START NORTH	START EAST	END STATION	END NORTH	END EAST	BEARING
L201	215+79.32	411624.02	814436.94	255+00.00	407783.21	815224.28	S11° 35' 05.41"E

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- RSA RUNWAY SAFETY AREA
- ROFA RUNWAY OBJECT FREE AREA
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TSA TAXIWAY SAFETY AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- (L1) LINE SEGMENT NUMBER
- (C1) CURVE SEGMENT NUMBER

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ORIGINAL SHEET - ANSI D

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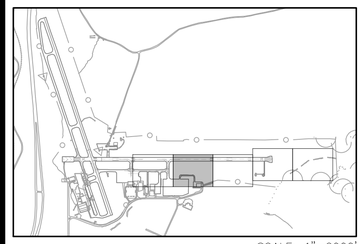

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

ABC	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID M. ZAZZARO 13257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LAYOUT & ALIGNMENT PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
C102	20 of 79	0

IRPMS
N: 407927.23
E: 815613.38
EL: 589.48

EXISTING EDGE OF PAVEMENT

RUNWAY 18–36 ALIGNMENT

RUNWAY 18–36

MEET EXISTING SAW AND SEAL JOINT (TYP.) SEE ASPHALT JOINT DETAIL ON C611

STA: 402+53.00
N: 408421.80
E: 815351.64

TAXIWAY A2
STA: 402+53.10
O/S: 57.62' L
N: 408478.26
E: 815340.17

TAXIWAY A2
STA: 402+53.00
O/S: 57.52' R
N: 408365.45
E: 815363.19

TAXIWAY A2
STA: 402+50.00
O/S: 57.52' L
N: 408477.54
E: 815337.15

TAXIWAY A2
STA: 402+50.00
O/S: 57.52' R
N: 408364.85
E: 815360.25

EXISTING EDGE OF PAVEMENT (TYP.)

PROPOSED LIMIT OF GRADING (TYP.)

TAXIWAY A2
STA: 401+63.74
O/S: 25.02' L
N: 408428.38
E: 815259.17

TAXIWAY A2
STA: 401+63.74
O/S: 25.02' R
N: 408379.36
E: 815269.22

TAXIWAY A2
STA: 401+47.63
O/S: 24.33' L
N: 408424.47
E: 815243.52

TAXIWAY A2
STA: 401+47.63
O/S: 24.33' R
N: 408376.80
E: 815253.30

TAXIWAY A2
STA: 401+31.51
O/S: 25.02' L
N: 408421.91
E: 815227.60

TAXIWAY A2
STA: 401+31.51
O/S: 25.02' R
N: 408372.89
E: 815237.65

TAXIWAY A
STA: 249+53.00
O/S: 46.49' L
N: 408328.40
E: 815159.97

TAXIWAY A
STA: 247+68.49
O/S: 25.02' L
N: 408504.84
E: 815101.89

TAXIWAY A2
STA: 400+47.88
O/S: 47.88' L
N: 408427.51
E: 815141.09

TAXIWAY A2
STA: 400+47.88
O/S: 47.88' R
N: 408333.70
E: 815160.32

TAXIWAY A2 ALIGNMENT

PROPOSED TAXIWAY 'A'

PROPOSED TAXIWAY 'A' ALIGNMENT

STA: 249+53.00
N: 408319.07
E: 815114.44

TAXIWAY A
STA: 249+53.00
O/S: 17.50' R
N: 408315.55
E: 815097.29

PROPOSED FULL DEPTH PAVEMENT (TYP.)

STA. 249+00.00 (TAXIWAY A) =
STA. 400+00.00 (TAXIWAY A2)
N: 408370.99
E: 815103.79

MATCH LINE – SEE DRAWING NO. C102

MATCH LINE – SEE DRAWING NO. C104

RSA · OFZ · ROFA · TSA · TOFA · LOC

100.00' · 150.00' · 200.00' · 250.00' · 300.00'

47+00 · 48+00 · 49+00 · 50+00 · 51+00 · 52+00 · 53+00 · 54+00 · 55+00 · 56+00 · 57+00

247+00 · 248+00 · 249+00 · 250+00 · 251+00 · 252+00 · 253+00 · 254+00

L401 · L201

402+00 · 401+00

ALIGNMENT LINE DATA

SEGMENT	START STATION	START NORTH	START EAST	END STATION	END NORTH	END EAST	BEARING
L201	215+79.32	411624.02	814436.94	255+00.00	407783.21	815224.28	S11° 35' 05.41"E
L401	400+00.00	408370.99	815103.79	403+00.00	408431.23	815397.68	N78° 24' 54.59"E

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- RSA — RUNWAY SAFETY AREA
- ROFA — RUNWAY OBJECT FREE AREA
- OFZ — RUNWAY OBSTACLE FREE ZONE
- LOC — LOCALIZER CRITICAL AREA
- TSA — TAXIWAY SAFETY AREA
- TOFA — TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- (L1) LINE SEGMENT NUMBER
- (C1) CURVE SEGMENT NUMBER

N

0 40' 80'

ORIGINAL SHEET - ANSI D

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02/9/2024 11:41 AM By: Zazueta, Dominic

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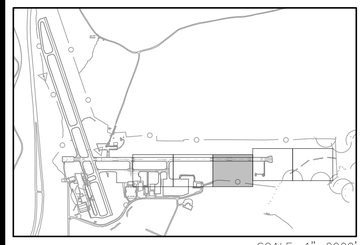


SCALE: 1"=2000'

KEY MAP

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

ABC Dwn. · DCD Chkd. · DMZ Dsgn.

Permit-Seal

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

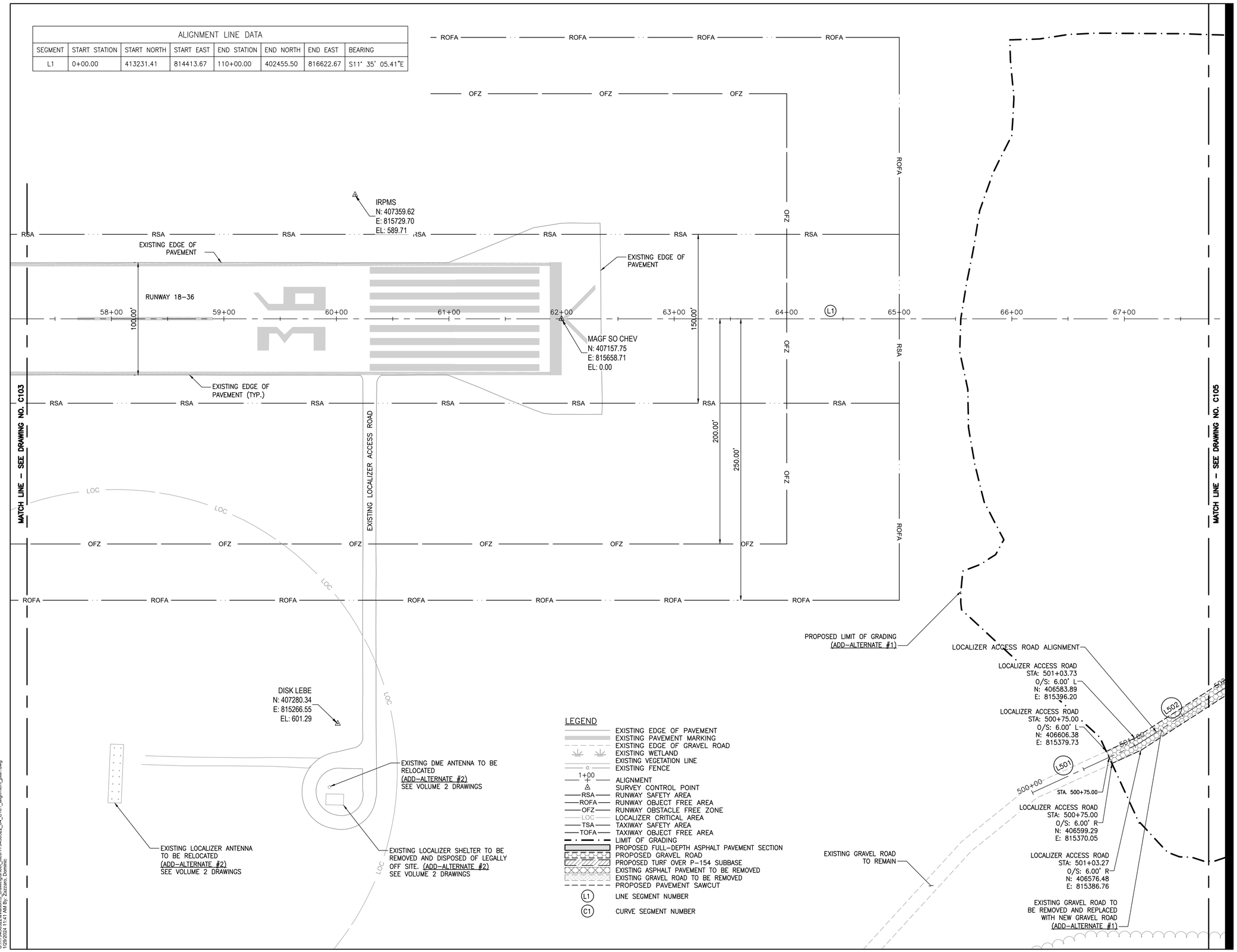
Title

LAYOUT & ALIGNMENT PLAN - 3

Project No.
179450522

Drawing No. C103 · Sheet 21 of 79 · Revision 0

ALIGNMENT LINE DATA							
SEGMENT	START STATION	START NORTH	START EAST	END STATION	END NORTH	END EAST	BEARING
L1	0+00.00	413231.41	814413.67	110+00.00	402455.50	816622.67	S11° 35' 05.41"E



LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- RSA RUNWAY SAFETY AREA
- ROFA RUNWAY OBJECT FREE AREA
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TSA TAXIWAY SAFETY AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- (L1) LINE SEGMENT NUMBER
- (C1) CURVE SEGMENT NUMBER

Stantec

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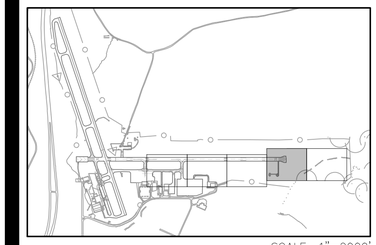

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31
Issued	By	Appd.	YY.MM.DD

ABC Dwn. | DCD Chkd. | DMZ Dsgn.

Permit-Seal

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LAYOUT & ALIGNMENT PLAN - 4

Project No. 179450522

Drawing No. C104 | Sheet 22 of 79 | Revision 0

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2/29/2024 11:41 AM By: Zazzaro, Domitric

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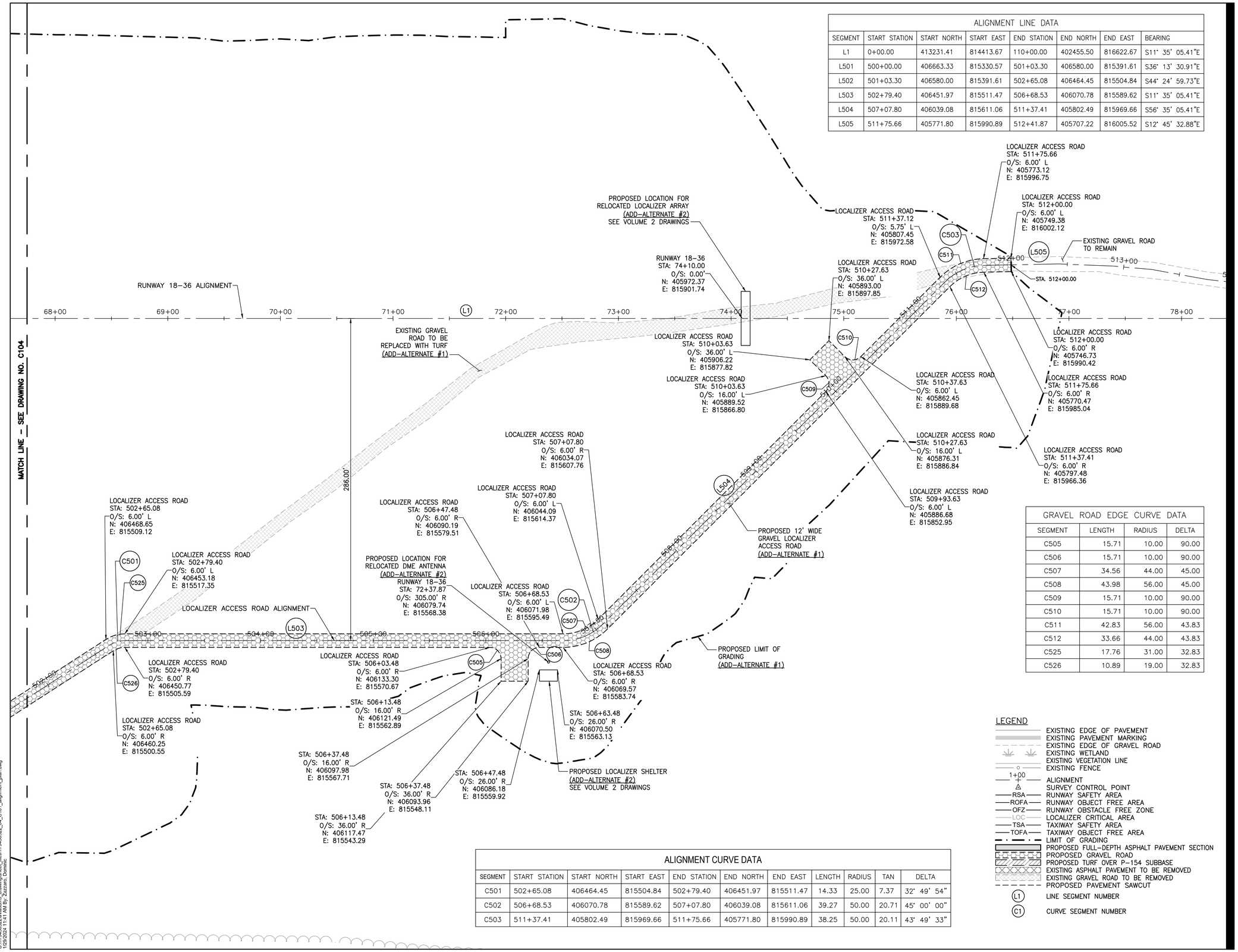

ALIGNMENT LINE DATA							
SEGMENT	START STATION	START NORTH	START EAST	END STATION	END NORTH	END EAST	BEARING
L1	0+00.00	413231.41	814413.67	110+00.00	402455.50	816622.67	S11° 35' 05.41"E
L501	500+00.00	406663.33	815330.57	501+03.30	406580.00	815391.61	S36° 13' 30.91"E
L502	501+03.30	406580.00	815391.61	502+65.08	406464.45	815504.84	S44° 24' 59.73"E
L503	502+79.40	406451.97	815511.47	506+68.53	406070.78	815589.62	S11° 35' 05.41"E
L504	507+07.80	406039.08	815611.06	511+37.41	405802.49	815969.66	S56° 35' 05.41"E
L505	511+75.66	405771.80	815990.89	512+41.87	405707.22	816005.52	S12° 45' 32.88"E

GRAVEL ROAD EDGE CURVE DATA			
SEGMENT	LENGTH	RADIUS	DELTA
C505	15.71	10.00	90.00
C506	15.71	10.00	90.00
C507	34.56	44.00	45.00
C508	43.98	56.00	45.00
C509	15.71	10.00	90.00
C510	15.71	10.00	90.00
C511	42.83	56.00	43.83
C512	33.66	44.00	43.83
C525	17.76	31.00	32.83
C526	10.89	19.00	32.83

ALIGNMENT CURVE DATA										
SEGMENT	START STATION	START NORTH	START EAST	END STATION	END NORTH	END EAST	LENGTH	RADIUS	TAN	DELTA
C501	502+65.08	406464.45	815504.84	502+79.40	406451.97	815511.47	14.33	25.00	7.37	32° 49' 54"
C502	506+68.53	406070.78	815589.62	507+07.80	406039.08	815611.06	39.27	50.00	20.71	45° 00' 00"
C503	511+37.41	405802.49	815969.66	511+75.66	405771.80	815990.89	38.25	50.00	20.11	43° 49' 33"

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- RSA RUNWAY SAFETY AREA
- ROFA RUNWAY OBJECT FREE AREA
- OFZ RUNWAY OBSTACLE FREE ZONE
- LOC LOCALIZER CRITICAL AREA
- TSA TAXIWAY SAFETY AREA
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- (L1) LINE SEGMENT NUMBER
- (C1) CURVE SEGMENT NUMBER

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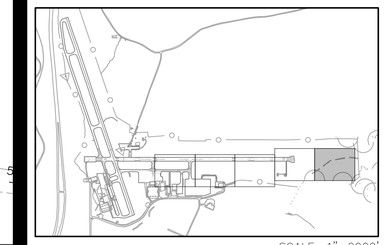

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

By	Appd.	YY.MM.DD

ABC	DCD	DMZ
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Permit-Seal

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LAYOUT & ALIGNMENT PLAN - 5

Project No.
179450522

Drawing No. C105 | Sheet 23 of 79 | Revision 0

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2/29/2024 11:41 AM By: Zazzaro, Dominic

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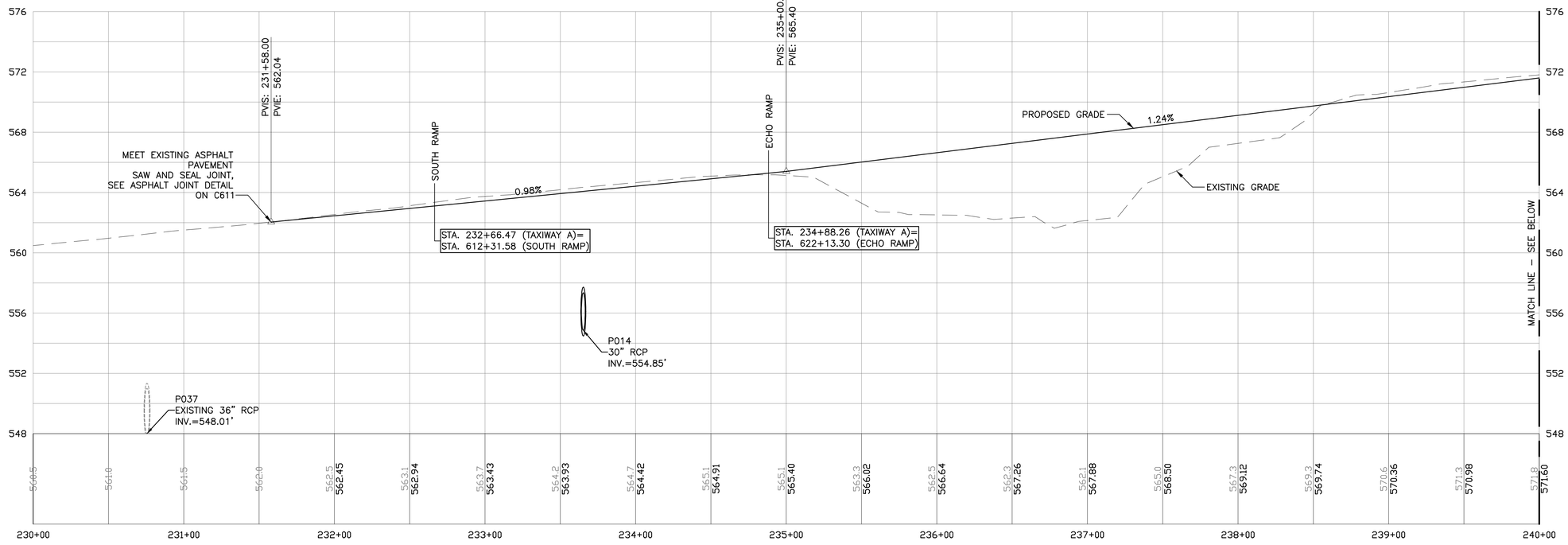

TAXIWAY 'A' PROFILE – STA. 230+00 TO 240+00

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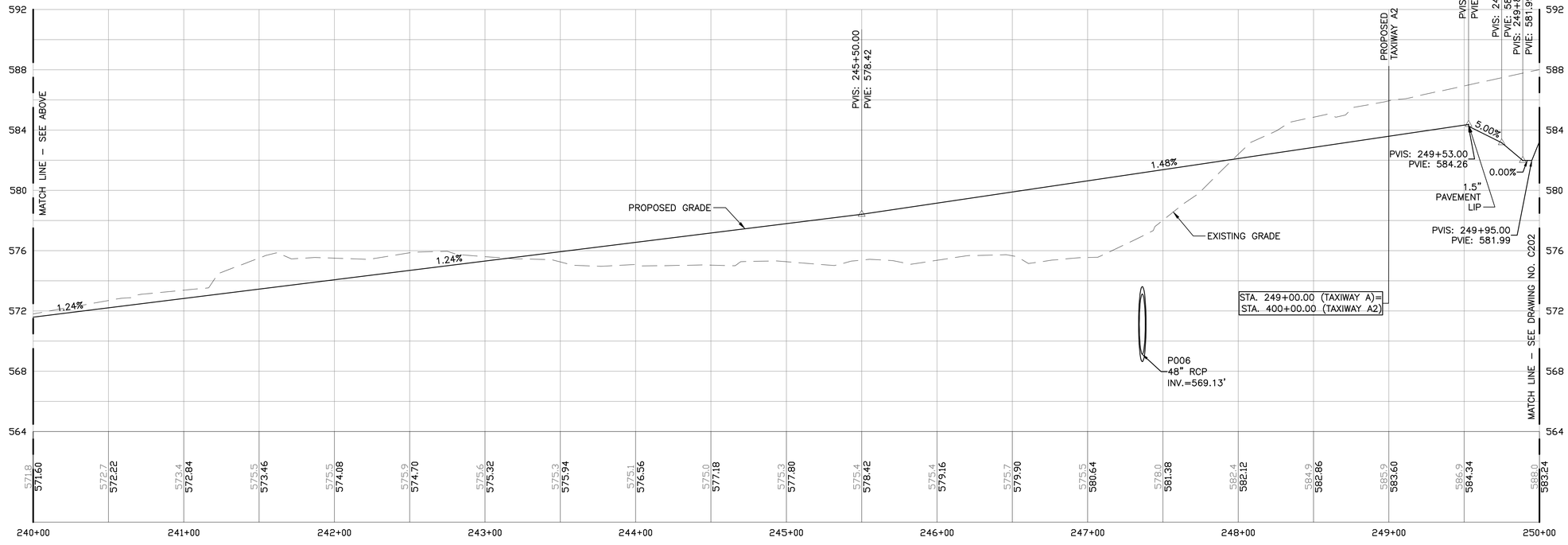
VERTICAL SCALE: 1"=4'



TAXIWAY 'A' PROFILE – STA. 240+00 TO 250+00

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

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6/28/2024 11:40 AM By: Zazzaro, Dominic

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LEGEND

EXISTING GRADE ELEVATION — 600.0 — PROPOSED GRADE ELEVATION 600.00

VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DMZ	DCD	DMZ

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THE STATE OF NEW HAMPSHIRE DAVID M. ZAZZARO 22257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

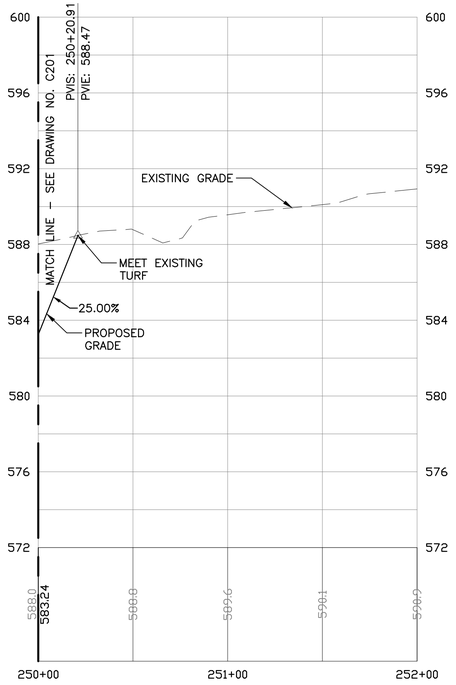
EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

PROFILES - 1

Project No.
179450522

Drawing No.	Sheet	Revision
C201	23 of 79	0



TAXIWAY 'A' PROFILE – STA. 250+00 TO 252+00

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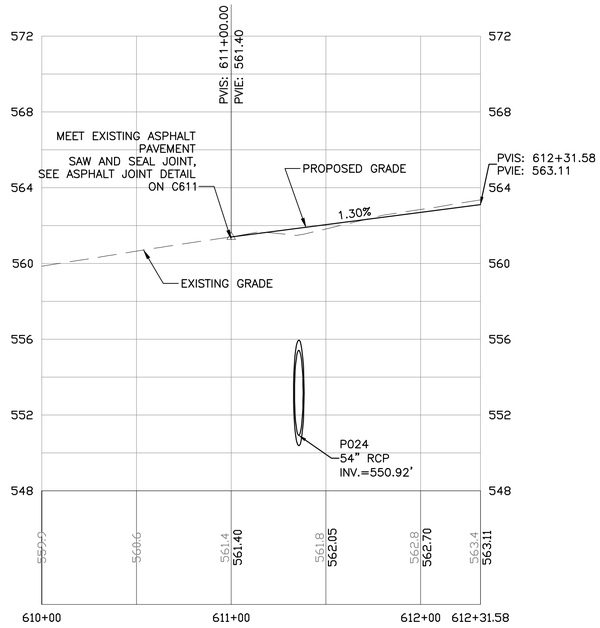
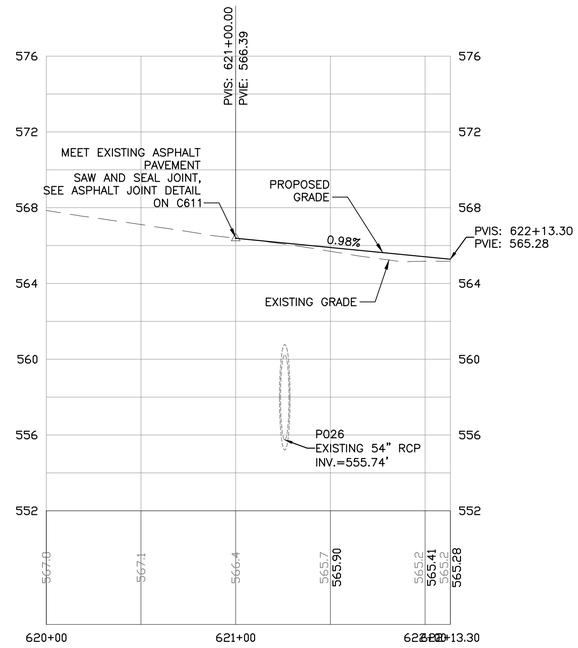
VERTICAL SCALE: 1"=4'



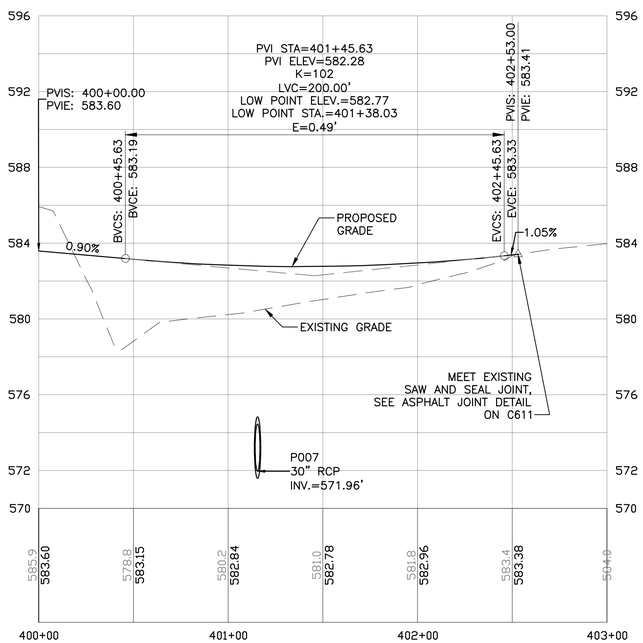
SOUTH RAMP TAXILANE PROFILE

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



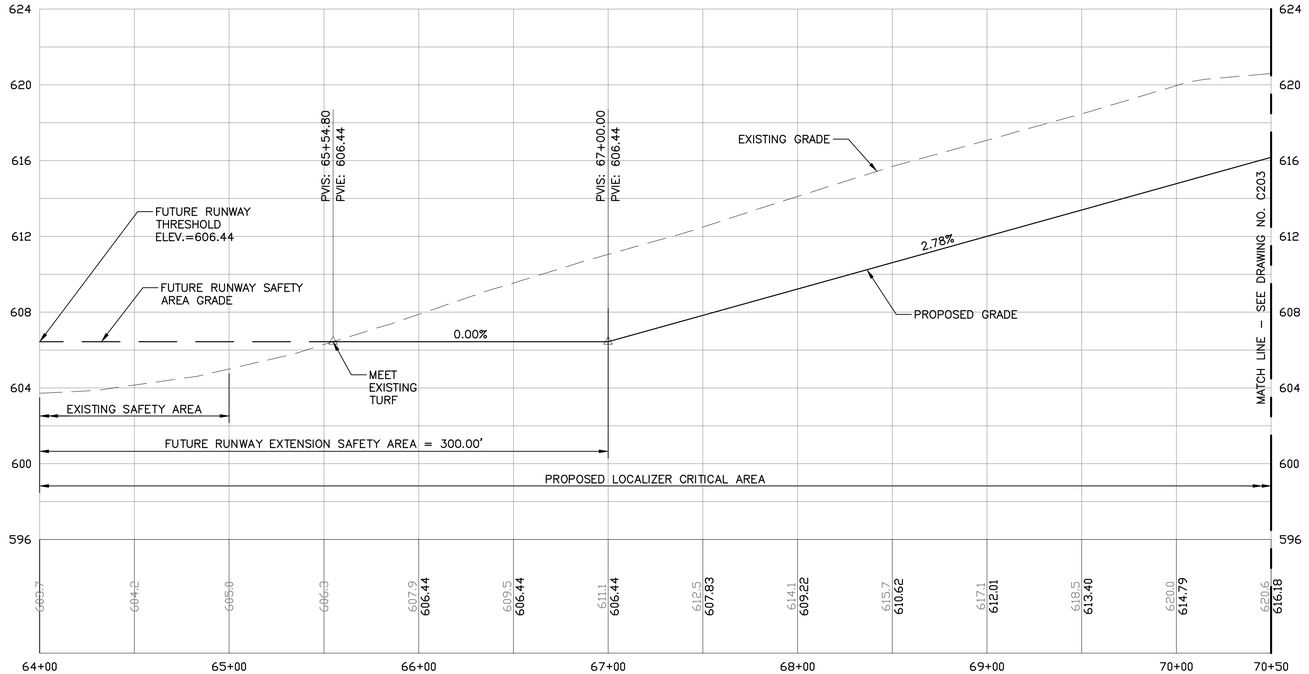
ECHO RAMP TAXILANE PROFILE

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



PROPOSED TAXIWAY 'A2' PROFILE

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



RUNWAY 18–36 LOCALIZER CRITICAL AREA PROFILE – STA. 64+00 TO 70+50 (ADD–ALTERNATE #1)

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

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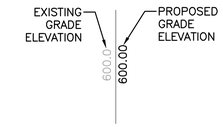
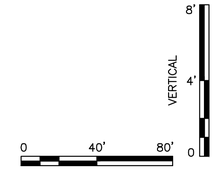
LEGEND





Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

PROFILES - 2

Project No.
179450522

Drawing No.	Sheet	Revision
C202	24 of 79	0

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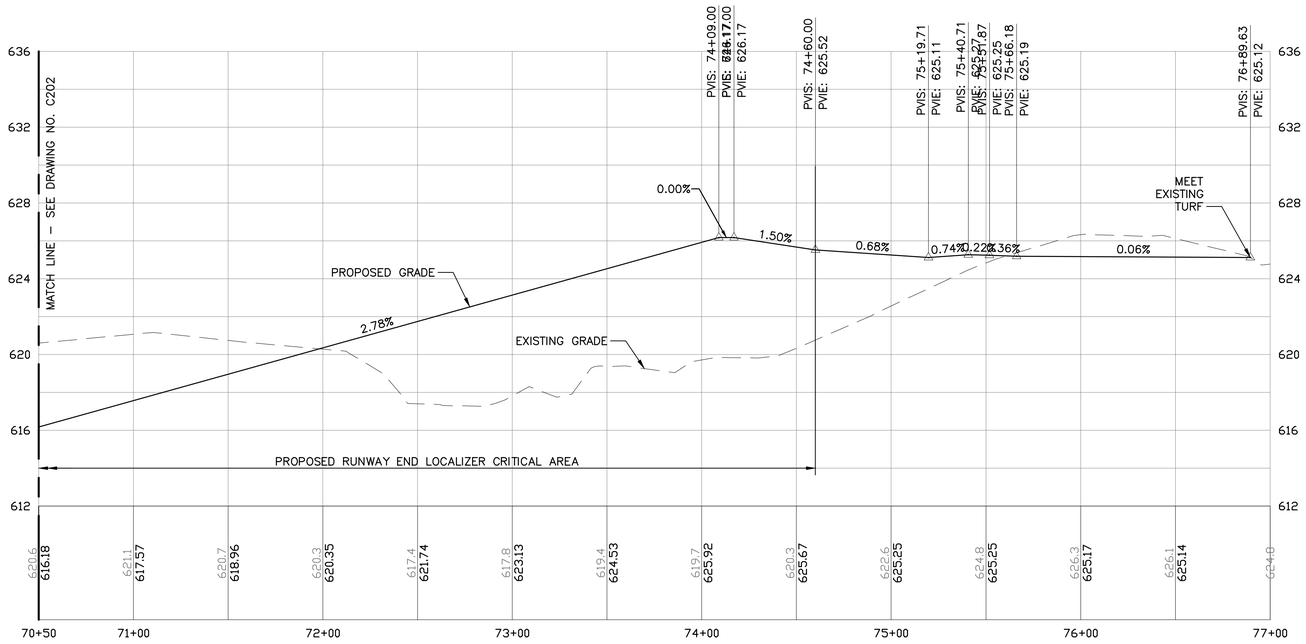
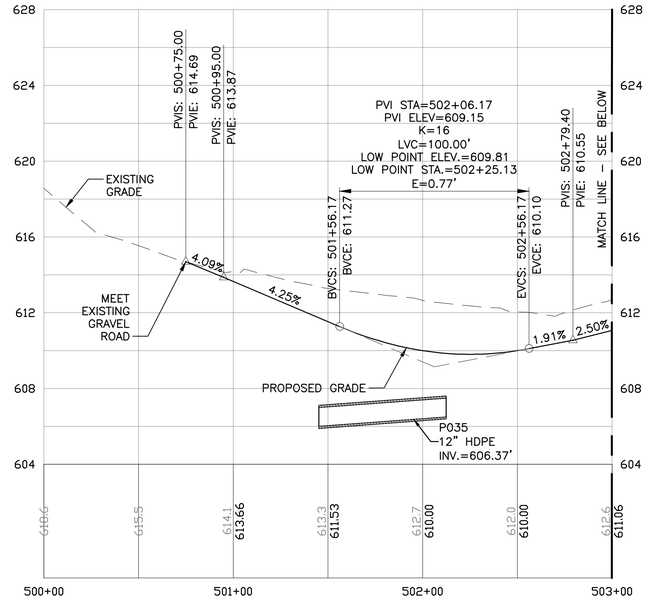


RUNWAY 18–36 LOCALIZER CRITICAL AREA PROFILE – STA. 70+50 TO 77+00 (ADD–ALTERNATE #1)

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



LOCALIZER ACCESS ROAD PROFILE – STA. 500+00 TO 503+00 (ADD–ALTERNATE #1)

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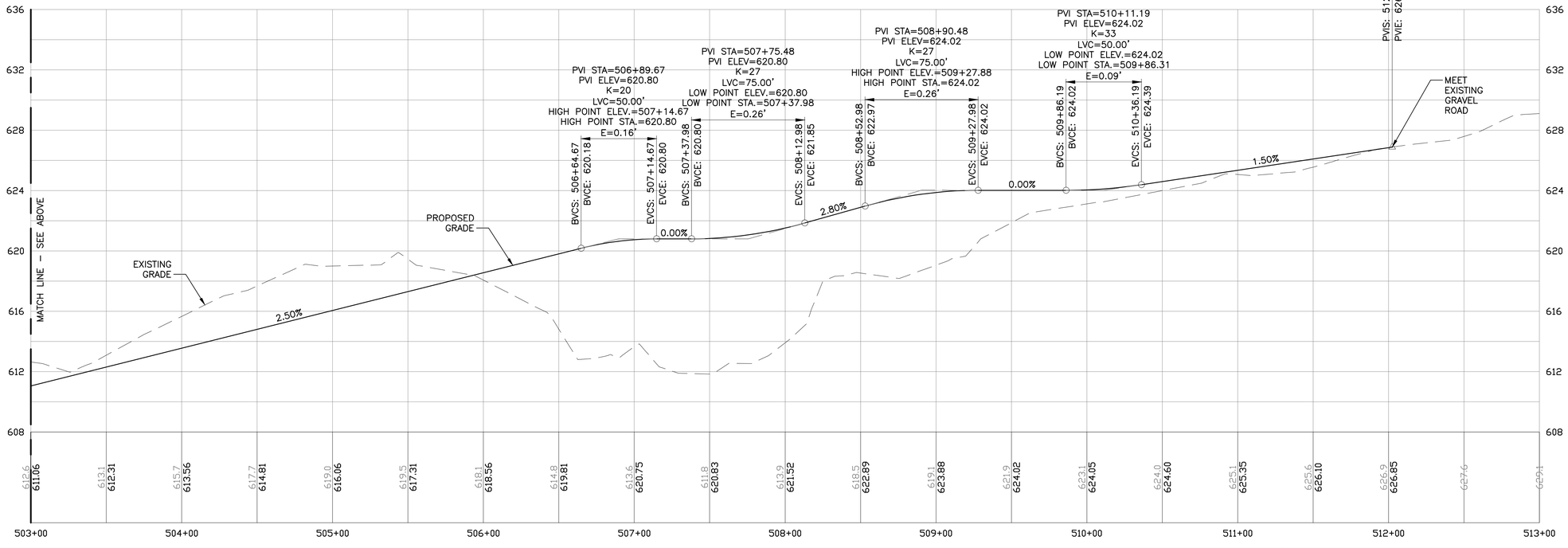
VERTICAL SCALE: 1"=4'



LOCALIZER ACCESS ROAD PROFILE – STA. 503+00 TO 513+00 (ADD–ALTERNATE #1)

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

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LEGEND

EXISTING GRADE ELEVATION 600.00
PROPOSED GRADE ELEVATION 600.00

VERTICAL 8' 4' 0
0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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By	Appd.	YY.MM.DD
DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID C. DEPUTE 6257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

PROFILES - 3

Project No.
179450522

Drawing No.	Sheet	Revision
C203	25 of 79	0

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12/20/2024 11:40 AM By: Zazzaro, Dominic

ORIGINAL SHEET - ANSI D

RUNWAY 18–36

EXISTING EDGE OF PAVEMENT

EXISTING TAXIWAY 'A'2 BITUMINOUS PAVEMENT TO BE REMOVED AND REPLACED WITH TURF

EXISTING TAXIWAY 'A2'

PROPOSED 6' WIDE DIVERSION SWALE

PROPOSED 6' WIDE EARTHEN BERM

EXISTING ASPHALT PAVEMENT TO BE REMOVED AND REPLACED WITH TURF

PROPOSED 16' WIDE UNDERDRAINED SURFACE SAND FILTER SWALE

PROPOSED LIMIT OF GRADING

EXISTING PAVEMENT TO BE RECONSTRUCTED

TAXIWAY 'A'

TAXIWAY 'A' ALIGNMENT

SAWCUT EXISTING PAVEMENT FOR TAPER

MEET EXISTING ASPHALT PAVEMENT

MAINTENANCE ACCESS ROAD

EXISTING GRANITE STATE ELECTRIC HIGH VOLTAGE POWERLINE TO REMAIN UNDISTURBED

EXISTING EDGE OF PAVEMENT

MEET EXISTING ASPHALT PAVEMENT

SOUTH RAMP TAXILANE

EXISTING EDGE OF PAVEMENT

MEET EXISTING ASPHALT PAVEMENT

ECHO RAMP TAXILANE

EXISTING EDGE OF PAVEMENT

MATCH LINE – SEE DRAWING NO. C302

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- ALIGNMENT
- SURVEY CONTROL POINT
- RUNWAY OBSTACLE FREE ZONE
- TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED RUNWAY EDGE LIGHT
- PROPOSED TAXIWAY EDGE LIGHT
- PROPOSED AIRFIELD GUIDANCE SIGN

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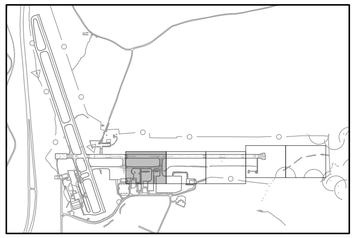

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision | By | Appd. | YY.MM.DD

0 ISSUED FOR BID | DMZ | LAM | 24.01.31

Issued | By | Appd. | YY.MM.DD

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

GRADING PLAN - 1

Project No. 179450522

Drawing No. C301 | Sheet 26 of 79 | Revision 0

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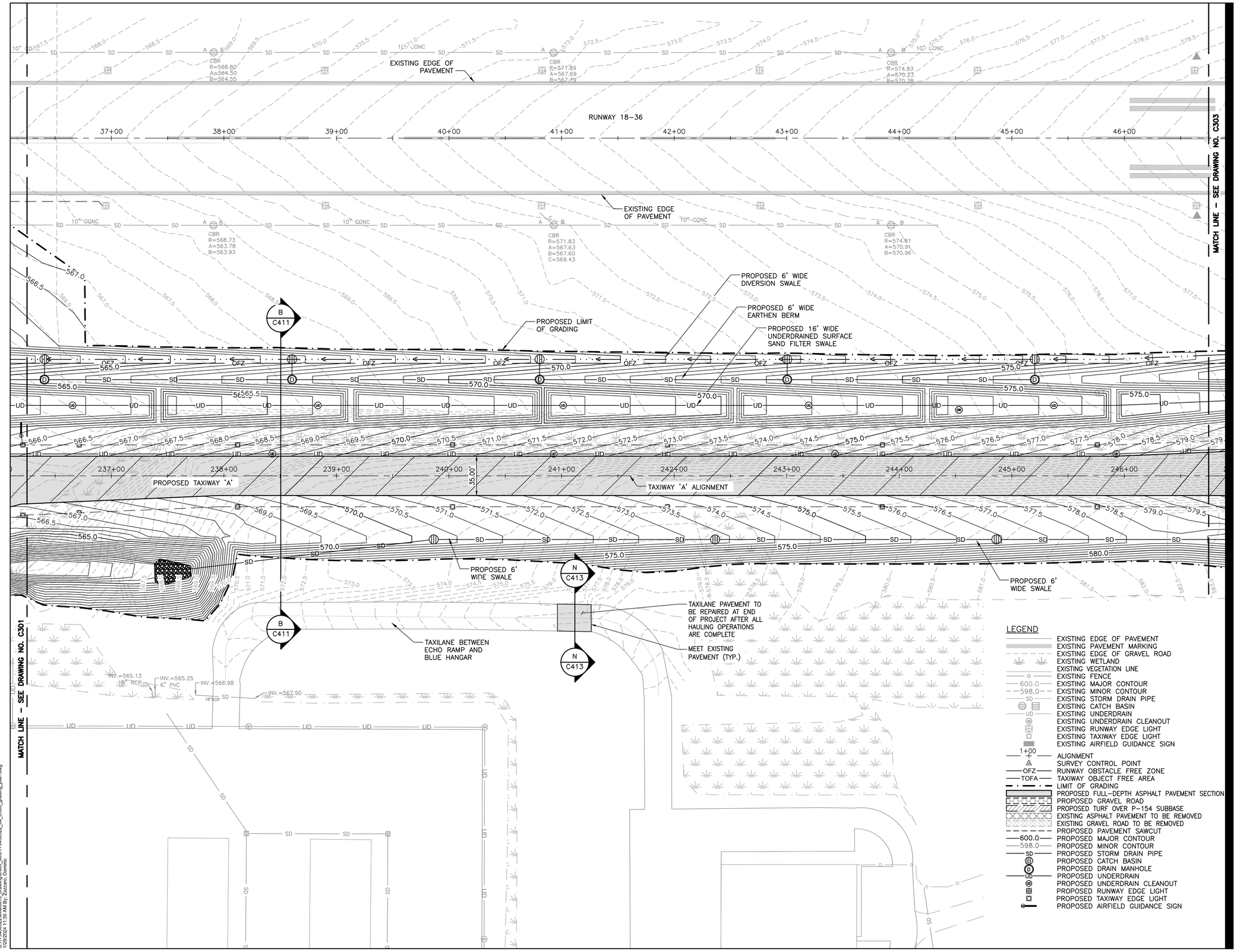

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED RUNWAY EDGE LIGHT
- PROPOSED TAXIWAY EDGE LIGHT
- PROPOSED AIRFIELD GUIDANCE SIGN

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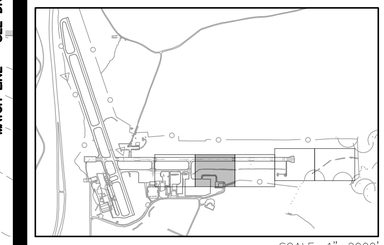

SCALE: 1"=2000'

KEY MAP

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0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

By	Appd.	YY.MM.DD

DMZ	DCD	DMZ
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THE STATE OF NEW HAMPSHIRE DAVID C. DEROSE 9257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

GRADING PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
C302	27 of 79	0

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12/9/2024 11:59 AM By: Zzzzlaro, Dominic

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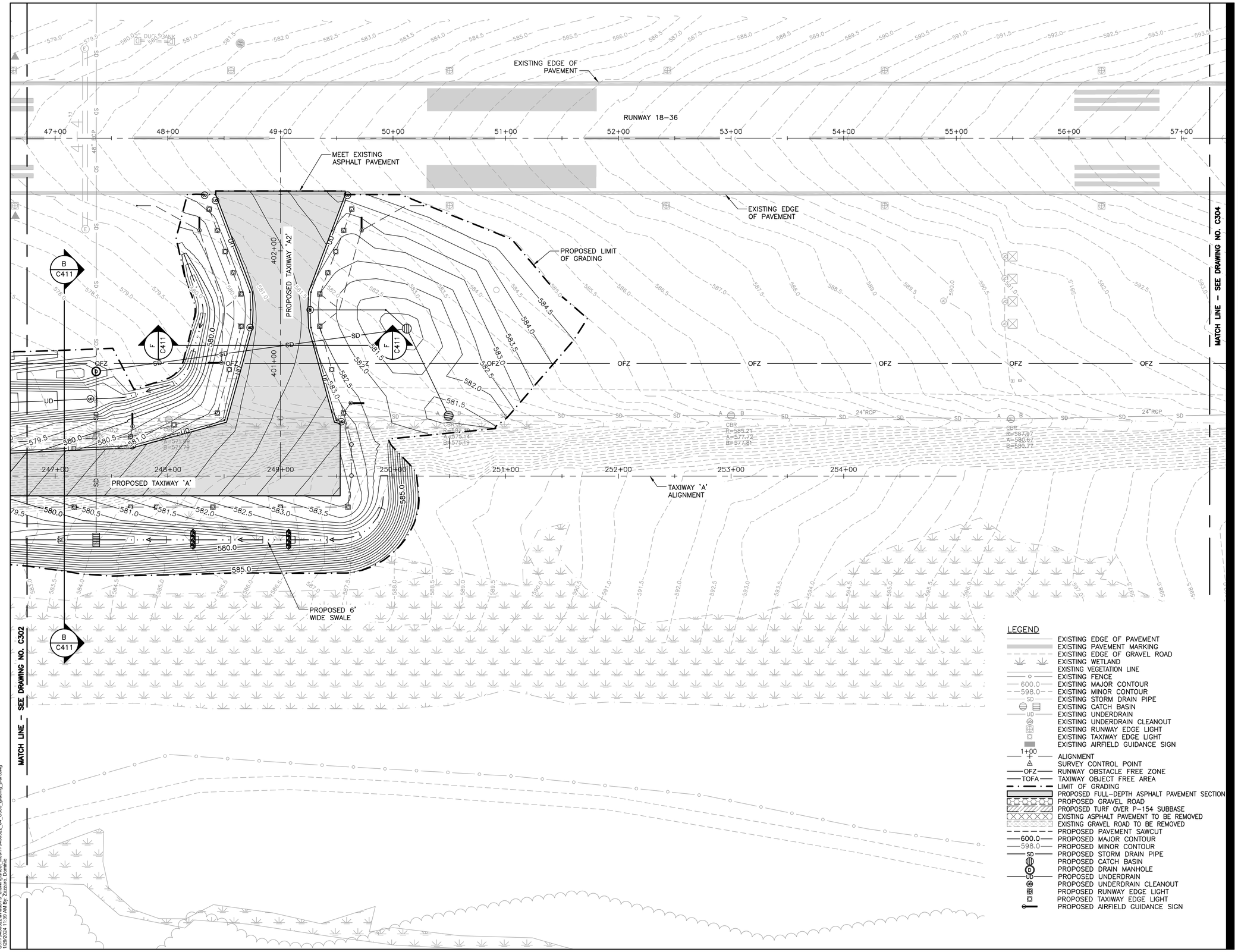

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED RUNWAY EDGE LIGHT
- PROPOSED TAXIWAY EDGE LIGHT
- PROPOSED AIRFIELD GUIDANCE SIGN

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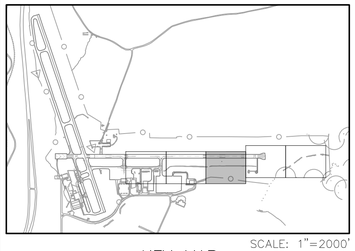

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

Dwn.	Chkd.	Dsgn.
DMZ	DCD	DMZ

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THE STATE OF NEW HAMPSHIRE DAVID M. ZAZZARO 13857 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

GRADING PLAN - 3

Project No.
179450522

Drawing No.	Sheet	Revision
C303	28 of 79	0

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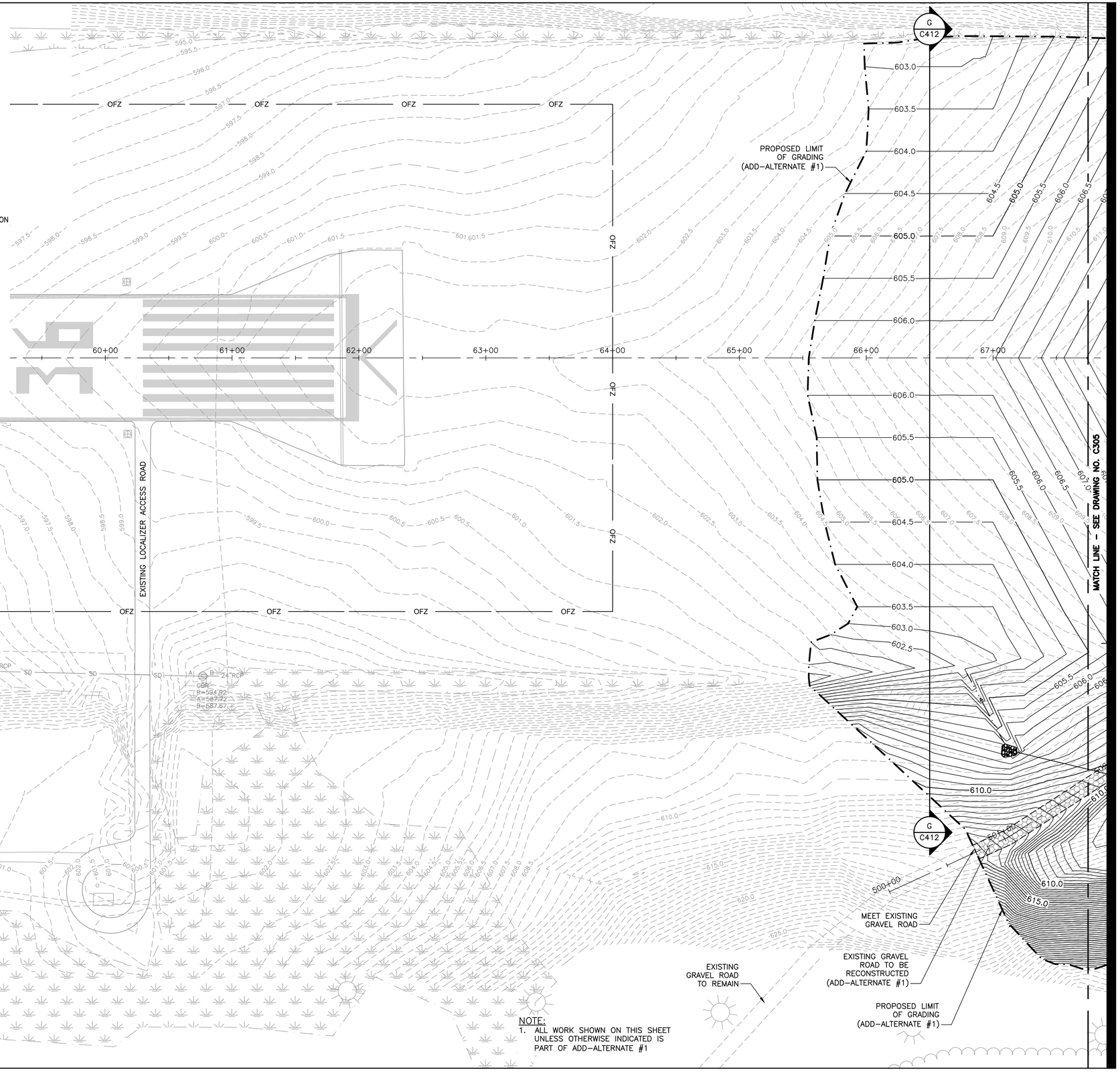
02/2024 11:09 AM By: Zazzaro, Dominic

ORIGINAL SHEET - ANSI D

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED RUNWAY EDGE LIGHT
- PROPOSED TAXIWAY EDGE LIGHT
- PROPOSED AIRFIELD GUIDANCE SIGN



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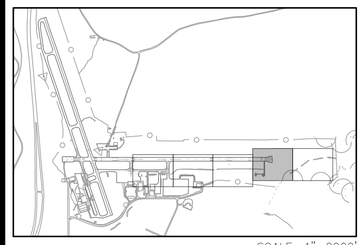

SCALE: 1"=2000'

KEY MAP

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Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

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DMZ	DCD	DMZ

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THE STATE OF NEW HAMPSHIRE DAVID C. DEROSE 12257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

GRADING PLAN - 4

Project No.	Drawing No.	Sheet	Revision
179450522	C304	29 of 79	0

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5/29/2024 11:59 AM By: Zazarino, Dominic

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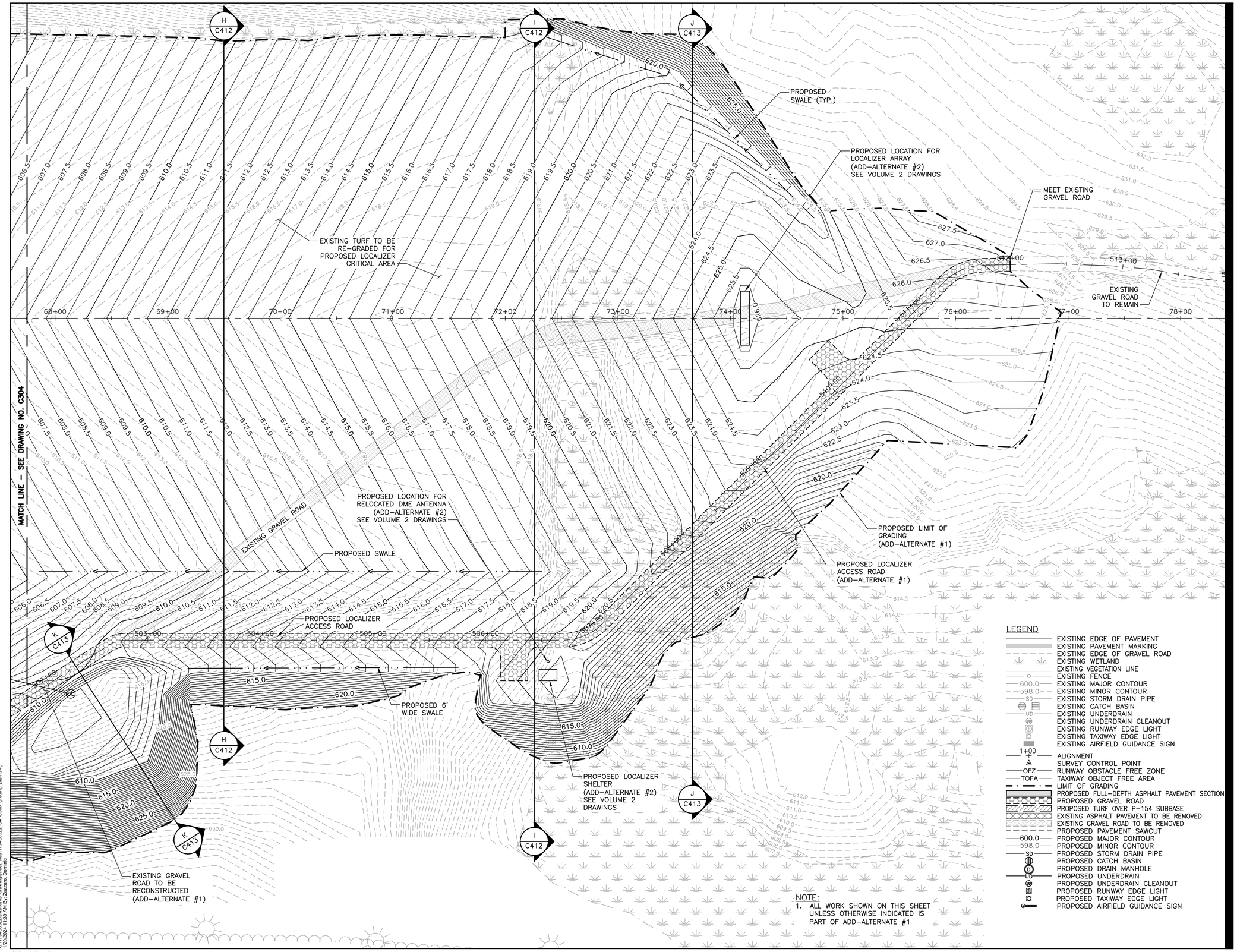

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED RUNWAY EDGE LIGHT
- PROPOSED TAXIWAY EDGE LIGHT
- PROPOSED AIRFIELD GUIDANCE SIGN

NOTE:
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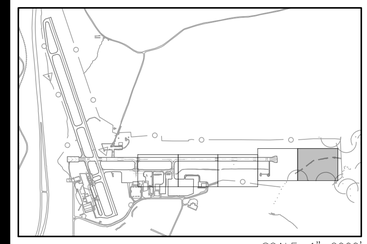

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

GRADING PLAN - 5

Project No.
179450522

Drawing No.	Sheet	Revision
C305	30 of 79	0

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2/29/2024 11:59 AM By: Zaccaro, Dominic

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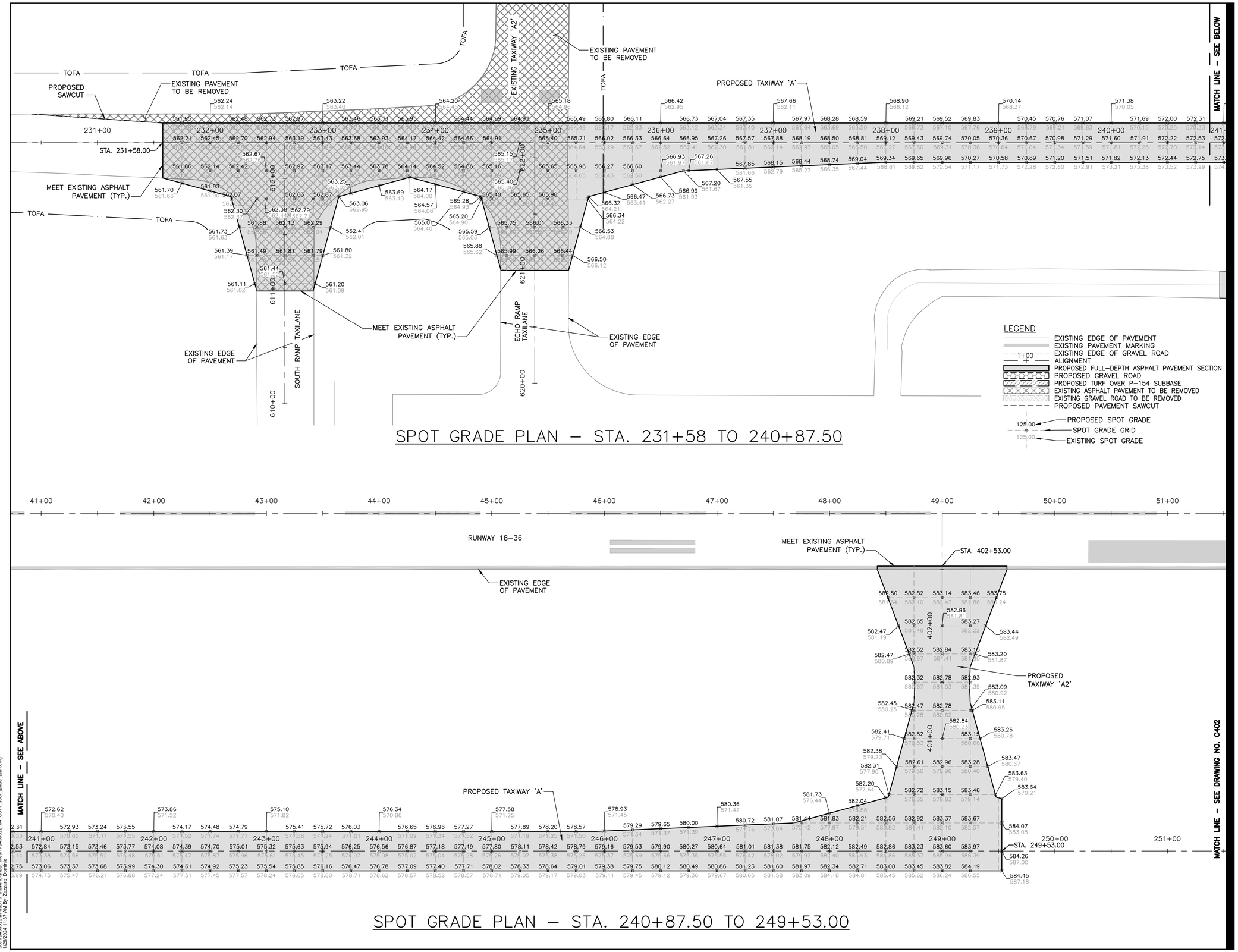

SPOT GRADE PLAN – STA. 231+58 TO 240+87.50

SPOT GRADE PLAN – STA. 240+87.50 TO 249+53.00

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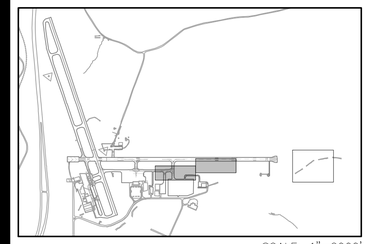

KEY MAP

SCALE: 1"=2000'

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

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DMZ	DCD	DMZ

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

SPOT GRADE PLAN - 1

Project No.
179450522

Drawing No.	Sheet	Revision
C401	31 of 79	0

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2/29/2024 11:37 AM By: Zazzaro, Dominic

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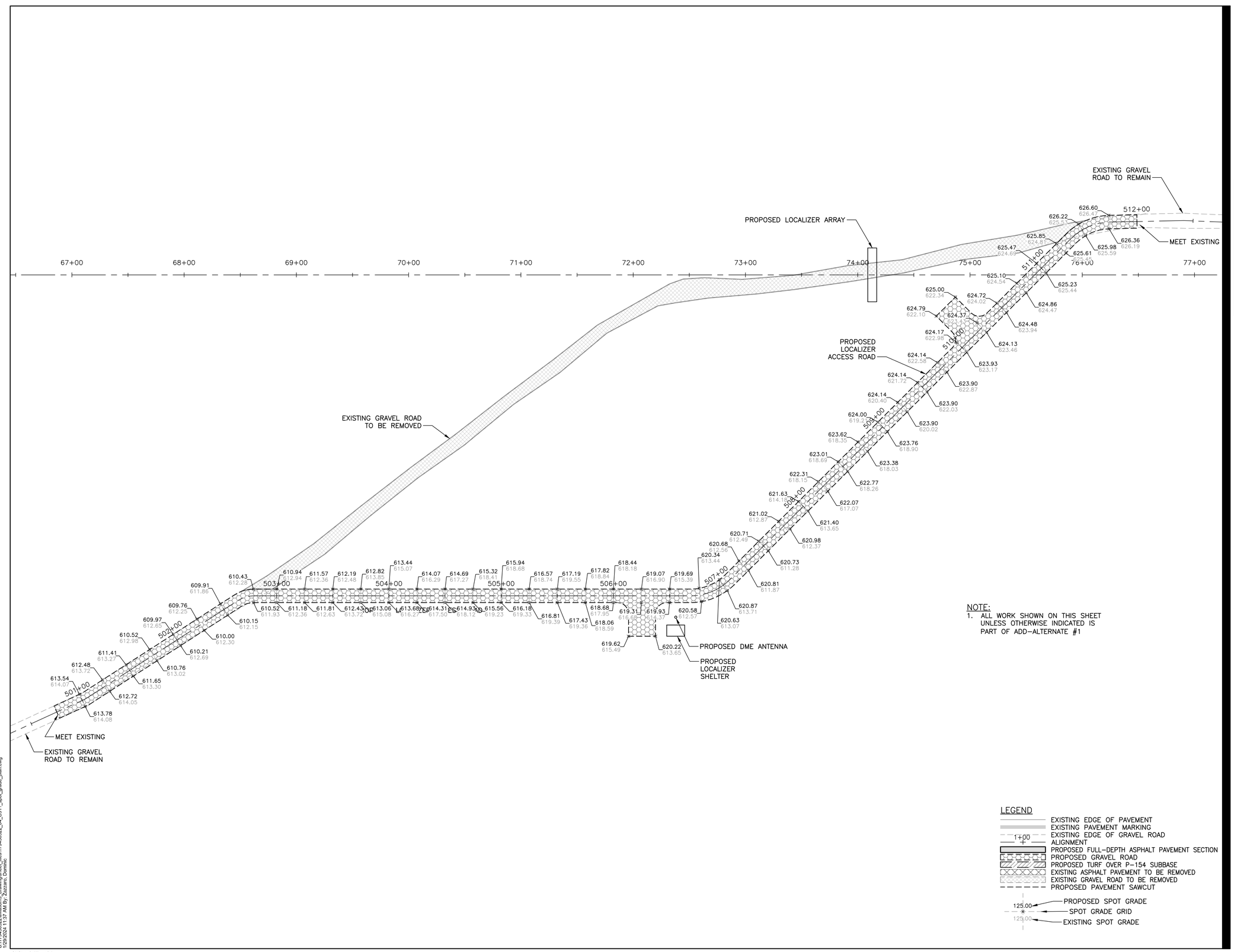

NOTE:
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LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- 1+00 ALIGNMENT
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 125.00 PROPOSED SPOT GRADE
- 125.00 SPOT GRADE GRID
- 125.00 EXISTING SPOT GRADE

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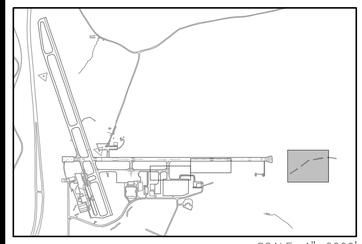

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

SPOT GRADE PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
C402	32 of 79	0

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12/6/2024 11:37 AM By Zazzaro, Dominic

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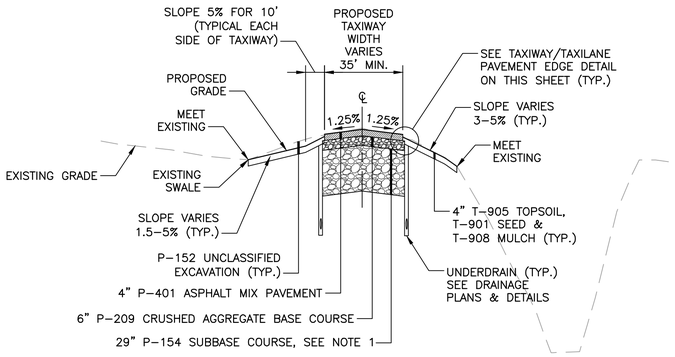
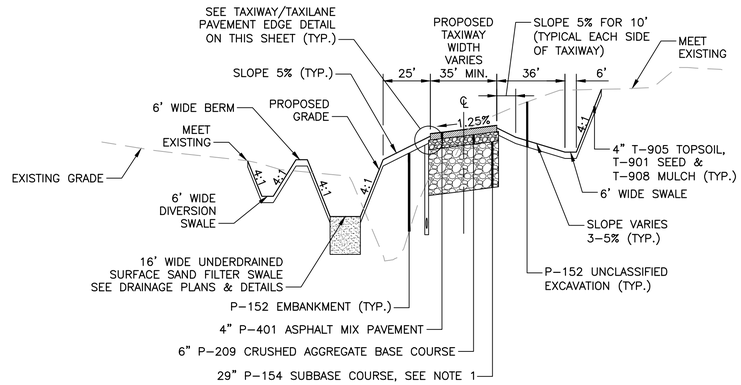


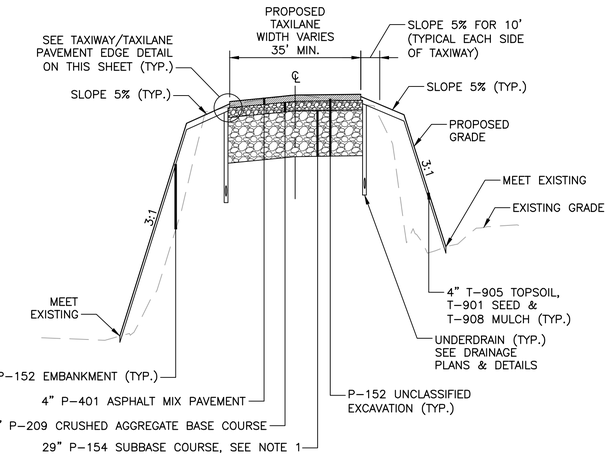
TAXIWAY 'A' TYPICAL SECTION A-A
STA. 226+68.42 TO 235+17.75

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



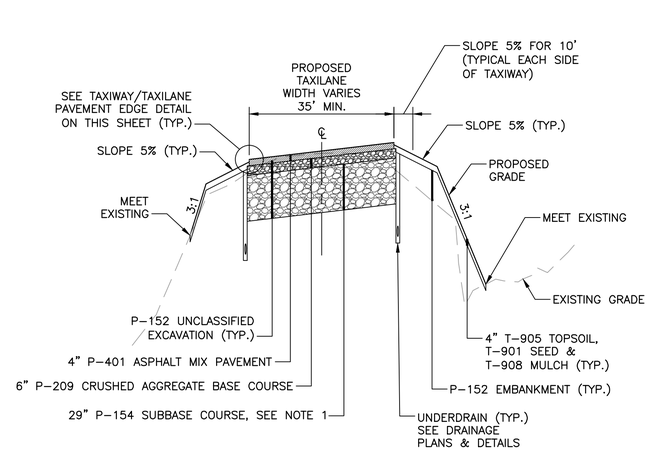
TAXIWAY 'A' TYPICAL SECTION B-B
STA. 235+17.75 TO 260+25

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



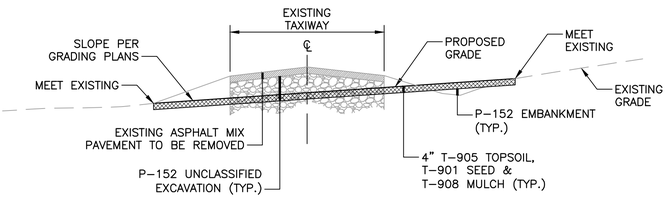
SOUTH RAMP TAXILANE TYPICAL SECTION C-C
STA. 611+00 TO 611+83.70

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



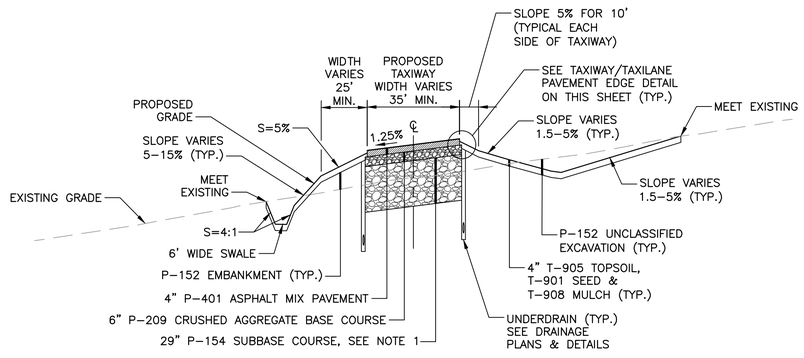
ECHO RAMP TAXILANE TYPICAL SECTION D-D
STA. 621+00 TO 621+65.41

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



EXISTING TAXIWAY REMOVAL TYPICAL SECTION E-E

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



TAXIWAY 'A2' TYPICAL SECTION F-F
STA. 400+47.88 TO 402+50

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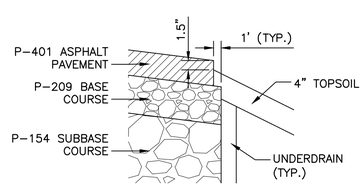
VERTICAL SCALE: 1"=4'



TAXIWAY/TAXILANE PAVEMENT EDGE DETAIL

NOTES:
1. SEPARATION GEOTEXTILE SHALL BE PLACED BETWEEN THE P-154 SUBBASE MATERIAL AND THE EXISTING SOIL.
2. P-209 BASE AND P-154 SUBBASE SHALL BE EXTENDED 1 FOOT BEYOND EDGE OF P-401 ASPHALT MIX PAVEMENT.
3. 4" OF T-905 TOPSOIL, T-901 SEED AND T-908 MULCH SHALL BE PLACED ON ALL DISTURBED AREAS UNLESS OTHERWISE NOTED.

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

TYPICAL SECTIONS - 1

Project No.
179450522

Drawing No.	Sheet	Revision
C411	33 of 79	0

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02/8/2024 11:54 AM By: Zizzamia, Dominic

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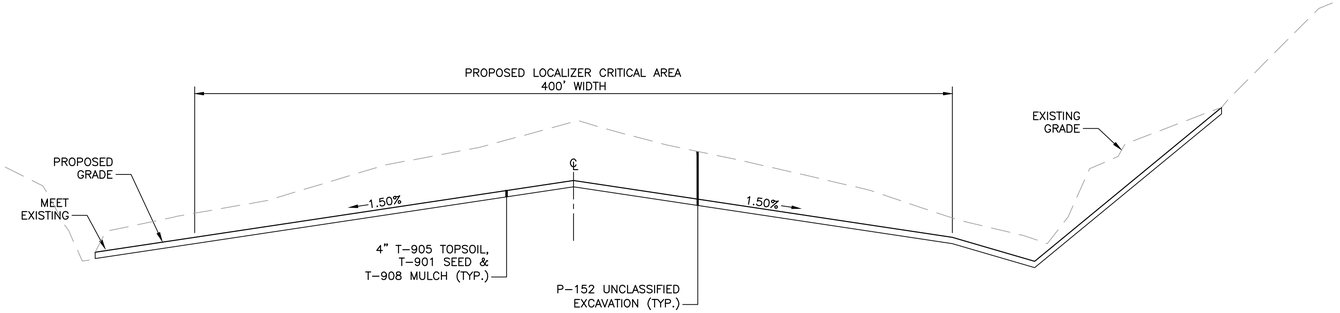
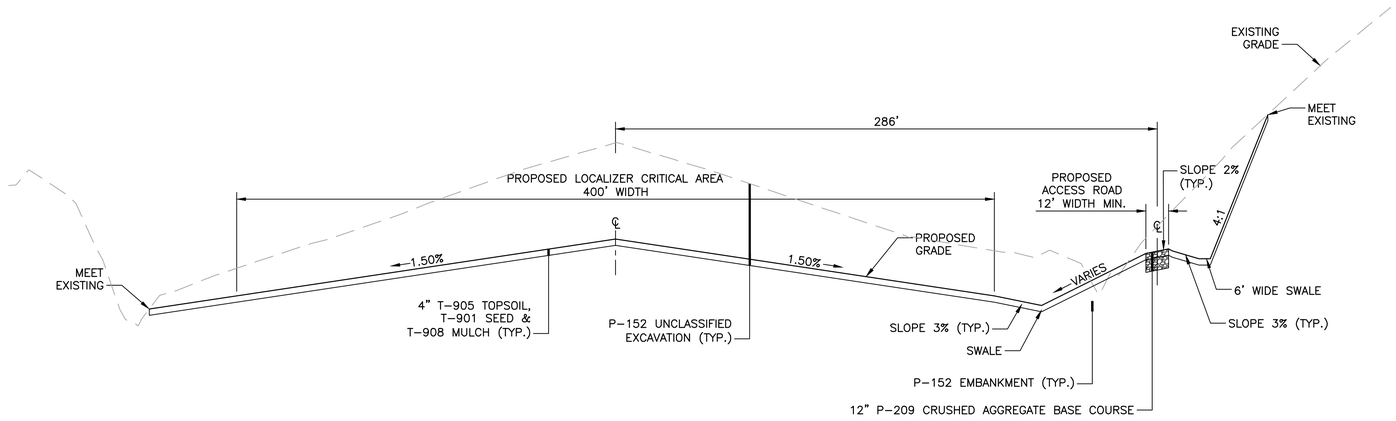


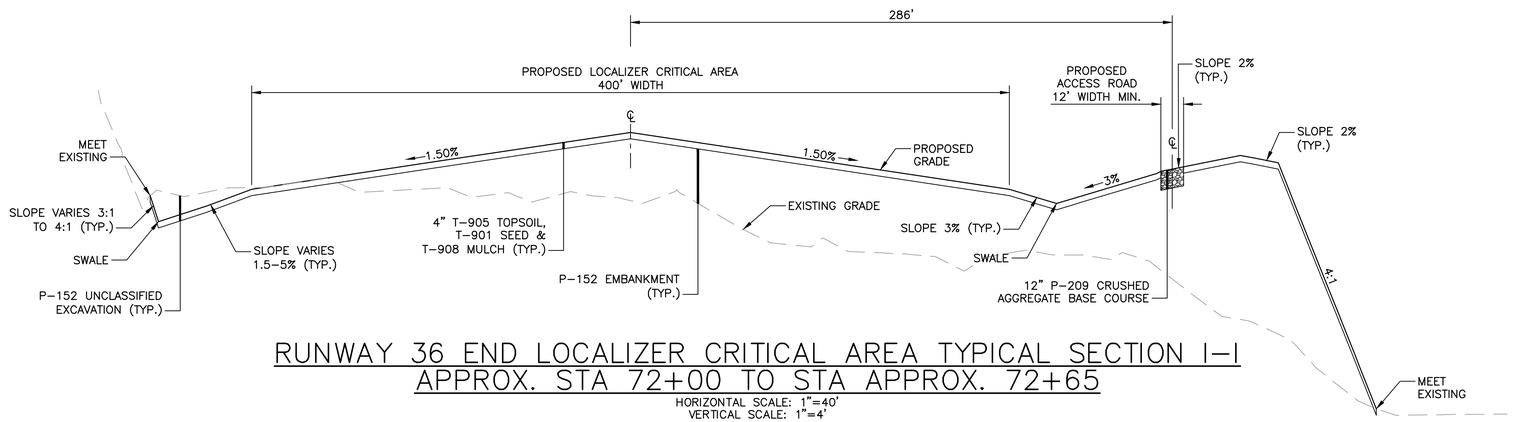
RUNWAY 36 END LOCALIZER CRITICAL AREA TYPICAL SECTION G-G
STA. 65+54.80 TO APPROX. STA. 68+50

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



RUNWAY 36 END LOCALIZER CRITICAL AREA TYPICAL SECTION H-H
APPROX. STA. 68+50 TO APPROX. 72+00

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



RUNWAY 36 END LOCALIZER CRITICAL AREA TYPICAL SECTION I-I
APPROX. STA 72+00 TO STA APPROX. 72+65

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'

NOTES:
1. SEPARATION GEOTEXTILE SHALL BE PLACED BETWEEN THE P-154 SUBBASE MATERIAL AND THE EXISTING SOIL.
2. P-209 BASE AND P-154 SUBBASE SHALL BE EXTENDED 1 FOOT BEYOND EDGE OF P-401 ASPHALT MIX PAVEMENT.
3. 4" OF T-905 TOPSOIL, T-901 SEED AND T-908 MULCH SHALL BE PLACED ON ALL DISTURBED AREAS UNLESS OTHERWISE NOTED.

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

TYPICAL SECTIONS - 2

Project No.
179450522

Drawing No.	Sheet	Revision
C412	34 of 79	0

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2/8/2024 11:41 AM By: Zazzaro, Dominic

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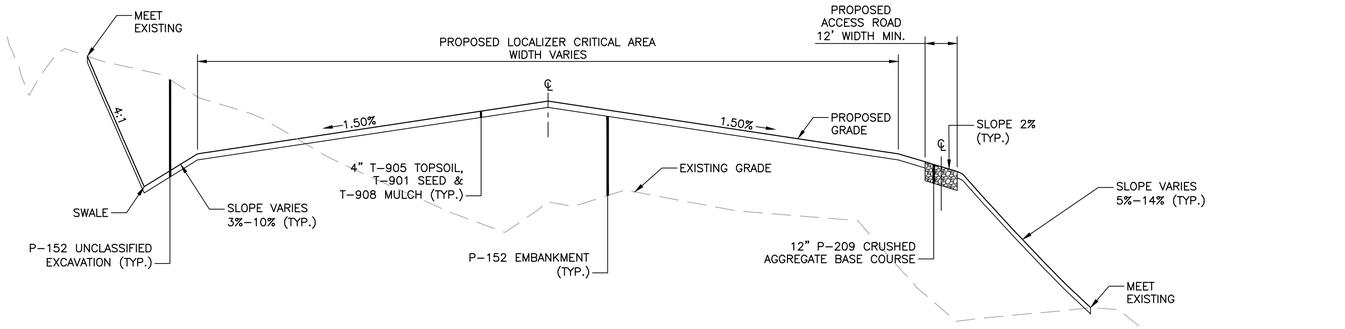
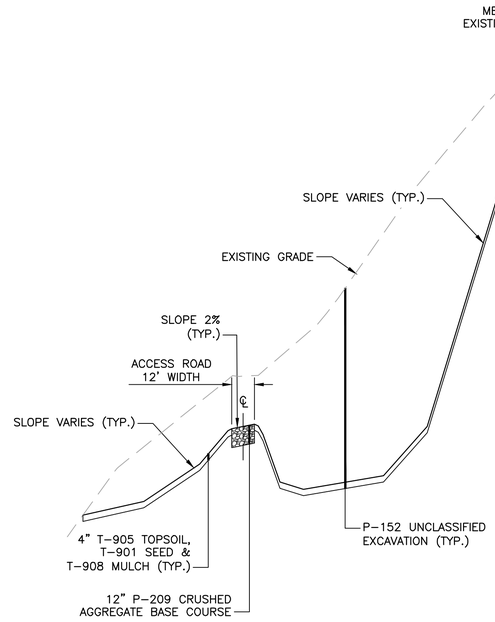


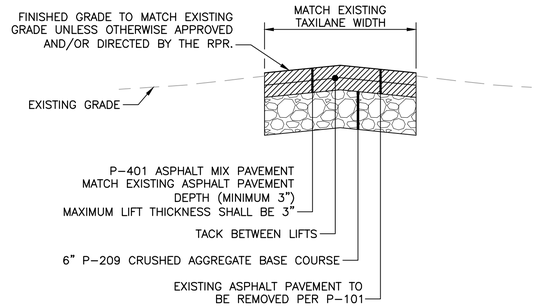
RUNWAY 36 END LOCALIZER CRITICAL AREA TYPICAL SECTION J-J
APPROX. STA. 72+65 TO APPROX. 74+60

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



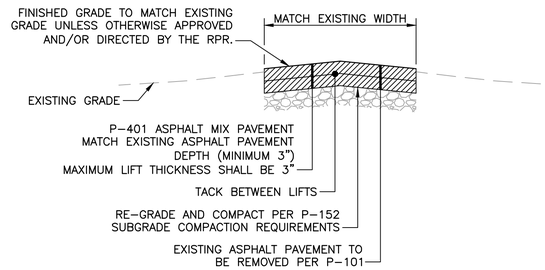
ACCESS ROAD
TYPICAL SECTION K-K
STA 500+75 TO APPROX. 502+65

HORIZONTAL SCALE: 1"=40'
VERTICAL SCALE: 1"=4'



TAXILANE PAVEMENT REPAIR
TYPICAL SECTION N-N

HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"=1'



ROADWAY PAVEMENT REPAIR
TYPICAL SECTION

HORIZONTAL SCALE: 1"=10'
VERTICAL SCALE: 1"=1'

NOTE:
1. P-209 BASE AND P-154 SUBBASE SHALL BE EXTENDED 1 FOOT BEYOND EDGE OF P-401 ASPHALT MIX PAVEMENT.
2. 4" OF T-905 TOPSOIL, T-901 SEED AND T-908 MULCH SHALL BE PLACED ON ALL DISTURBED AREAS UNLESS OTHERWISE NOTED.

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Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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Dwn.	Chkd.	Dsgn.
DMZ	DCD	DMZ

Permit-Seal

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

TYPICAL SECTIONS - 3

Project No.
179450522

Drawing No.	Sheet	Revision
C413	35 of 79	0

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2/29/2024 11:41 AM By: Zazzaro, Dominic

ORIGINAL SHEET - ANSI D

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED SURFACE SAND FILTER
- PROPOSED VEGETATED BUFFER
- PROPOSED VEGETATED FILTER STRIP
- TEMPORARY SEDIMENT BARRIER

EXISTING EDGE OF PAVEMENT

IRPMS
N: 410200.44
E: 815154.90
EL: 551.66

EXISTING EDGE OF PAVEMENT

28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00

EXISTING UNDERDRAIN SYSTEM SHALL BE REMOVED (TYP.)

EXISTING EDGE OF PAVEMENT

EXISTING TAXIWAY A2 BITUMINOUS PAVEMENT TO BE REMOVED AND REPLACED WITH TURF

EXISTING TAXIWAY 'A2'

EXISTING EDGE OF PAVEMENT

IRPMS
N: 409674.16
E: 814980.21
EL: 565.78

EXISTING UNDERDRAIN SYSTEM SHALL BE REMOVED (TYP.)

CONSTRUCT INLET SEDIMENT FILTER AT ALL CATCH BASINS WITHIN LIMITS OF DISTURBANCE (TYP.)

EXISTING CB 01

PROPOSED LIMIT OF GRADING

EXISTING PAVEMENT TO BE REMOVED AND RETURNED TO TURF

CB 102

P015 15" HDPE

P023 24" HDPE

P022 6" HDPE

P013 30" RCP

DMH 102

DMH 101

OBSERVATION RISER

UD OUTLET x 2

P012 21" RCP

EXISTING CB 03

WATER LINE

SEWER LINE

CORE EXIST. CB AT ELEV.=552.40' AND CONNECT NEW SD

P037 EXISTING 36" RCP SHALL REMAIN

P027 8" HDPE

UD CLEANOUT 205

P036 8" HDPE

24" EARTHEN BERM (TYP.)

CAP EXISTING UNDERDRAIN AND REMOVE UPSTREAM SECTIONS (TYP.)

UD CLEANOUT 206

UD CLEANOUT 207

EMERGENCY SPILLWAY (EL.=561.65') AND RIPRAP PLUNGE POOL

EXISTING PAVEMENT TO BE RECONSTRUCTED

CONSTRUCT TEMPORARY STABILIZED CONSTRUCTION EXIT (TYP.; REFER TO PHASING PLANS)

PROPOSED 6" UNDERDRAIN & CLEANOUT (TYP.)

UD CLEANOUT 219

UD CLEANOUT 222

P014 30" RCP

P025 54" RCP (EXTENSION)

EXISTING GRANITE STATE ELECTRIC HIGH VOLTAGE POWERLINE TO REMAIN UNDISTURBED

UNDERDRAIN OUTLET W/ RIPRAP APRON TYP. (MIN. 6'Wx8'L; d50=6" TYP. AT ALL UNDERDRAIN OUTLETS)

P030 8" HDPE

P031 8" HDPE

P024 54" RCP

MAINTENANCE ACCESS ROAD

CONSTRUCT RCP FLARED END AND RIPRAP OUTFALL INV.=549.50' (MIN. 36'Lx27'W; d50=18")

CONSTRUCT HAYBALE SEDIMENT FILTER AT ALL CULVERTS (TYP.)

EXISTING EDGE OF PAVEMENT

CONSTRUCT DOUBLE SEDIMENT BARRIER AT DOWNHILL LIMITS OF WORK (TYP.)

REPLACE AND EXTEND 54" SD WITH 54" RCP

SOUTH RAMP TAXILANE

CONSTRUCT RCP FLARED END AND RIPRAP INLET APRON INV.=552.20'

CONSTRUCT HAYBALE SEDIMENT FILTER AT ALL CULVERTS (TYP.)

CONSTRUCT RCP FLARED END AND RIPRAP OUTLET APRON INV.=554.00' (MIN. 15'Wx20'L; d50=12")

UD CLEANOUT 223

P026 EXISTING 54" RCP SHALL REMAIN

ECHO RAMP TAXILANE

REMOVE EXISTING RCP FLARED END AND EXTEND 54"RCPx15'L INV.≅557.4'±

6'ø OUTLET CONTROL STRUCTURE #1
15"ø x1 ORIFICE @INV.=557.60'
16"ø x3 ORIFICES @INV.=558.40'
30.5"Lx18"Hx4EACH @INV.=561.90
36"ø SPILLWAY GRATE @INV.=565.00'
54" RCP OUTLET INV.=557.60

CONSTRUCT TEMPORARY STABILIZED CONSTRUCTION EXIT (TYP.; REFER TO PHASING PLANS)

EXISTING EDGE OF PAVEMENT (TYP.)

MATCH LINE – SEE DRAWING NO. C502

226+00 227+00 228+00 229+00 230+00 231+00 233+00 234+00 235+00 236+00

EXISTING EDGE OF PAVEMENT

INV.=545.15
INV.=544.98
INV.=544.25

CBR
R=553.92
A=544.32
B=547±
SUMP=540.5±
NOTE: PIPES OBSCURED AND INVERTS ARE APPROXIMATE

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4/29/2024 11:51 AM By: Zazzaro, Dominic

ORIGINAL SHEET - ANSI D

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KEY MAP

SCALE: 1"=2000'

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DPN	DCD	DPN
Dwn.	Chkd.	Dsgn.

Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID C. DAZZARO 8257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

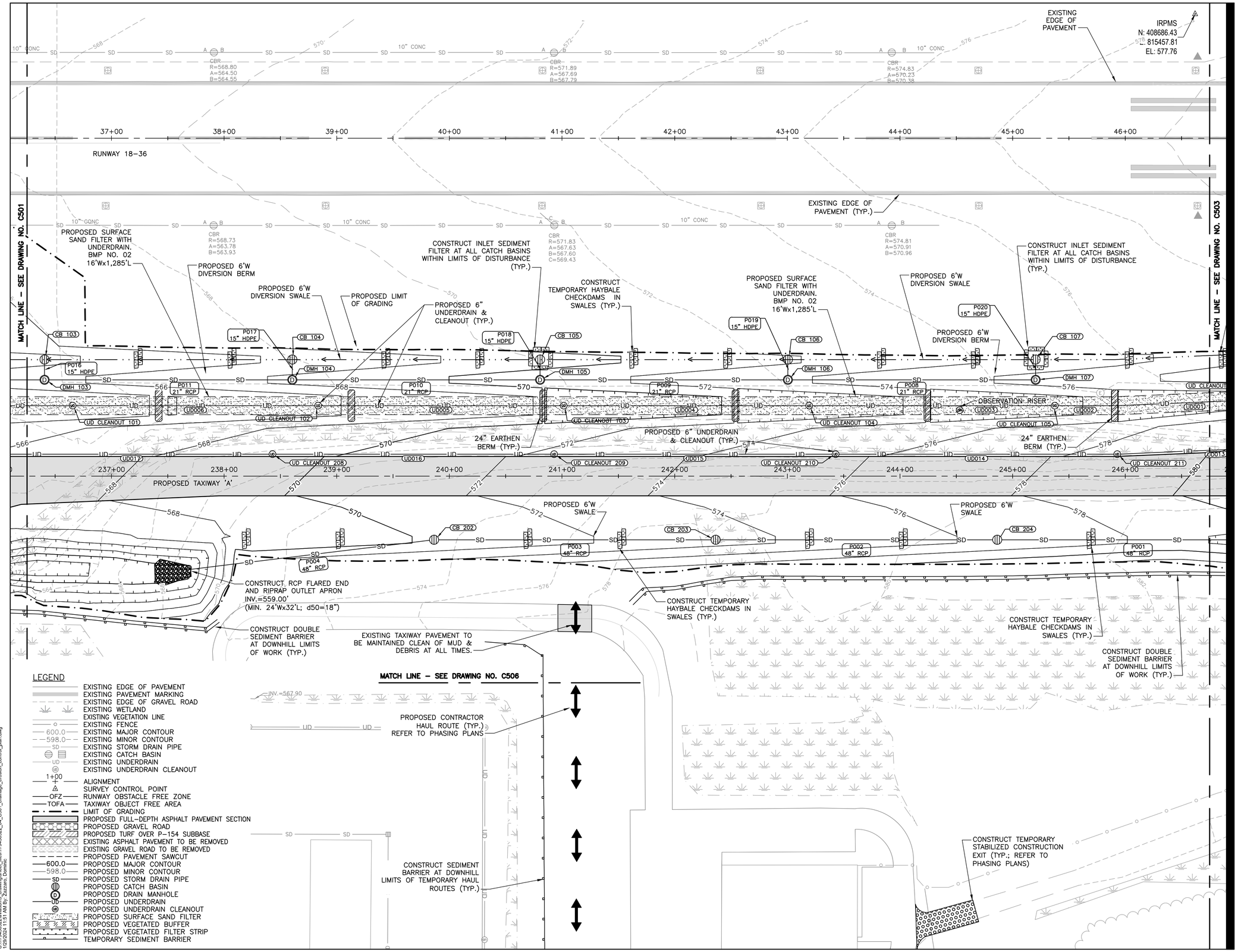
EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROSION CONTROL PLAN - 1

Project No.
179450522

Drawing No.	Sheet	Revision
C501	36 of 79	0



LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- ALIGNMENT
- SURVEY CONTROL POINT
- RUNWAY OBSTACLE FREE ZONE
- TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED SURFACE SAND FILTER
- PROPOSED VEGETATED BUFFER
- PROPOSED VEGETATED FILTER STRIP
- TEMPORARY SEDIMENT BARRIER

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2/29/2024 11:51 AM By: Zazueta Domitilo

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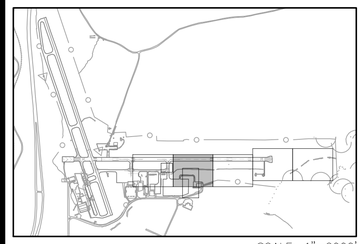

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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THE STATE OF NEW HAMPSHIRE DAVID C. ZAZUETA 13057 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROSION CONTROL PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
C502	37 of 79	0

IRPMS
N: 407927.23
E: 815613.38
EL: 589.48

RUNWAY 18–36

INTERCEPT EXISTING RUNWAY 18–36 UNDERDRAIN AND INSTALL NEW CLEANOUT

INTERCEPT EXISTING RUNWAY 18–36 UNDERDRAIN AND CONNECT TO NEW UNDERDRAIN SYSTEM

P033 EXISTING 48" RCP

UD CLEANOUT 224

UD CLEANOUT 214

UD CLEANOUT 215

EXIST. UNDERDRAIN TO REMAIN; CAP UPSTREAM END

UD008

EXISTING CATCH BASIN AND STORMDRAINS SHALL BE REMOVED

CONSTRUCT TEMPORARY HAYBALE CHECKDAMS IN SWALES (TYP.)

INTERCEPT EXISTING 48" RCP @ ELEV. 570.5± AND CONSTRUCT NEW DRAIN MANHOLE

DMH 201

UD CLEANOUT 213

UD009

UD043

UD010

UD041

UD040

UD039

UD011

UD044

PROPOSED TAXIWAY 'A2'

UD CLEANOUT 216

P028 8" HDPE

P029 8" HDPE

CB 206

P007 30" RCP

P027 24" HDPE

EXISTING CB 02

CONSTRUCT INLET SEDIMENT FILTER AT ALL CATCH BASINS WITHIN LIMITS OF DISTURBANCE (TYP.)

PROPOSED LIMIT OF GRADING

CORE EXIST. CB AT ELEV.=575.10' AND CONNECT NEW SD

EXISTING STORMDRAIN AND CATCH BASIN SYSTEM SHALL REMAIN (TYP.)

UD CLEANOUT 217

REMOVE EXISTING PIPE AND PLUG OPENING WATERTIGHT

UD CLEANOUT 212

UD013

P006 48" RCP

PROPOSED TAXIWAY 'A'

CB 205

PROPOSED STONE CHECK DAMS (TYP.) IN 6'W SWALE

MATCH LINE – SEE DRAWING NO. C502

MATCH LINE – SEE DRAWING NO. C504

47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00

247+00 248+00 249+00 250+00 251+00 252+00 253+00 254+00 255+00

402+00 401+00 400+00 403+00

24"RCP

CBR R=585.21 A=577.72 B=577.81

CBR R=587.97 A=580.67 B=580.77

CBR A=577.62 B=575.14 B=575.19

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- D PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED SURFACE SAND FILTER
- PROPOSED VEGETATED BUFFER
- PROPOSED VEGETATED FILTER STRIP
- TEMPORARY SEDIMENT BARRIER

N

0 40' 80'

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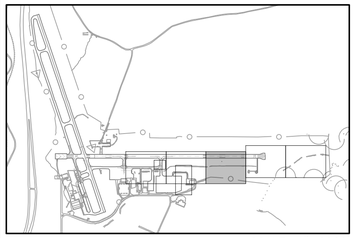

SCALE: 1"=2000'

KEY MAP

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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THE STATE OF NEW HAMPSHIRE DAVID C. DEROSE 15257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROSION CONTROL PLAN - 3

Project No. 179450522

Drawing No. C503

Sheet 38 of 79

Revision 0

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5/8/2024 11:51 AM By: Zaccaro, Dominic

ORIGINAL SHEET - ANSI D

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
- 598.0 EXISTING MINOR CONTOUR
- SD EXISTING STORM DRAIN PIPE
- EXISTING CATCH BASIN
- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL-DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P-154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED SURFACE SAND FILTER
- PROPOSED VEGETATED BUFFER
- PROPOSED VEGETATED FILTER STRIP
- TEMPORARY SEDIMENT BARRIER

58+00 59+00 60+00 61+00 62+00 63+00 64+00 65+00 66+00 67+00

RUNWAY 18-36

IRPMS
N: 407359.62
E: 815729.70
EL: 589.71

MAGF SO CHEV
N: 407157.75
E: 815658.71
EL: 0.00

CONSTRUCT DOUBLE SEDIMENT BARRIER AT DOWNHILL LIMITS OF WORK (TYP.) (ADD-ALTERNATE #1)

CONSTRUCT SEDIMENT BARRIER AT DOWNHILL LIMITS OF WORK (TYP.) (ADD-ALTERNATE #1)

CONSTRUCT TEMPORARY HAYBALE CHECKDAMS IN SWALES (TYP.) (ADD-ALTERNATE #1)

EXISTING LOCALIZER ACCESS DRIVE

MATCH LINE - SEE DRAWING NO. C503

MATCH LINE - SEE DRAWING NO. C505

SD A B 24"RCP
CBR
R=591.99
A=583.99
B=584.14

SD A B 24"RCP
CBR
R=594.92
A=587.72
B=587.67

DISK LEBE
N: 407280.34
E: 815266.55
EL: 601.29

GRADE TO DRAIN BY CONSTRUCTING DRAINAGE SWALE W/ 4H:1V SIDE SLOPES; MIN. LONGITUDINAL GRADE 1.0% (ADD-ALTERNATE #1)

P035
12" HDPE

CONSTRUCT RIPRAP OUTLET APRON INV.=606.00' (MIN. 6'Wx8'L; d50=6") (ADD-ALTERNATE #1)

500+00

EXISTING GRAVEL ROAD TO BE REGRADED (ADD-ALTERNATE #1)

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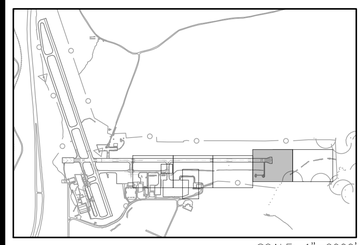

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

NOTE:
1. ALL WORK EFFORTS SHOWN ON THIS SHEET ARE PART OF ADD-ALTERNATE #1, UNLESS SPECIFICALLY INDICATED OTHERWISE.

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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By	Appd.	YY.MM.DD
DPN	DCD	DPN
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID C. PATRIE 15257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROSION CONTROL PLAN - 4

Project No.
179450522

Drawing No.	Sheet	Revision
C504	39 of 79	0

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Feb 2024 1:15 AM By: Zaccaro, Dominic

ORIGINAL SHEET - ANSI D

MATCH LINE – SEE DRAWING NO. C504

CONSTRUCT TEMPORARY HAYBALE CHECKDAMS IN SWALES (TYP.) (ADD–ALTERNATE #1)

PROPOSED LOCALIZER ARRAY STA 74+10 (ADD–ALTERNATE #2) REFER TO VOLUME 2 DRAWINGS

EXISTING GRAVEL ROAD

EXISTING TURF TO BE RE–GRADED TO LOCALIZER CRITICAL AREA SURFACE STANDARDS (ADD–ALTERNATE #1)

EXISTING GRAVEL ROAD TO BE REMOVED AND REPLACED WITH TURF (ADD–ALTERNATE #1)

CONSTRUCT TEMPORARY HAYBALE CHECKDAMS IN SWALES (TYP.) (ADD–ALTERNATE #1)

CONSTRUCT DOUBLE SEDIMENT BARRIER AT DOWNHILL LIMITS OF WORK (TYP.) (ADD–ALTERNATE #1)

PROPOSED GRAVEL ROAD (ADD–ALTERNATE #1)

EXISTING CULVERT TO BE REMOVED (ADD–ALTERNATE #1)

PROPOSED LIMIT OF GRADING (ADD–ALTERNATE #1)

50' ROADSIDE BUFFER (TYP.) (ADD–ALTERNATE #1)

PROPOSED SWALE (ADD–ALTERNATE #1)

PROPOSED DME ANTENNA (ADD–ALTERNATE #2) REFER TO VOLUME 2 DRAWINGS

PROPOSED LOCALIZER ACCESS ROAD

P035 12" HDPE

4'ø OUTLET CONTROL STRUCTURE #2
6"ø ORIFICE @INV.=606.50'
36"ø SPILLWAY GRATE @INV.=609.00'
12" OUTLET SD INV.=606.50'
(ADD–ALTERNATE #1)

PLACE EROSION CONTROL BLANKET ON ALL SLOPES EXCEEDING 4H:1V OR GREATER THAN 10' HIGH (ADD–ALTERNATE #1)

CONSTRUCT HAYBALE SEDIMENT FILTER AT ALL CULVERT INLETS (TYP.) (ADD–ALTERNATE #1)

CONSTRUCT DOUBLE SEDIMENT BARRIER AT DOWNHILL LIMITS OF WORK (TYP.) (ADD–ALTERNATE #1)

PROPOSED LOCALIZER SHELTER (ADD–ALTERNATE #2) REFER TO VOLUME 2 DRAWINGS

LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT MARKING
- EXISTING EDGE OF GRAVEL ROAD
- EXISTING WETLAND
- EXISTING VEGETATION LINE
- EXISTING FENCE
- 600.0 EXISTING MAJOR CONTOUR
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- UD EXISTING UNDERDRAIN
- EXISTING UNDERDRAIN CLEANOUT
- 1+00 ALIGNMENT
- SURVEY CONTROL POINT
- OFZ RUNWAY OBSTACLE FREE ZONE
- TOFA TAXIWAY OBJECT FREE AREA
- LIMIT OF GRADING
- PROPOSED FULL–DEPTH ASPHALT PAVEMENT SECTION
- PROPOSED GRAVEL ROAD
- PROPOSED TURF OVER P–154 SUBBASE
- EXISTING ASPHALT PAVEMENT TO BE REMOVED
- EXISTING GRAVEL ROAD TO BE REMOVED
- PROPOSED PAVEMENT SAWCUT
- 600.0 PROPOSED MAJOR CONTOUR
- 598.0 PROPOSED MINOR CONTOUR
- SD PROPOSED STORM DRAIN PIPE
- PROPOSED CATCH BASIN
- D PROPOSED DRAIN MANHOLE
- UD PROPOSED UNDERDRAIN
- PROPOSED UNDERDRAIN CLEANOUT
- PROPOSED SURFACE SAND FILTER
- PROPOSED VEGETATED BUFFER
- PROPOSED VEGETATED FILTER STRIP
- TEMPORARY SEDIMENT BARRIER

SCALE: 1"=2000'

KEY MAP

0 40' 80'

NOTE:
1. ALL WORK EFFORTS SHOWN ON THIS SHEET ARE PART OF ADD–ALTERNATE #1, UNLESS SPECIFICALLY INDICATED OTHERWISE.

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

By	Appd.	YY.MM.DD
DPN	DCD	DPN
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID C. PRICE 17057 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROSION CONTROL PLAN - 5

Project No. 179450522

Drawing No. C505 | Sheet 40 of 79 | Revision 0

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02/20/2024 11:51 AM By: Zaccaro Domitilla

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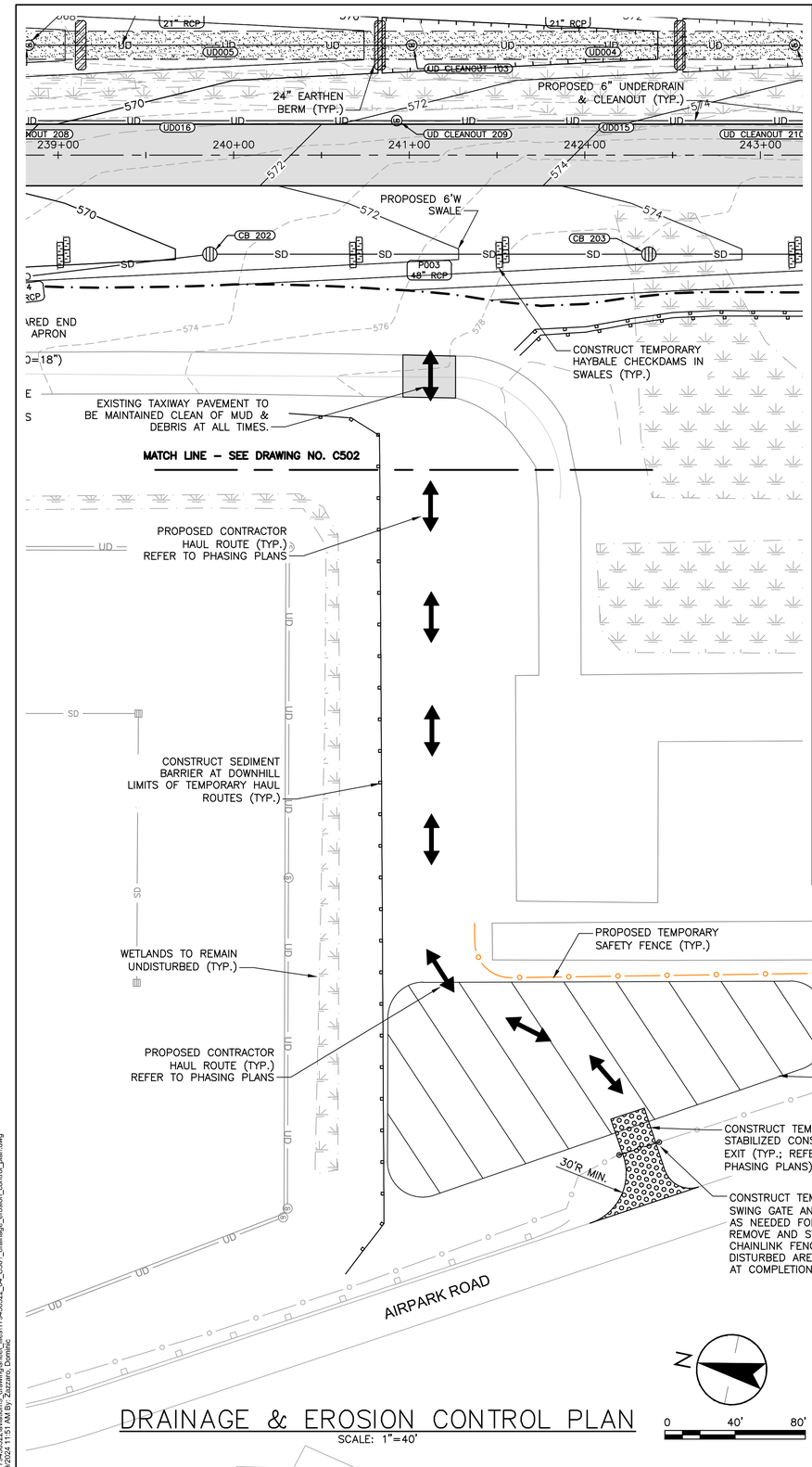
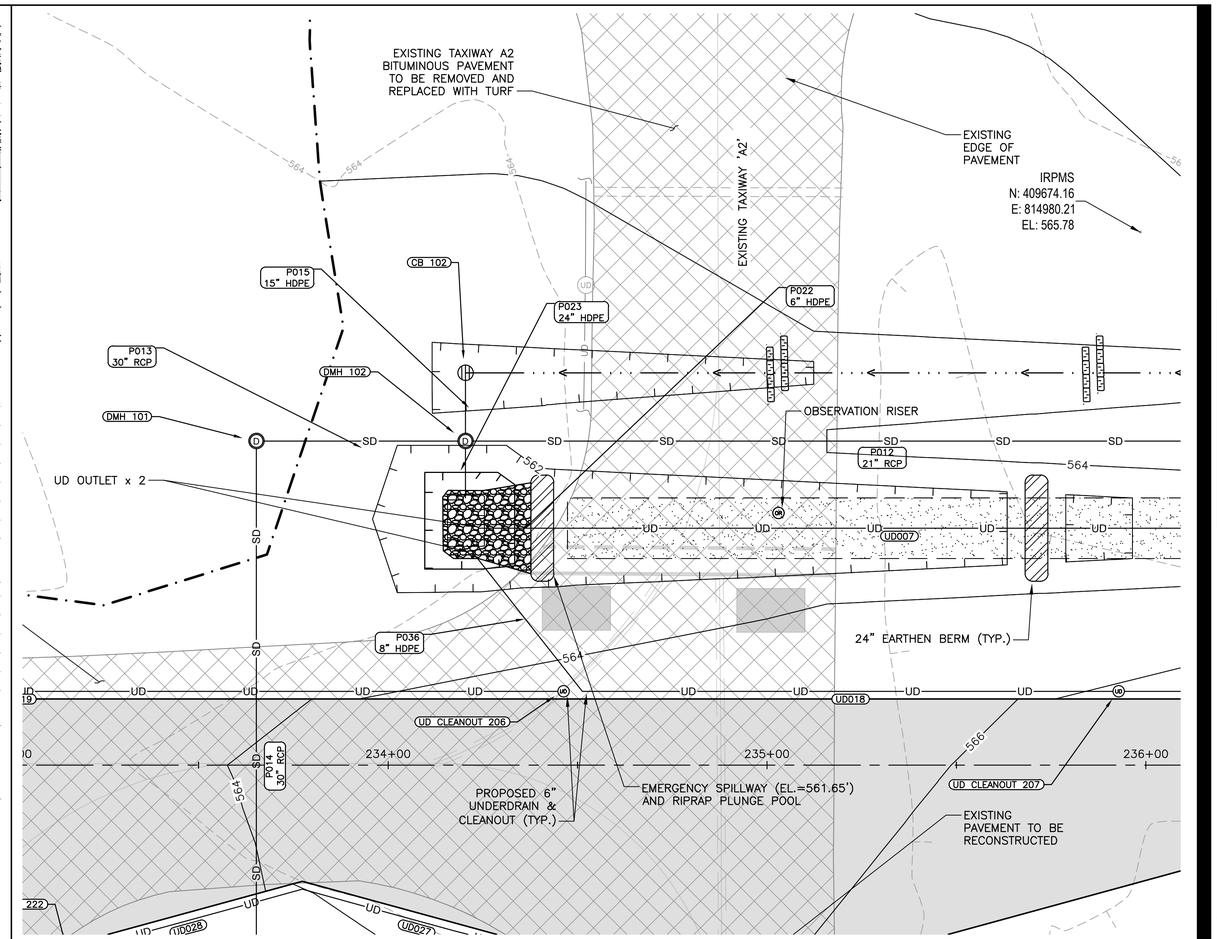


DRAINAGE & EROSION CONTROL PLAN

SCALE: 1"=40'



SITE ENLARGEMENT PLAN

SCALE: 1"=20'

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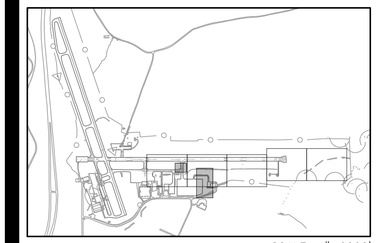

SCALE: 1"=2000'

KEY MAP

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Issued	By	Appd.	YY.MM.DD

Dwn.	Chkd.	Dsgn.
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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROSION CONTROL PLAN - 6

Project No.
179450522

Drawing No.	Sheet	Revision
C506	41 of 79	0

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5/29/2024 11:51 AM By: Zazarino, Dominic

ORIGINAL SHEET - ANSI D

STRUCTURE TABLE				
STRUCTURE NAME	DETAILS	COORDINATES	PIPES IN	PIPES OUT
CB 102	4' DIA. CB RIM = 560.85 FT	N: 409841.19 E: 814908.06		P015, 15" HDPE INV OUT =557.05 (W)
CB 103	4' DIA. CB RIM = 563.60 FT	N: 409625.68 E: 814952.24		P016, 15" HDPE INV OUT =558.85 (W)
CB 104	4' DIA. CB RIM = 566.35 FT	N: 409410.16 E: 814996.42		P017, 15" HDPE INV OUT =561.10 (W)
CB 105	4' DIA. CB RIM = 569.10 FT	N: 409194.64 E: 815040.60		P018, 15" HDPE INV OUT =563.35 (W)
CB 106	4' DIA. CB RIM = 571.85 FT	N: 408979.12 E: 815084.78		P019, 15" HDPE INV OUT =565.60 (W)
CB 107	4' DIA. CB RIM = 574.64 FT	N: 408763.60 E: 815128.96		P020, 15" HDPE INV OUT =567.85 (W)
CB 202	6' DIA. CB RIM = 570.24 FT	N: 409254.65 E: 814864.97	P003, 48" RCP INV IN =562.05 (S)	P004, 48" RCP INV OUT =561.95 (N)
CB 203	6' DIA. CB RIM = 573.34 FT	N: 409009.74 E: 814915.18	P002, 48" RCP INV IN =564.10 (S)	P003, 48" RCP INV OUT =564.00 (N)
CB 204	6' DIA. CB RIM = 576.44 FT	N: 408764.83 E: 814965.38	P001, 48" RCP INV IN =566.15 (S)	P002, 48" RCP INV OUT =566.05 (N)
CB 205	8' DIA. CB W/ HIGH FLOW GRATE RIM = 577.13 FT	N: 408519.93 E: 815015.59	P006, 48" RCP INV IN =568.60 (E)	P001, 48" RCP INV OUT =568.10 (N)
CB 206	7' DIA. CB RIM = 580.60 FT	N: 408287.53 E: 815254.53	P021, 24" HDPE INV IN =574.20 (SW) P029, 8" HDPE INV IN =575.65 (NE)	P007, 30" RCP INV OUT =573.10 (N)
DMH 101	6' DIA. DMH RIM = 562.50 FT	N: 409891.67 E: 814879.34	P013, 30" RCP INV IN =555.80 (S)	P014, 30" RCP INV OUT =555.70 (W)
DMH 102	6' DIA. DMH RIM = 562.24 FT	N: 409837.58 E: 814890.43	P012, 21" RCP INV IN =556.40 (S) P015, 15" HDPE INV IN =556.85 (E) P023, 24" HDPE INV IN =556.85 (W)	P013, 30" RCP INV OUT =556.30 (N)
DMH 103	5' DIA. DMH RIM = 565.55 FT	N: 409622.06 E: 814934.61	P011, 21" RCP INV IN =558.65 (S) P016, 15" HDPE INV IN =558.65 (E)	P012, 21" RCP INV OUT =558.55 (N)
DMH 104	5' DIA. DMH RIM = 568.27 FT	N: 409406.54 E: 814978.79	P010, 21" RCP INV IN =560.90 (S) P017, 15" HDPE INV IN =560.90 (E)	P011, 21" RCP INV OUT =560.80 (N)
DMH 105	5' DIA. DMH RIM = 571.01 FT	N: 409191.03 E: 815022.97	P009, 21" RCP INV IN =563.15 (S) P018, 15" HDPE INV IN =563.15 (E)	P010, 21" RCP INV OUT =563.05 (N)
DMH 106	5' DIA. DMH RIM = 573.73 FT	N: 408975.51 E: 815067.15	P008, 21" RCP INV IN =565.40 (S) P019, 15" HDPE INV IN =565.40 (E)	P009, 21" RCP INV OUT =565.30 (N)
DMH 107	5' DIA. DMH RIM = 576.46 FT	N: 408759.99 E: 815111.33	P020, 15" HDPE INV IN =567.65 (E)	P008, 21" RCP INV OUT =567.55 (N)
DMH 201	8' DIA. DMH RIM = 578.47 FT	N: 408549.93 E: 815161.95	P007, 30" RCP INV IN =570.30 (S) P033, 48" INV IN =570.50 (E)	P006, 48" RCP INV OUT =570.00 (W)
EXISTING CB 01	EXISTING CB RIM = 553.78 FT	N: 410140.21 E: 814813.87	P034, 36" INV IN =550.20 (SE) P027, 8" HDPE INV IN =552.40 (SW)	P037, 36" INV OUT =548.90 (W)
EXISTING CB 02	EXISTING CB RIM = 577.37 FT	N: 408235.56 E: 815186.28		P021, 24" HDPE INV OUT =575.10 (NE)
OCS 01	72" DIA. OUTLET CONTROL STRUCTURE RIM = 565.00 FT	N: 409649.63 E: 814756.58	REFER TO PLANS FOR INLET ORIFICES INFORMATION	P025, 54" RCP INV OUT =557.60 (N)
OCS 02	48" DIA. OUTLET CONTROL STRUCTURE RIM = 609.00 FT	N: 406489.41 E: 815455.18	REFER TO PLANS FOR INLET ORIFICES INFORMATION	P035, 12" HDPE INV OUT =606.50 (N)
UD CLEANOUT 101	UD CLEANOUT (BMP SWALE) RIM = 562.85 FT	N: 409593.01 E: 814917.08	UD006, 6" HDPE INV IN =560.35 (S)	UD007, 6" HDPE INV OUT =560.35 (N)
UD CLEANOUT 102	UD CLEANOUT (BMP SWALE) RIM = 565.56 FT	N: 409379.45 E: 814960.86	UD005, 6" HDPE INV IN =563.06 (S)	UD006, 6" HDPE INV OUT =563.06 (N)
UD CLEANOUT 103	UD CLEANOUT (BMP SWALE) RIM = 568.26 FT	N: 409165.89 E: 815004.64	UD004, 6" HDPE INV IN =565.76 (S)	UD005, 6" HDPE INV OUT =565.76 (N)
UD CLEANOUT 104	UD CLEANOUT (BMP SWALE) RIM = 570.96 FT	N: 408952.33 E: 815048.42	UD003, 6" HDPE INV IN =568.46 (S)	UD004, 6" HDPE INV OUT =568.46 (N)
UD CLEANOUT 105	UD CLEANOUT (BMP SWALE) RIM = 573.67 FT	N: 408738.77 E: 815092.20	UD002, 6" HDPE INV IN =571.17 (S)	UD003, 6" HDPE INV OUT =571.17 (N)

STRUCTURE TABLE				
STRUCTURE NAME	DETAILS	COORDINATES	PIPES IN	PIPES OUT
UD CLEANOUT 106	UD CLEANOUT (BMP SWALE) RIM = 576.42 FT	N: 408550.13 E: 815136.96		UD001, 6" HDPE INV OUT =573.92 (N)
UD CLEANOUT 205	UD CLEANOUT RIM = 561.49 FT	N: 410081.42 E: 814773.07	UD019, 6" INV IN =556.28 (S)	P027, 8" HDPE INV OUT =553.94 (NE)
UD CLEANOUT 206	UD CLEANOUT RIM = 564.43 FT	N: 409799.02 E: 814830.96		UD019, 6" INV OUT =559.17 (N)
UD CLEANOUT 207	UD CLEANOUT RIM = 566.10 FT	N: 409655.45 E: 814860.39	UD017, 6" INV IN =560.86 (S)	UD018, 6" INV OUT =560.86 (N)
UD CLEANOUT 208	UD CLEANOUT RIM = 569.20 FT	N: 409410.55 E: 814910.59	UD016, 6" INV IN =563.95 (S)	UD017, 6" INV OUT =563.95 (N)
UD CLEANOUT 209	UD CLEANOUT RIM = 572.30 FT	N: 409165.64 E: 814960.80	UD015, 6" INV IN =567.05 (S)	UD016, 6" INV OUT =567.05 (N)
UD CLEANOUT 210	UD CLEANOUT RIM = 575.40 FT	N: 408920.73 E: 815011.00	UD014, 6" INV IN =570.16 (S)	UD015, 6" INV OUT =570.16 (N)
UD CLEANOUT 211	UD CLEANOUT RIM = 578.61 FT	N: 408675.83 E: 815061.21	UD013, 6" INV IN =573.36 (S)	UD014, 6" INV OUT =573.36 (N)
UD CLEANOUT 212	UD CLEANOUT RIM = 581.13 FT	N: 408505.55 E: 815103.78	UD012, 6" INV IN =574.86 (SE)	UD013, 6" INV OUT =574.86 (N)
UD CLEANOUT 213	UD CLEANOUT RIM = 582.25 FT	N: 408423.92 E: 815227.50	UD010, 6" INV IN =576.22 (E)	UD011, 6" INV OUT =576.22 (W)
UD CLEANOUT 214	UD CLEANOUT RIM = 582.39 FT	N: 408476.57 E: 815331.85		UD008, 6" INV OUT =577.21 (SW)
UD CLEANOUT 215	UD CLEANOUT RIM = 584.20 FT	N: 408362.87 E: 815359.94		UD042, 6" INV OUT =578.95 (W)
UD CLEANOUT 216	UD CLEANOUT RIM = 582.85 FT	N: 408374.84 E: 815253.70	UD043, 6" INV IN =577.50 (E) UD041, 6" INV IN =577.50 (W)	P028, 8" HDPE INV OUT =577.50 (S)
UD CLEANOUT 217	UD CLEANOUT RIM = 583.50 FT	N: 408327.79 E: 815161.94		UD039, 6" INV OUT =578.58 (N)
UD CLEANOUT 219	UD CLEANOUT RIM = 561.48 FT	N: 410070.80 E: 814721.25	UD032, 6" INV IN =554.59 (S)	P030, 8" HDPE INV OUT =554.59 (W)
UD CLEANOUT 220	UD CLEANOUT RIM = 561.02 FT	N: 409971.34 E: 814641.41		UD031, 6" INV OUT =555.77 (NE)
UD CLEANOUT 221	UD CLEANOUT RIM = 559.33 FT	N: 409918.29 E: 814652.28		UD030, 6" INV OUT =555.79 (E)
UD CLEANOUT 222	UD CLEANOUT RIM = 562.96 FT	N: 409912.79 E: 814737.19	UD028, 6" INV IN =557.71 (SE)	UD029, 6" INV OUT =557.71 (W)
UD CLEANOUT 223	UD CLEANOUT RIM = 566.08 FT	N: 409762.64 E: 814702.86		UD026, 6" INV OUT =560.84 (NE)
UD CLEANOUT 224	UD CLEANOUT RIM = 582.34 FT	N: 408487.07 E: 815334.48	MATCH EXISTING UD	MATCH EXISTING UD

NOTES:
1. COORDINATES PROVIDED ARE FOR CENTER OF STRUCTURE. CONTRACTOR SHALL ENSURE THAT CATCH BASIN GRATES ARE CENTERED AT THE PROVIDED COORDINATES.

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE PIPE & STRUCTURE SCHEDULE - 1

Project No.		
179450522	1"=40'	
Drawing No.	Sheet	Revision
C511	42 of 79	0

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12/9/2024 11:51 AM By: Zazzaro, Dominic

ORIGINAL SHEET - ANSI D

PIPE TABLE					
NAME	DESCRIPTION	2D LENGTH (to inside edges)	SLOPE	PIPE START INVERT	PIPE END INVERT
P001	48" RCP	243'	0.78%	568.10'	566.15'
P002	48" RCP	244'	0.78%	566.05'	564.10'
P003	48" RCP	244'	0.78%	564.00'	562.05'
P004	48" RCP	215'	0.94%	561.95'	559.90'
P006	48" RCP	141'	0.94%	570.00'	568.60'
P007	30" RCP	271'	1.01%	573.10'	570.30'
P008	21" RCP	215'	0.98%	567.55'	565.40'
P009	21" RCP	215'	0.98%	565.30'	563.15'
P010	21" RCP	215'	0.98%	563.05'	560.90'
P011	21" RCP	215'	0.98%	560.80'	558.65'
P012	21" RCP	215'	0.98%	558.55'	556.40'
P013	30" RCP	49'	0.91%	556.30'	555.80'
P014	30" RCP	168'	0.99%	555.70'	554.00'
P015	15" HDPE	13'	1.11%	557.05'	556.85'
P016	15" HDPE	14'	1.11%	558.85'	558.65'
P017	15" HDPE	14'	1.11%	561.10'	560.90'
P018	15" HDPE	14'	1.11%	563.35'	563.15'
P019	15" HDPE	14'	1.11%	565.60'	565.40'
P020	15" HDPE	14'	1.11%	567.85'	567.65'
P021	24" HDPE	82'	1.05%	575.10'	574.20'
P022	6" HDPE	23'	0.86%	557.65'	557.45'
P023	24" HDPE	12'	1.00%	557.00'	556.85'
P024	54" RCP	174'	1.56%	552.20'	549.50'
P025	54" RCP (EXTENSION)	15'	1.13%	557.60'	557.40'
P026	EXISTING 54" RCP	160'	2.31%	553.70'	557.40'
P027	8" HDPE	71'	2.15%	553.94'	552.40'
P028	8" HDPE	67'	2.00%	577.50'	576.15'
P029	8" HDPE	21'	2.02%	576.15'	575.65'
P030	8" HDPE	50'	2.18%	554.59'	553.50'
P031	8" HDPE	40'	2.10%	556.60'	555.75'
P032	8" HDPE	45'	2.03%	555.52'	554.60'
P033	EXISTING 48" RCP	462'	0.47%	572.70'	570.50'
P034	EXISTING 36" RCP	372'	1.32%	550.20'	555.10'
P035	12" HDPE	95'	0.51%	606.50'	606.00'
P036	8" HDPE	49'	2.08%	559.22'	558.20'
P037	EXISTING 36" RCP	186'	1.13%	548.90'	546.80'
UD001	6" HDPE UD	140'	1.37%	573.92'	572.01'
UD002	6" HDPE UD	54'	1.55%	572.01'	571.17'
UD003	6" HDPE UD	218'	1.24%	571.17'	568.46'
UD004	6" HDPE UD	218'	1.24%	568.46'	565.76'

PIPE TABLE					
NAME	DESCRIPTION	2D LENGTH (to inside edges)	SLOPE	PIPE START INVERT	PIPE END INVERT
UD005	6" HDPE UD	218'	1.24%	565.76'	563.06'
UD006	6" HDPE UD	218'	1.24%	563.06'	560.35'
UD007	6" HDPE UD	218'	1.16%	560.35'	557.82'
UD008	6" HDPE UD	87'	0.85%	577.21'	576.48'
UD009	6" HDPE UD	16'	0.80%	576.48'	576.35'
UD010	6" HDPE UD	16'	0.80%	576.35'	576.22'
UD011	6" HDPE UD	85'	0.80%	576.22'	575.54'
UD012	6" HDPE UD	85'	0.80%	575.54'	574.86'
UD013	6" HDPE UD	175'	0.85%	574.86'	573.36'
UD014	6" HDPE UD	250'	1.28%	573.36'	570.16'
UD015	6" HDPE UD	250'	1.24%	570.16'	567.05'
UD016	6" HDPE UD	250'	1.24%	567.05'	563.95'
UD017	6" HDPE UD	250'	1.24%	563.95'	560.86'
UD018	6" HDPE UD	141'	1.16%	560.86'	559.22'
UD019	6" HDPE UD	288'	1.00%	559.17'	556.28'
UD026	6" HDPE UD	66'	1.53%	560.84'	559.83'
UD027	6" HDPE UD	64'	1.71%	559.83'	558.74'
UD028	6" HDPE UD	63'	1.62%	558.74'	557.71'
UD029	6" HDPE UD	41'	2.71%	557.71'	556.60'
UD030	6" HDPE UD	34'	0.80%	555.52'	555.79'
UD031	6" HDPE UD	85'	0.81%	555.77'	555.08'
UD032	6" HDPE UD	61'	0.81%	555.08'	554.59'
UD039	6" HDPE UD	4'	1.51%	578.58'	578.51'
UD040	6" HDPE UD	85'	1.03%	578.51'	577.63'
UD041	6" HDPE UD	16'	0.80%	577.63'	577.50'
UD042	6" HDPE UD	92'	1.41%	578.95'	577.66'
UD043	6" HDPE UD	16'	1.00%	577.66'	577.50'

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE PIPE & STRUCTURE SCHEDULE - 2

Project No. 179450522 | 1"=40'

Drawing No. C512 | Sheet 43 of 79 | Revision 0

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1/22/2024 11:51 AM By: Zazzaro, Domitic

ORIGINAL SHEET - ANSI D

EROSION AND SEDIMENT CONTROL PLAN

A. GENERAL DESCRIPTION

THIS EROSION CONTROL PLAN HAS BEEN DEVELOPED FOR THE EXTENSION OF TAXIWAY 'A', EXTENSION OF RUNWAY 18-36 AND ASSOCIATED IMPROVEMENTS AT THE LEBANON MUNICIPAL AIRPORT. THE PRINCIPAL TEMPORARY EROSION CONTROL MEASURES INCLUDE THE ESTABLISHMENT OF SINGLE AND DOUBLE SEDIMENT BARRIERS AT SELECTED LOCATIONS ALONG THE PROJECT CONSTRUCTION LIMITS AS INDICATED, EROSION CONTROL MATTING ON STEEP SLOPES AND IN CHANNEL BOTTOMS, AND CHECK DAMS IN CHANNELS. PERMANENT EROSION CONTROL MEASURES INCLUDE SEEDING AND MULCHING OF ALL DISTURBED SOILS, RIP-RAP APRONS AT UNDERDRAIN AND STORM DRAIN INLETS AND OUTFALLS , AND STONE CHECK DAMS / BERMS IN CHANNEL BOTTOMS.

ALL EROSION CONTROL MEASURES SHALL COMPLY WITH THE NEW HAMPSHIRE STORMWATER MANUAL, VOLUME 3 EROSION AND SEDIMENT CONTROLS DURING CONSTRUCTION PUBLISHED BY THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES.

B. SITE SOILS

THE FOLLOWING SOIL TYPES ARE FOUND IN THE WORK AREAS:

- UDORTHENTS. NO EROSION FACTOR ASSIGNED.
- STISSING SILT LOAM, VERY STONY, EROSION FACTOR (K) 0.37
- CHOCURUA MUCKY PEAT, NO EROSION FACTOR ASSIGNED
- WINDSOR LOAMY SAND, NO EROSION FACTOR ASSIGNED
- BERNARDSON SILT LOAM, EROSION FACTOR (K) 0.43
- PITTSTOWN LOAM, EROSION FACTOR (K) 0.32
- CHARLTON FINE SANDY LOAM, EROSION FACTOR (K) 0.24
- CARDIGAN-KEARSARGE-ROCK OUTCROP COMPLEX, EROSION FACTOR (K) 0.32

C. EROSION AND SEDIMENT CONTROL MEASURES

EROSION AND SEDIMENT CONTROLS WILL BE EMPLOYED TO PREVENT THE EROSION AND TRANSPORT OF SEDIMENT INTO RESOURCE AREAS DURING THE EARTHWORK AND CONSTRUCTION PHASES OF THE PROJECT. EROSION AND SEDIMENTATION CONTROL MEASURES WILL BE INSTALLED PRIOR TO SITE EXCAVATION OR DISTURBANCE AND WILL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD. DESCRIBED BELOW ARE THE EROSION AND SEDIMENT CONTROL MEASURES THAT WILL BE IMPLEMENTED AT THE PROJECT SITE AND THAT ARE INCLUDED IN THE *STORMWATER POLLUTION PREVENTION PLAN (SWPPP)* THAT THE ENGINEER WILL PREPARE FOR THIS PROJECT. A COPY OF THE SWPPP WILL BE PROVIDED TO THE CONTRACTOR PRIOR TO CONSTRUCTION. THE CONTRACTOR IS RESPONSIBLE FOR COMPLYING WITH ALL SWPPP REQUIREMENTS AND SHALL IMPLEMENT AN INSPECTION AND MAINTENANCE PROGRAM AS DESCRIBED THEREIN.

VEGETATIVE BUFFERS

UNDISTURBED VEGETATIVE BUFFERS ARE TO BE USED WHERE PRACTICAL BETWEEN WETLAND AREAS, STREAMS AND SENSITIVE AREAS. THE CONTRACTOR SHALL TAKE CARE IN LEAVING THE BUFFER STRIPS IN THEIR NATURAL STATE AND ASSURE THAT RUNOFF DOES NOT CHANNELIZE THROUGH THE BUFFER. CONSTRUCTION ACTIVITIES AND EQUIPMENT SHALL BE RESTRICTED IN AREAS TO REMAIN AS BUFFERS OR NOT OTHERWISE SCHEDULED FOR CONSTRUCTION.

SEDIMENT BARRIERS

SEDIMENT BARRIERS ARE TEMPORARY SEDIMENT CONTROL FEATURES. THE BARRIERS ARE PLACED TO TRAP SEDIMENT TRANSPORTED BY RUNOFF BEFORE IT REACHES THE DRAINAGE SYSTEM OR LEAVES THE CONSTRUCTION SITE. WHEN NECESSARY, ADDITIONAL BARRIERS WILL BE INSTALLED IMMEDIATELY DOWN GRADIENT OF EROSION-PRONE AREAS, SUCH AS THE BASE OF STEEP EXPOSED SLOPES AND AROUND THE BASE OF STOCKPILES, THROUGHOUT THE CONSTRUCTION PHASE OF THE PROJECT. IT IS ESSENTIAL FOR PERFORMANCE THAT A LAYER OF COMPOST MATERIAL BE PLACED BETWEEN THE BARRIER AND THE GROUND SURFACE AS SHOWN ON THE DRAWINGS. IN AREAS ADJACENT TO WETLANDS OR OTHER PROTECTED RESOURCES, A DOUBLE LAYER OF SEDIMENT BARRIERS SHALL BE INSTALLED AS SHOWN ON THE PLANS AND DETAILS..

MULCHING

HAY, STRAW, OR SYNTHETIC MULCH SHALL BE APPLIED TO EXPOSED SOILS IN ORDER TO PREVENT THE EROSION OF BARE OR DISTURBED AREAS. MULCH WILL BE SUBSTITUTED WITH MATTING WHERE NECESSARY OR AS SPECIFIED.

MATTING

MATTING SHALL CONSIST OF STRAW, COCONUT OR EXCELSIOR SANDWICHED BETWEEN PHOTODEGRADABLE NETTING. MATTING MAY BE SUBSTITUTED WITH SOD WHERE DESIRED. MATTING SHALL BE USED AS FOLLOWS:

(1) IN THE BASE OF SWALES.
(2) ON STEEP SLOPES WHERE RILLING MAY OCCUR (SLOPES STEEPER THAN 33% (3H:1V).
(3) IN ANY SENSITIVE AREAS SUBJECT TO EROSION OR AS INDICATED ON THE PLANS.
(4) ON ANY DISTURBED OR NEWLY GRADED SLOPES STEEPER THAN 33% (3H:1V) AND LOCATED WITHIN 100 FEET OF A PERENNIAL OR INTERMITTENT STREAM OR OTHER SENSITIVE AREA PROVIDED THAT RUNOFF FROM THE AREA CONTRIBUTES DIRECTLY TO THE STREAM OR SENSITIVE AREA.
(5) WHERE STRAW MULCH HAS BEEN DETERMINED TO BE INEFFECTIVE BASED ON OBSERVATIONS MADE IN THE FIELD OR AS DIRECTED BY THE ENGINEER.
(6) ANY OTHER AREAS IDENTIFIED ON THE PLANS OR AS DIRECTED BY THE ENGINEER.

RIP-RAP

STONE RIP-RAP SHALL BE USED IN TEMPORARY SWALES, STEEP SLOPES, POND OUTLETS, ETC. AS SHOWN ON THE PLANS TO PROTECT SOILS FROM EXCESSIVE FLOW VELOCITIES. IT SHALL BE OF THE SIZE AND DEPTHS SPECIFIED ON THE PLANS. A MINIMUM RIP-RAP SIZE OF D50 = 6 IN. SHALL BE USED IF NOT OTHERWISE INDICATED ON PLANS.

OUTLET PROTECTION

RIP-RAP OUTLET APRONS SHALL BE INSTALLED AT ALL UNDERDRAIN AND STORMDRAIN OUTLETS AS DETAILED ON THE PLANS TO PREVENT SCOURING. A D50 = 6 IN SHALL BE USED IF NOT OTHERWISE SPECIFIED.

HAY BALE BARRIERS

HAY BALE BARRIERS SHALL BE INSTALLED IN EXISTING AND PROPOSED SWALES OR AT CULVERT INLETS AS SHOWN ON THE PLANS AND SHALL BE REMOVED AFTER THE SITE HAS FULLY STABILIZED. THESE BARRIERS SERVE TO REDUCE FLOW VELOCITIES IN SWALES HELPING TO REDUCE RILLING, AS WELL AS INTERCEPT SEDIMENT FROM UNSTABILIZED SOILS. BARRIERS SHALL BE CONSTRUCTED OF STAKED HAY BALES.

DUST CONTROL

FUGITIVE DUST WILL BE CONTROLLED USING A WATER TRUCK.

SLOPE STABILIZATION

A TEMPORARY VEGETATIVE COVER WILL BE ESTABLISHED ON AREAS OF EXPOSED SOILS (INCLUDING STOCKPILES) THAT REMAIN INACTIVE AND UNSTABILIZED FOR A PERIOD OF MORE THAN 21 DAYS FOR SLOPES, AND WEATHER PERMITTING. THE SEEDED SURFACES WILL BE COVERED WITH A LAYER OF STRAW MULCH OR HYDRO MULCH AS DESCRIBED ABOVE. ON SLOPES 4:1 AND STEEPER, LOAMED AND SEEDED AREAS WILL BE MULCHED WITH HAY TO PREVENT EROSION PRIOR TO GERMINATION OF THE SEED. ON SLOPES GREATER THAN 3:1, EROSION CONTROL BLANKET OR MATTING WILL BE INSTALLED AND MAINTAINED UNTIL VEGETATION HAS BEEN ESTABLISHED.

STABILIZED CONSTRUCTION EXIT

THE PURPOSE OF STABILIZED CONSTRUCTION EXITS IS TO REMOVE SEDIMENT ATTACHED TO VEHICLE TIRES AND TO MINIMIZE SEDIMENT TRANSPORT AND DEPOSITION ONTO PUBLIC ROAD SURFACES. THE CONSTRUCTION EXIT WILL BE COMPOSED OF BEDS OF CRUSHED STONE OVER GEOTEXTILE WHICH WILL BE REPLENISHED AS NECESSARY TO MAINTAIN THEIR PROPER FUNCTION. THE STABILIZED CONSTRUCTION EXIT WILL REMAIN IN PLACE UNTIL ALL CONSTRUCTION WORK IN AN AREA IS COMPLETE AND THE SITE HAS BEEN FULLY STABILIZED AS DETERMINED BY THE ENGINEER.

DIVERSION CHANNELS

DIVERSION CHANNELS ARE TEMPORARY CONTROLS TO DIVERT RUNOFF AROUND WORK ZONES AND DISCHARGE IT TO A STABLE AREA. DIVERSION CHANNELS WILL BE CONSTRUCTED WITH STABILIZED BEDS USING CRUSHED STONE, PLASTIC OR OTHER APPROVED MATERIALS, CRUSHED STONE CHECK DAMS OR POLYMER TREATMENTS AS NECESSARY. TEMPORARY DIVERSIONS WILL REMAIN IN PLACE UNTIL SLOPES ARE PERMANENTLY STABILIZED OR GRADED LEVEL.

D. ENTITY RESPONSIBLE FOR PLAN COMPLIANCE

THE CITY OF LEBANON, THROUGH THE LEBANON MUNICIPAL AIRPORT COMMISSION AND IT'S ON-SITE REPRESENTATIVES, SHALL BE RESPONSIBLE FOR ENSURING COMPLIANCE WITH THE CONSTRUCTION PERIOD EROSION AND SEDIMENT CONTROL PLAN. CONTACT INFORMATION FOR THE AIRPORT COMMISSION IS AS FOLLOWS:

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD
WEST LEBANON, NH 03784
TELEPHONE: (603) 298-8878
CONTACT PERSON: AIRPORT MANAGER

E. CONSTRUCTION PERIOD POLLUTION PREVENTION MEASURES

CONSTRUCTION SOURCES OF POLLUTION IN STORMWATER RUNOFF INCLUDE CONSTRUCTION DEBRIS, FLUIDS ASSOCIATED WITH CONSTRUCTION EQUIPMENT (FUEL AND OILS), CHEMICALS ASSOCIATED WITH SEEDING (FERTILIZER AND LIME), AND HERBICIDES.

PRECAUTIONS SHALL BE IMPLEMENTED WHICH MINIMIZE THE RISK OF POTENTIAL POLLUTANTS IMPACTING STORMWATER. CONSTRUCTION DEBRIS SHALL NOT BE STORED ON-SITE FOR LONG DURATIONS BUT SHALL BE REMOVED FROM THE SITE AND DISPOSED OF PROPERLY. STOCKPILED MATERIAL IS INTENDED FOR USE AT THE PROJECT AREA; NO STOCKPILED MATERIAL SHALL REMAIN ON-SITE AFTER THE COMPLETION OF THE PROJECT. TOPSOIL WILL BE STOCKPILED WHEN NECESSARY IN AREAS WHICH HAVE MINIMUM POTENTIAL FOR EROSION AND WILL BE KEPT AS FAR AS POSSIBLE FROM EXISTING DRAINAGE AREAS. ALL STOCKPILES EXPECTED TO REMAIN LONGER THAN 21 DAYS SHALL BE TREATED WITH MULCH. STOCKPILES EXPECTED TO REMAIN LONGER THAN 3 DAYS OR IN THE EVENT OF ANTICIPATED PRECIPITATION WITHIN 3 DAYS SHALL BE ENCIRCLED WITH SILT FENCE AT THE DOWN-GRADIENT TOE OF THE PILE. AT A MINIMUM, ANY DISTURBED SOILS WHERE ACTIVITY IS SUSPENDED FOR GREATER THAN 30 DAYS SHALL BE MULCHED WITH HAY OR STRAW TO STABILIZE ERODIBLE MATERIAL.

STAGING AND STORAGE AREAS SHALL BE ESTABLISHED IN STABLE, RELATIVELY LEVEL AREAS AWAY FROM WETLANDS. FUEL AND OILS WILL NOT BE STORED ON THE SITE. LANDSCAPING CHEMICALS WILL ARRIVE WITH THE SEEDING VEHICLE ONLY WHEN THE SEEDING PORTION OF THE PROJECT COMMENCES. THESE CHEMICALS WILL BE TRANSPORTED ON THE SEEDING VEHICLE DURING THE SEEDING PROCESS. CHEMICALS WILL NOT BE STORED ON SITE AT ANY TIME.

THE FOLLOWING PRODUCT-SPECIFIC PRACTICES WILL BE FOLLOWED ON-SITE.

PETROLEUM PRODUCTS

ALL ON-SITE VEHICLES WILL BE MONITORED FOR LEAKS AND WILL RECEIVE REGULAR PREVENTIVE MAINTENANCE TO REDUCE THE CHANCE OF LEAKAGE. NO VEHICLE MAINTENANCE OR HANDLING OF PETROLEUM PRODUCTS WILL OCCUR WITHIN 100 FEET OF A WATERWAY. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS THAT ARE CLEARLY LABELED. NO PETROLEUM-BASED OR ASPHALT SUBSTANCES WILL BE STORED WITHIN 100 FEET OF A WATERWAY.

FERTILIZERS

FERTILIZERS WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, THE FERTILIZER WILL BE WORKED INTO THE SOIL TO LIMIT EXPOSURE TO STORMWATER. STORAGE WILL BE IN A COVERED AREA; AND THE CONTENTS OF ANY PARTIALLY USED BAGS WILL BE TRANSFERRED TO A SEALABLE, PLASTIC BIN TO AVOID SPILLS.

SOLVENTS, PAINTS, AND OTHER HAZARDOUS SUBSTANCES

ALL CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT REQUIRED FOR USE. EXCESS MATERIALS WILL NOT BE DISCHARGED TO THE STORM SEWER SYSTEM, BUT WILL BE PROPERLY DISPOSED ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR STATE AND LOCAL REGULATIONS. NO STORAGE WILL OCCUR WITHIN 100 FEET OF A WATERWAY.

CONCRETE TRUCKS

CONCRETE TRUCKS WILL NOT BE ALLOWED TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER WITHIN THE LIMITS OF THE AIRPORT OR WITHIN 100 FEET OF WETLAND RESOURCES OR INTO CATCH BASINS. THE CONTRACTOR SHALL OBTAIN APPROVAL FROM THE ENGINEER PRIOR TO WASH OUT ACTIVITIES IN ANY AREA.

SPILL RESPONSE

IN THE EVENT OF AN EMERGENCY SPILL OR LEAK DURING CONSTRUCTION ACTIVITIES, THE SPILL RESPONSE PLAN (I.E., CLEAN UP) FOR THIS CONSTRUCTION SITE SHALL BE AS FOLLOWS:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR IMPLEMENTING THE SPILL RESPONSE PLAN;
2. IF POSSIBLE AND IT IS SAFE TO DO SO, ALL SPILLS WILL BE CLEANED UP IMMEDIATELY UPON DISCOVERY;
3. NOTIFY LEBANON MUNICIPAL AIRPORT AND THE LEBANON FIRE DEPARTMENT (911) OF ANY EMERGENCY SPILL OR LEAK;
4. CONTACT THE NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES (NH DES) EMERGENCY RESPONSE UNIT FOR ANY RELEASE OF PETROLEUM BASED MATERIAL OR OTHER HAZARDOUS SUBSTANCE THAT BECOMES HAZARDOUS UPON RELEASE AND POSES A THREAT TO HUMAN HEALTH OR THE ENVIRONMENT. THE NH DES EMERGENCY RESPONSE PHONE NUMBER IS 603-271-3899 (MONDAY-FRIDAY, 8:00AM-4:00PM) AND 603-223-4381 (WEEKENDS AND EVENINGS / STATE POLICE DISPATCH) .
5. STORE SPILL RESPONSE EQUIPMENT IN A PRE-ESTABLISHED AND READILY ACCESSIBLE LOCATION. THE SPILL RESPONSE EQUIPMENT SHALL INCLUDE:
   SAFETY EQUIPMENT: EYE GUARDS, PROTECTIVE CLOTHING, FIRE EXTINGUISHER, AND RUBBER GLOVES.
   CLEAN-UP EQUIPMENT: BROOMS, SORBENT PADS AND BOOMS, SHOVELS, SPEEDY DRY, CAT LITTER, AND APPROPRIATE DISPOSAL CONTAINERS.

THE FOLLOWING PROCEDURES ARE REQUIRED BY EPA IN THE EVENT OF A SPILL THAT REACHES OR THREATENS NAVIGABLE WATERS OF THE UNITED STATES (INCLUDING WETLANDS):

1. THE AIRPORT MANAGER (OR OTHER AIRPORT OFFICIAL) IS REQUIRED TO NOTIFY THE NATIONAL RESPONSE CENTER AT (800) 424-8802, AS SOON AS HE OR SHE IS AWARE OF THE DISCHARGE;
2. THE FACILITY SWPPP FOR THE AIRPORT MUST BE UPDATED WITHIN 14 CALENDAR DAYS OF A SPILL OR LEAK OF A REPORTED SPILL. THE UPDATE MUST INCLUDE A DESCRIPTION OF THE RELEASE, AN ACCOUNT OF THE CIRCUMSTANCES LEADING TO THE RELEASE, AND THE DATE OF THE RELEASE. IN ADDITION, THE SWPPP MUST BE REVIEWED TO IDENTIFY MEASURES TO PREVENT THE RECURRENCE OF SUCH RELEASES, AND IT MUST BE MODIFIED WHERE APPROPRIATE;
3. IN THE EVENT OF A REPORTED DISCHARGE, THE AIRPORT MUST ALSO SUBMIT TO EPA WITHIN 14 CALENDAR DAYS OF KNOWLEDGE OF THE RELEASE, A WRITTEN DESCRIPTION OF THE RELEASE (INCLUDING THE TYPE AND ESTIMATE OF THE AMOUNT OF MATERIAL RELEASED), THE DATE THAT SUCH RELEASE OCCURRED, THE CIRCUMSTANCES LEADING TO THE RELEASE, AND STEPS TO BE TAKEN TO MODIFY THE POLLUTION PREVENTION PLAN AT THE AIRPORT.

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO ENSURE SPILL PREVENTION MEASURES ARE IN PLACE PRIOR TO CONSTRUCTION AND THE CONTRACTOR SHALL BE FAMILIAR WITH SPILL RESPONSE PROCEDURES PRIOR TO INITIATING CONSTRUCTION ACTIVITIES. IF A SPILL OCCURS DURING CONSTRUCTION IT SHALL BE THE RESPONSIBILITY OF THE CITY OF LEBANON/AIRPORT MANAGER TO ENSURE THAT SPILL REPORTING REQUIREMENTS OUTLINED ABOVE HAVE BEEN SATISFIED.

F. VEGETATION PLANNING

FOLLOWING LAND DISTURBANCE ACTIVITIES, ONLY THOSE AREAS UNDER ACTIVE CONSTRUCTION SHALL BE LEFT IN AN UNTREATED OR UN-VEGETATED CONDITION. DURING CONSTRUCTION, ALL DISTURBED AREAS SHALL ADHERE TO THE FOLLOWING SCHEDULE:

TEMPORARY SEEDING AND MULCHING:

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR MONITORING DAILY WEATHER REPORTS. THE CONTRACTOR SHALL ADJUST THE WORK SCHEDULE IN ANTICIPATION OF RAINS AND SHALL STABILIZE THE SITE AS INDICATED.

TEMPORARY SEEDING AND MULCHING SCHEDULE

WORK AREA	EXPECTED INTERIM PERIOD (CALENDAR	NO TREATMENT	TEMPORARY MULCHING (1)	TEMPORARY SEEDING & MULCHING (2)
SENSITIVE AREA (3)	<7	XXX		
	7-21		XXX	
	>21			XXX
NON SENSITIVE AREA	<21	XXX		
	21-45		XXX	
	>45			XXX

(1) MULCHING SHALL BE APPLIED AT A RATE OF 90 LBS/1,000 SQ. FT. (180 LBS/1000 SQ. FT. FOR WINTER CONSTRUCTION).
(2) TEMPORARY SEEDING RATES SHALL BE AS SHOWN.
(3) SENSITIVE AREAS INCLUDE ALL DISTURBED AREAS WITHIN 100 FEET OF STREAMS, WETLANDS OR IN LAKE WATERSHEDS. ALL EXPOSED SOILS IN SENSITIVE AREAS SHALL BE MULCHED PRIOR TO EVERY ANTICIPATED STORM EVENT.

TEMPORARY SEEDING RATES

DATES	SEED	RATES	
		LBS/MSF	LBS/ACRE
4/1 TO 6/1	ANNUAL RYE GRASS	1.0	40
8/15 TO 9/15	ANNUAL RYE GRASS	1.0	40
4/1 TO 6/1	PERENNIAL RYE GRASS	0.7	30
8/15 TO 9/15	PERENNIAL RYE GRASS	0.7	30
4/1 TO 5/15	OATS	2.0	80
8/15 TO 9/15	WINTER RYE	3.0	120

2. GRADING WILL BE HELD TO A MAXIMUM 4:1 SLOPE WHERE PRACTICAL EXCEPT IN ROCK CUTS OR AS DEPICTED ON THE PLANS. ALL SLOPES SHALL BE STABILIZED WITH PERMANENT SEEDING AND MULCHING IMMEDIATELY AFTER FINAL GRADING IS COMPLETE. IF FINAL GRADING WILL NOT BE COMPLETED IMMEDIATELY, REFER TO THE TEMPORARY SEEDING AND MULCHING SCHEDULE. IT IS UNDERSTOOD THAT IMMEDIATELY MEANS WITHIN 72 HOURS OF THE COMPLETION OF WORK.
3. FOR ANY WORK PROPOSED DURING THE WINTER SEASON, THE CONTRACTOR SHALL ADHERE TO THE FOLLOWING PRACTICES:
   (A. A PLAN AND SCHEDULE OF ACTIVITIES SHALL BE SUBMITTED TO THE ENGINEER AND APPROVED PRIOR TO ANY WORK BEING DONE.
   (B. THE INTERIM PERIOD FOR ANY EXPOSED AREA SHALL BE LIMITED TO 7 CALENDAR DAYS.
   (C. MULCHING AND SEEDING RATES SHALL ADHERE TO THE TEMPORARY SEEDING AND MULCHING SCHEDULE. *NOTE THAT ALL MULCHING RATES SHALL BE DOUBLED AS SHOWN IN NOTE 1.*

PERMANENT SEEDING AND MULCHING:

THE FOLLOWING GENERAL PRACTICES WILL BE USED TO RE-ESTABLISH FINAL VEGETATION:

1. LOAMING - A MINIMUM OF 4 INCHES OF LOAM WILL BE SPREAD OVER DISTURBED AREAS AND GRADED TO A UNIFORM DEPTH AND A NATURAL APPEARANCE. ALL LOAM SHALL BE AS SPECIFIED OR APPROVED BY THE ENGINEER.
2. FINAL SEEDING: - ALL FINAL SEEDING SHALL BE COMPLETED IMMEDIATELY FOLLOWING FINAL GRADING. ALL FINAL FERTILIZING AND SEEDING SHALL ADHERE TO THE SPECIFICATIONS UNLESS OTHERWISE APPROVED BY THE ENGINEER.
   2.1. SEED SHALL BE ENDOPHYTE ENHANCED AIRPORT MIXTURE, IN ACCORDANCE WITH SECTION T-901 OF THE SPECIFICATIONS.
3. MULCHING: - ALL AREAS SHALL BE MULCHED AFTER IT HAS BEEN SEEDED UNLESS DEEMED UNNECESSARY BY THE ENGINEER OR LANDSCAPE ARCHITECT. MULCHING SHALL CONSIST OF HAY MULCH, HYDRO-MULCH OR ANY SUITABLE SUBSTITUTE DEEMED ACCEPTABLE BY THE ENGINEER IN ACCORDANCE WITH THE SPECIFICATIONS.
   (A. STRAW MULCH SHALL BE APPLIED AT THE RATE OF 2 TONS PER ACRE (90 LBS. OR 2 BALES/1,000 SQ. FT.).
   (B. HYDRO-MULCH SHALL CONSIST OF A MIXTURE OF WOOD FIBER, PAPER FIBER, OR SYNTHETIC FIBER AND WATER SPRAYED OVER A SEEDED AREA. HYDRO-MULCH SHALL NOT BE USED DURING THE FALL, WINTER OR MUD SEASON.
   (C. MULCHING SHALL BE MONITORED ACCORDING TO THE MONITORING SCHEDULE. SHOULD MULCHING PROVE TO BE INEFFECTIVE, THEN NETTING OR MATTING SHALL BE USED IN ITS PLACE.
4. DORMANT SEEDING: CONSTRUCTION SHALL BE PLANNED TO ELIMINATE THE NEED FOR SEEDING DURING THE FALL, WINTER OR MUD SEASON. SHOULD SEEDING BE NECESSARY BETWEEN THESE DATES, THE FOLLOWING PROCEDURE SHALL BE FOLLOWED:
   (A. ONLY UNFROZEN LOAM SHALL BE USED
   (B. LOAMING, SEEDING AND MULCHING WILL NOT BE DONE OVER SNOW COVER. IF SNOW EXISTS, IT MUST BE REMOVED PRIOR TO PLACEMENT OF SEED.
   (C. NO PERMANENT SEEDING WILL BE DONE DURING FALL, WINTER OR MUD SEASON UNLESS SPECIFICALLY APPROVED BY THE ENGINEER.
   (D. WHERE TEMPORARY SEEDING IS REQUIRED, THE RATES SPECIFIED IN THE TEMPORARY SEEDING AND MULCHING SCHEDULE SHALL BE ADHERED TO.
   (E. FERTILIZING, SEEDING AND MULCHING SHALL BE DONE ON LOAM THE SAME DAY THE LOAM IS SPREAD. WINTER MULCH RATES SHALL APPLY AS SPECIFIED IN THE TEMPORARY SEEDING AND MULCHING SCHEDULE.
   (F. ON SLOPES GREATER THAN 3:1, STRAW MATTING OR EXCELSIOR MATTING WILL BE SUBSTITUTED FOR MULCH, EXCEPT THAT BIODEGRADABLE NETTING OVER MULCH MAY BE USED WHERE APPROVED BY THE ENGINEER.

FOLLOWING FINAL SEEDING, THE SITE WILL BE INSPECTED EVERY 30 DAYS UNTIL 80% COVER HAS BEEN ESTABLISHED. RESEEDING AND MULCHING SHALL BE CARRIED OUT AS REQUIRED, AT NO ADDITIONAL EXPENSE TO THE OWNER, UNTIL AN ADEQUATE CATCH IS ESTABLISHED IN ALL SEEDED AREAS, AS AGREED UPON BY THE OWNER AND ENGINEER.

G. SEQUENCING OF EROSION AND SEDIMENTATION CONTROLS

PRIOR TO RECEIVING RUNOFF, ALL BMPS AND DISTURBED SLOPES WILL BE STABILIZED TO THE SATISFACTION OF THE RESIDENT ENGINEER. ALL BMPS INSTALLED IN A "TRAIN" FASHION (I.E. SWALE TO SEDIMENT TRAP TO DETENTION BASIN) WILL BE COMPLETELY STABILIZED PRIOR TO RECEIVING RUNOFF THROUGH THE SYSTEM OR "TRAIN" OF BMPS.

1. EROSION & SEDIMENTATION CONTROLS INSTALLATION - EROSION CONTROL INSTALLATION MAY OCCUR ALL YEAR LONG, EXCEPT THAT SUCH MEASURES SHALL BE INSTALLED PRIOR TO COMMENCEMENT OF DISTURBANCE ACTIVITIES RELATED TO EACH EROSION CONTROL MEASURE. HOWEVER, IT SHALL BE AVOIDED, TO THE EXTENT PRACTICAL, IN THE WINTER AND MUD SEASON. SEE DRAWINGS AND DETAILS FOR LOCATIONS AND INSTALLATION PROCEDURES.
2. TEMPORARY HAUL ROUTE CONSTRUCTION - THIS CONSTRUCTION MAY OCCUR IN THE SPRING, SUMMER AND FALL SEASONS. IT MAY BE ALLOWED IN THE WINTER SEASON EXCEPT IN SENSITIVE AREAS IN WHICH CASE THE WINTER CONSTRUCTION SCHEDULE MUST BE FOLLOWED.

H. MAINTENANCE OF EROSION AND SEDIMENTATION CONTROLS

MAINTENANCE MEASURES WILL BE PERFORMED AS NEEDED DURING THE ENTIRE CONSTRUCTION CYCLE. AFTER EACH RAINFALL, A VISUAL INSPECTION WILL BE MADE TO INSURE THEIR CONTINUING FUNCTION AS DESIGNED. THE FOLLOWING SECTIONS OUTLINE THE SPECIFIC MAINTENANCE PROGRAMS AND SCHEDULES FOR THE BMPS TO BE IMPLEMENTED DURING CONSTRUCTION:

1. STONE CHECK DAMS, HAY BALE BARRIERS, SILT BARRIERS, MATTING AND MULCH SHALL BE INSPECTED AND REPAIRED (IF NECESSARY) ONCE A WEEK OR IMMEDIATELY FOLLOWING ANY SIGNIFICANT RAINFALL (GREATER THAN OR EQUAL TO 0.5") OVER A 24 HOUR PERIOD. SEDIMENT TRAPPED BEHIND THESE BARRIERS SHALL BE REMOVED WHEN IT REACHES A DEPTH OF 6 INCHES (OR 1/2 THE HEIGHT OF THE DAM FOR CHECK DAMS) AND REDISTRIBUTED TO AREAS UNDERGOING FINAL GRADING OUTSIDE THE LIMITS OF PROPOSED PAVEMENT.
2. EMERGENCY PROTECTION PROCEDURES - SHOULD CONSTRUCTION BE HAMPERED BY EXCESSIVE RUNOFF AND SEDIMENT ENTERING DOWNSTREAM CHANNELS, THE CONTRACTOR SHALL IMMEDIATELY EMPLOY CORRECTIVE BMPS (STRUCTURAL OR NON STRUCTURAL IN ACCORDANCE WITH NH DES EROSION CONTROL REGULATIONS) NECESSARY TO REMEDIATE THE SITUATION.

EROSION CONTROL MEASURE REMOVAL

REMOVAL OF TEMPORARY EROSION CONTROL MEASURES SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR. ALL EROSION CONTROLS SHALL REMAIN IN PLACE AND MAINTAINED BY THE CONTRACTOR UNTIL ALL RELATED CONSTRUCTION IS COMPLETE AND THE AREA IS STABLE. AN AREA IS CONSIDERED STABLE IF:

(1) IN AREAS THAT WILL NOT BE PAVED, "STABLE" MEANS THAT:
- A MINIMUM OF 85% VEGETATIVE COVER HAS BEEN ESTABLISHED;
- A MINIMUM OF 3 INCHES OF NON-EROSIVE MATERIAL SUCH AS STONE OR RIPRAP HAS BEEN INSTALLED; OR
- EROSION CONTROL BLANKETS HAVE BEEN INSTALLED IN ACCORDANCE WITH ENV-WQ 1506.03.

(2) IN AREAS THAT SHALL BE PAVED, "STABLE" MEANS THAT BASE COURSE GRAVELS MEETING THE REQUIREMENTS OF SPECIFICATION P-209 HAVE BEEN INSTALLED.

HAY BALES AND SILT BARRIERS SHALL BE REMOVED BY THE CONTRACTOR ONCE THE AREAS UPSTREAM ARE STABLE. THE HAY BALES AND SILT BARRIERS SHALL BE DISPOSED OF LEGALLY AND PROPERLY OFF-SITE. ALL SEDIMENT TRAPPED BEHIND THESE CONTROLS SHALL BE:

(1) DISTRIBUTED TO AN AREA UNDERGOING FINAL GRADING OUTSIDE THE LIMITS OF PROPOSED PAVEMENT.
(2) GRADED IN AN AESTHETIC MANNER TO CONFORM TO THE TOPOGRAPHY, AND FERTILIZED, SEEDED AND MULCHED IN ACCORDANCE WITH THE RATES PREVIOUSLY STATED.

ONCE ALL THE TRAPPED SEDIMENTS HAVE BEEN REMOVED FROM THE TEMPORARY SEDIMENTATION DEVICES, THE DISTURBED AREAS MUST BE LOAMED (IF NECESSARY), FERTILIZED, SEEDED AND MULCHED IN ACCORDANCE WITH THE RATES PREVIOUSLY STATED.

I. INSPECTION AND MAINTENANCE SCHEDULES

1. THE CONTRACTOR SHALL BE RESPONSIBLE FOR WEEKLY INSPECTIONS AND REQUIRED MAINTENANCE OF ALL BMPS UTILIZED ON SITE DURING CONSTRUCTION. BMPS SHALL BE INSPECTED AT LEAST ONCE EVERY SEVEN (7) DAYS WITHIN 24 HOURS OF ALL RAIN EVENTS TOTALING 0.5".
2. THE CONTRACTOR SHALL MAINTAIN A LOG OF ALL INSPECTIONS AND MAINTENANCE PERFORMED, COPIES OF SUCH LOGS SHALL BE PROVIDED TO THE ENGINEER ON A MONTHLY BASIS.

NH DES STANDARD WINTER CONSTRUCTION NOTES:

(a) TO ADEQUATELY PROTECT WATER QUALITY DURING COLD WEATHER AND DURING SPRING RUNOFF, THE ADDITIONAL STABILIZATION TECHNIQUES SPECIFIED IN THIS SECTION SHALL BE EMPLOYED DURING THE PERIOD FROM OCTOBER 15 THROUGH MAY 1.

(b) SUBJECT TO (c) BELOW, THE AREA OF EXPOSED, UNSTABILIZED SOIL SHALL BE:
(1) LIMITED TO ONE ACRE; AND
(2) PROTECTED AGAINST EROSION BY THE METHODS DESCRIBED IN THIS SECTION PRIOR TO ANY THAW OR SPRING MELT EVENT.

(c) THE ALLOWABLE AREA OF EXPOSED SOIL MAY BE INCREASED IF A WINTER CONSTRUCTION PLAN IS DEVELOPED BY A QUALIFIED ENGINEER OR A CPESC SPECIALIST AND SUBMITTED TO THE DEPARTMENT FOR APPROVAL AS A REQUEST TO WAIVE THE ONE-ACRE LIMIT.

(d) SUBJECT TO (f) AND (g) BELOW, ALL PROPOSED VEGETATED AREAS HAVING A SLOPE OF LESS THAN 15% THAT DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15, OR THAT ARE DISTURBED AFTER OCTOBER 15, SHALL BE SEEDED AND COVERED WITH 3 TO 4 TONS OF HAY OR STRAW MULCH PER ACRE SECURED WITH ANCHORED NETTING OR TACKIFIER OR WITH AT LEAST 2 INCHES OF EROSION CONTROL MIX MEETING THE CRITERIA OF ENV-WQ 1506.05(B).

(e) SUBJECT TO (f) AND (g) BELOW, ALL PROPOSED VEGETATED AREAS HAVING A SLOPE OF 15% OR GREATER THAT DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15, OR THAT ARE DISTURBED AFTER OCTOBER 15, SHALL BE SEEDED AND COVERED WITH A PROPERLY INSTALLED AND ANCHORED EROSION CONTROL BLANKET OR WITH AT LEAST 4 INCHES OF EROSION CONTROL MIX MEETING THE CRITERIA OF ENV-WQ 1506.05(B).

(f) ANCHORED HAY MULCH OR EROSION CONTROL MIX THAT MEETS THE CRITERIA OF ENV-WQ 1506.05(B) SHALL NOT BE INSTALLED OVER SNOW GREATER THAN ONE INCH IN DEPTH.

(g) EROSION CONTROL BLANKETS SHALL NOT BE INSTALLED OVER SNOW GREATER THAN ONE INCH IN DEPTH OR ON FROZEN GROUND.

(h) ALL PROPOSED STABILIZATION IN ACCORDANCE WITH (d) OR (e), ABOVE, SHALL BE COMPLETED WITHIN A DAY OF ESTABLISHING THE GRADE THAT IS FINAL OR THAT OTHERWISE WILL EXIST FOR MORE THAN 5 DAYS.

(i) ALL DITCHES OR SWALES THAT DO NOT EXHIBIT A MINIMUM OF 85% VEGETATIVE GROWTH BY OCTOBER 15, OR THAT ARE DISTURBED AFTER OCTOBER 15, SHALL BE STABILIZED TEMPORARILY WITH STONE OR EROSION CONTROL BLANKETS APPROPRIATE FOR THE DESIGN FLOW CONDITIONS, AS DETERMINED BY THE OWNER'S ENGINEERING CONSULTANT.

(j) AFTER OCTOBER 15, INCOMPLETE ROAD OR PARKING AREAS WHERE ACTIVE CONSTRUCTION OF THE ROAD OR PARKING AREAS HAS STOPPED FOR THE WINTER SEASON SHALL BE PROTECTED WITH A MINIMUM 3-INCH LAYER OF BASE COURSE GRAVELS MEETING THE GRADATION REQUIREMENTS OF FAA P-209.

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Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31
Issued	By	Appd.	YY.MM.DD

DPN	DCD	DPN
Dwn.	Chkd.	Dsgn.

Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID C. DARGIE 8257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

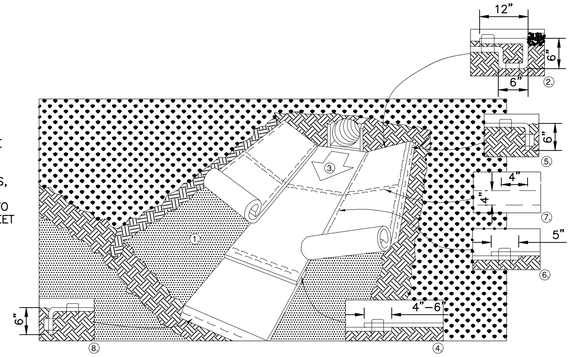
EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROISION
NOTES & DETAILS - 1

Project No.
179450522

Drawing No.	Sheet	Revision
C601	44 of 79	0



** EROSION CONTROL BLANKET SHALL BE INSTALLED IN THE BOTTOM OF ALL PROPOSED DITCHES, CHANNELS AND SWALES. REFER TO DETAIL 5 THIS SHEET FOR LIMITS.

NOTES:

1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.

2. BEGIN AT THE TOP OF THE CHANNEL BY ANCHORING THE BLANKET IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF BLANKET EXTENDED BEYOND THE UP-SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE BLANKET.

3. ROLL CENTER BLANKET IN DIRECTION OF WATER FLOW IN BOTTOM OF CHANNEL. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.

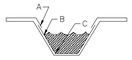
4. PLACE CONSECUTIVE BLANKETS END OVER END (SHINGLE STYLE) WITH A 4"–6" OVERLAP. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER TO SECURE BLANKETS.

5. FULL LENGTH EDGE OF BLANKETS AT TOP OF SIDE SLOPES MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.

6. ADJACENT BLANKETS MUST BE OVERLAPPED APPROXIMATELY 5" (DEPENDING ON BLANKET TYPE) AND STAPLED. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE BLANKET BEING OVERLAPPED. *

7. IN HIGH FLOW CHANNEL APPLICATIONS, A STAPLE CHECK SLOT IS RECOMMENDED AT 30 TO 40 FOOT INTERVALS. USE A DOUBLE ROW OF STAPLES STAGGERED 4" APART AND 4" ON CENTER OVER ENTIRE WIDTH OF THE CHANNEL.

8. THE TERMINAL END OF THE BLANKETS MUST BE ANCHORED WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN A 6" DEEP X 6" WIDE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING.



CRITICAL POINTS
A. OVERLAPS AND SEAMS

B. PROJECTED WATER LINE

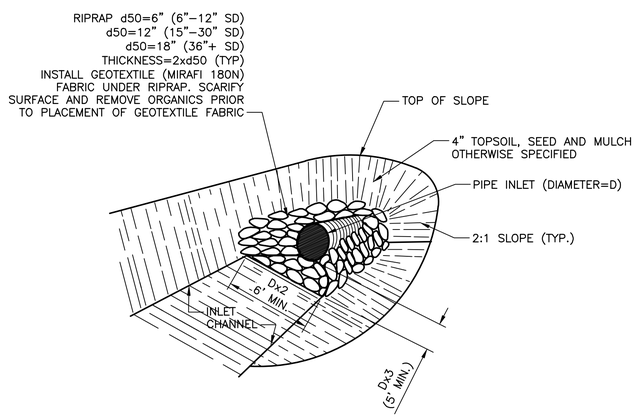
C. CHANNEL BOTTOM/SIDE SLOPE VERTICES

NOTE:

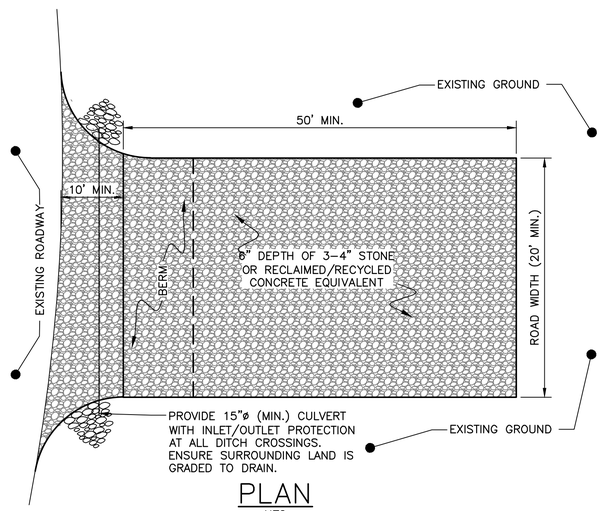
* HORIZONTAL STAPLE SPACING SHOULD BE ALTERED IF NECESSARY TO ALLOW STAPLES TO SECURE THE CRITICAL POINTS ALONG THE CHANNEL SURFACE.

** IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY ANCHOR THE BLANKETS.

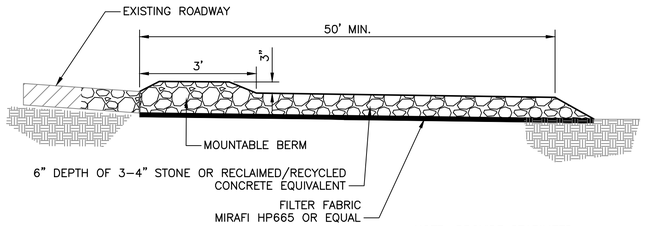
1 EROSION CONTROL BLANKET–CHANNEL INSTALLATION DETAIL
NOT TO SCALE



2 RIPRAP INLET DETAIL
NOT TO SCALE



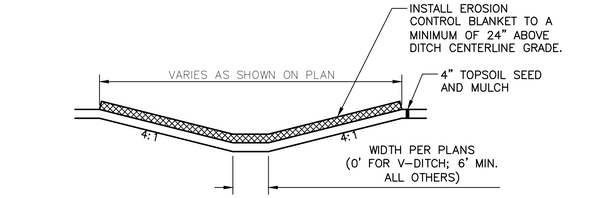
PLAN
NTS



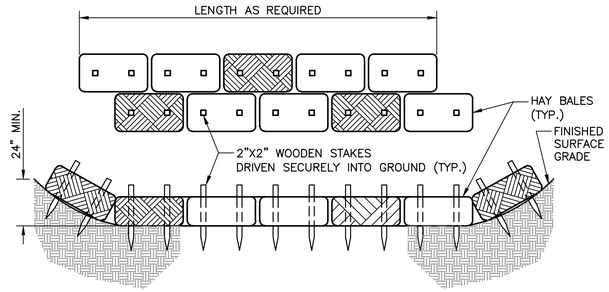
SECTION
NTS

NOTE: PROVIDE STABILIZED CONSTRUCTION EXIT IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENTATION CONTROL GUIDELINES.

3 STABILIZED CONSTRUCTION EXIT
N.T.S.

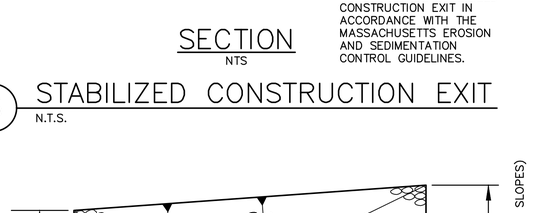


5 TYPICAL DITCH SECTION
NOT TO SCALE

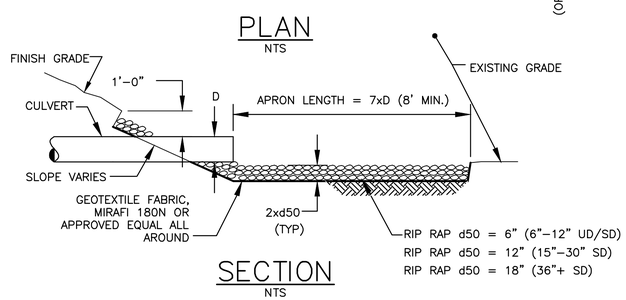


NOTE: CHECK DAMS SHALL BE INSTALLED ACROSS ALL CONSTRUCTED SWALES AT A MAXIMUM SPACING OF 50' O.C. AND AS DIRECTED BY THE ENGINEER. THEY SHALL BE REMOVED ONCE SITE HAS BEEN FULLY STABILIZED.

6 HAY–BALE CHECK DAM
N.T.S.

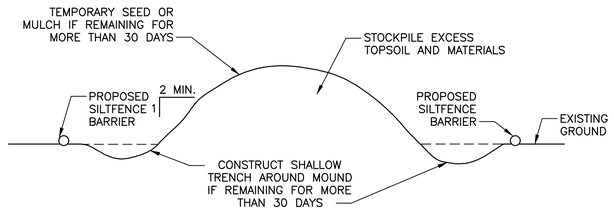


PLAN
NTS

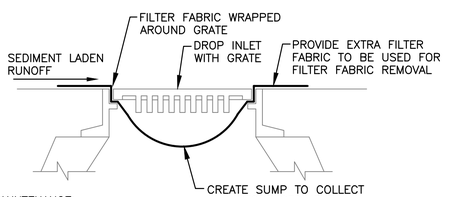


SECTION
NTS

4 RIPRAP OUTFALL DETAIL
N.T.S



7 MATERIAL STOCKPILE MOUND
N.T.S.



MAINTENANCE:

1. CONTRACTOR TO CLEAN AFTER EVERY STORM. IF THE BARRIER BECOMES CLOGGED WITH SEDIMENT SO THAT IT NO LONGER ADEQUATELY PASSES FILTERED WATER, THE SEDIMENT SHALL BE REMOVED AND THE BARRIER SHALL BE REPLACED. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.

2. THE FABRIC SHALL BE REMOVED ONLY WHEN THE DRAINAGE AREA HAS BEEN ADEQUATELY STABILIZED.

3. INSTALL INLET PROTECTION AT ALL CB'S (EXISTING AND PROPOSED) WITHIN THE LIMITS OF CONSTRUCTION.

4. SILTSACK MAY BE USED IN–LIEU OF FOLDING FABRIC.

8 CB INLET PROTECTION DETAIL
N.T.S.

GENERAL BMP NOTES:

1. THERE SHALL BE NO PLASTIC, OR MULTI–FILAMENT OR MONOFILAMENT POLYPROPYLENE NETTING OR MESH UTILIZED WITH AN OPENING SIZE GREATER THAN ¼ INCHES ON ANY BMP MATERIAL. (NOT APPLICABLE TO TURF REINFORCEMENT MATS)

2. TURF REINFORCEMENT MATS SHALL BE COVERED WITH SOIL TO PREVENT EXPOSURE OF THE MATS TO THE SURFACE.

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0 ISSUED FOR BID	DMZ	LAM	24.01.31
Issued	By	Appd.	YY.MM.DD

DPN Dwn. | DCD Chkd. | DPN Dsgn.

Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
DRAINAGE & EROISION NOTES & DETAILS - 2

Project No.
179450522

Drawing No. C602 | Sheet 45 of 79 | Revision 0

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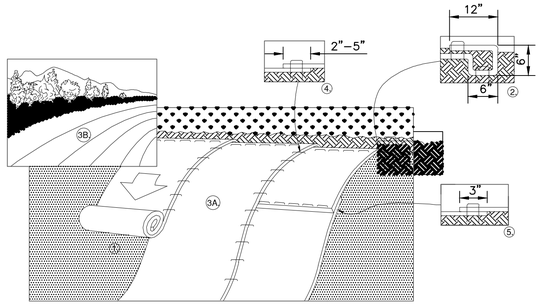
5/17/2024 7:24 AM By: Zaccheo, Dominic

ORIGINAL SHEET - ANSI D



1. PREPARE SOIL BEFORE INSTALLING BLANKETS, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.

2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE BLANKET IN A 6" DEEP X 6" WIDE TRENCH WITH APPROXIMATELY 12" OF BLANKET EXTENDED BEYOND THE UP–SLOPE PORTION OF THE TRENCH. ANCHOR THE BLANKET WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" PORTION OF BLANKET BACK OVER SEED AND COMPACTED SOIL. SECURE BLANKET OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" APART ACROSS THE WIDTH OF THE BLANKET.

3. ROLL THE BLANKETS (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. BLANKETS WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL BLANKETS MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE.

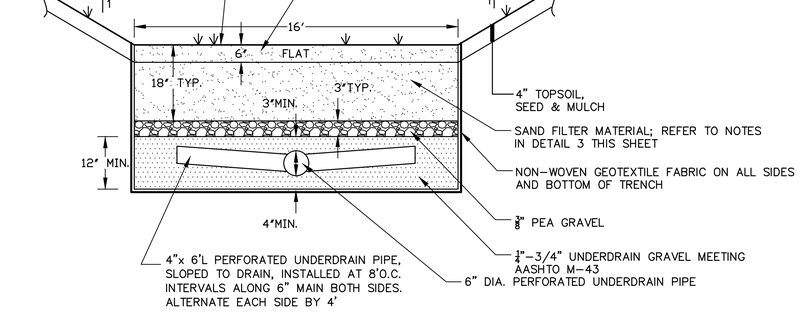
4. THE EDGES OF PARALLEL BLANKETS MUST BE STAPLED WITH APPROXIMATELY 2"–5" OVERLAP DEPENDING ON BLANKET TYPE. TO ENSURE PROPER SEAM ALIGNMENT, PLACE THE EDGE OF THE OVERLAPPING BLANKET (BLANKET BEING INSTALLED ON TOP) EVEN WITH THE COLORED SEAM STITCH ON THE PREVIOUSLY INSTALLED BLANKET.

5. CONSECUTIVE BLANKETS SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" APART ACROSS ENTIRE BLANKET WIDTH.

NOTE:
* IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE BLANKETS.

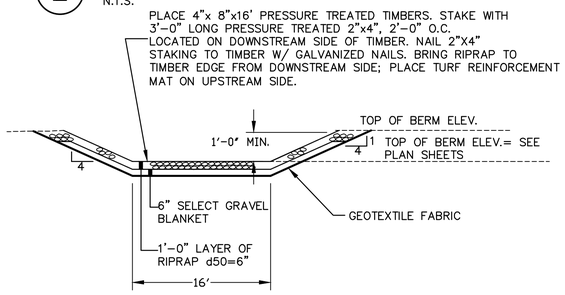
EROSION CONTROL BLANKET SLOPE INSTALLATION DETAIL

1 NOT TO SCALE



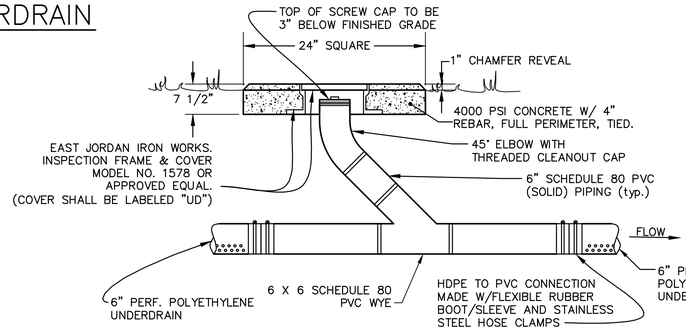
SURFACE SAND FILTER W/UNDERDRAIN

2 N.T.S.



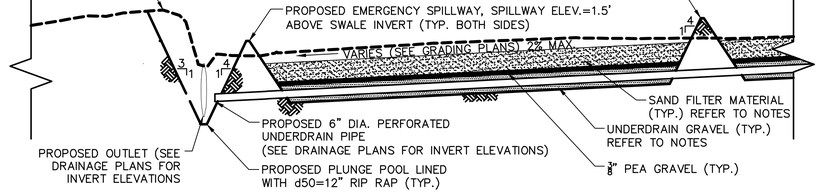
SPILLWAY AT END OF SAND FILTER

4 N.T.S.



UNDERDRAIN CLEANOUT DETAILS

5 N.T.S.



NOTES:

1. SURFACE SAND FILTER SWALE SHALL BE CONSTRUCTED PER NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES GUIDELINES FOUND IN THE NEW HAMPSHIRE STORMWATER MANUAL, DATED DECEMBER 2008.

2. SAND FILTER MATERIAL SHALL CONSIST OF A MIXTURE OF 70–80% LOAMY COARSE SAND SOIL WITH 20–30% BY VOLUME OF MODERATELY FINE SHREDDED BARK OR WOOD FIBER MULCH THAT HAS NO MORE THAN 5% FINES PASSING THE #200 SIEVE. THE LOAMY COARSE SAND SHALL HAVE THE FOLLOWING GRADATION:

SIEVE NO.	PERCENT BY WEIGHT PASSING
10	85 TO 100
20	70 TO 100
60	15 TO 40
200	8 TO 15

3. DURING CONSTRUCTION, CARE SHALL BE TAKEN TO AVOID COMPACTION OF BOTH THE UNDERDRAIN GRAVEL AND THE SAND FILTER MATERIAL. COMPACTION SHALL BE BY SATURATION ONLY, UNLESS SPECIAL LOW COMPACTION EQUIPMENT IS USED.

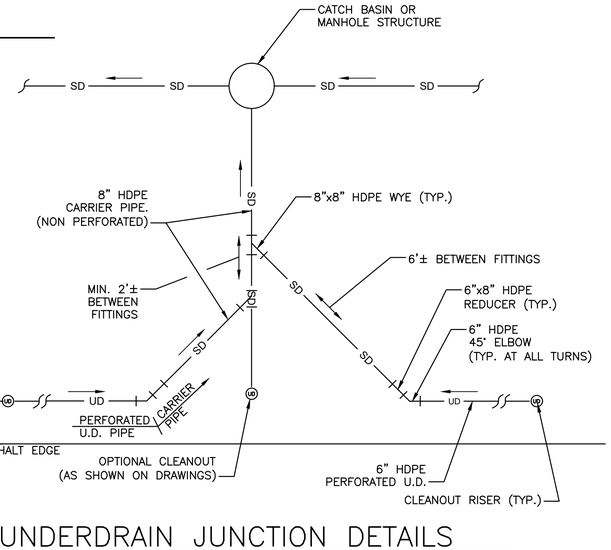
4. INSTALLATION OF THE SOIL FILTER SHALL NOT COMMENCE UNTIL: ALL SITE WORK UPSTREAM FROM THE SWALE HAS BEEN COMPLETED, ALL DRAINAGE SYSTEMS HAVE BEEN INSTALLED, AND PERMANENT STABILIZATION OF THE SITE HAS BEEN ESTABLISHED.

TYP. PROFILE – SURFACE SAND FILTER W/UNDERDRAIN

3 N.T.S.

OBSERVATION RISER DETAIL

7 N.T.S.



UNDERDRAIN JUNCTION DETAILS

6 N.T.S.

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GENERAL BMP NOTES:
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2. TURF REINFORCEMENT MATS SHALL BE COVERED WITH SOIL TO PREVENT EXPOSURE OF THE MATS TO THE SURFACE.

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

By	Appd.	YY.MM.DD
DPN	DCD	DPN
Dwn.	Chkd.	Dsgn.

Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
DRAINAGE & EROISION NOTES & DETAILS - 3

Project No.
179450522

Drawing No.	Sheet	Revision
C603	46 of 79	0

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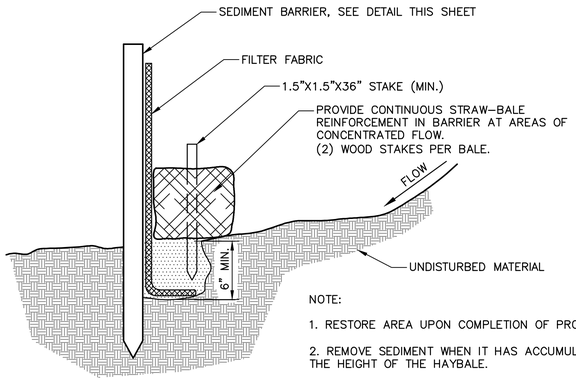
1/12/2024 7:24 AM By: Zaccaria, Dominic

ORIGINAL SHEET - ANSI D



NOTE:

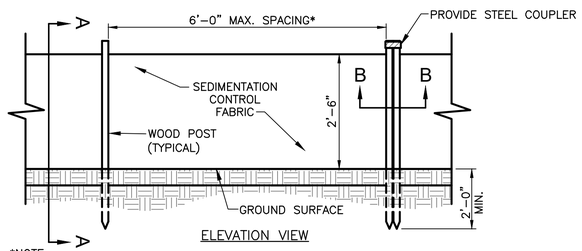
1. RESTORE AREA UPON COMPLETION OF PROJECT.

2. REMOVE SEDIMENT WHEN IT HAS ACCUMULATED TO 1/2 THE HEIGHT OF THE HAYBALE.

3. INSTALL REINFORCED SEDIMENT BARRIER AT LOW SPOTS IN TOPOGRAPHY AND AT ALL BENDS IN SILT FENCE GREATER THAN 30'.

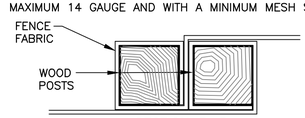
1 REINFORCED SEDIMENT BARRIER DETAIL

NOT TO SCALE

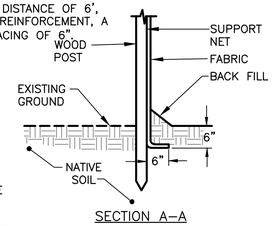


ELEVATION VIEW

*NOTE:
THE SILT FENCE SHOULD HAVE A MAXIMUM STAKING DISTANCE OF 6', UNLESS THE FENCE IS SUPPORTED BY WIRE FENCE REINFORCEMENT, A MAXIMUM 14 GAUGE AND WITH A MINIMUM MESH SPACING OF 6".



SECTION B-B



SECTION A-A

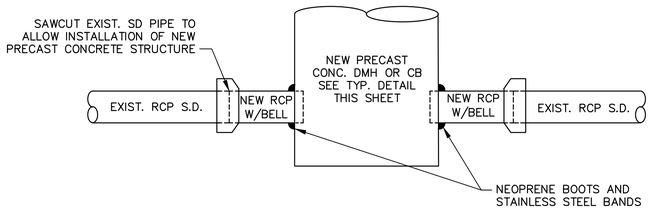
NOTES:
1. BOTTOM OF SILT FENCE MUST BE TOED INTO GROUND OR NO PAYMENT SHALL BE MADE. SEE EROSION CONTROL PLAN(S) FOR SILT FENCE LOCATION(S).
2. INSTALL J-HOOKS IN THE SILT FENCE LINE EVERY 100' AND AS NEEDED BASED ON SITE TOPOGRAPHY.
3. WHERE DOUBLE SEDIMENT BARRIERS ARE CALLED FOR ON THE PLANS, TWO ROWS OF SILT FENCE SHALL BE INSTALLED, 5 FEET APART.

4 SEDIMENT BARRIER DETAIL

NOT TO SCALE

NOTE:

THERE IS NO SEPARATE PAY ITEM FOR THIS WORK. IT IS INCIDENTAL TO THE RESPECTIVE CATCH BASIN/DRAIN MANHOLE PAY ITEMS.



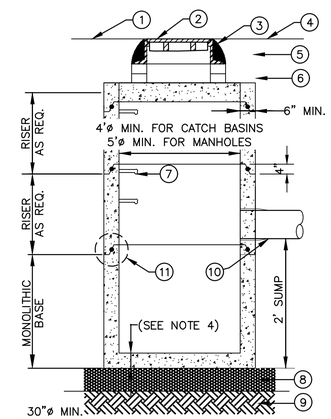
* CONTRACTOR SHALL VERIFY EXISTING STORMDRAIN SIZE AND ELEVATIONS SHOWN ON PLANS PRIOR TO FABRICATION. ADJUST INV. ELEVATIONS, WITH APPROVAL OF ENGINEER, AS NECESSARY.

7 EXISTING S.D. TO NEW DRAINAGE STRUCTURE CONNECTION DETAIL

NOT TO SCALE

2 (NOT USED)

N.T.S.



1. UNPAVED SURFACE (4" TOPSOIL, SEED AND MULCH)
2. MANHOLE FRAME & COVER (LABELED DRAIN)/CB FRAME AND GRATE (LOADING PER NOTE 1 BELOW)
3. FRAME TO BE SET IN FULL BED OF MORTAR
4. PAVED SURFACE (P-401 BITUMINOUS PAVEMENT)
5. MORTAR
6. ADJUST TO GRADE WITH BRICK OR PRECAST CONCRETE RINGS: MAX. 6" ADJUSTMENT
7. COPOLYMER POLYPROPYLENE MANHOLE STEP @ 12" O.C. (TYP) (MANHOLES ONLY)
8. 12" CRUSHED STONE
9. UNDISTURBED SUBGRADE
10. NEOPRENE BOOT AND STAINLESS STEEL CLAMPS
11. BUTYL RUBBER JOINTS

CORE HOLE SIZE

PIPE SIZE	RCP CORE HOLE DIA.		PLASTIC CORE HOLE DIA.	
INCHES	INCHES	FEET	INCHES	FEET
6			7	0.6
12	18	1.5	18	1.5
15	22	1.8	20	1.7
18	26	2.2	24	2.0
24	34	2.8	32	2.7
30	42	3.5	42	3.5
36	48	4.0	48	4.0
42	54	4.5	54	4.5
48	64	5.3	64	5.3
54	72	6.0		
60	78	6.5		

NOTES:
1. PRECAST CONCRETE STRUCTURES AND CASTINGS SHALL ACCOMMODATE 100,000 LB. DUAL WHEEL AIRCRAFT GEAR LOADINGS. SUBMIT DESIGN CALCULATIONS TO ENGINEER FOR REVIEW. CB TYPICAL GRATES SHALL MATCH NEENAH R-3491-JG O.A.E. CB HIGH FLOW GRATES SHALL MATCH NEENAH R-3480 O.A.E.

2. PRECAST CONCRETE STRUCTURES SHALL BE MANUFACTURED IN ACCORDANCE WITH ASTM-C-478.

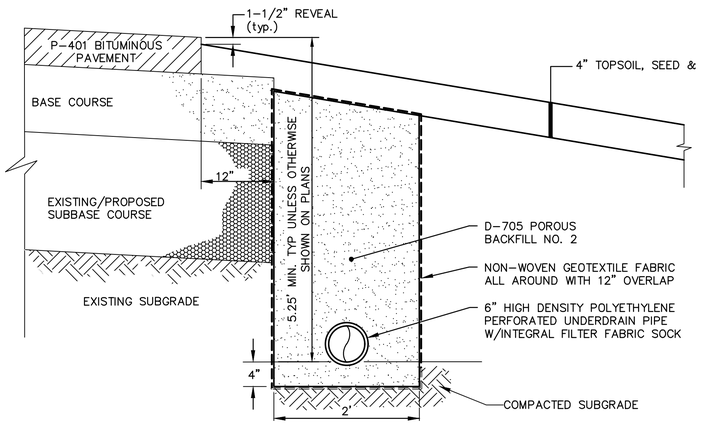
3. UNLESS OTHERWISE NOTED, MANHOLES SHALL BE 60" I.D. MINIMUM, CATCH BASINS SHALL BE 48" I.D. MINIMUM.

4. WALL THICKNESS SHALL BE 6" MIN FOR 4'ø STRUCTURES AND 7" FOR 5'ø+ STRUCTURES. FLOOR THICKNESS SHALL BE 7" MIN. FOR 4'ø STRUCTURES AND 8" FOR 5'ø+ STRUCTURES.

5. STRUCTURES WITH MULTIPLE PIPES SHALL HAVE A MIN OF 12" OF INSIDE SURFACE BETWEEN HOLES. NO MORE THAN 75% OF A HORIZONTAL CROSS SECTION SHALL BE HOLES CLOSER THAN 3" TO JOINTS. REFER TO CORE HOLE SIZE TABLE FOR MIN. HOLE SIZES.

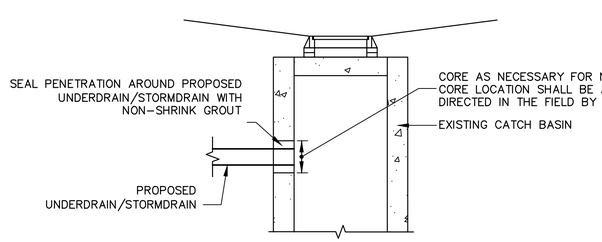
3 PRECAST CONCRETE CATCH BASIN/MANHOLE DETAIL

NOT TO SCALE



5 TYPICAL UNDERDRAIN AT PAVEMENT EDGE SECTION

N.T.S.



NOTES:

1. THERE IS NO SEPARATE PAY ITEM FOR THIS WORK. IT IS INCIDENTAL TO THE RESPECTIVE UNDERDRAIN/STORMDRAIN PAY ITEMS.
2. IF EXISTING UNDERDRAINS / STORMDRAINS ARE SHOWN TO BE REMOVED, THE PIPE SHALL BE REMOVED IN ITS ENTIRETY AND THE EXISTING PENETRATION SHALL BE SEALED WITH BRICK AND NON-SHRINK GROUT.

6 STORMDRAIN/UNDERDRAIN TIE-IN TO EXISTING CATCH BASIN/DMH DETAIL

N.T.S.

GENERAL BMP NOTES:
1. THERE SHALL BE NO PLASTIC, OR MULTI-FILAMENT OR MONOFILAMENT POLYPROPYLENE NETTING OR MESH UTILIZED WITH AN OPENING SIZE GREATER THAN $\frac{1}{8}$ INCHES ON ANY BMP MATERIAL. (NOT APPLICABLE TO TURF REINFORCEMENT MATS)

2. TURF REINFORCEMENT MATS SHALL BE COVERED WITH SOIL TO PREVENT EXPOSURE OF THE MATS TO THE SURFACE.

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0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

DPN	DCD	DPN
Dwn.	Chkd.	Dsgn.

Permit-Seal

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

DRAINAGE & EROISION NOTES & DETAILS - 4

Project No.
179450522

Drawing No. C604 | Sheet 47 of 79 | Revision 0

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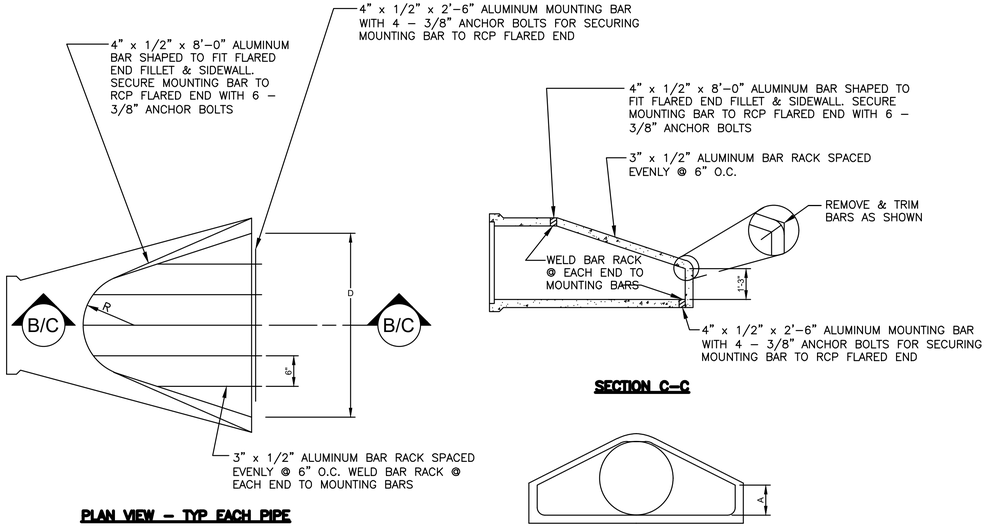
1/12/2024 12:24 AM By: Zaccaro, Dominic

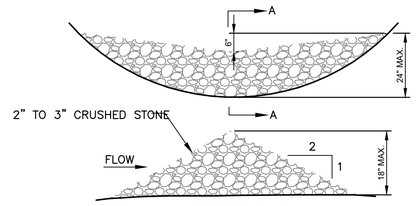
ORIGINAL SHEET - ANSI D



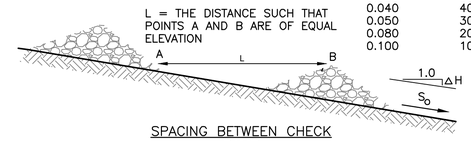
DIA.	A	B	C	D	E	R
18"	9"	2'-3"	3'-10"	3'-0"	2½"	12"
24"	9½"	3'-7½"	2'-6"	4'-0"	3"	14"
30"	12"	4'-6"	1'-7¾"	5'-0"	3½"	15"
36"	15"	5'-3"	2'-10¾"	6'-0"	4"	20"
42"	21"	5'-3"	2'-11"	6'-6"	4½"	22"
48"	24"	6'-0"	2'-2"	7'-0"	5"	22"
54"	27"	5'-5"	2'-11"	7'-6"	5½"	24"
60"	30"	5'-0"	3'-3"	8'-0"	6"	24"

NOTE:
JOINTS MAY BE FURNISHED WITH EITHER BELL & SPIGOT OR TONGUE & GROOVE ENDS. CULVERT END SECTIONS SHALL CONFORM TO NEW HAMPSHIRE DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.

1 RCP FLARED END DETAIL
NOT TO SCALE

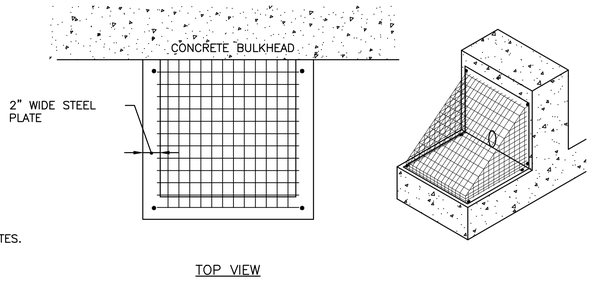


S_o (FT./FT.)	L (FT.)
0.020	75
0.030	50
0.040	40
0.050	30
0.080	20
0.100	10

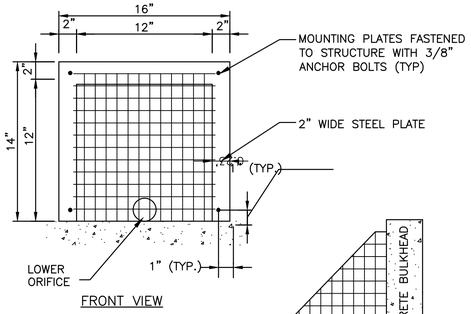


SPACING BETWEEN CHECK DAMS

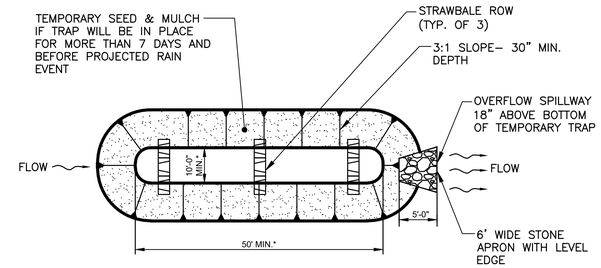
3 STONE CHECK DAM DETAIL
NOT TO SCALE



TOP VIEW



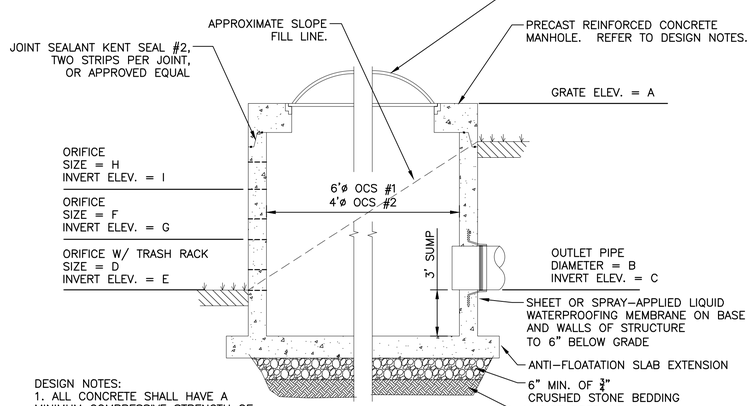
5 TRASH RACK DETAIL
NOT TO SCALE



*DIMENSIONS AS NEEDED TO PROVIDE A MINIMUM OF 3,600CF OF STORAGE PER ACRE OF DISTURBED AREA DRAINING TO TRAP.

NOTE:
1. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT HAS FILLED 50% OF THE VOLUME OF THE TRAP. SEDIMENT SHALL BE INCORPORATED INTO AREAS OF WORK PRIOR TO FINAL GRADING AND PLACEMENT OF TOPSOIL.
2. INSTALL SEDIMENT TRAPS AT LOCATIONS OF CONCENTRATED FLOW AT DOWNHILL LIMITS OF EACH CONSTRUCTION PHASE.

2 TEMPORARY SEDIMENT TRAP DETAIL
NOT TO SCALE



DESIGN NOTES:
1. ALL CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 4,000PSI AT 28 DAYS.
2. DESIGN LOAD FOR H–20 WHEEL LOAD.
3. MANHOLE SHALL CONFORM TO ASTM C478.

DETENTION POND OUTLET CONTROL STRUCTURE ELEVATIONS/GEOMETRY									
STRUCTURE ID	A	B	C	D	E	F	G	H	I
OCS #1	565.00'	54"	557.60'	15"ø	557.60'	16"ø x 3 EACH	558.40'	30.5"Wx18"H x4 EACH	561.90'
OCS #2	609.00'	12"	606.50'	6"ø	606.50'	N/A	N/A	N/A	N/A

4 OUTLET CONTROL STRUCTURE DETAIL
NOT TO SCALE

GENERAL BMP NOTES:
1. THERE SHALL BE NO PLASTIC, OR MULTI–FILAMENT OR MONOFILAMENT POLYPROPYLENE NETTING OR MESH UTILIZED WITH AN OPENING SIZE GREATER THAN ¼ INCHES ON ANY BMP MATERIAL. (NOT APPLICABLE TO TURF REINFORCEMENT MATS)

2. TURF REINFORCEMENT MATS SHALL BE COVERED WITH SOIL TO PREVENT EXPOSURE OF THE MATS TO THE SURFACE.

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0 ISSUED FOR BID	DMZ	LAM	24.01.31
Issued	By	Appd.	YY.MM.DD

DPN	DCD	DPN
Dwn.	Chkd.	Dsgn.

Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
DRAINAGE & EROSION NOTES & DETAILS - 5

Project No.
179450522

Drawing No.	Sheet	Revision
C605	48 of 79	0

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11/22/2024 3:34 AM By: Zaccaro, Dominic
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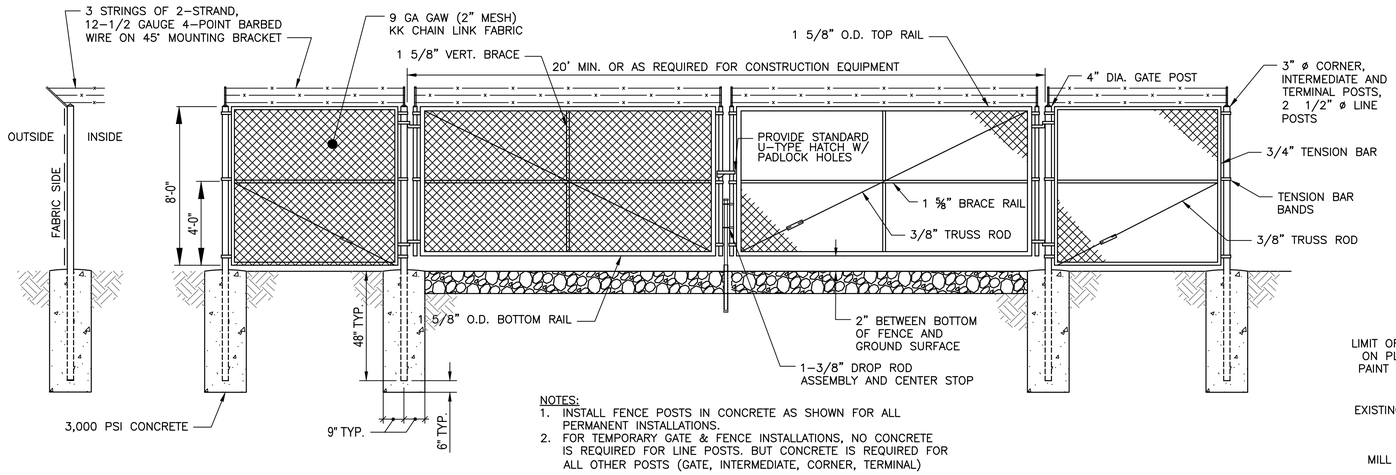
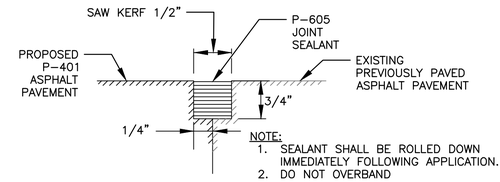


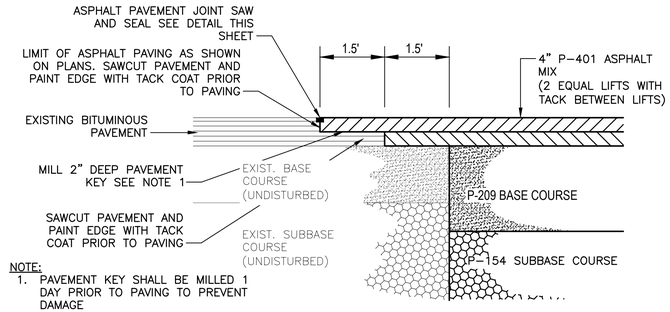
NOTES:
1. INSTALL FENCE POSTS IN CONCRETE AS SHOWN FOR ALL PERMANENT INSTALLATIONS.
2. FOR TEMPORARY GATE & FENCE INSTALLATIONS, NO CONCRETE IS REQUIRED FOR LINE POSTS. BUT CONCRETE IS REQUIRED FOR ALL OTHER POSTS (GATE, INTERMEDIATE, CORNER, TERMINAL)

CONSTRUCTION ACCESS GATE & FENCE
NOT TO SCALE



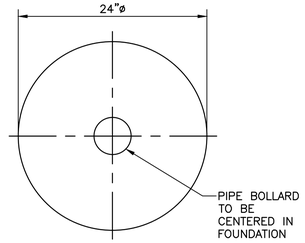
NOTE:
1. SEALANT SHALL BE ROLLED DOWN IMMEDIATELY FOLLOWING APPLICATION.
2. DO NOT OVERBAND

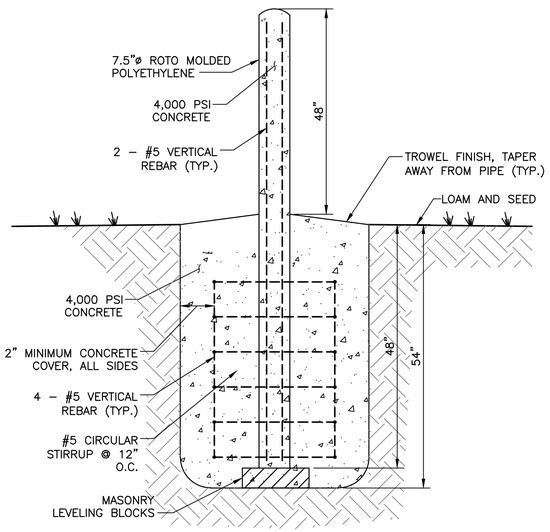
ASPHALT PAVEMENT JOINT SAW AND SEAL DETAIL
NOT TO SCALE



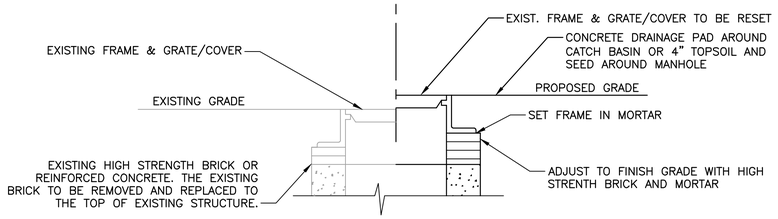
NOTE:
1. PAVEMENT KEY SHALL BE MILLED 1 DAY PRIOR TO PAVING TO PREVENT DAMAGE

ASPHALT PAVEMENT JOINT DETAIL
NOT TO SCALE

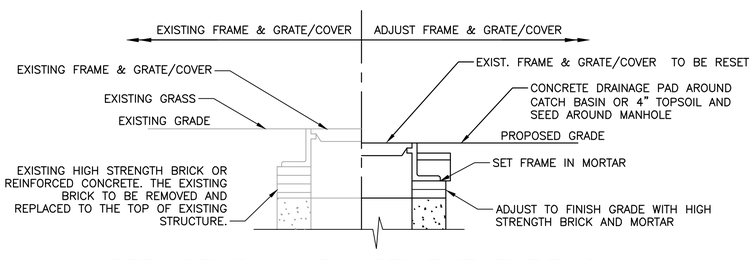




PIPE BOLLARD DETAIL
NOT TO SCALE



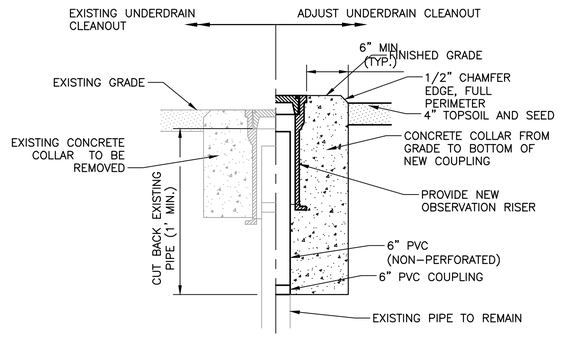
STRUCTURAL ADJUSTMENT TYPE 1 (RAISE EXISTING CATCH BASIN/MANHOLE)
NOT TO SCALE



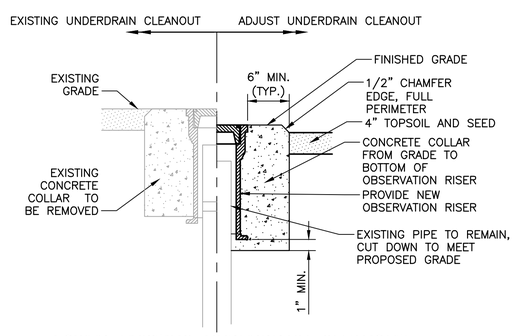
STRUCTURAL ADJUSTMENT TYPE 2 (REBUILD/LOWER EXISTING CATCH BASIN/MANHOLE)
NOT TO SCALE

STRUCTURAL ADJUSTMENT TYPE I AND II NOTES:

1. DURING THE PROCESS OF ADJUSTING THE FRAME, GRATE AND COVERS, THE CONTRACTOR SHALL REMOVE ALL BRICK, CONCRETE AND OTHER MATERIALS TO THE TOP OF THE ORIGINAL STRUCTURE AND REBUILD THE RISER USING NEW MATERIALS TO THE LINE AND GRADE AS DETERMINED ON THE CONTRACT DRAWINGS.
2. THE CONTRACTOR SHALL DISPOSE OF ALL SURPLUS MATERIALS, DIRT, RUBBISH, SILT AND OTHER MATERIALS GENERATED DURING THE REMOVAL IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS AND RESET ALL FRAME, GRATES AND COVERS.
3. STRUCTURES REQUIRING NO ADJUSTMENT SHALL BE REBUILT WITH NEW MATERIALS AND SET TO ORIGINAL GRADE AS DIRECTED/APPROVED BY THE RPR. WORK ASSOCIATED WITH REBUILD WILL BE PAID FOR AS A STRUCTURE ADJUSTMENT.
4. INTERIOR OF UTILITY STRUCTURE SHALL BE CLEANED OF ALL DEBRIS PRIOR TO INSTALLING GRATE OR COVER.



RAISE EXISTING UNDERDRAIN CLEANOUT



LOWER EXISTING UNDERDRAIN CLEANOUT

UNDERDRAIN CLEANOUT ADJUSTMENTS
NOT TO SCALE

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DMZ	DCD	DMZ
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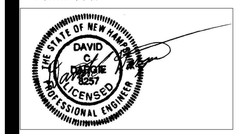

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

CIVIL & MISCELLANEOUS DETAILS

Project No.
179450522

Drawing No.	Sheet	Revision
C611	49 of 79	0

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[C8/2023 3:28 PM By: Zaccaro, Dominic
ORIGINAL SHEET - ANSI D

RUNWAY 18–36

31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00 40+00 41+00

REMOVE TAXIWAY LEAD–ON/ LEAD–OFF LINE (TYP.)

W W

DO NOT PAINT TAXIWAY CENTERLINE CURVE UNTIL THE COMPLETION OF PHASES 2 & 4

OFZ

PROPOSED 6" YELLOW TAXIWAY CENTERLINE WITH 6" BLACK BORDER (TYP.)

TOFA

PROPOSED TAXIWAY EDGE OF PAVEMENT

PROPOSED TAXIWAY EDGE LIGHT (TYP.) SEE E100 SERIES DRAWINGS

TAXIWAY A ALIGNMENT

PROPOSED TAXIWAY EDGE OF PAVEMENT

231+00 232+00 233+00 234+00 235+00 236+00 237+00 238+00 239+00 240+00 241+00

TAXIWAY A

601 603 621 623 L201

C611 C612 C621 C622

611+00 612+00 622+00

602 604 605 622 624 625

L611 L621

611+00 621+00

610+00 620+00

SOUTH RAMP TAXILANE

ECHO RAMP TAXILANE

NON–MOVEMENT AREA BOUNDARY LINE REFER TO MARKING DETAILS ON DWG C711

PROPOSED AIRFIELD SIGN (TYP.) SEE E100 SERIES DRAWINGS

DO NOT PAINT TAXIWAY CENTERLINE CURVE UNTIL THE COMPLETION OF PHASES 3 & 5

NON–MOVEMENT AREA BOUNDARY LINE REFER TO MARKING DETAILS ON DWG C711

6" YELLOW TAXIWAY CENTERLINE WITH 6" BLACK BORDER (TYP.)

PROPOSED TAXIWAY EDGE LIGHT (TYP.) SEE E100 SERIES DRAWINGS

6" YELLOW TAXILANE CENTERLINE WITH 6" BLACK BORDER (TYP.)

TAXILANE PAVEMENT REPAIR

MATCH LINE – SEE DRAWING C702

MARKING PLAN – STA. 231+00 TO 241+50

SCALE: 1"=40'

POINT TABLE		
POINT #	NORTHING	EASTING
601	410030.02	814763.70
602	409959.19	814716.97
603	409912.46	814787.80
604	410000.28	814702.93
605	409915.89	814720.23
621	409812.75	814808.24
622	409741.93	814761.51
623	409695.20	814832.34
624	409783.01	814747.47
625	409698.63	814764.77

MARKING CURVE DATA			
CURVE #	LENGTH	RADIUS	DELTA
C611	94.25	60.00	90.00
C612	94.25	60.00	90.00
C621	94.25	60.00	90.00
C622	94.25	60.00	90.00

MARKING LINE DATA		
LINE #	LENGTH	DIRECTION
L611	65.58	N78° 24' 54.59"E
L621	47.30	N78° 24' 54.59"E

LEGEND

- (L301) PAVEMENT MARKING LINE SEGMENT LABEL
- (C301) PAVEMENT MARKING CURVE SEGMENT LABEL
- ○ 301 PAVEMENT MARKING LAYOUT POINT
- LIMIT OF PAVING
- OFZ RUNWAY OBSTACLE FREE ZONE
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- PROPOSED TAXIWAY EDGE LIGHT
- PROPOSED AIRFIELD GUIDANCE SIGN

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KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DMZ	DCD	DMZ

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Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

MARKING PLAN - 1

Project No.
179450522

Drawing No.	Sheet	Revision
C701	50 of 79	0

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12/6/2024 10:02 AM By Zzattano, Dominic

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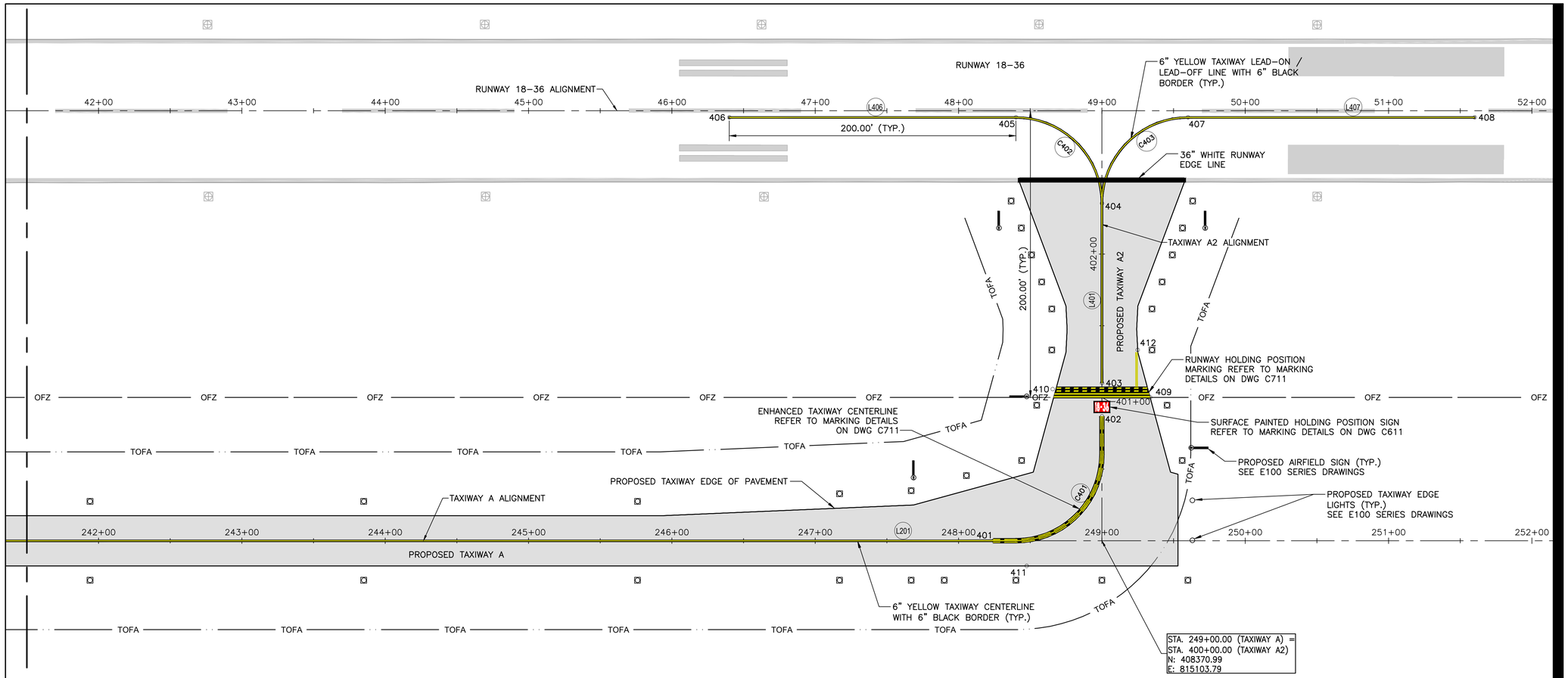

MARKING PLAN – STA. 241+50 TO 252+00

SCALE: 1"=40'

POINT TABLE		
POINT #	NORTHING	EASTING
401	408445.20	815088.58
402	408388.41	815188.78
403	408393.08	815211.55
404	408418.23	815334.25
405	408489.06	815380.98
406	408684.98	815340.81
407	408371.50	815405.08
408	408175.58	815445.24
409	408358.12	815208.51
410	408425.95	815200.50
411	408418.94	815076.10
412	408373.26	815239.15

MARKING CURVE DATA			
CURVE #	LENGTH	RADIUS	DELTA
C401	94.25	60.00	90.00
C402	76.23	60.00	72.79
C403	76.23	60.00	72.79

MARKING LINE DATA		
LINE #	LENGTH	DIRECTION
L401	125.25	N78° 24' 54.59"E
L406	200.00	N11° 35' 05.41"W
L407	200.00	S11° 35' 05.41"E

LEGEND

- (L301) PAVEMENT MARKING LINE SEGMENT LABEL
- (C301) PAVEMENT MARKING CURVE SEGMENT LABEL
- ○ 301 PAVEMENT MARKING LAYOUT POINT
- LIMIT OF PAVING
- OFZ RUNWAY OBSTACLE FREE ZONE
- EXISTING TAXIWAY EDGE LIGHT
- EXISTING RUNWAY EDGE LIGHT
- EXISTING AIRFIELD GUIDANCE SIGN
- PROPOSED TAXIWAY EDGE LIGHT
- PROPOSED AIRFIELD GUIDANCE SIGN

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KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

By	Appd.	YY.MM.DD
DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

Permit-Seal

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

MARKING PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
C702	51 of 79	5

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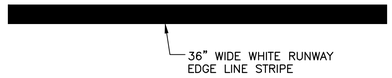
1/29/2024 10:02 AM By Zzzstrom, Dominic

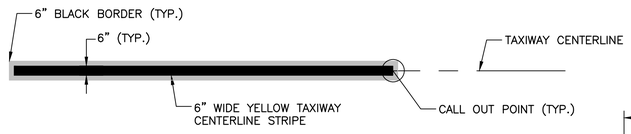
ORIGINAL SHEET - ANSI D

PAVEMENT MARKING NOTES:

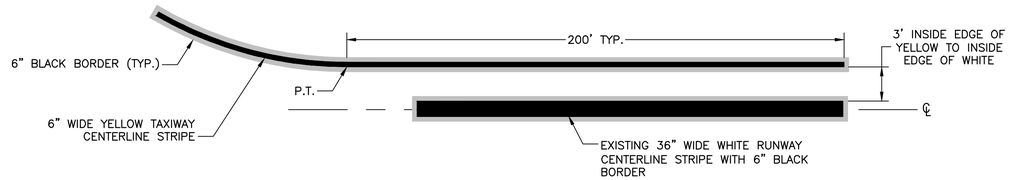
1. ALL MARKINGS AND GLASS BEADS SHALL MEET THE REQUIREMENTS OF FAA ADVISORY CIRCULAR AC 150/5340-1M.
2. PAVEMENT MARKING PAINT AND GLASS BEADS SHALL MEET THE REQUIREMENTS OF ITEM P-620 OF THE SPECIFICATIONS.
3. MARKING LAYOUT SHALL BE APPROVED BY THE RESIDENT PROJECT REPRESENTATIVE (RPR) PRIOR TO APPLICATION OF MARKINGS.
4. ALL MARKINGS SHALL BE APPLIED IN TWO SEPARATE APPLICATIONS. THE FIRST (INITIAL) APPLICATION SHALL BE APPLIED AFTER PAVING OPERATIONS AND PRIOR TO REOPENING THE AREA TO AIR TRAFFIC. THE SECOND (PERMANENT) APPLICATION SHALL BE APPLIED AFTER NEW PAVEMENT SURFACES HAVE BEEN ALLOWED TO CURE FOR A PERIOD OF NOT LESS THAN 30 DAYS.
5. THE FIRST (INITIAL) APPLICATION OF MARKINGS SHALL ONLY BE APPLIED ON NEW PAVEMENT AND ON EXISTING PAVEMENT WHERE NEW MARKINGS ARE BEING ADDED. THE FIRST APPLICATION SHALL BE APPLIED AT 50% OF THE SPECIFIED APPLICATION RATE AND SHALL NOT INCLUDE GLASS BEADS OR BLACK BORDERS.
6. THE SECOND (PERMANENT) APPLICATION SHALL BE APPLIED AT THE 100% OF THE SPECIFIED APPLICATION RATE AND SHALL INCLUDE GLASS BEADS AND BLACK BORDERS.
7. TYPE III GLASS BEADS SHALL BE APPLIED TO ALL WHITE AND YELLOW MARKINGS.
8. TYPE I, GRADATION A GLASS BEADS SHALL BE APPLIED TO RED BACKGROUND OF SURFACE PAINTED HOLDING POSITION SIGNS (SPHPS)



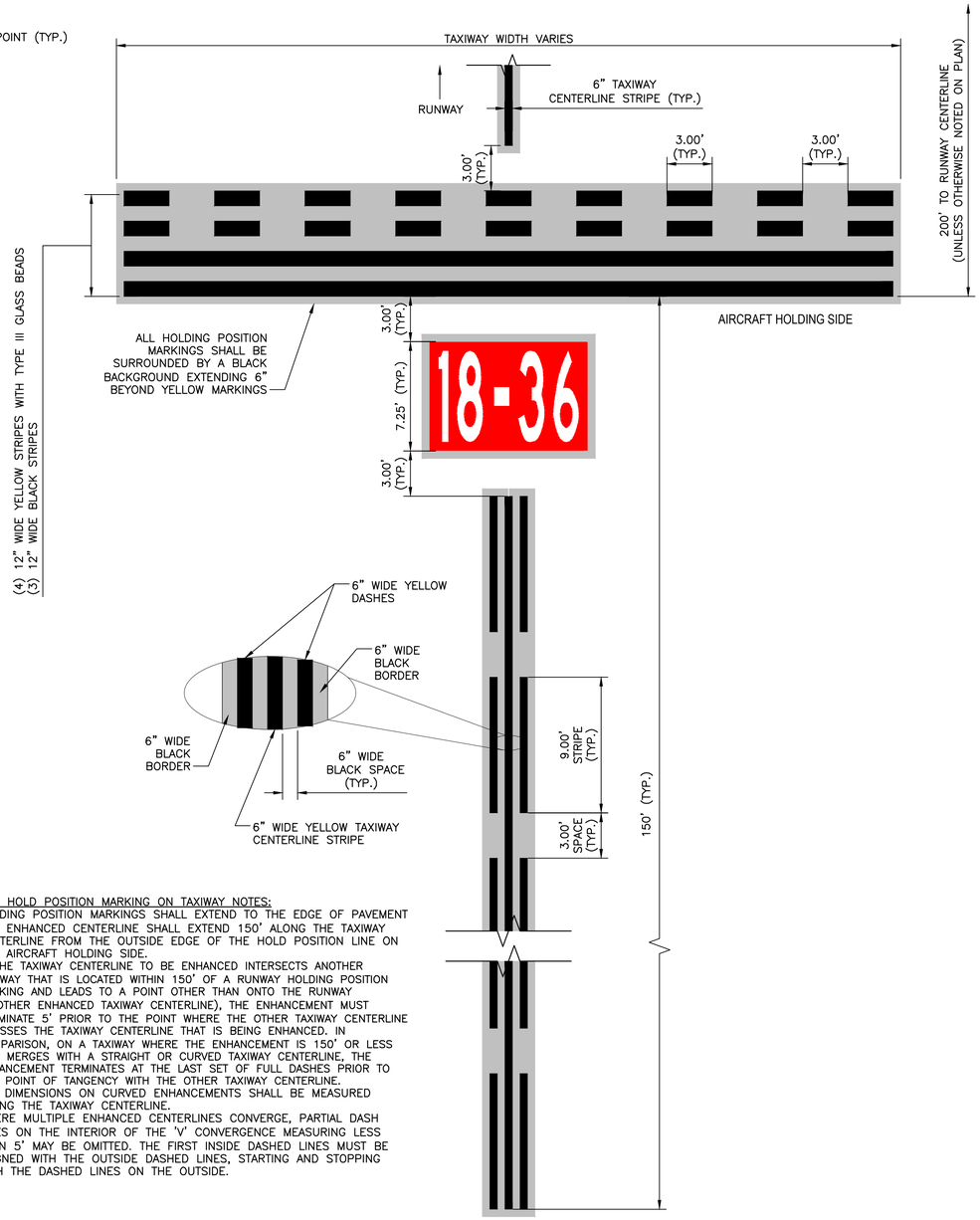
RUNWAY EDGE LINE MARKING
NOT TO SCALE

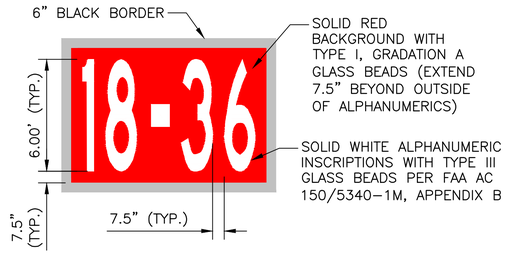


TAXIWAY CENTERLINE MARKING
NOT TO SCALE

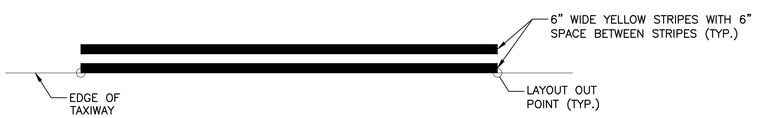


TAXIWAY CENTERLINE MARKING AT RUNWAY CENTERLINE
NOT TO SCALE

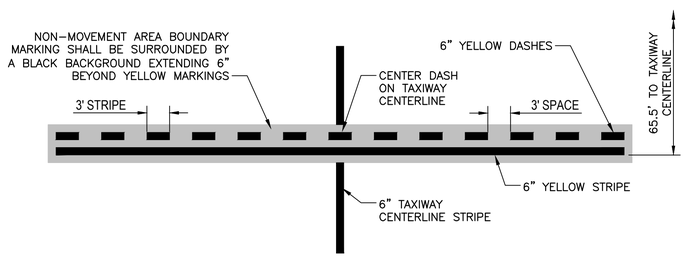




SURFACE PAINTED HOLDING POSITION SIGN
NOT TO SCALE



TAXIWAY EDGE MARKING (CONTINUOUS)
NOT TO SCALE



NON-MOVEMENT AREA BOUNDARY MARKING
NOT TO SCALE

RUNWAY HOLD POSITION MARKING ON TAXIWAY NOTES:

1. HOLDING POSITION MARKINGS SHALL EXTEND TO THE EDGE OF PAVEMENT
2. THE ENHANCED CENTERLINE SHALL EXTEND 150' ALONG THE TAXIWAY CENTERLINE FROM THE OUTSIDE EDGE OF THE HOLD POSITION LINE ON THE AIRCRAFT HOLDING SIDE.
3. IF THE TAXIWAY CENTERLINE TO BE ENHANCED INTERSECTS ANOTHER TAXIWAY THAT IS LOCATED WITHIN 150' OF A RUNWAY HOLDING POSITION MARKING AND LEADS TO A POINT OTHER THAN ONTO THE RUNWAY (ANOTHER ENHANCED TAXIWAY CENTERLINE), THE ENHANCEMENT MUST TERMINATE 5' PRIOR TO THE POINT WHERE THE OTHER TAXIWAY CENTERLINE CROSSES THE TAXIWAY CENTERLINE THAT IS BEING ENHANCED. IN COMPARISON, ON A TAXIWAY WHERE THE ENHANCEMENT IS 150' OR LESS AND MERGES WITH A STRAIGHT OR CURVED TAXIWAY CENTERLINE, THE ENHANCEMENT TERMINATES AT THE LAST SET OF FULL DASHES PRIOR TO THE POINT OF TANGENCY WITH THE OTHER TAXIWAY CENTERLINE.
4. ALL DIMENSIONS ON CURVED ENHANCEMENTS SHALL BE MEASURED ALONG THE TAXIWAY CENTERLINE.
5. WHERE MULTIPLE ENHANCED CENTERLINES CONVERGE, PARTIAL DASH LINES ON THE INTERIOR OF THE 'V' CONVERGENCE MEASURING LESS THAN 5' MAY BE OMITTED. THE FIRST INSIDE DASHED LINES MUST BE ALIGNED WITH THE OUTSIDE DASHED LINES, STARTING AND STOPPING WITH THE DASHED LINES ON THE OUTSIDE.

RUNWAY HOLDING POSITION MARKING ON TAXIWAY
NOT TO SCALE

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DMZ	DCD	CRF	
	Dwn.	Chkd.	Dsgn.

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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
MARKING DETAILS

Project No.
179450522

Drawing No.	Sheet	Revision
C711	52 of 79	0

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12/7/2023 3:53 PM by Zaccaro, Dominic

ORIGINAL SHEET - ANSI D

ELECTRICAL GENERAL NOTES

1. ALL PROPOSED RUNWAY AND TAXIWAY FIXTURES SHALL BE INSTALLED 10' FROM EDGE OF PAVEMENT UNLESS OTHERWISE INDICATED.
2. ALL EXISTING RUNWAY AND TAXIWAY EDGE LIGHT FIXTURES AND ISOLATION TRANSFORMERS AS SHOWN ON THE PLANS SHALL BE REMOVED, CAREFULLY PLACED IN PROTECTIVE CRATES, MOVED TO A STORAGE LOCATION DESIGNATED BY THE AIRPORT AND TURNED OVER TO THE AIRPORT UNLESS OTHERWISE NOTED. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION TO THE RPR OF THE TURN OVER OF EXISTING EQUIPMENT TO THE AIRPORT. ALL AIRFIELD LIGHTING CABLES BETWEEN EXISTING FIXTURES TO BE REMOVED, ALL LIGHT BASE CANS, COVER PLATES, MOUNTING STAKES AND ALL OTHER ANCILLARY MATERIALS SHALL BE REMOVED AND DISPOSED OF OFF AIRPORT PROPERTY IN AN APPROVED MANNER.
3. ALL UNDERGROUND UTILITIES ARE SHOWN IN APPROXIMATE LOCATIONS ONLY. CONTRACTOR SHALL VERIFY THE EXACT LOCATIONS OF ALL DUCTS AND DIRECT BURIED CABLE WITHIN THE PROJECT AREA BY USE OF METAL DETECTORS, OTHER TYPES OF UTILITY LOCATING EQUIPMENT AND HAND DIGGING WITHIN 3 FEET OF UTILITIES PRIOR TO EXCAVATION WITH MECHANICAL EQUIPMENT. ANY DAMAGE TO EXISTING CABLES SHALL BE REPAIRED IMMEDIATELY BY THE CONTRACTOR AT NO EXPENSE TO THE OWNER. MULTIPLE EXISTING UTILITIES ARE LOCATED UNDER TAXIWAY A, RUN EAST–TO–WEST ACROSS THE AIRFIELD. CONTRACTOR SHALL COORDINATE ALL WORK IN AREAS WHERE EXISTING UTILITIES ARE ROUTED WITH EXISTING UTILITY PROVIDER. ALL EXISTING UTILITIES SHALL REMAIN UNDISTURBED.
4. BOND #6 AWG COUNTERPOISE WIRE TO GROUND ROD AT BEGINNING OF DUCT BANK 5' FROM OPENING. CONTRACTOR SHALL BOND #6 AWG COPPER WIRE TO GROUND ROD UTILIZING EXOTHERMIC WELD (TYPICAL). WHERE CONNECTION FROM EXISTING TO PROPOSED COUNTERPOISE WIRE IS REQUIRED, CONTRACTOR SHALL INSTALL A NEW GROUND ROD AND BOND BOTH WIRES TO THE GROUND ROD.
5. INSTALL PULL WIRE, CAP BOTH ENDS AT ALL SPARE DUCTS.
6. GROUND RODS SHALL BE 3/4" X 10'. GROUND RODS SHALL BE INSTALLED, AT A MINIMUM, EVERY 500' ALONG COUNTERPOISE RUNS AND ARE CONSIDERED INCIDENTAL TO ALL RESPECTIVE LINE ITEMS.
7. ALL NEW LED TAXIWAY LIGHT FIXTURES SHALL BE PROVIDED WITH INTEGRAL HEATER UNIT.
8. WHERE POSSIBLE, CONTRACTOR SHALL FURNISH AND INSTALL NEW AIRFIELD LIGHTING CABLES AND CONDUIT IN SAME TRENCH AS REMOVED LIGHTING CABLES OR CONDUIT.
9. CONTRACTOR SHALL VERIFY THAT CIRCUITS ARE PROPERLY DE–ENERGIZED, ISOLATED AND GROUNDED AS PART OF CONTRACTORS LOCK OUT/TAG OUT PROCEDURE BEFORE PERFORMING WORK. CONTRACTOR SHALL ADHERE TO AIRPORTS OWN LOCK–OUT, TAG–OUT PROCEDURE AND SHALL COORDINATE LOCK–OUT, TAG–OUT METHODS WITH AIRPORT AND RPR.
10. ALL REQUIRED MODIFICATIONS TO EXISTING ELECTRICAL JUNCTION STRUCTURES INCLUDING CORE DRILLING IN TO THE SIDE OF EXISTING LIGHT FIXTURE BASE CANS OR ELECTRICAL HANDHOLES/MANHOLES SHALL BE CONSIDERED INCIDENTAL TO THE RESPECTIVE L–108 OR L–110 LINE ITEMS.
11. ALL NEW AND EXISTING UNDERGROUND CABLES SHALL BE PROTECTED FROM DAMAGE WHERE HAUL ROUTES CROSS OVER CABLES. THE CONTRACTOR SHALL REMOVE AND REPLACE IN KIND ANY CABLES DAMAGED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.
12. IMPEDANCE TESTING SHALL BE IN ACCORDANCE WITH TECHNICAL SPECIFICATION SECTION L–108 AND MEASUREMENTS TAKEN INCREMENTALLY THROUGHOUT PROJECT. CONTRACTOR SHALL ALSO PERFORM "MEGGER" OR INSULATION RESISTANCE TESTING IN ACCORDANCE WITH TECHNICAL SECTION L–108 FOR EXISTING AND PROPOSED PORTIONS OF AIRFIELD LIGHTING CIRCUIT CABLES. ALL TESTING DATA SHALL BE DOCUMENTED AND REPORTED BACK TO THE RPR.
13. REFER TO FAA VOLUME 2 DRAWING SET FOR ALL LOCALIZER ARRAY AND SHELTER DEMOLITION AND INSTALLATION PLANS AND DETAILS ASSOCIATED WITH ADD ALTERNATE'S #1 & #2.
14. ALL TEMPORARY L–824 AIRFIELD LIGHTING CABLES SHALL NOT BE UTILIZED IN PERMANENT AIRFIELD LIGHTING CIRCUIT INSTALLATIONS ON THIS PROJECT. CONTRACTOR SHALL RETAIN OWNERSHIP OF ALL CABLES UTILIZED IN TEMPORARY CONSTRUCTION PHASING APPLICATIONS. CONDUIT REQUIRED FOR TEMPORARY AIRFIELD LIGHTING CABLE CONNECTIONS ABOVE GRADE SHALL BE CONSIDERED INCIDENTAL TO THE TEMPORARY AIRFIELD LIGHTING CABLE UNIT COST.
15. SAFELY DISCONNECT EXISTING LOCALIZER POWER CABLE FROM RUNWAY 18 GLIDESLOPE TRANSFORMER PRIOR TO ABANDONING POWER CABLE. PRIOR TO DISCONNECTION DENERGIZE TRANSFORMER AND REMOVE BOOT. GROUND CABLE TO GROUND ROD. REFER TO ELECTRICAL GENERAL NOTE 15.

ELECTRICAL LEGEND

EXISTING SYMBOL	PROPOSED SYMBOL	DESCRIPTION
	W/G/Y	ELEVATED BASE MOUNTED RUNWAY EDGE LIGHT. LETTER INDICATES LENS COLOR
		ELEVATED BASE MOUNTED LED TAXIWAY EDGE LIGHT
N/A		STAKE MOUNTED LED TAXIWAY EDGE LIGHT
		EXISTING ELEVATED BASE MOUNTED TAXIWAY EDGE LIGHT FIXTURE REPLACED WITH NEW LED ELEVATED TAXIWAY FIXTURE
N/A	BC	L–867B LIGHT BASE CAN AND STEEL COVER PLATE
	IM	ILLUMINATED AIRFIELD GUIDANCE SIGN HOUSING MOUNTED TO CONCRETE FOUNDATION AND TRANSFORMER JUNCTION CAN
JC	JC	ELECTRICAL L–868 JUNCTION CAN AND COVER PLATE
HH	HH	ELECTRICAL 3X3' PRECAST CONCRETE HANDHOLE AND LABELED COVER
D / C	D / C	CONCRETE DUCT/CABLE MARKER
		CONCRETE ENCASED DUCT BANK. SIZES AS INDICATED ON DRAWINGS
N/A	E	PROPOSED AIRFIELD LIGHTING CABLE(S) INSTALLED IN EXISTING/TEMPORARY CONDUIT, DUCTBANK OR DIRECT BURIED
		2" CONDUIT WITH AIRFIELD LIGHTING CABLE(S) AND COUNTERPOISE ABOVE CONDUIT IN SAME TRENCH
XX	XX	EXISTING/PROPOSED CIRCUIT ID. * INDICATES TWO SERIES LIGHTING CABLES. REFER TO AIRFIELD LIGHTING CIRCUIT INDEX THIS SHEET
N/A		REMOVE AND DISPOSE OF EXISTING AIRFIELD LIGHTING CABLES AND ASSOCIATED CONDUIT/DUCTBANK, UNLESS OTHERWISE NOTED
N/A		TO BE REMOVED, DISPOSED OF OR REPLACED, UNLESS OTHERWISE NOTED
		EXISTING TAXIWAY EDGE LIGHT TO BE COVERED OR REMOVED FROM SERVICE DURING PROJECT PHASE
		EXISTING AIRFIELD GUIDANCE SIGN TO BE COVERED OR REMOVED FROM SERVICE DURING PROJECT PHASE

AIRFIELD LIGHTING CIRCUIT INDEX

RUNWAY 18–36	36
RUNWAY 7–25	25
TAXIWAY A	A
TAXIWAY B EAST	BE
TAXIWAY B WEST	BW
RUNWAY 36 PAPI	PA

SIGN LEGEND SCHEDULE

SIGN NO	SIDE A	SIDE B	CIRCUIT ID	REMARKS
S1	←A→ B/Y	BL	A	NEW LED, SIZE 1, STYLE 2, MODE 2
S2	←A→ B/Y	BL	A	NEW LED, SIZE 1, STYLE 2, MODE 2
S3	BL A Y/B	← RAMP B/Y	A	NEW LED, SIZE 1, STYLE 2, MODE 2
S4	←A2 B/Y	BL	A	NEW LED, SIZE 1, STYLE 2, MODE 2
S5	A2 18-36 Y/B W/R	A2 Y/B BL	36	NEW LED, SIZE 1, STYLE 3, MODE 2
S6	A2 → B/Y	BL	36	NEW LED, SIZE 1, STYLE 3, MODE 2
S7	BL	←A2 B/Y	36	NEW LED, SIZE 1, STYLE 3, MODE 2
S8	BL	←A→ B/Y	A	NEW LED, SIZE 1, STYLE 2, MODE 2. RIGHT ARROW ONLY. REFER TO SIGN NOTE 1

SIGN NOTES:

1. ONLY INCLUDE DIRECTIONAL ARROW INDICATED. SIZE SIGN FOR FUTURE INSTALLATION OF PANEL WITH BOTH ARROWS. PROVIDE ADDITIONAL BLANK PANELS AS REQUIRED.
2. PROPOSED SIGNS SHALL BE PROVIDED WITH SIGN STYLE AS INDICATED. THOSE PROPOSED SIGNS THAT SHALL BE CONNECTED TO RUNWAY 18–36 CIRCUIT SHALL BE STYLE 3 (5–STEP) WHILE THOSE TO BE CONNECTED TO THE TAXIWAY A CIRCUIT SHALL BE STYLE 2 (3–STEP).

SIGN LEGEND:

BL BLANK
B/Y BLACK SYMBOL ON YELLOW BACKGROUND
Y/B YELLOW SYMBOL ON BLACK BACKGROUND
W/R WHITE SYMBOL ON RED BACKGROUND

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STATE OF NEW HAMPSHIRE · DANA BERGMAN No. 17978 LICENSED PROFESSIONAL ENGINEER · 1-31-2024

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
ELECTRICAL LEGEND & GENERAL NOTES

Project No. 179450522
AS NOTED
Drawing No. E001
Sheet 53 of 79
Revision 0

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1/29/2024 10:18 AM By: Burpee, Howard

ORIGINAL SHEET - ANSI D

EXISTING ILLUMINATED AIRFIELD GUIDANCE SIGN, FOUNDATION AND JUNCTION CAN SHALL BE DEMOLISHED (TYP.)

PROPOSED 2" SCH 40 PVC CONDUIT. PROVIDE 1–1/C L–824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLE (RUNWAY 18–36). PROVIDE #6 BARE COUNTERPOISE WIRE IN SAME TRENCH ABOVE CONDUIT

EXISTING SEMI–FLUSH RUNWAY EDGE LIGHT FIXTURE AND TRANSFORMER SHALL BE REMOVED. FIXTURE BASE CAN, AIRFIELD LIGHTING CABLES, CONDUIT AND ANCILLARY MATERIALS SHALL BE DEMOLISHED (TYP.)

PROPOSED BASE MOUNTED L–862 ELEVATED RUNWAY EDGE LIGHT. FURNISH AND INSTALL FIXTURE EQUIDISTANT BETWEEN ADJACENT FIXTURES AND ALIGNED WITH FIXTURE ON OPPOSITE SIDE OF RW 18–36

26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00

RUNWAY 18–36

385.05'

192.53' 192.53'

EXISTING RUNWAY EDGE LIGHT SHALL REMAIN

EXISTING CONDUIT AND AIRFIELD LIGHTING CABLE (RUNWAY 18–36) SHALL REMAIN (TYP.)

EXISTING DUCTBANK AND EXISTING AIRFIELD LIGHTING CABLES SHALL BE DEMOLISHED

EXISTING AIRFIELD JUNCTION CAN AND COVER PLATE SHALL BE DEMOLISHED (TYP.)

EXISTING AIRFIELD LIGHTING CABLES AND CONDUIT SHALL BE DEMOLISHED (TYP.)

EXISTING TAXIWAY A2

EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT SHALL BE REMOVED (TYP.)

EXISTING BASE MOUNTED TAXIWAY EDGE LIGHT SHALL BE REMOVED (TYP.)

PROPOSED 2" SCH 40 PVC CONDUIT. PROVIDE 1–1/C L–824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLE (TAXIWAY A). PROVIDE #6 BARE COUNTERPOISE WIRE IN SAME TRENCH ABOVE CONDUIT (TYP.)

TOFA OFZ

EXISTING AIRFIELD LIGHTING CABLES AND CONDUIT SHALL BE DEMOLISHED (TYP.)

PROPOSED PAVEMENT SAWCUT

A01 A02 A03 A04 A05 A06 A07 A08 A09 A10 A11

SIGN S3

226+00 227+00 230+00 231+00 232+00 233+00 234+00 235+00 236+00

EXISTING TAXIWAY EDGE LIGHT SHALL REMAIN
DISCONNECT EXISTING AIRFIELD LIGHTING CABLE FROM ISOLATION TRANSFORMER AND SPLICE TO NEW AIRFIELD LIGHTING CABLE WITH L–823 PRIMARY CABLE CONNECTOR

PROPOSED BASE MOUNTED L–861T(L) LED ELEVATED TAXIWAY EDGE LIGHT (TYP.)

PROPOSED TAXIWAY A

EXISTING AIRFIELD JUNCTION CAN AND COVER PLATE SHALL BE DEMOLISHED (TYP.)

EXISTING GRANITE STATE ELECTRIC HIGH VOLTAGE POWERLINE TO REMAIN UNDISTURBED

A74 A75 A76 A77

EXISTING SIGN SHALL REMAIN. DEMOLISH EXISTING CONDUIT AND CABLES. PROVIDE NEW AS INDICATED

EDGE OF PROPOSED TAXIWAY PAVEMENT (TYP.)

PROPOSED FULL DEPTH PAVEMENT (TYP.)

A63 A64 A65 A66 A67 A68 A69 A70 A71 A72 A73

EXISTING ILLUMINATED AIRFIELD GUIDANCE SIGN, FOUNDATION AND JUNCTION CAN SHALL BE DEMOLISHED (TYP.)

SIGN S1 SIGN S2

PROPOSED ILLUMINATED AIRFIELD GUIDANCE SIGN, CONCRETE FOUNDATION AND TRANSFORMER JUNCTION CAN (TYP.)

MAINTENANCE ACCESS ROAD

SOUTH RAMP TAXILANE

ECHO RAMP TAXILANE

EXISTING DUCTBANK SHALL BE DEMOLISHED PROVIDE 1–1/C L–824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLE (TAXIWAY A) IN NEW 2–WAY, 4" SCH. 40 PVC CONCRETE ENCASED DUCTBANK.

A51 A52 A53 A54 A55 A56 A57 A58 A59 A60 A61 A62

EXISTING DUCTBANK SHALL BE DEMOLISHED PROVIDE 1–1/C L–824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLE (TAXIWAY A) IN NEW 2–WAY, 4" SCH. 40 PVC CONCRETE ENCASED DUCTBANK.

PROPOSED 3'X3' PRECAST ELECTRICAL HANDHOLE (TYP.)

EXISTING TAXIWAY EDGE LIGHT FIXTURE, TRANSFORMER AND BASE PLATE SHALL BE REMOVED. PROVIDE L–861T(L) LED ELEVATED TAXIWAY EDGE LIGHT ON EXISTING TO REMAIN BASE CAN (TYP.)

REMOVE AND REPLACE EXISTING AIRFIELD LIGHTING CABLES FROM EXISTING CONDUIT. PROVIDE 2–1/C L–824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLES (TAXIWAY A) IN EXISTING RACEWAY (TYP.)

MATCH LINE – SEE DRAWING NO. E102

DRAWING NOTES:

1. REFER TO DRAWING E–001 FOR ELECTRICAL LEGEND AND GENERAL NOTES.
2. REFER TO E–500 DRAWING SERIES FOR AIRFIELD ELECTRICAL FIXTURE AND INSTALLATION DETAILS.
3. REFER TO DRAWING E–601 FOR AIRFIELD LIGHTING FIXTURE AND SIGN SCHEDULE FOR PROPOSED FIXTURE AND SIGN LOCATIONS.

KEY MAP

SCALE: 1"=2000'

N

0 40' 80'

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STATE OF NEW HAMPSHIRE – PROFESSIONAL ENGINEER – DANA BERGMAN No. 17978 LICENSED

1-31-2024

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LIGHTING AND SIGNAGE PLAN - 1

Project No. 179450522

Drawing No. E101 | Sheet 54 of 79 | Revision 0

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1/30/2024 9:31 AM By: Bergman, Howard

ORIGINAL SHEET - ANSI D

RUNWAY 18–36

37+00 38+00 39+00 40+00 41+00 42+00 43+00 44+00 45+00 46+00

385.05'

192.53'

EXISTING RUNWAY EDGE LIGHT SHALL REMAIN

EXISTING CONDUIT AND AIRFIELD LIGHTING CABLE (RUNWAY 18–36) SHALL REMAIN (TYP.)

EXISTING FAA LOC/DME ELECTRICAL POWER FEED CONDUCTORS SHALL BE ABANDONED IN PLACE. EXISTING CABLES SHALL BE DEMOLISHED WHERE REQUIRED. REFER TO ELECTRICAL GENERAL NOTE 15 ON DRAWING E001

OFZ

PROPOSED BASE MOUNTED L–861T(L) LED ELEVATED TAXIWAY EDGE LIGHT (TYP.)

EDGE OF PROPOSED TAXIWAY PAVEMENT (TYP.)

A11 A12 A13 A14 A15 A16 A17

237+00 238+00 239+00 240+00 241+00 242+00 243+00 244+00 245+00 246+00

PROPOSED TAXIWAY A

35.00'

A51 A50 A49 A48 A47 A46 A45

PROPOSED FULL DEPTH PAVEMENT (TYP.)

PROPOSED 2" SCH 40 PVC CONDUIT. PROVIDE 1–1/C L–824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLE (TAXIWAY A). PROVIDE #6 BARE COUNTERPOISE WIRE IN SAME TRENCH ABOVE CONDUIT (TYP.)

MATCH LINE – SEE DRAWING NO. E101

MATCH LINE – SEE DRAWING NO. E103

DRAWING NOTES:

1. REFER TO DRAWING E–001 FOR ELECTRICAL LEGEND AND GENERAL NOTES.
2. REFER TO E–500 DRAWING SERIES FOR AIRFIELD ELECTRICAL FIXTURE AND INSTALLATION DETAILS.
3. REFER TO DRAWING E–601 FOR AIRFIELD LIGHTING FIXTURE AND SIGN SCHEDULE FOR PROPOSED FIXTURE AND SIGN LOCATIONS.

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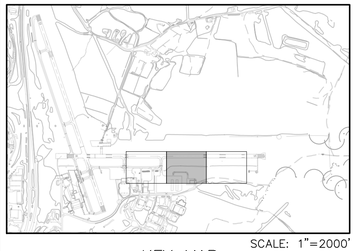

SCALE: 1"=2000'

KEY MAP

N

0 40' 80'

Revision	By	Appd.	YY.MM.DD

0 ISSUED FOR BID	DMZ	LAM	24.01.31
Issued	By	Appd.	YY.MM.DD

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Dwn.	Chkd.	Dsgn.

Permit-Seal

STATE OF NEW HAMPSHIRE - DANA BERGMAN No. 17978 LICENSED PROFESSIONAL ENGINEER -

1-31-2024

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LIGHTING AND SIGNAGE PLAN - 2

Project No.
179450522

Drawing No.	Sheet	Revision
E102	55 of 79	0

1X2" DUCT BANK

RUNWAY 18–36

RUNWAY 18–36

47+00 48+00 49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00

EXISTING ELEVATED RUNWAY EDGE LIGHT FIXTURE AND TRANSFORMER SHALL BE REMOVED. FIXTURE BASE CAN, AIRFIELD LIGHTING CABLES, CONDUIT AND ANCILLARY MATERIALS SHALL BE DEMOLISHED (TYP.)

EXISTING DUCTBANK AND AIRFIELD LIGHTING CABLES (RUNWAY 36 PAPI) SHALL REMAIN (TYP.)

EXISTING AIRFIELD LIGHTING CABLES AND CONDUIT SHALL BE DEMOLISHED

EXISTING RUNWAY EDGE LIGHT SHALL REMAIN

EXISTING ELECTRICAL MANHOLE SHALL REMAIN (TYP.)

EXPOSE AND INTERCEPT EXISTING CONDUIT. PROVIDE COUPLING AND REROUTE CONDUIT AS INDICATED (TYP.)

EXISTING CONDUIT AND AIRFIELD LIGHTING CABLE (RUNWAY 18–36) SHALL REMAIN (TYP.)

EXISTING RUNWAY 36 PAPI LHA (TYP. OF 4)

PROPOSED TAXIWAY A2

402+00

401+00

PROPOSED CONCRETE ENCASED 2–WAY, 4" SCH. 40 PVC DUCTBANK. PROVIDE 2–1/C L824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLES (1–RUNWAY 18–36, 1–TAXIWAY A). PROVIDE #6 BARE COUNTERPOISE WIRE IN SAME TRENCH ABOVE DUCTBANK

PROPOSED DIRECT BURIED 1–WAY, 2" SCH. 80 PVC DUCTBANK. PROVIDE AND SPLICE 2–1/C L–824C #6 AWG AIRFIELD LIGHTING CABLES TO EXISTING IN PROPOSED JUNCTION CANS

PROPOSED 3'X3' PRECAST ELECTRICAL HANDHOLE (TYP.)

EXISTING DIRECT BURIED 2–1/C L–824C, #6 AWG AIRFIELD LIGHTING CABLES SHALL REMAIN (RUNWAY 36 PAPI)

EXISTING FAA LOC/DME ELECTRICAL POWER FEED CONDUCTORS SHALL BE ABANDONED IN PLACE. EXISTING CABLES SHALL BE DEMOLISHED WHERE REQUIRED. REFER TO ELECTRICAL GENERAL NOTE 15 ON DRAWING E001

EXISTING RUNWAY 36 PAPI PCU EQUIPMENT RACK. CONTRACTOR SHALL COORDINATE ALL PAPI OUTAGES WITH RPR AND AIRPORT

OFZ

SIGN S5 SIGN S6 SIGN S7 SIGN S8 SIGN S4

PROPOSED FULL DEPTH PAVEMENT (TYP.)

PROPOSED L–868 JUNCTION CAN AND COVER PLATE (TYP. OF 2). INSTALL TO CAPTURE EXISTING DIRECT BURIED CABLES

HAND DIG TO EXPOSE EXISTING RUNWAY 36 PAPI CABLES. CUT EXISTING CABLES AND PULL BACK BEYOND LIMITS OF PROPOSED TAXIWAY.

PROPOSED STAKE MOUNTED L–861T(L) LED ELEVATED TAXIWAY EDGE LIGHT (TYP.)

247+00 248+00 249+00 250+00 251+00 252+00 253+00 254+00

PROPOSED TAXIWAY A

PROPOSED 1–1/C L–824C #8 AWG 5kV AIRFIELD LIGHTING CABLE DIRECT BURIED IN TRENCH. PROVIDE #6 AWG COUNTERPOISE WIRE IN SAME TRENCH ALIGNED ABOVE AIRFIELD LIGHTING CABLE

PROPOSED BASE MOUNTED L–861T(L) LED ELEVATED TAXIWAY EDGE LIGHT (TYP.)

PROPOSED 2" SCH 40 PVC CONDUIT. PROVIDE 1–1/C L–824C, #8 AWG, 5kV AIRFIELD LIGHTING CABLE (TAXIWAY A). PROVIDE #6 BARE COUNTERPOISE WIRE IN SAME TRENCH ABOVE CONDUIT (TYP.)

PROPOSED ILLUMINATED AIRFIELD GUIDANCE SIGN, CONCRETE FOUNDATION AND TRANSFORMER JUNCTION CAN (TYP.)

EDGE OF PROPOSED TAXIWAY PAVEMENT (TYP.)

MATCH LINE – SEE DRAWING NO. E102

DRAWING NOTES:

1. REFER TO DRAWING E–001 FOR ELECTRICAL LEGEND AND GENERAL NOTES.
2. REFER TO E–500 DRAWING SERIES FOR AIRFIELD ELECTRICAL FIXTURE AND INSTALLATION DETAILS.
3. REFER TO DRAWING E–601 FOR AIRFIELD LIGHTING FIXTURE AND SIGN SCHEDULE FOR PROPOSED FIXTURE AND SIGN LOCATIONS.

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SCALE: 1"=2000'

KEY MAP

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0 40' 80'

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STATE OF NEW HAMPSHIRE - DANA BERGMAN No. 17978 LICENSED PROFESSIONAL ENGINEER - 1-31-2024

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

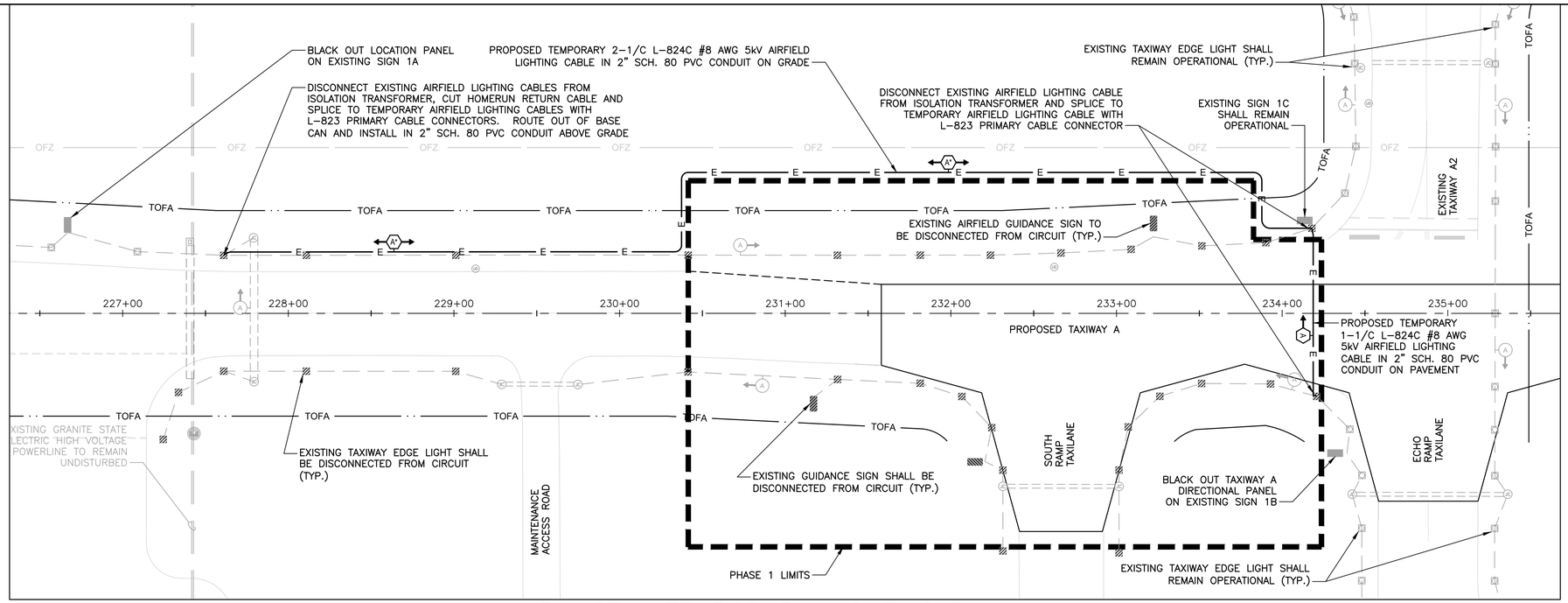
EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LIGHTING AND SIGNAGE PLAN - 3

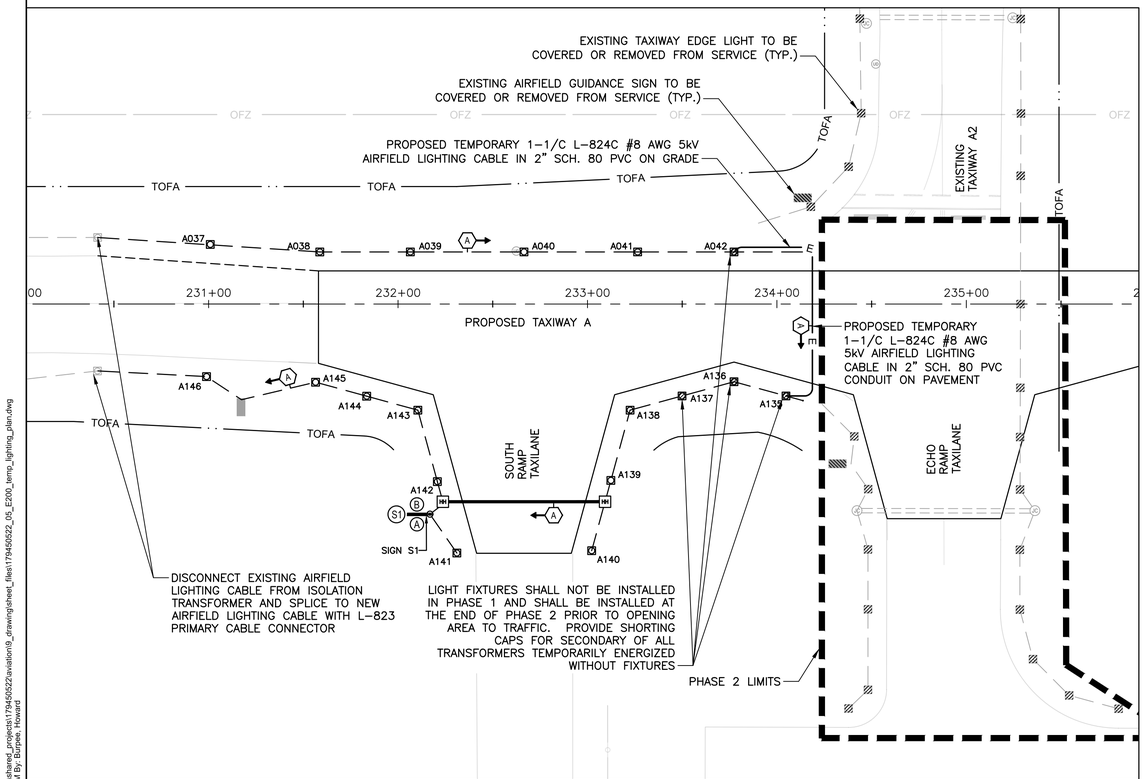
Project No. 179450522

Drawing No.	Sheet	Revision
E103	56 of 79	0



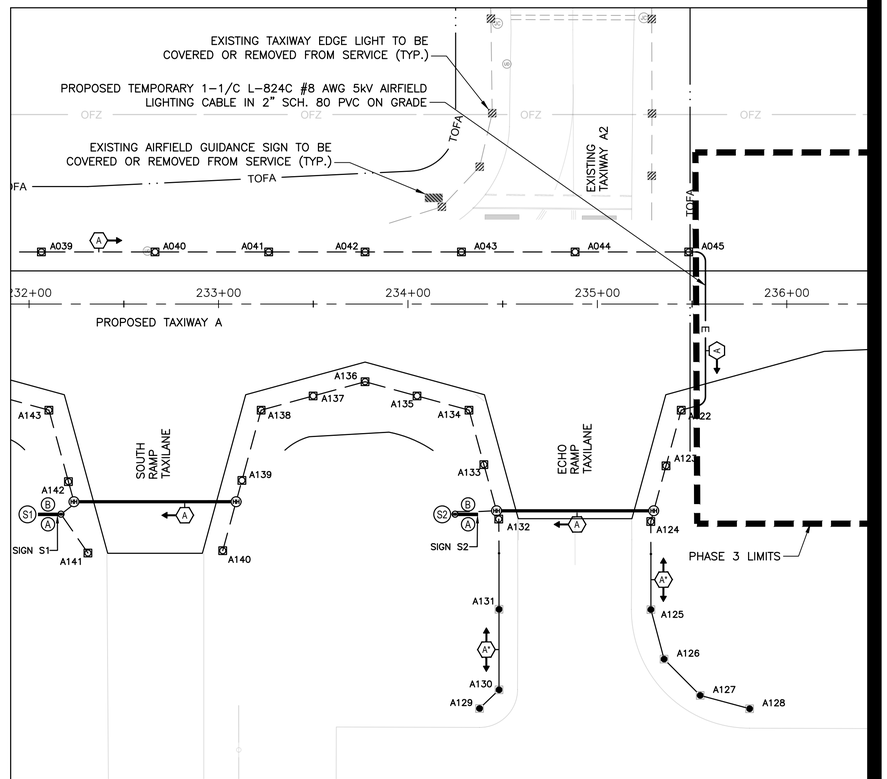
PHASE 1 TEMPORARY LIGHTING PLAN

SCALE: 1"=40'



PHASE 2 TEMPORARY LIGHTING PLAN

SCALE: 1"=40'



PHASE 3 TEMPORARY LIGHTING PLAN

SCALE: 1"=40'

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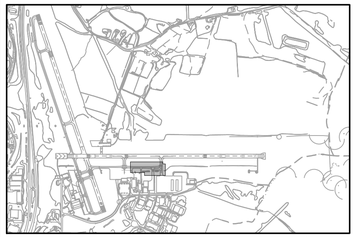

SCALE: 1"=2000'

KEY MAP

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0 40' 80'

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DANA BERGMAN
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PROFESSIONAL ENGINEER
1-31-2024

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

TEMPORARY LIGHTING PLAN

Project No.
179450522

Drawing No.	Sheet	Revision
E201	57 of 79	0

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1/29/2024 9:36 AM By: Bergman, Howard

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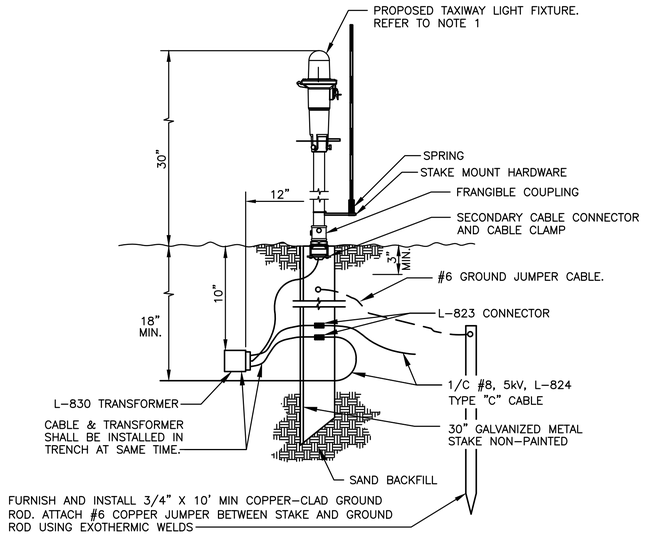
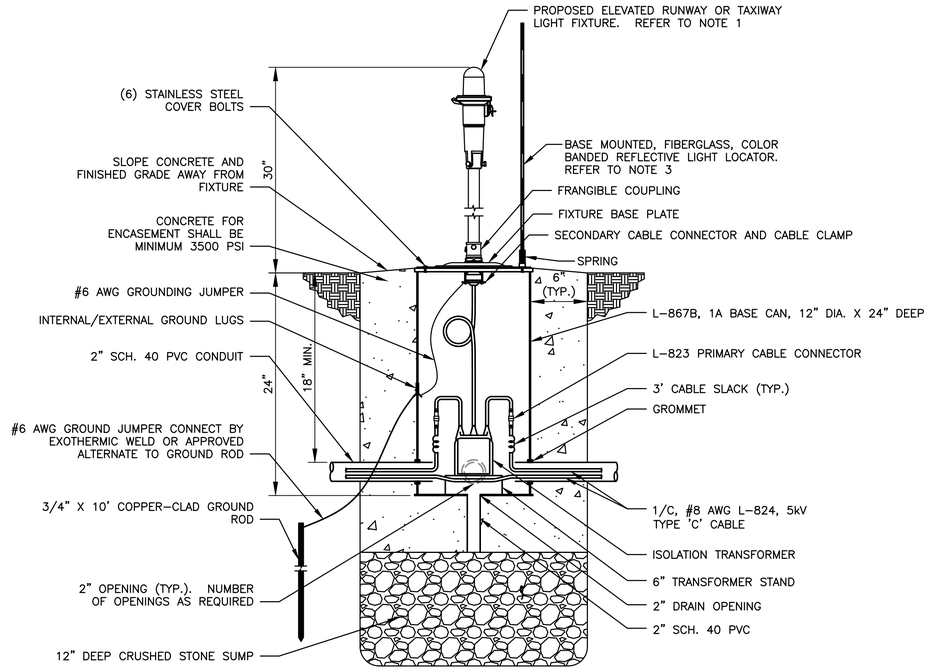


L-861 STAKE MOUNTED FIXTURE DETAIL

NOT TO SCALE

NOTES:

1. CONTRACTOR SHALL PROVIDE L-861T(L) TAXIWAY STAKE MOUNTED FIXTURE TYPE WHERE INDICATED ON LAYOUT DRAWINGS. PROVIDE OMNI-DIRECTIONAL BLUE TAXIWAY LIGHTS.
2. ALL PROPOSED LED FIXTURES SHALL HAVE INTEGRAL HEATER OPTION INCLUDED.
3. PROVIDE REFLECTIVE LIGHT LOCATORS WITH SPRING AND COLOR BANDS. LOCATOR HEIGHT SHALL BE 36" FOR TAXIWAY EDGE LIGHTS PROVIDE BLUE COLOR BANDS. INSTALL LOCATOR WITH STAKE MOUNT HARDWARE PROVIDE BY LOCATOR MANUFACTURER. FURNISH AND INSTALL LOCATOR FAR SIDE OF FIXTURE OPPOSITE FROM EDGE OF PAVEMENT.

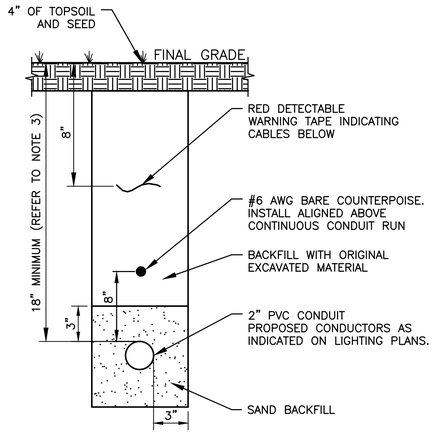


RUNWAY & TAXIWAY ELEVATED LIGHT FIXTURE DETAIL

NOT TO SCALE

NOTES:

1. CONTRACTOR SHALL PROVIDE L-862 AND L-861T(L) RUNWAY AND TAXIWAY BASE MOUNTED FIXTURE TYPES WHERE INDICATED ON LAYOUT DRAWINGS. PROVIDE BI-DIRECTIONAL FIXTURES FOR ALL PROPOSED RUNWAY FIXTURES. PROVIDE OMNI-DIRECTIONAL BLUE TAXIWAY LIGHTS.
2. ALL PROPOSED LED FIXTURES SHALL HAVE INTEGRAL HEATER OPTION INCLUDED.
3. PROVIDE REFLECTIVE LIGHT LOCATORS WITH SPRING AND COLOR BANDS. LOCATOR HEIGHT SHALL BE 36". FOR RUNWAY EDGE LIGHTS PROVIDE YELLOW COLOR BANDS. FOR TAXIWAY EDGE LIGHTS PROVIDE BLUE COLOR BANDS. INSTALL LOCATOR IN LIEU OF 6th BOLT LOCATION IN BASE CAN FURTHEST FROM EDGE OF PAVEMENT

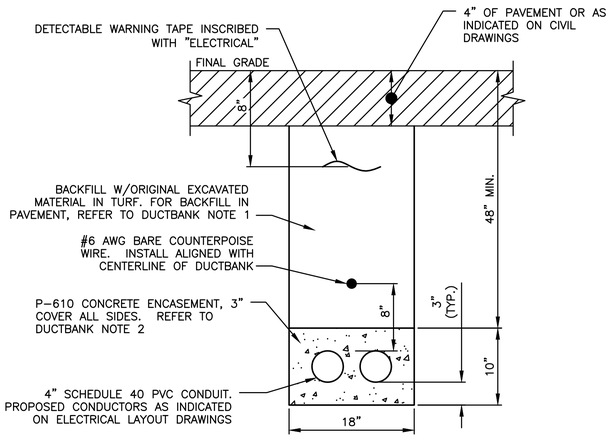


TYPICAL CONDUIT TRENCH DETAIL

NOT TO SCALE

NOTES:

1. CONTRACTOR SHALL PROVIDE AN EQUIPOTENTIAL LIGHTNING PROTECTION SYSTEM BY PLACING THE PROPOSED #6 AWG BARE CU COUNTERPOISE ABOVE CONDUIT AND AIRFIELD LIGHTING CABLES IN SAME TRENCH. CONNECT COUNTERPOISE TO EACH LIGHT BASE CAN OR JUNCTION CAN.
2. PVC CONDUIT SHALL BE SCHEDULE 40 WHEN INSTALLED BELOW TURF AND SCHEDULE 80 WHEN INSTALLED BELOW PAVEMENT.
3. 1-WAY, 2" SCH. 80 PVC DUCTBANKS UNDER PROPOSED PAVEMENT SHALL BE PROVIDED WITH NEGATIVE SWEEPS FROM CONNECTING JUNCTION STRUCTURE TO A MIN. DEPTH OF 36" BELOW FINAL GRADE.

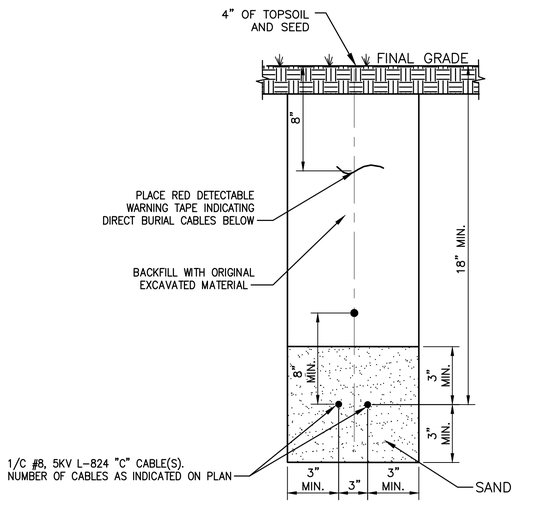


CONCRETE ENCASED DUCTBANK TRENCH DETAIL

NOT TO SCALE

DUCTBANK NOTES:

1. WHERE TRENCH RUNS UNDER PAVEMENT, REFER TO CIVIL DRAWINGS FOR REQUIRED BACKFILL MATERIALS.
2. DUCTBANK SHALL BE CONCRETE ENCASED UNDER PAVEMENT. CONCRETE ENCASEMENT SHALL EXTEND BEYOND EDGE OF PAVEMENT TO A POINT 5' BEYOND IN TO TURF. OTHERWISE, DUCTBANK SHALL BE ENCASED IN 3" OF CLEAN SAND BACKFILL.



DIRECT BURIED AIRFIELD LIGHTING CABLES AND COUNTERPOISE DETAIL

NOT TO SCALE

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STATE OF NEW HAMPSHIRE
DANA BERGMAN
No. 17978
LICENSED PROFESSIONAL ENGINEER
1-31-2024

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LIGHTING & SIGNAGE DETAILS - 1

Project No.
179450522

Drawing No.	Sheet	Revision
E501	58 of 79	0

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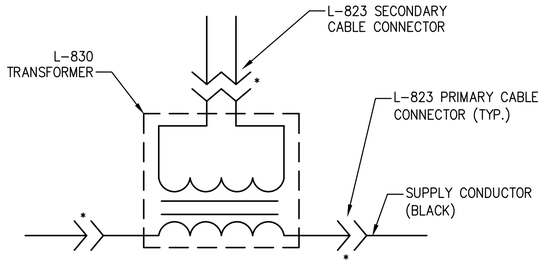
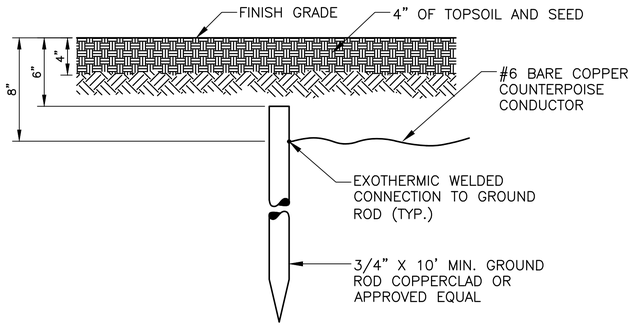


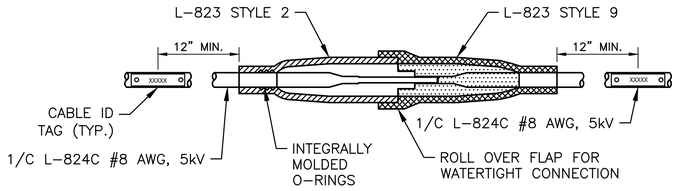
TYPICAL LIGHT FIXTURE WIRING SCHEMATIC
NOT TO SCALE

* – TAPE CONNECTOR WITH ELECTRICAL TAPE

NOTE:
1. HEAT SHRINK TUBING SHALL NOT BE USED ON L–823 CONNECTORS

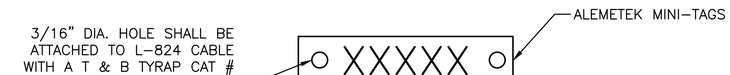


TYPICAL GROUND ROD INSTALLATION
NOT TO SCALE



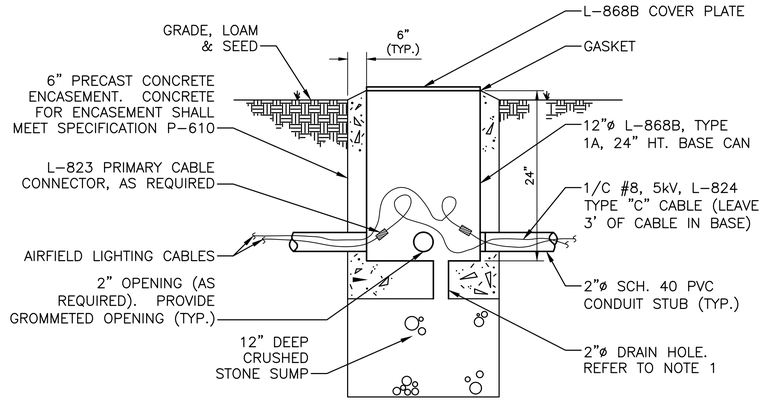
L-823 PRIMARY CABLE CONNECTOR DETAIL
NOT TO SCALE

NOTE:
1. CONTRACTOR SHALL COORDINATE WITH MANUFACTURER OF CONNECTOR KIT AND UTILIZE APPROPRIATE CRIMPING TOOL TO ASSURE PROPER AND WATERTIGHT FIT.
2. PROVIDE 2–1/2 LAPS OF ELECTRICAL TAPE COVERING ROLL OVER FLAP AND AT EACH END OF SPLICE KIT. TAPE SHALL MEET TECHNICAL SPECIFICATION L–108 REQUIREMENTS.



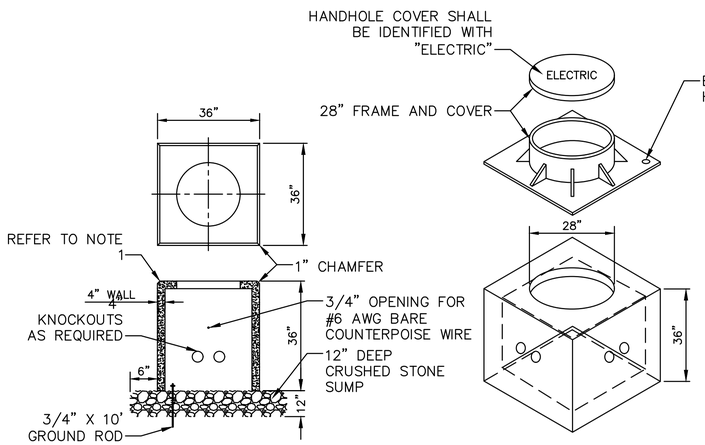
NOTE:
1. CONTRACTOR SHALL COORDINATE CABLE ID INSCRIPTION(S) WITH ENGINEER DURING EQUIPMENT SUBMITTAL TIMEFRAME PRIOR TO CONSTRUCTION.

TYPICAL L-824 CABLE ID TAG
NOT TO SCALE



L-868 ELECTRICAL JUNCTION CAN DETAIL
NOT TO SCALE

NOTE:
1. PROVIDE 2" DRAIN OPENING. AT JUNCTION CANS WHERE 2" DRAINAGE CONNECTION IS NOT REQUIRED CONTRACTOR SHALL PLUG/FILL 2" DRAIN HOLE IN JUNCTION CAN CONCRETE ENCASEMENT.



PRECAST ELECTRICAL HANDHOLE - 3'x3'
NOT TO SCALE

NOTES:
1. CONCRETE THICKNESS AND REINFORCING OF HANDHOLE TOP AND WALLS SHALL MEET OR EXCEED HS–20 DESIGN LOADING OF 32,000LBS.
2. INSTALL 4/0 INSULATED COPPER GROUNDING CABLE (NOT SHOWN) AND CONNECT TO GROUND ROD IN HANDHOLE. ROUTE CABLE AROUND WALL PERIMETER AND A #2 AWG GROUNDING CABLE UP TO HANDHOLE FRAME. DRILL AND TAP FRAME FOR 1/2" SS HARDWARE AND 2 HOLE COMPRESSION CRIMP CABLE LUGS. ATTACH CABLE TO WALLS WITH CABLE CLAMPS.
3. ONCE CONDUITS ARE INSTALLED WITHIN HANDHOLE KNOCKOUTS, PROVIDE GROUT AROUND EXTERIOR OF CONDUIT.

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STATE OF NEW HAMPSHIRE – PROFESSIONAL ENGINEER – DANA BERGMAN No. 17978 LICENSED
1-31-2024

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
LIGHTING & SIGNAGE DETAILS - 2

Project No.
179450522

Drawing No.	Sheet	Revision
E502	59 of 79	0

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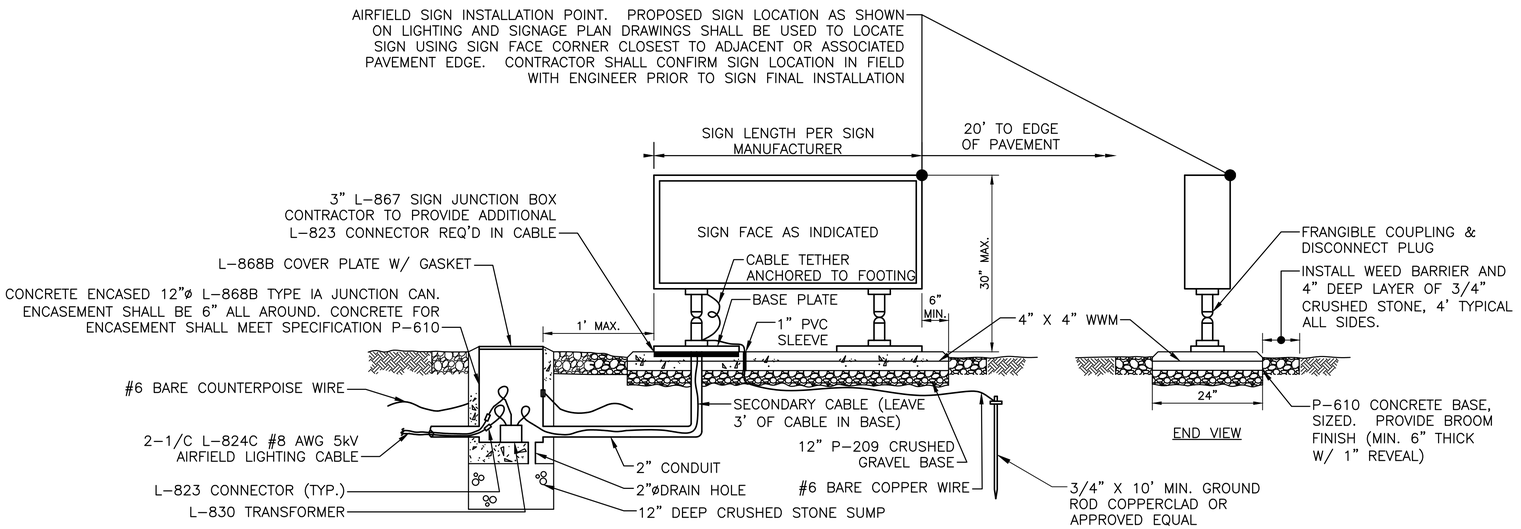
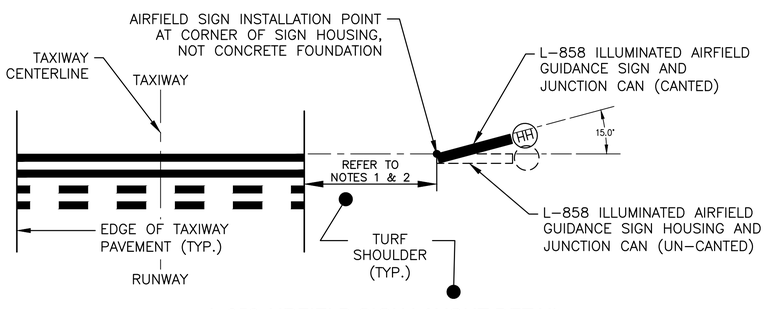


L-858 ILLUMINATED AIRFIELD GUIDANCE SIGN DETAIL

NOT TO SCALE

SIGN NOTES:

1. SIGNS SHALL BE SIZE 1, STYLE 2, LED.
2. CONTRACTOR SHALL INSTALL TRANSFORMER JUNCTION CANS AT END OF SIGN AWAY FROM NEAREST EDGE OF PAVEMENT.

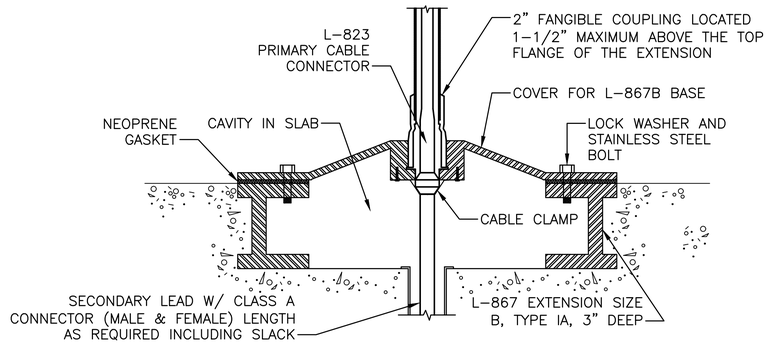


L-858 AIRFIELD SIGN LAYOUT DETAIL

NOT TO SCALE

NOTES:

1. REFER TO L-858 ILLUMINATED AIRFIELD GUIDANCE SIGN DETAIL THIS SHEET FOR SIGN HOUSING, CONCRETE FOUNDATION AND JUNCTION CAN INSTALLATION NOTES AND CALLOUTS.
2. MANDATORY HOLD SIGNS SHALL BE INSTALLED SO THAT THE TAXIWAY SIDE OF THE SIGN HOUSING IS INSTALLED IN LINE WITH THE CONTINUOUS YELLOW LINE WITHIN THE TAXIWAY HOLDLINE PAVEMENT MARKING. FOR SIGN HOUSING OFFSET FROM NEAREST PAVEMENT REFER TO L-858 ILLUMINATED AIRFIELD GUIDANCE SIGN DETAIL, THIS DRAWING.
3. AIRFIELD SIGN INSTALLATION POINT SHALL BE GIVEN IN THE FORM OF A NORTHING & EASTING LOCATION AND SHALL BE CALLED VIA THE SIGN IDENTIFICATION, SIGN SX, WITH 'X' BEING THE SIGN NUMBER. WHERE INDICATED SIGNS SHALL BE CANTED 15° ABOUT THE AIRFIELD SIGN INSTALLATION POINT AND TOWARDS THE ASSOCIATED TAXIWAY CENTERLINE.
4. ALL OTHER MANDATORY, GUIDANCE AND LOCATION SIGNS SHALL BE INSTALLED PER ELECTRICAL LIGHTING AND SIGNAGE PLAN DRAWINGS.



SIGN JUNCTION BOX AND L-823 CONNECTION

NOT TO SCALE

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Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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By	Appd.	YY.MM.DD
HAB	LS	HAB
Dwn.	Chkd.	Dsgn.

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STATE OF NEW HAMPSHIRE - DANA BERGMAN No. 17978 LICENSED PROFESSIONAL ENGINEER - 1-31-2024

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

LIGHTING & SIGNAGE DETAILS - 3

Project No.
179450522

Drawing No.	Sheet	Revision
E503	60 of 79	0

\\us0297-pgfss01\shared_projects\179450522\aviation\9_drawing\sheet_files\179450522_05_E500_allec_dtls.dwg
1/29/2024 9:40 AM By: Bergman, Howard

ORIGINAL SHEET - ANSI D

LIGHT FIXTURE AND SIGN SCHEDULE		
FIXTURE/SIGN ID	NORTHING	EASTING
A01	410139.81	814773.31
A02	410084.52	814780.60
A03	410035.54	814790.64
A04	409976.76	814802.69
A05	409917.98	814814.74
A06	409868.13	814824.96
A07	409818.27	814835.18
A08	409759.50	814847.23
A09	409700.72	814859.28
A10	409651.74	814869.32
A11	409629.15	814873.95
A12	409580.17	814883.99
A13	409442.23	814912.27
A14	409255.16	814950.61
A16	408881.01	815027.31
A17	408693.93	815065.66
A19	408508.36	815111.32
A20	408472.74	815129.37
A21	408437.12	815147.43
A22	408434.54	815187.27
A23	408431.96	815227.12

LIGHT FIXTURE AND SIGN SCHEDULE		
FIXTURE/SIGN ID	NORTHING	EASTING
A24	408437.70	815255.20
A25	408448.42	815272.21
A26	408459.15	815289.22
A27	408469.87	815306.24
A28	408480.60	815323.25
A29	408356.57	815348.68
A30	408359.73	815328.82
A31	408362.90	815308.95
A32	408366.07	815289.09
A33	408369.23	815269.23
A34	408363.46	815241.16
A35	408345.41	815205.55
A36	408327.36	815169.93
A37	408314.93	815144.06
A38	408309.34	815116.78
A39	408306.69	815088.90
A40	408365.47	815076.85
A41	408424.24	815064.80
A42	408473.23	815054.76
A43	408495.82	815050.13
A45	408682.89	815011.78

LIGHT FIXTURE AND SIGN SCHEDULE		
FIXTURE/SIGN ID	NORTHING	EASTING
A46	408869.96	814973.43
A47	409057.04	814935.08
A48	409244.11	814896.73
A49	409431.19	814858.39
A51	409616.60	814812.76
A52	409652.22	814794.71
A53	409687.84	814776.65
A54	409689.81	814746.25
A55	409691.78	814715.86
A56	409682.39	814670.30
A57	409670.33	814646.10
A58	409647.80	814631.17
A59	409620.81	814629.51
A60	409760.53	814601.02
A61	409752.43	814612.73
A62	409760.96	814654.36
A63	409770.67	814701.01
A64	409784.14	814727.58
A65	409797.61	814754.15
A66	409825.99	814755.99
A67	409854.37	814757.83

LIGHT FIXTURE AND SIGN SCHEDULE		
FIXTURE/SIGN ID	NORTHING	EASTING
A68	409879.74	814744.97
A69	409905.10	814732.12
A70	409907.59	814693.74
A71	409910.08	814655.37
A72	409979.53	814639.89
A73	409997.20	814674.75
A74	410014.87	814709.61
A75	410042.80	814711.42
A76	410070.73	814713.23
A77	410127.73	814704.57
SIGN S1	409999.29	814656.02
SIGN S2	409782.03	814700.56
SIGN S3	409632.06	814883.56
SIGN S4	408509.65	815122.25
SIGN S5	408444.33	815190.84
SIGN S6	408487.08	815314.78
SIGN S7	408347.27	815343.44
SIGN S8	408321.27	815180.76

DRAWING NOTES:

1. REFER TO E–100 SERIES FOR LIGHTING AND SIGNAGE LAYOUT PLANS.
2. REFER TO E–500 DRAWING SERIES FOR AIRFIELD ELECTRICAL FIXTURE AND INSTALLATION DETAILS.

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STATE OF NEW HAMPSHIRE · PROFESSIONAL ENGINEER · DANA BERGMAN No. 17978 LICENSED
1-31-2024

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

FIXTURE AND SIGNAGE SCHEDULE

Project No.
179450522

Drawing No.	Sheet	Revision
E601	61 of 79	0

\\us2297-pafss01\shared_projects\179450522\aviation\9_drawingsheet_files\179450522_05_E600_fixt_sched.dwg
1/29/2024 9:42 AM By Bergen, Howard

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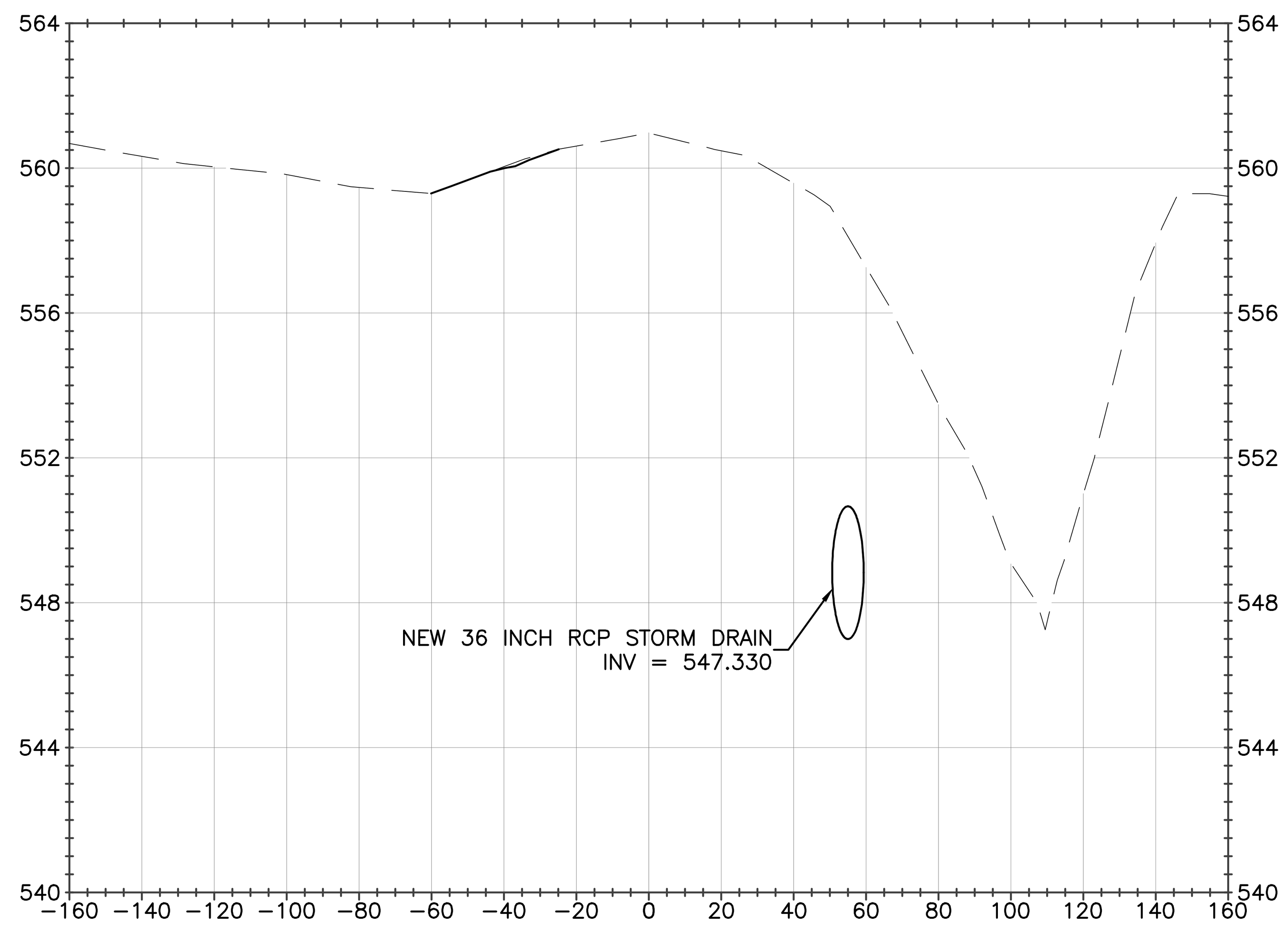

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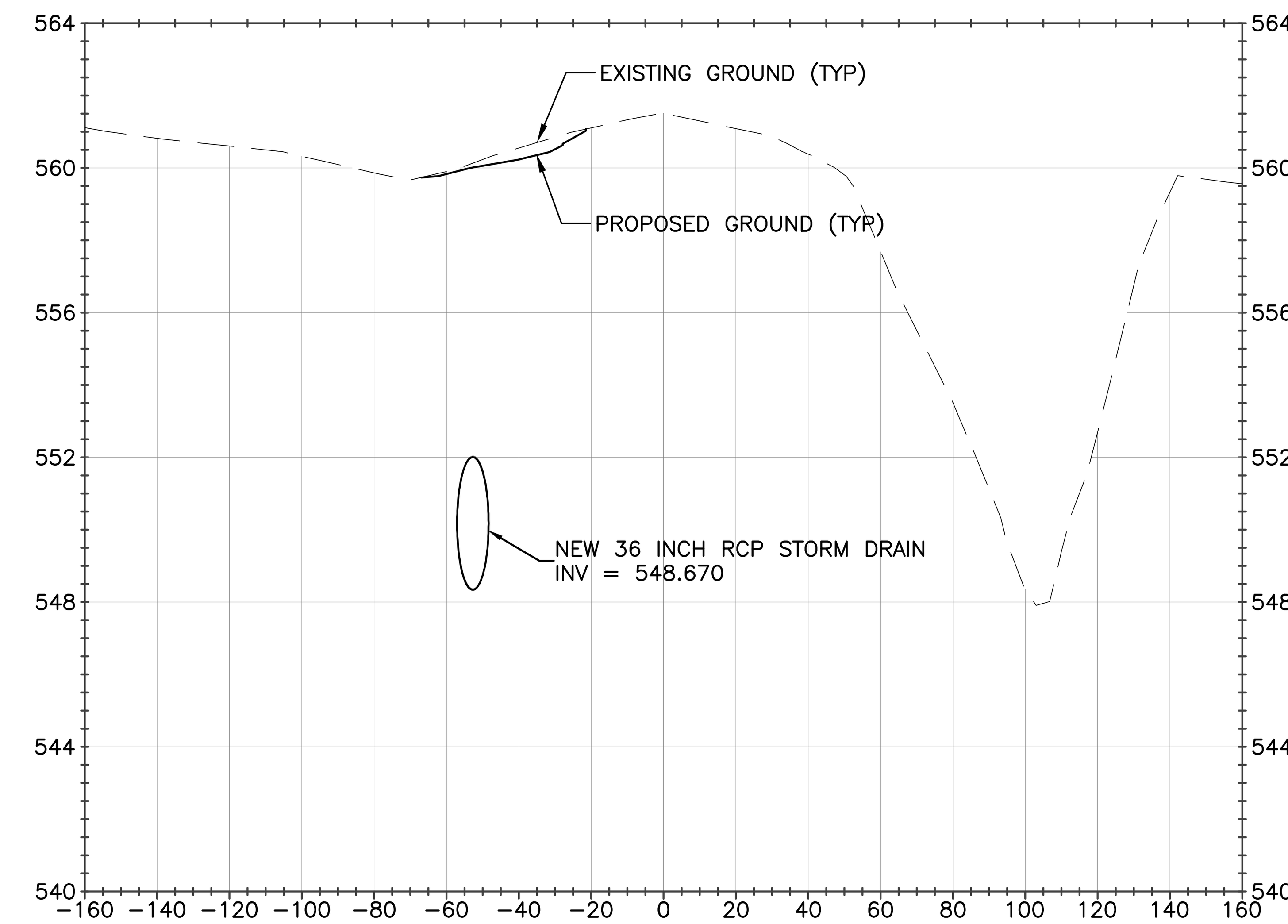

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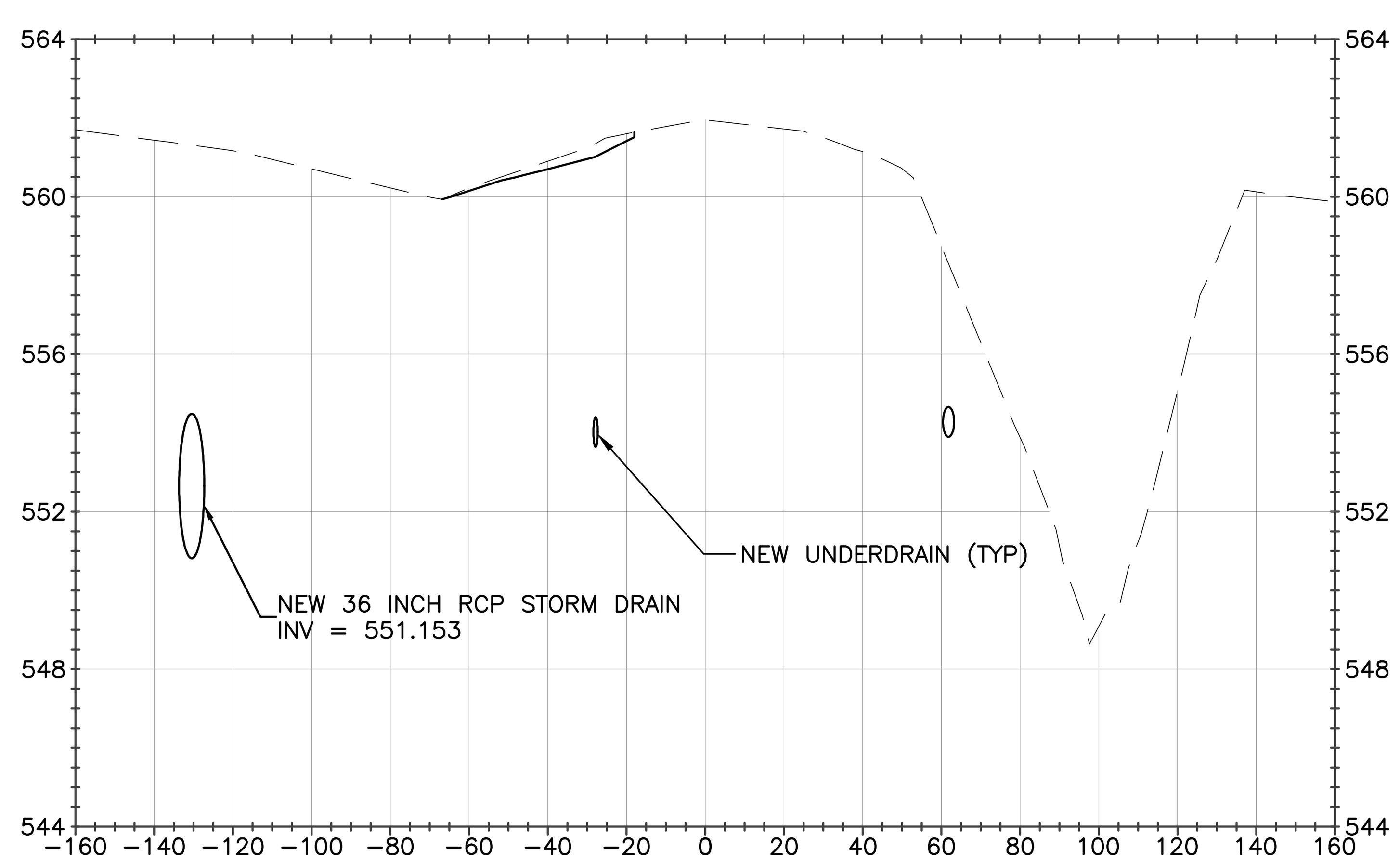

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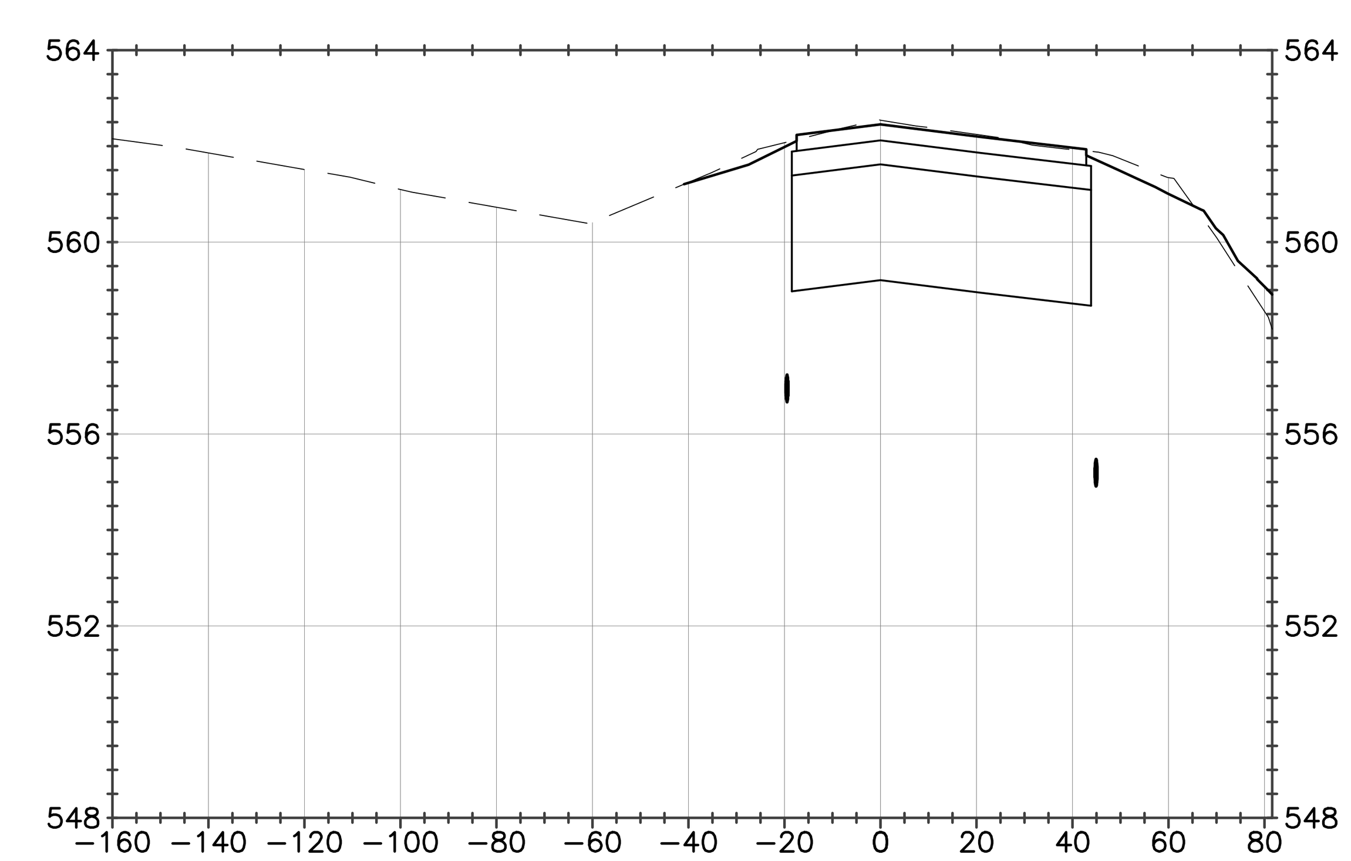

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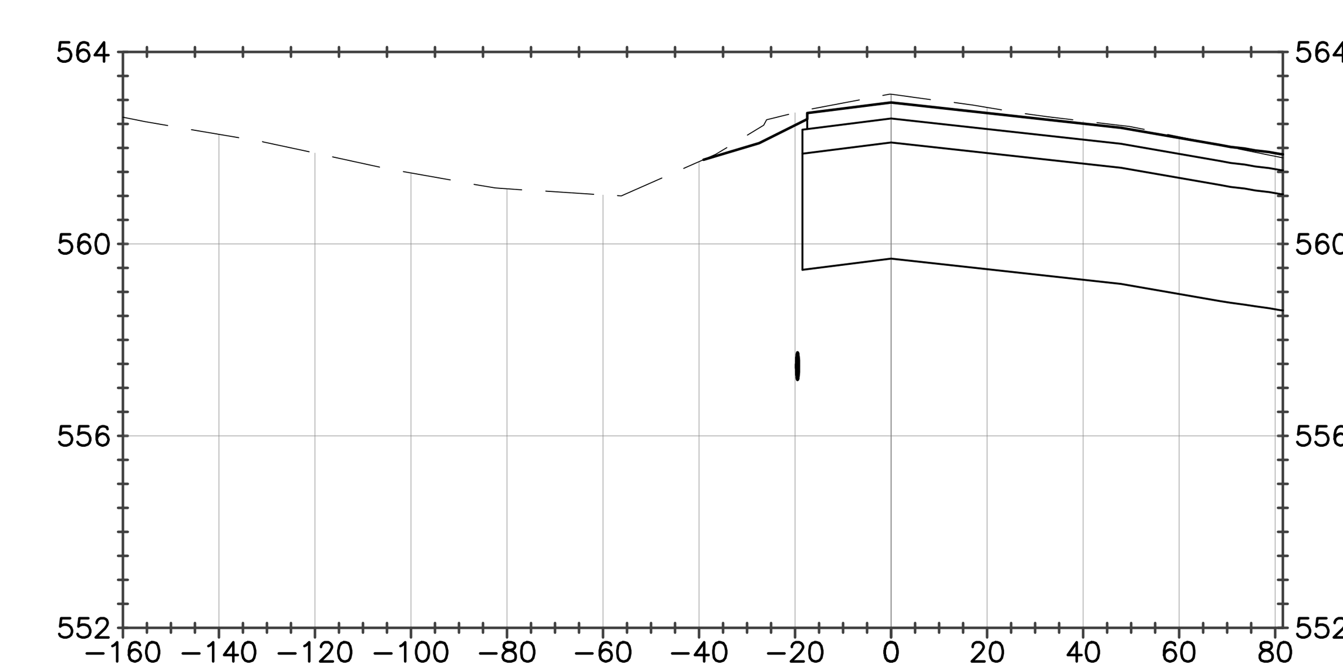

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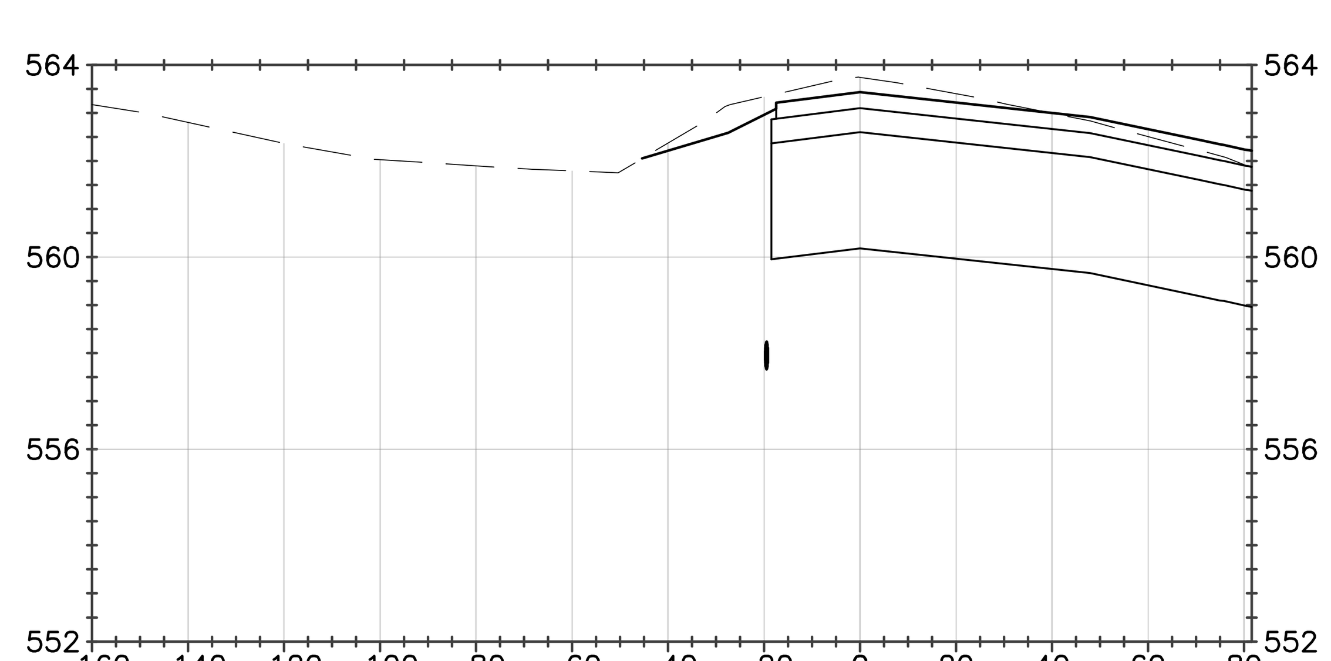

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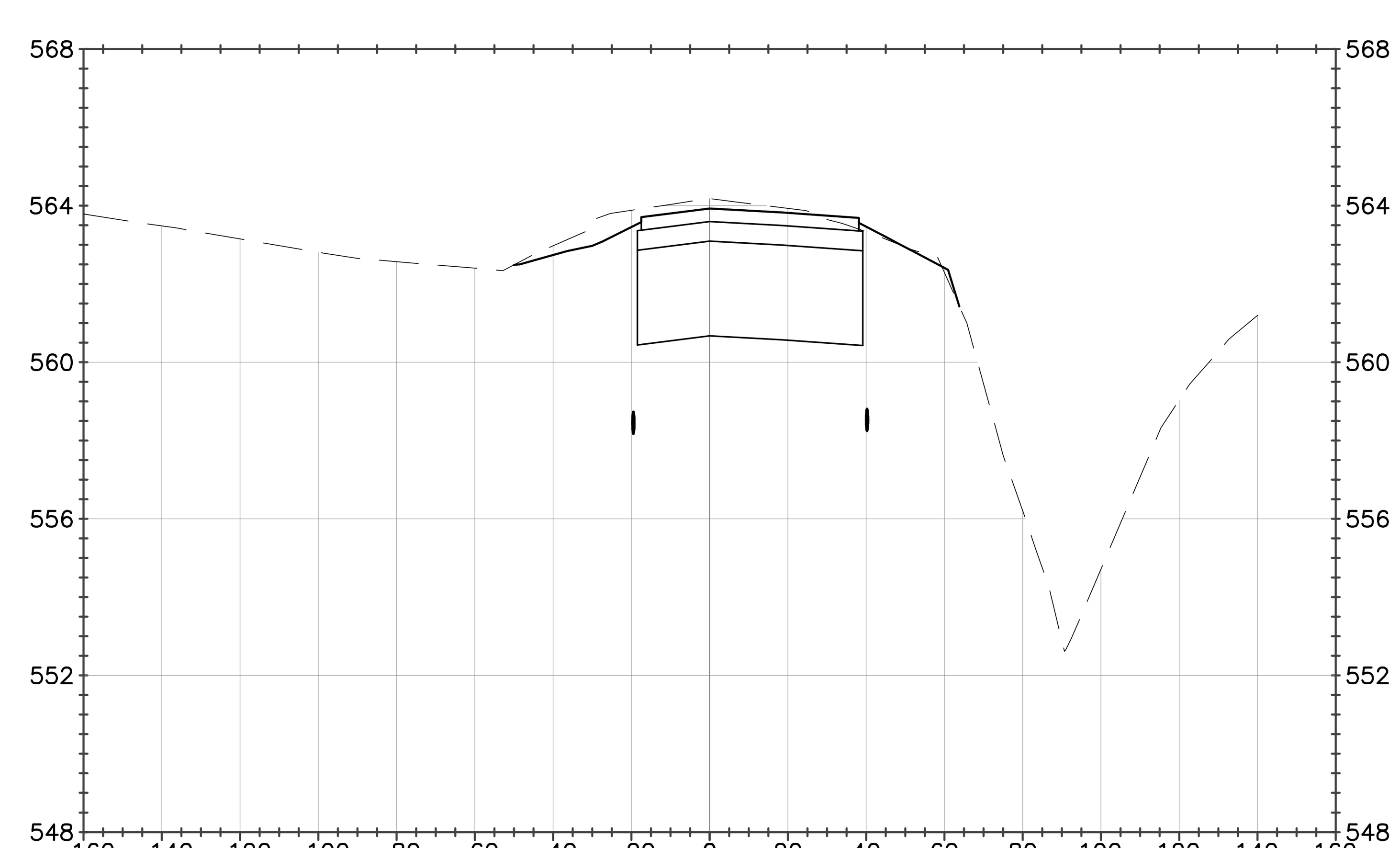

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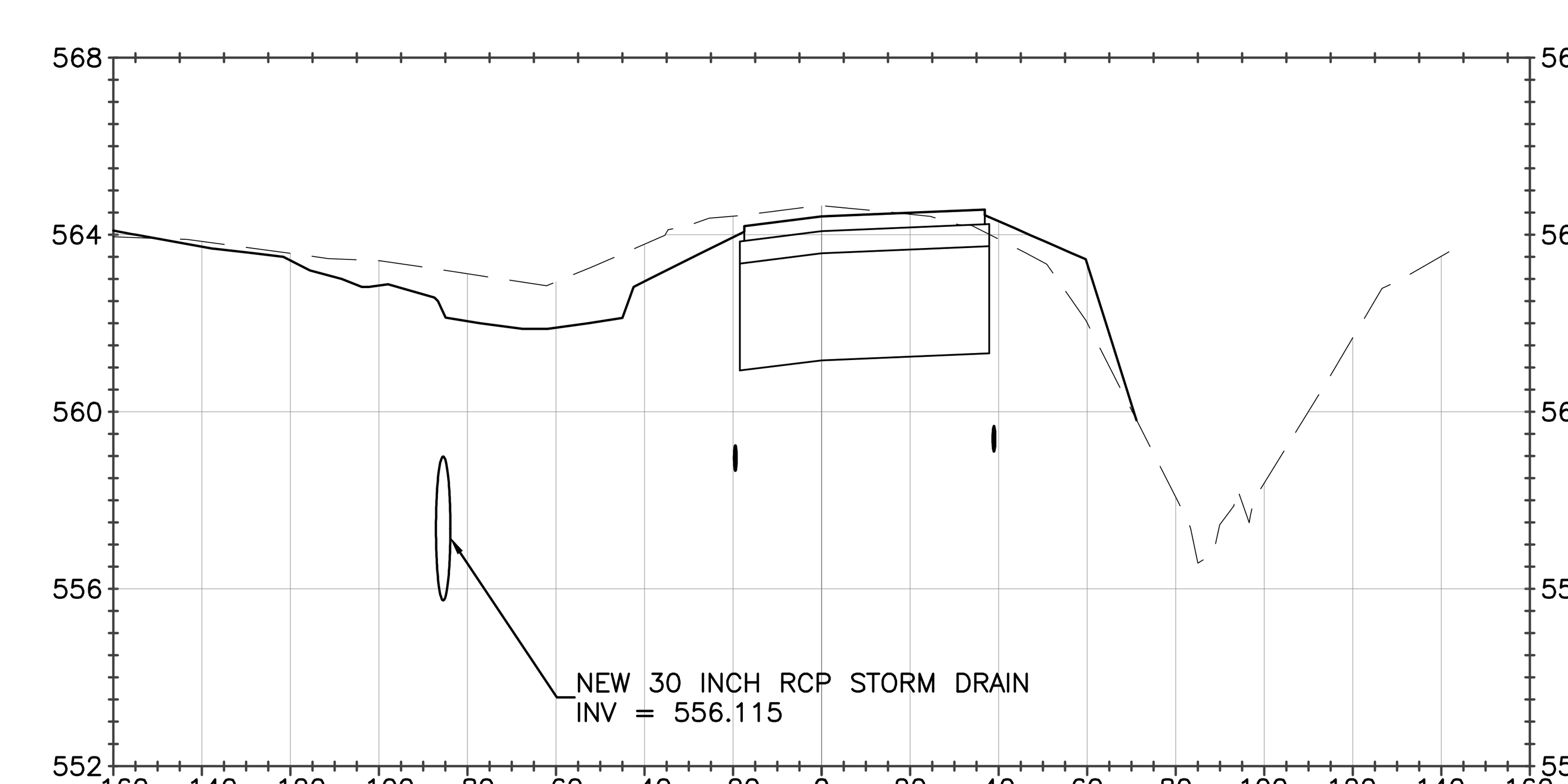

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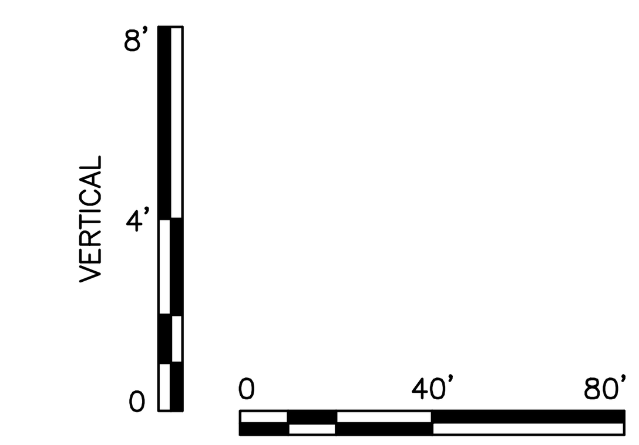

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31
Issued	By	Appd.	YY.MM.DD

DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID C. DUBOIS 8257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 1

Project No.
179450522

Drawing No.	Sheet	Revision
X101	62 of 79	0

U:\179450522\aviation\9_drawing\sheet_files\179450522_06_X101_cross_sections.dwg
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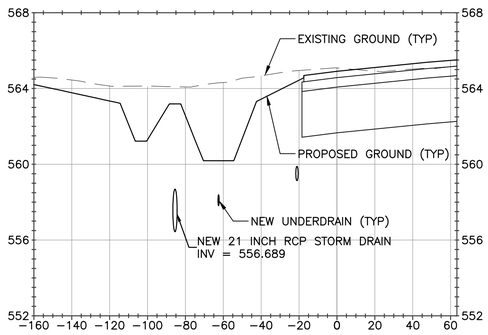

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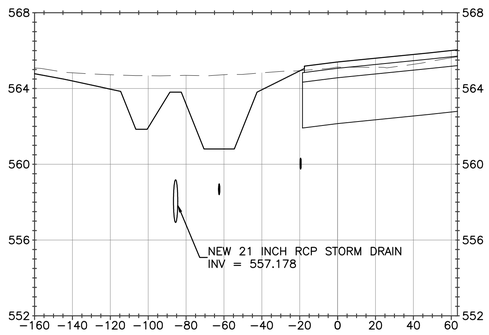

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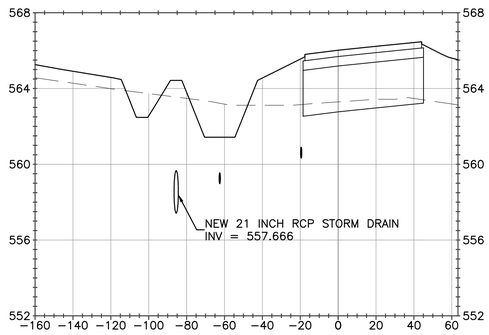

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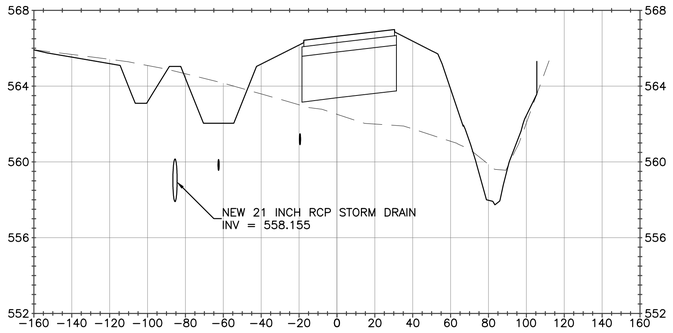

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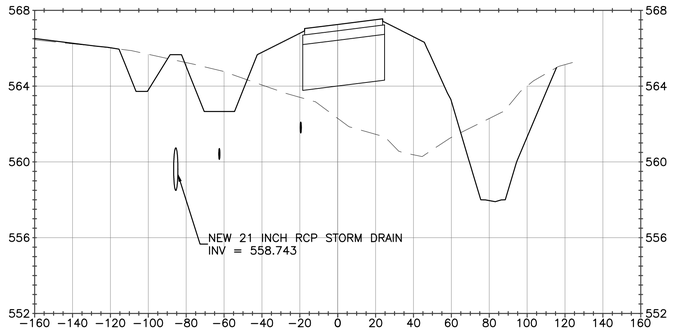

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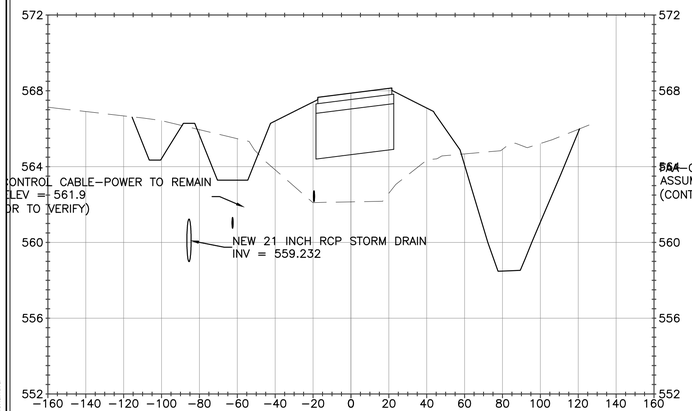

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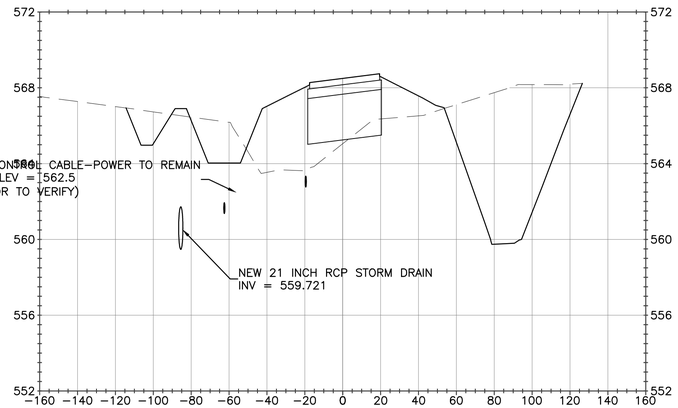

TAXIWAY A – STA. 237+50.00

NOTES

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VERTICAL 8' 4' 0

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DMZ	DCD	DMZ

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THE STATE OF NEW HAMPSHIRE DAVID M. ZIMMER 15577 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

CROSS SECTIONS - 2

Project No.
179450522

Drawing No.	Sheet	Revision
X102	63 of 79	0

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5/9/2024 9:42 AM By: dawenwgh, Alexandria

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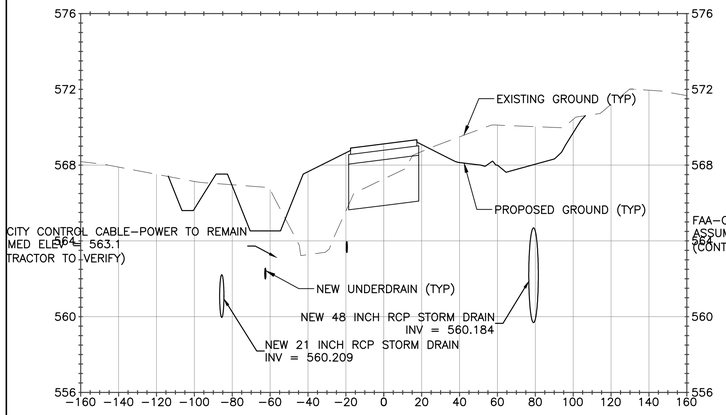

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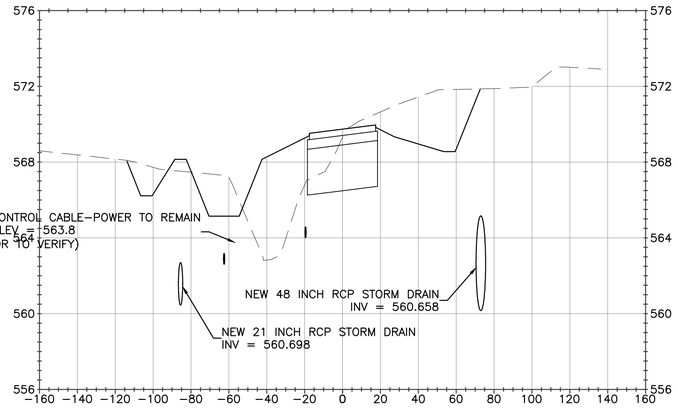

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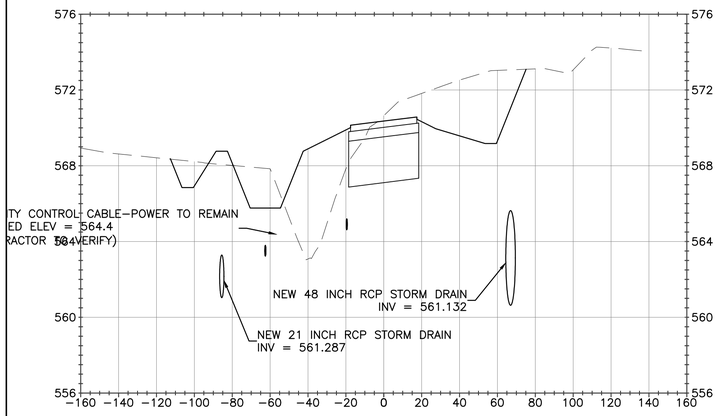

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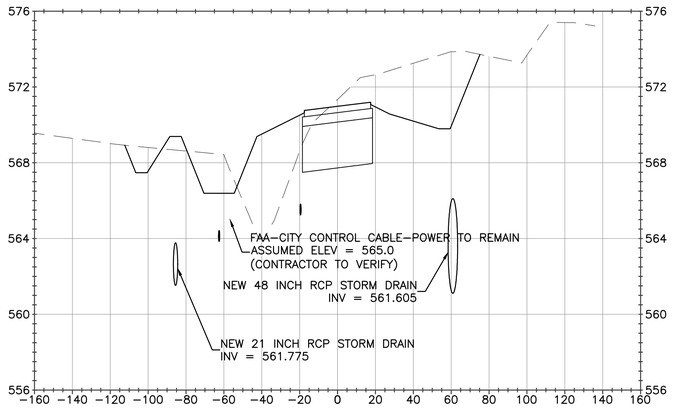

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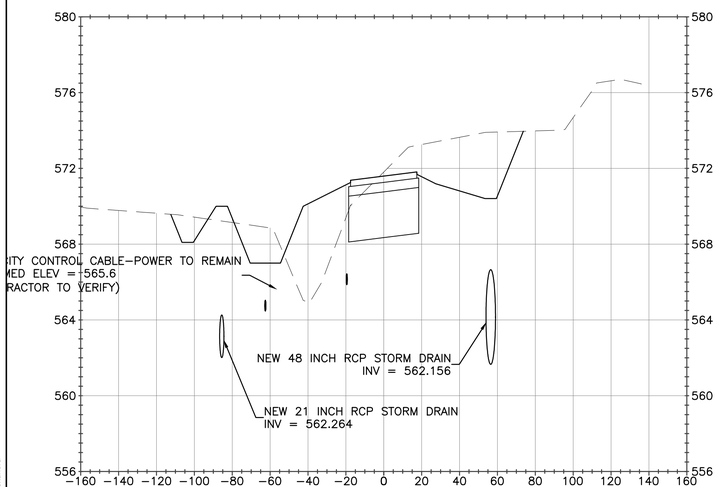

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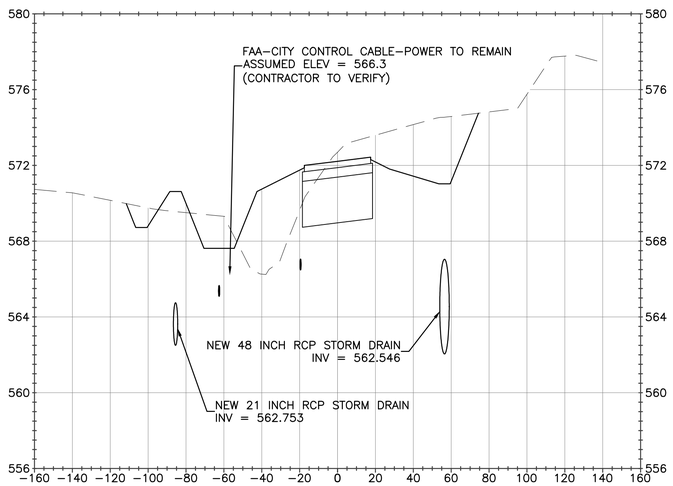

TAXIWAY A – STA. 240+50.00

NOTES
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THE STATE OF NEW HAMPSHIRE DAVID M. ZIMMERLE 13257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 3

Project No.
179450522

Drawing No.	Sheet	Revision
X103	64 of 79	0

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7/29/2024 9:42 AM By: Kavanagh, Alexandra

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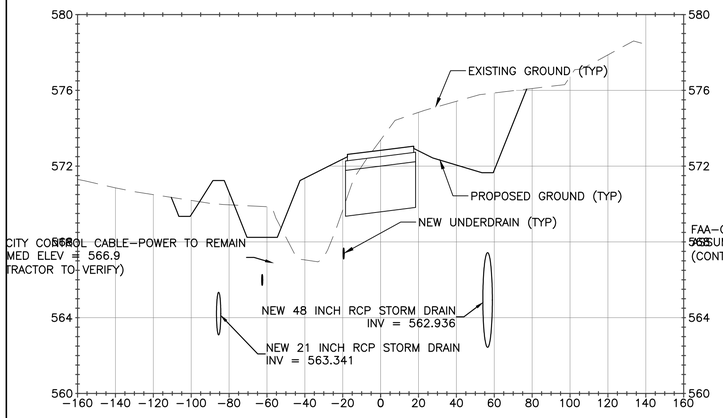

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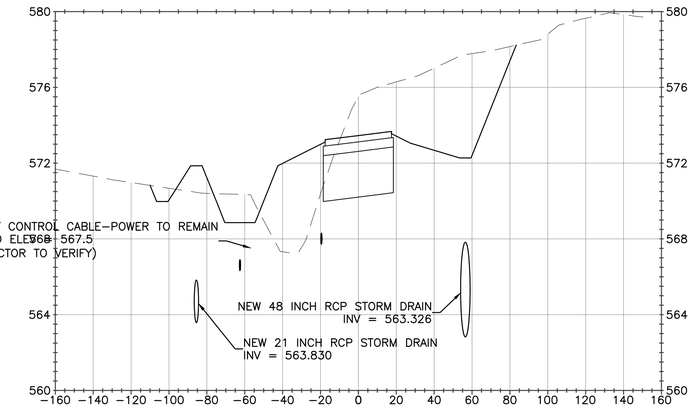

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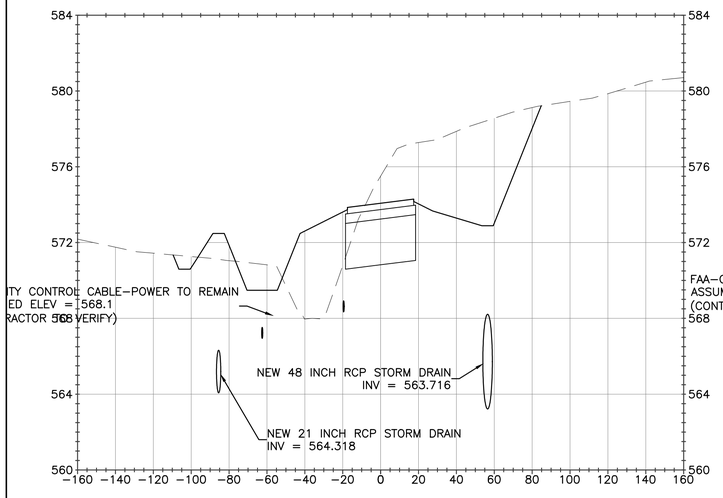

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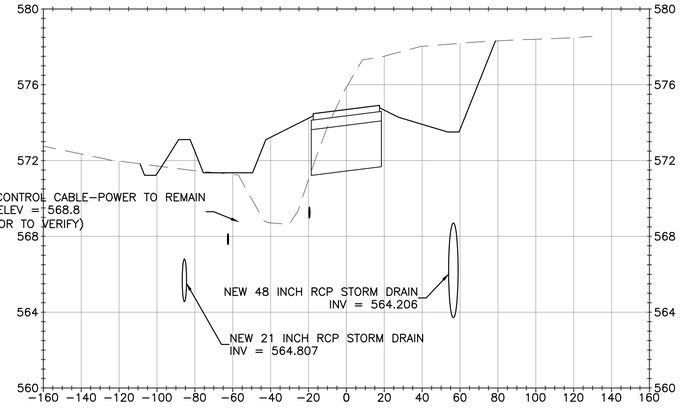

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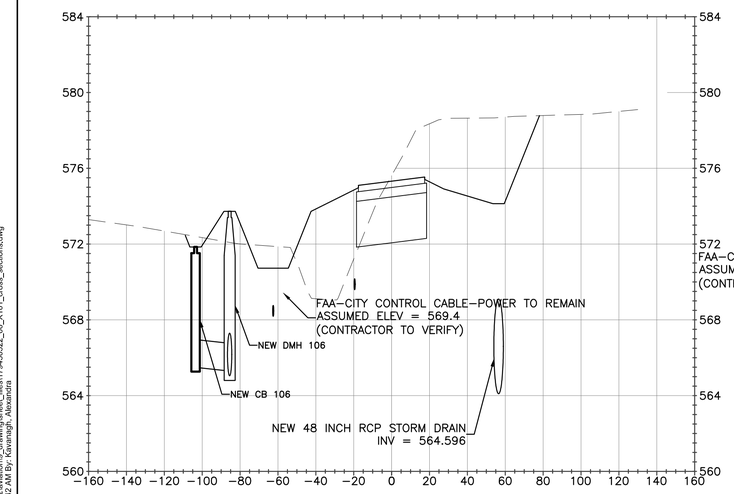

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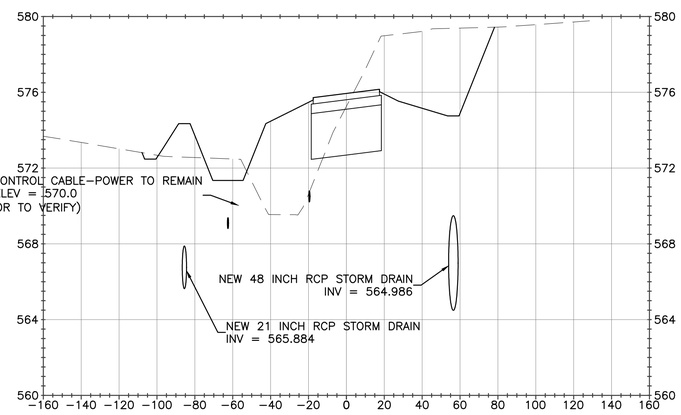

TAXIWAY A – STA. 243+50.00

NOTES
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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

Dwn.	Chkd.	Dsgn.
DMZ	DCD	DMZ

Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID M. ZIMMER 15257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 4

Project No.
179450522

Drawing No.	Sheet	Revision
X104	65 of 79	0

U:\179450522\aviation\9_drawing\sheet_files\179450522_06_X101_cross_sections.dwg
12/6/2024 9:42 AM By: kavanagh, Alexandra

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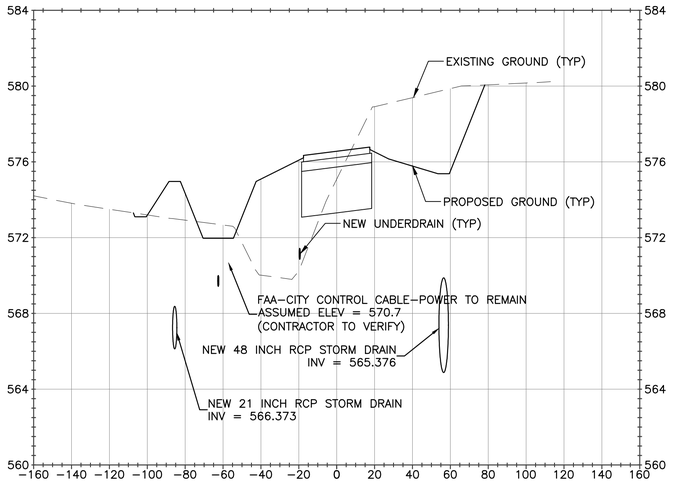

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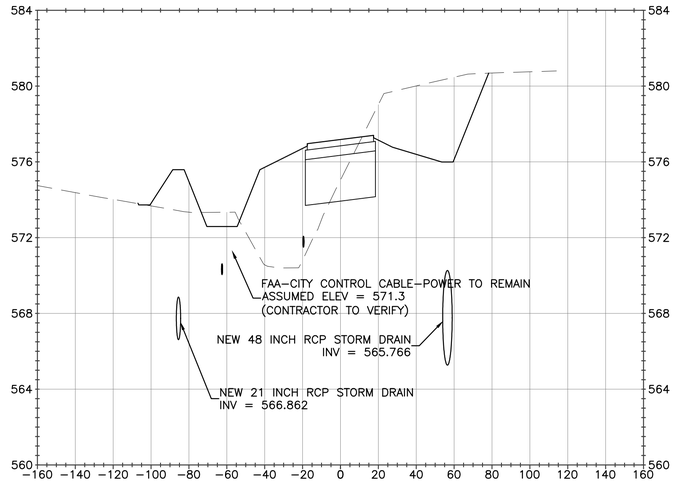

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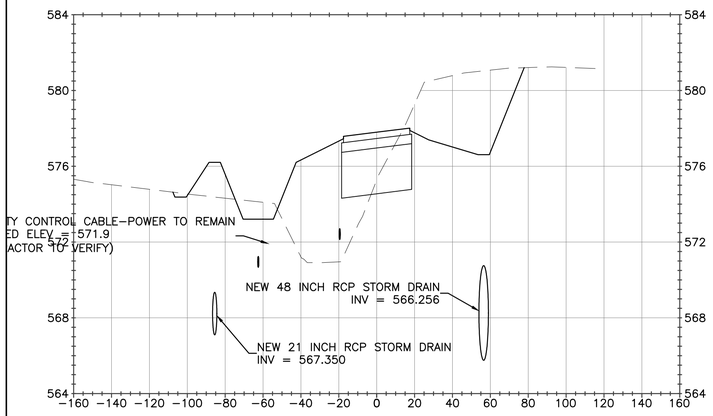

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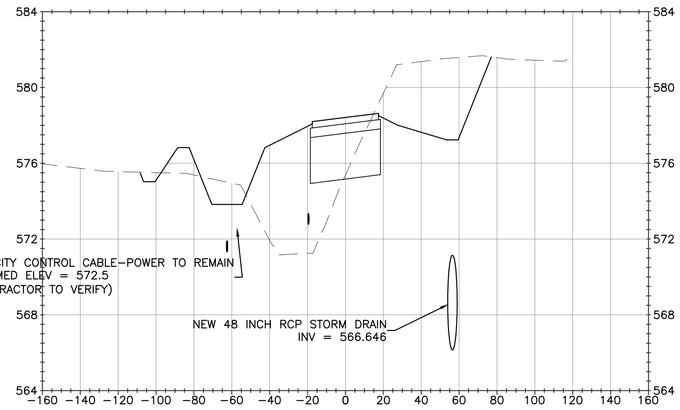

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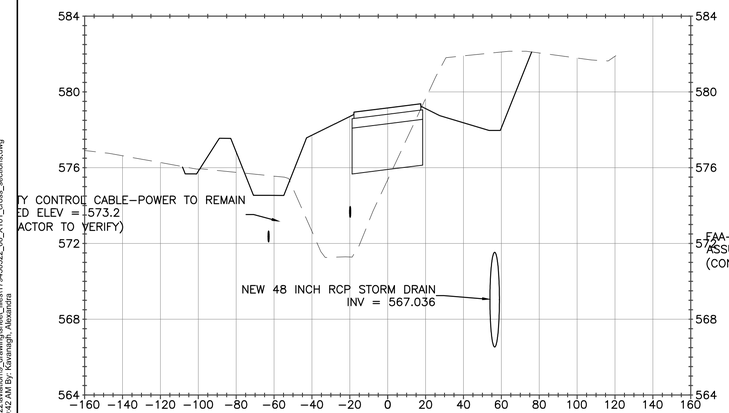
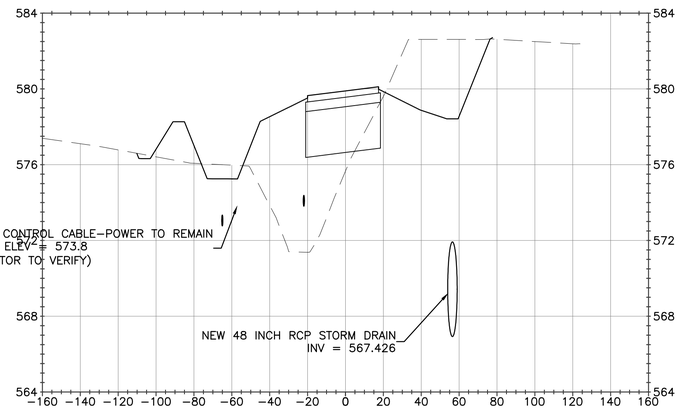


TAXIWAY A – STA. 246+00.00



TAXIWAY A – STA. 246+50.00

NOTES
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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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By	Appd.	YY.MM.DD

DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID M. ZAMPIERI 13257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 5

Project No.
179450522

Drawing No.	Sheet	Revision
X105	66 of 79	0

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12/8/2023 9:42 AM By: rdavenport, Alexandria

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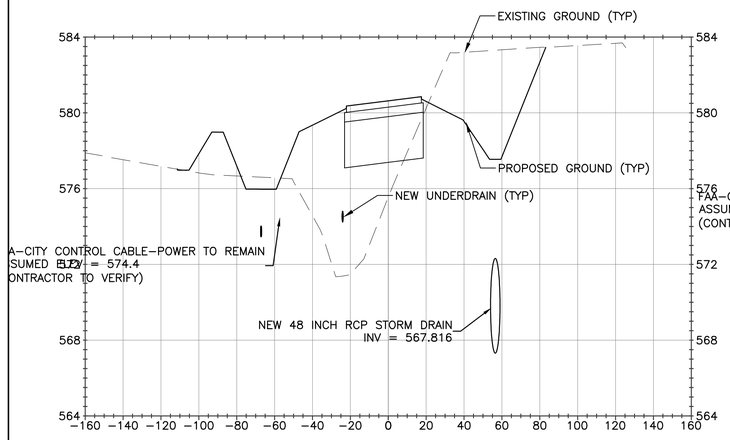

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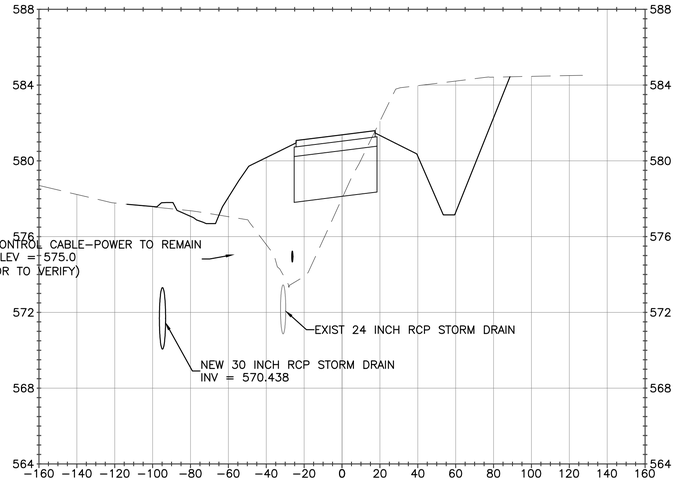

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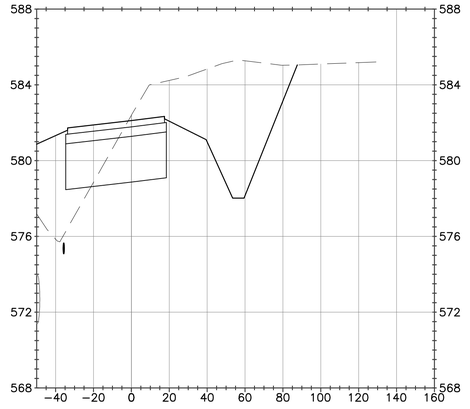

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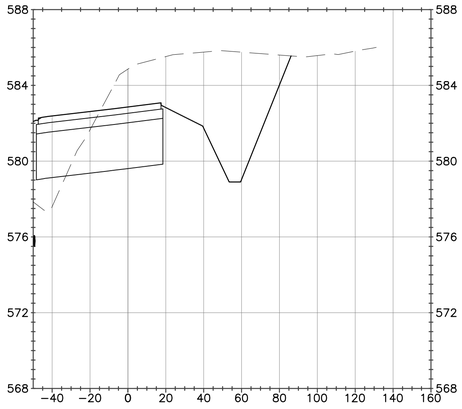

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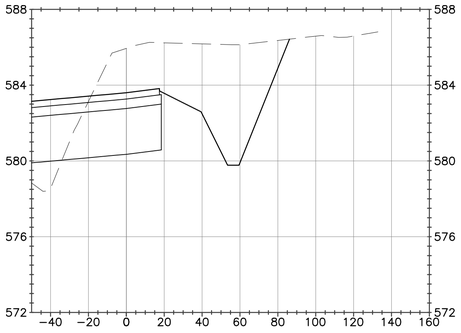

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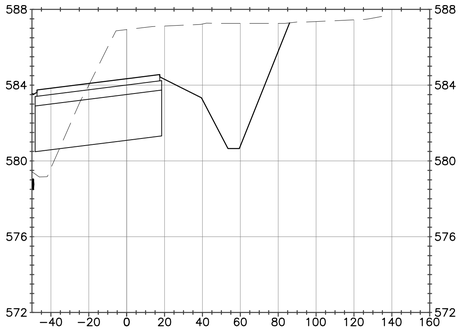

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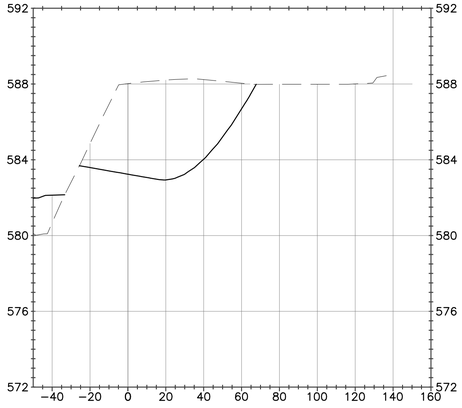

TAXIWAY A – STA. 250+00.00

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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID M. ZIMMER 17257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 6

Project No.
179450522

Drawing No.	Sheet	Revision
X106	67 of 79	0

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03/28/2024 3:42 AM By: Adawright, Alexandra

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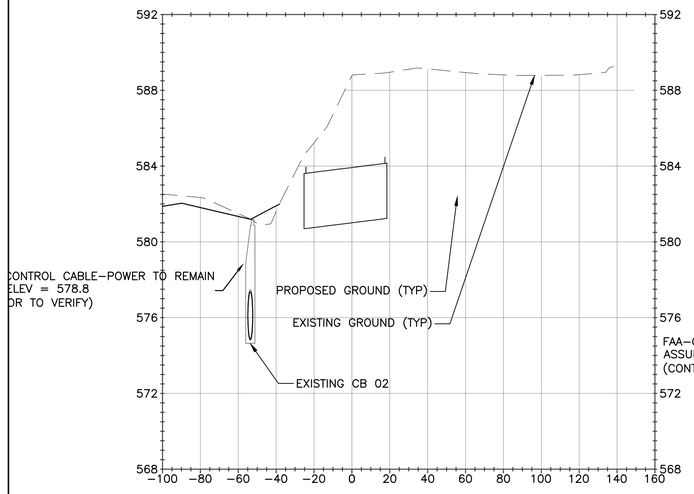

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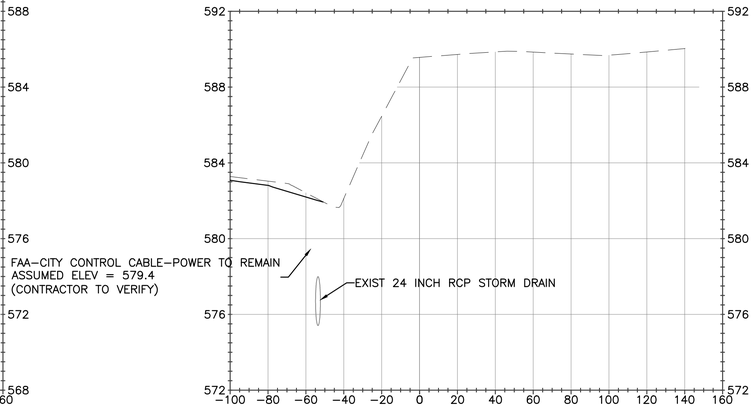

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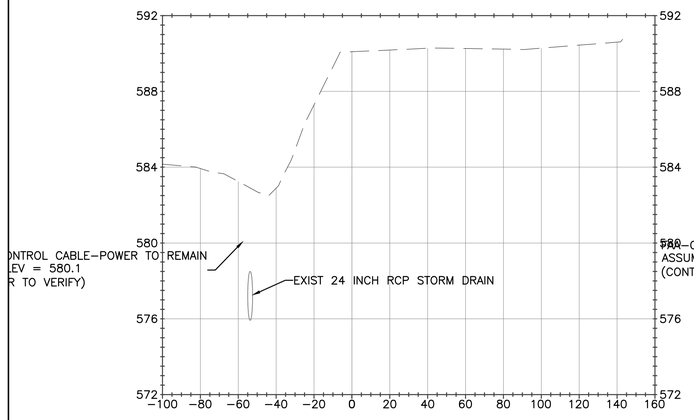

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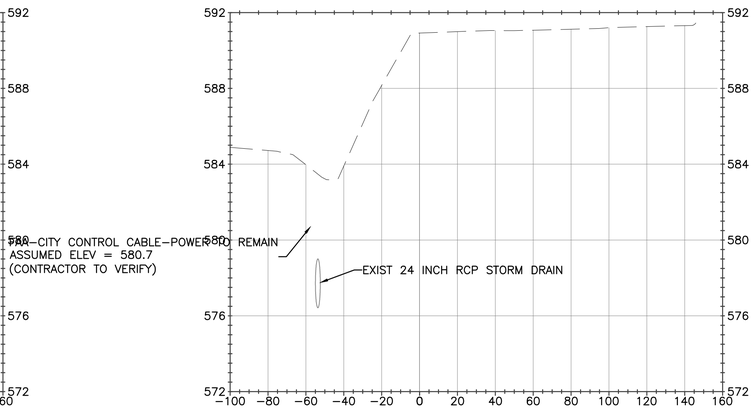

TAXIWAY A – STA. 252+00.00

NOTES
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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31
Issued	By	Appd.	YY.MM.DD

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Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID M. ZARDUS 15257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 7

Project No.
179450522

Drawing No. X107 | Sheet 68 of 79 | Revision 0

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12/20/2024 9:42 AM By: dzwanglin
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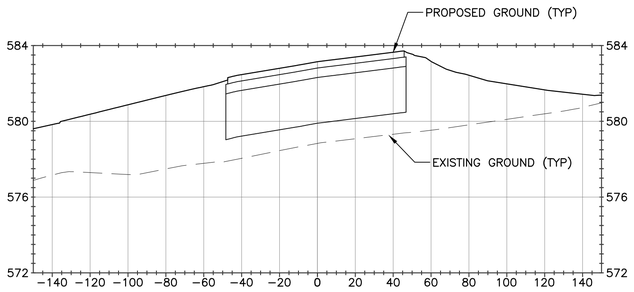

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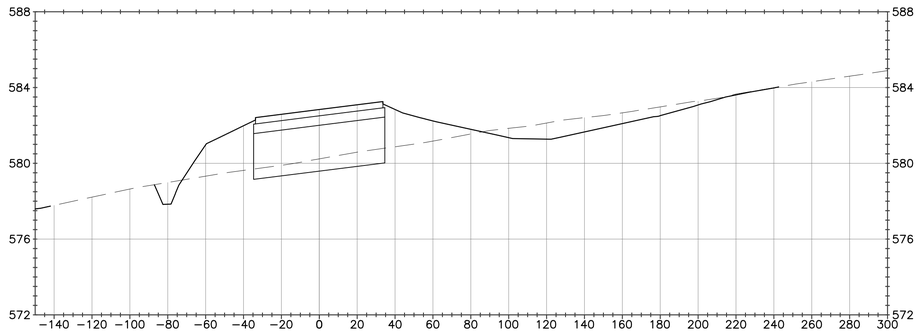

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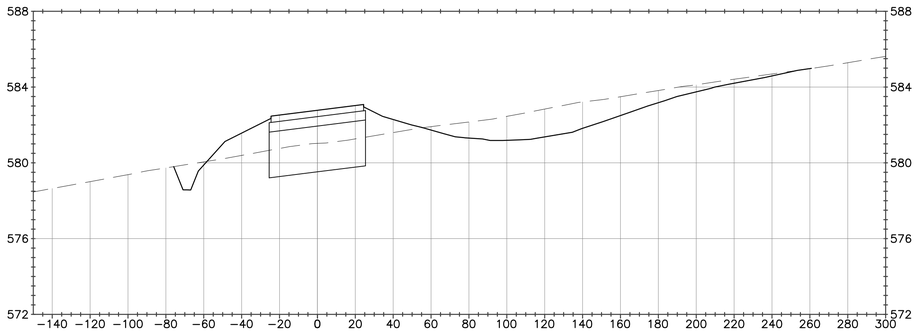

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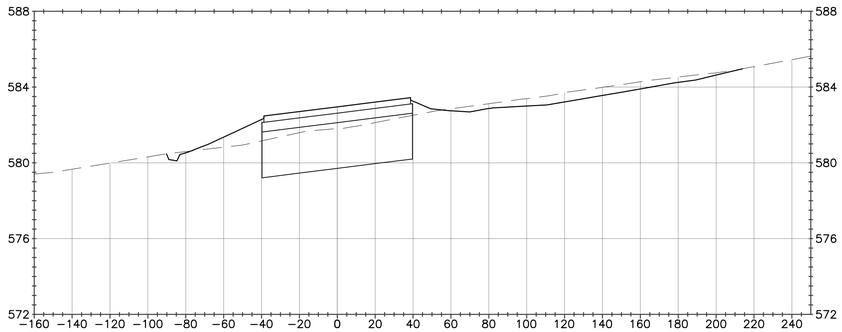

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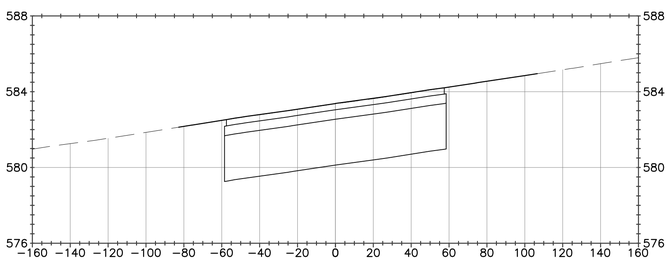

TAXIWAY A2 – STA. 402+50.00

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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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By	Appd.	YY.MM.DD

DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID M. ZIMMER 15057 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 8

Project No.
179450522

Drawing No.	Sheet	Revision
X108	69 of 79	0

I:\1\179450522\aviation\9_drawing\sheet_files\179450522_06_X101_cross_sections.dwg
12/20/2024 9:42 AM By: Kavanagh, Alexandra

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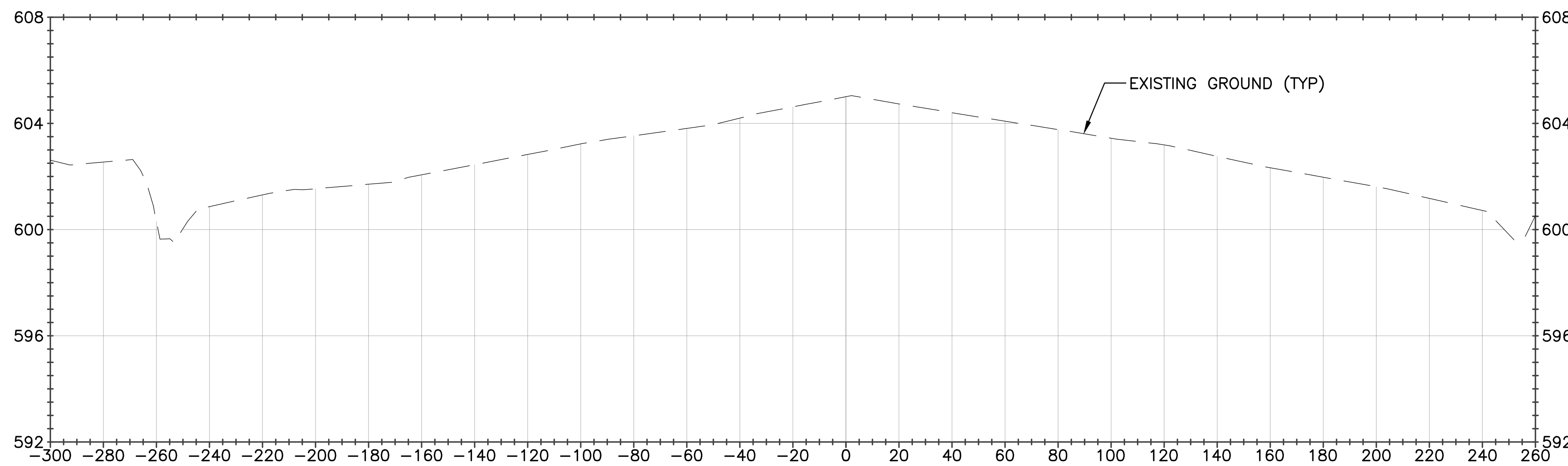
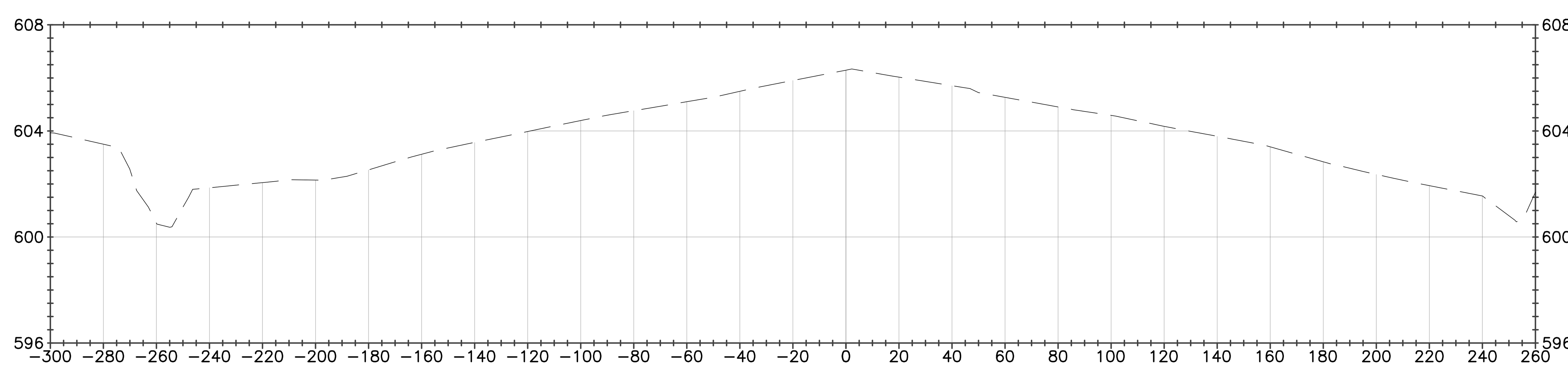
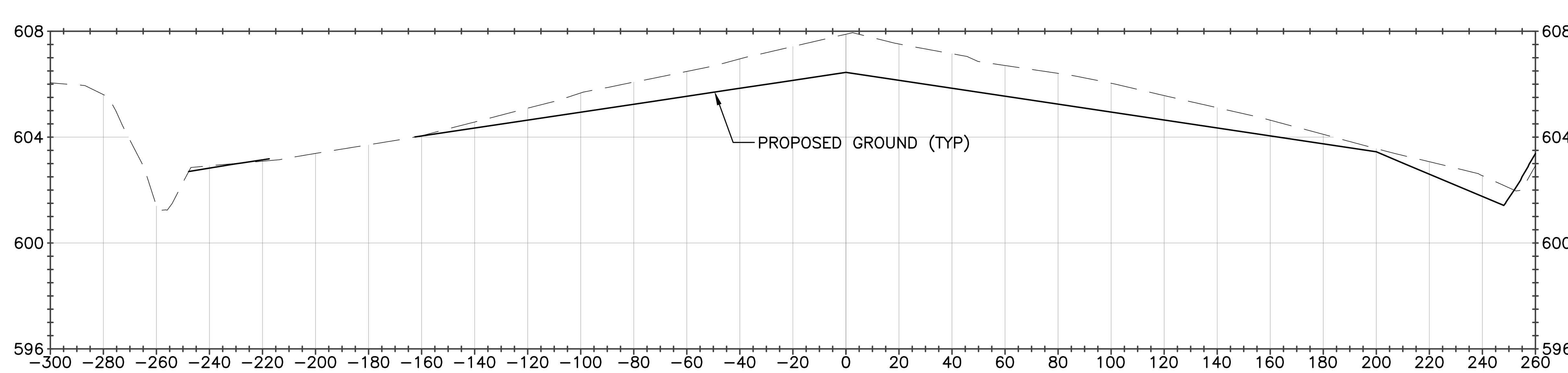


RUNWAY 18–36 – STA. 65+00.00



RUNWAY 18–36 – STA. 65+50.00



RUNWAY 18–36 – STA. 66+00.00

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VERTICAL 0 4' 8'

0 40' 80'

Revision | By | Appd. | YY.MM.DD

Issued	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DMZ	DCD	DMZ

Permit-Seal

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 9

Project No.
179450522

Drawing No.	Sheet	Revision
X109	70 of 79	0

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1/29/2024 9:42 AM By: Kavanagh, Alexandra

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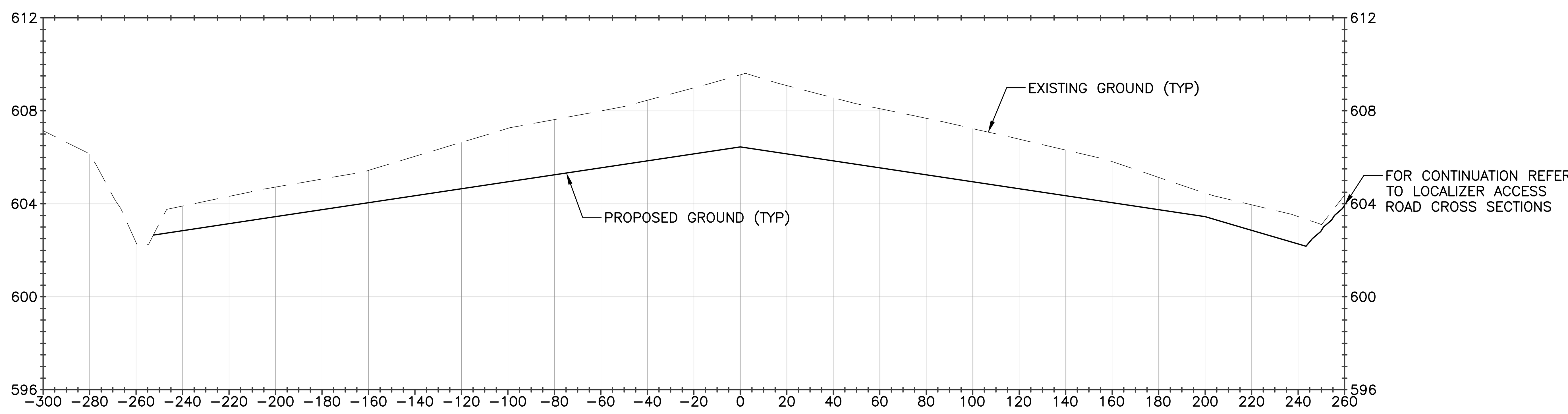

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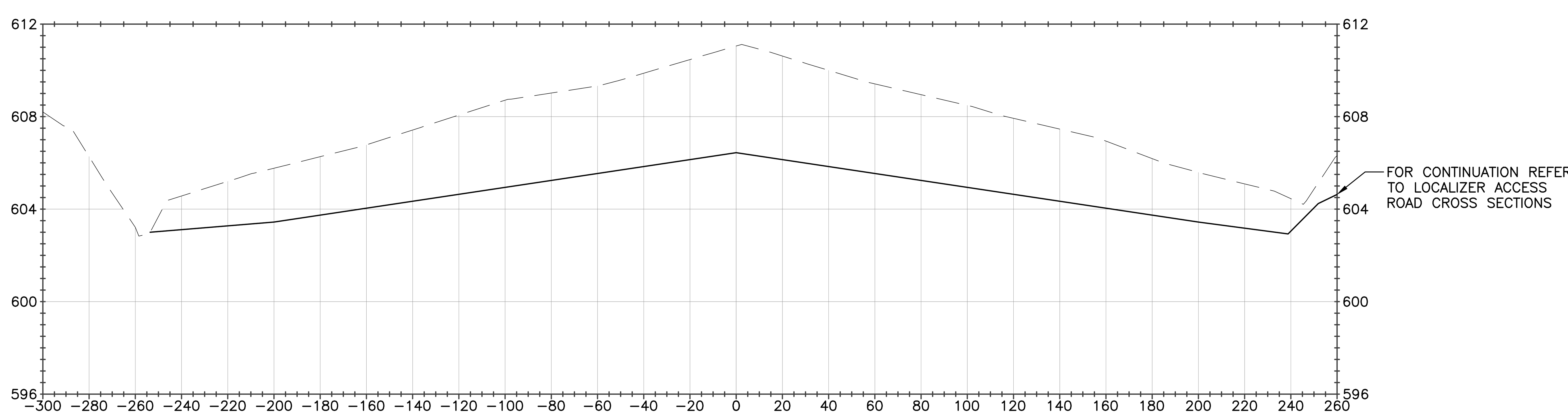

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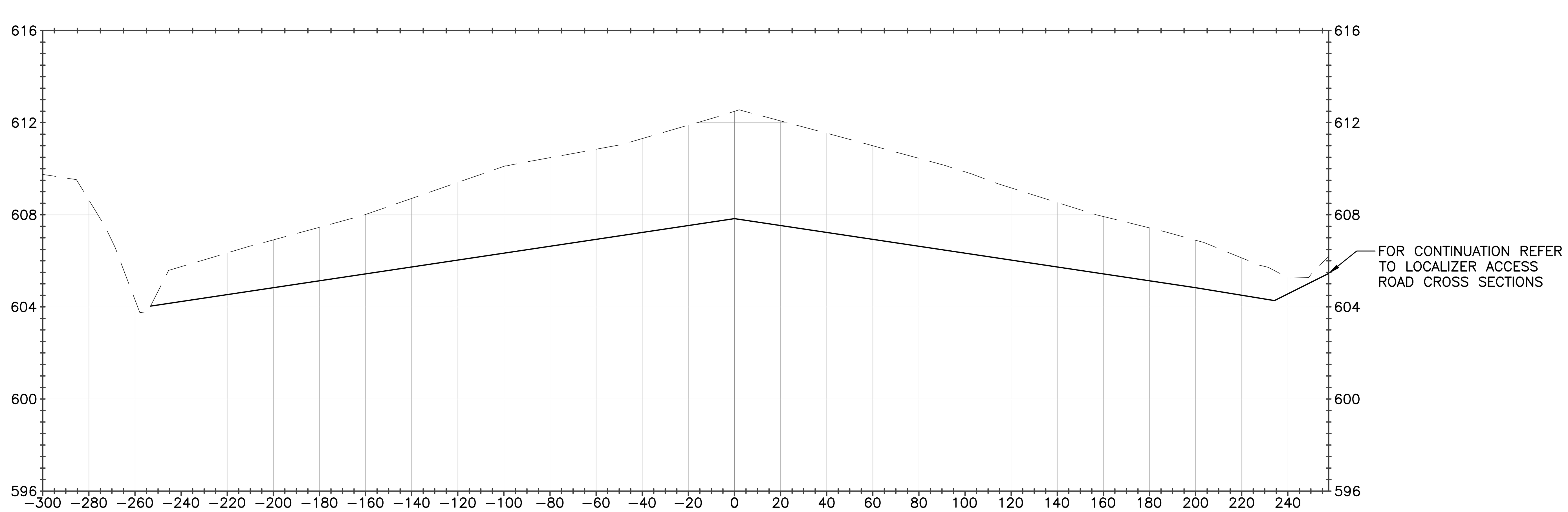

RUNWAY 18–36 – STA. 67+50.00

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VERTICAL 0 4' 8'
0 40' 80'

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 10

Project No.
179450522

Drawing No.	Sheet	Revision
X110	71 of 79	0

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1/29/2024 9:42 AM By: Kavanagh, Alexandra

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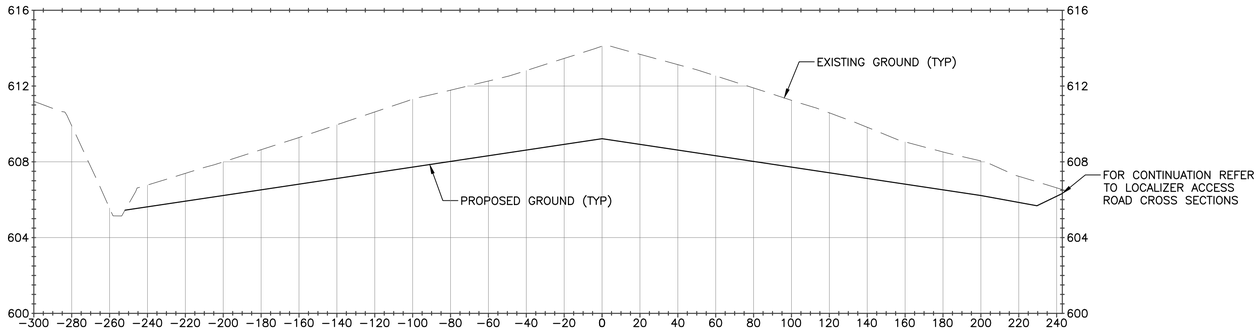

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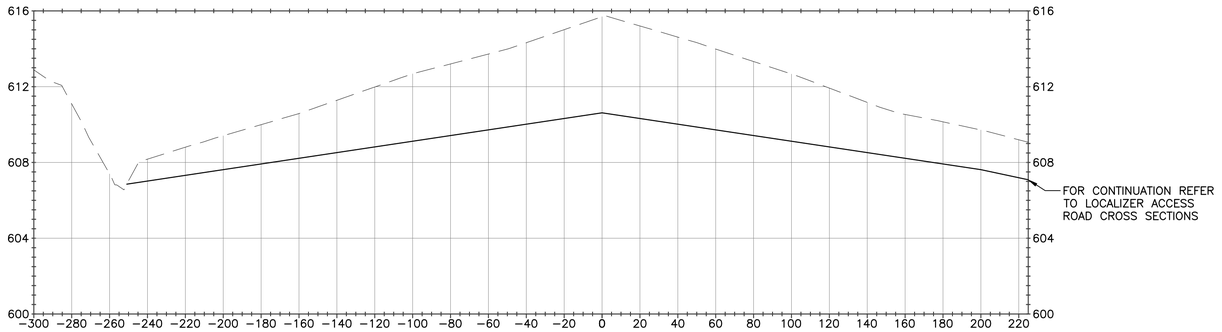

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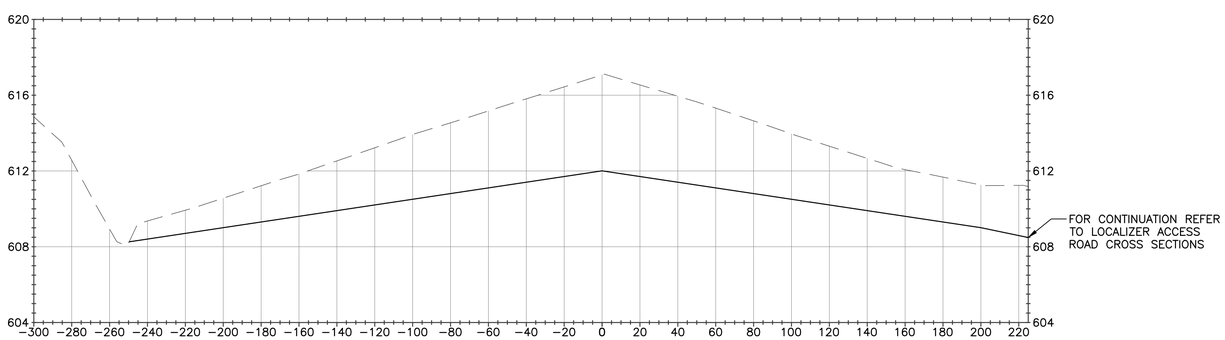

RUNWAY 18–36 – STA. 69+00.00

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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DMZ	DCD	DMZ
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THE STATE OF NEW HAMPSHIRE DAVID C. DUBE 12257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

CROSS SECTIONS - 11

Project No.
179450522

Drawing No.	Sheet	Revision
X111	72 of 79	0

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12/20/2024 9:42 AM By: Kavanagh, Alexandra

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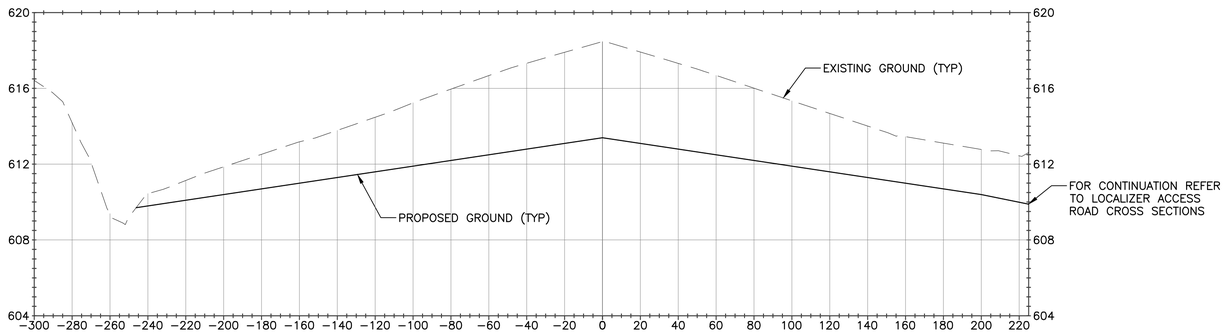

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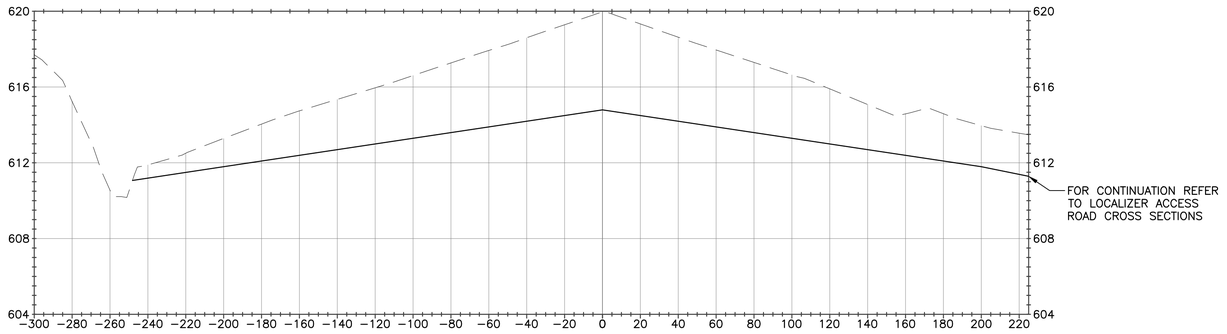
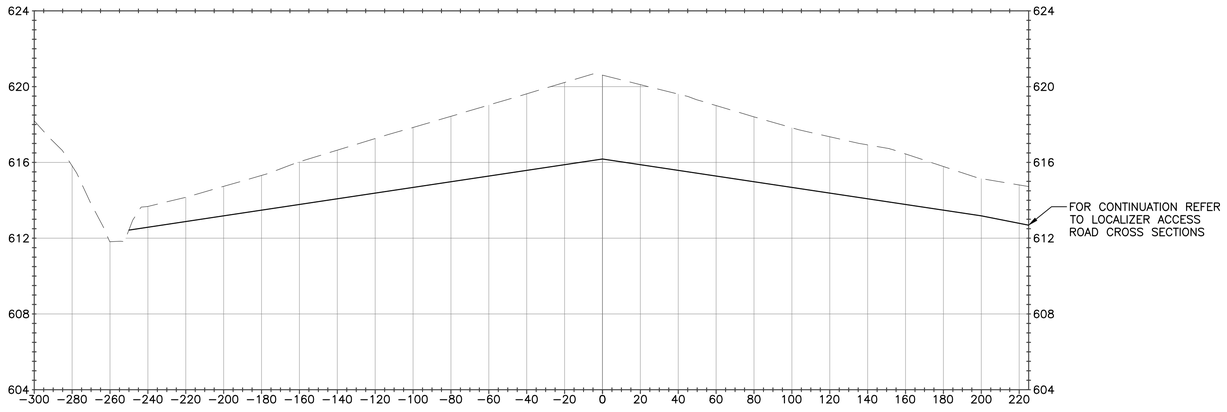


RUNWAY 18–36 – STA. 70+00.00



RUNWAY 18–36 – STA. 70+50.00

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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

Permit-Seal

THE STATE OF NEW HAMPSHIRE DAVID M. ZIMMER 9257 LICENSED PROFESSIONAL ENGINEER

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

CROSS SECTIONS - 12

Project No.
179450522

Drawing No.	Sheet	Revision
X112	73 of 79	0

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07/29/2024 12:42 AM By: Kavanagh, Alexandra

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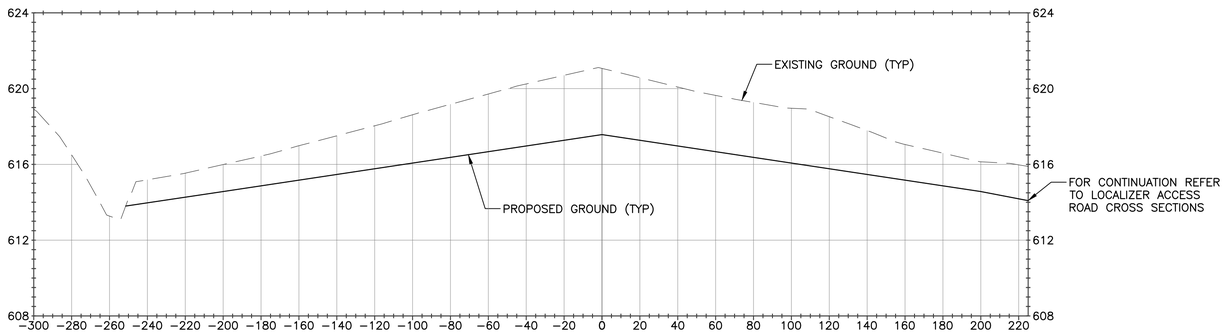

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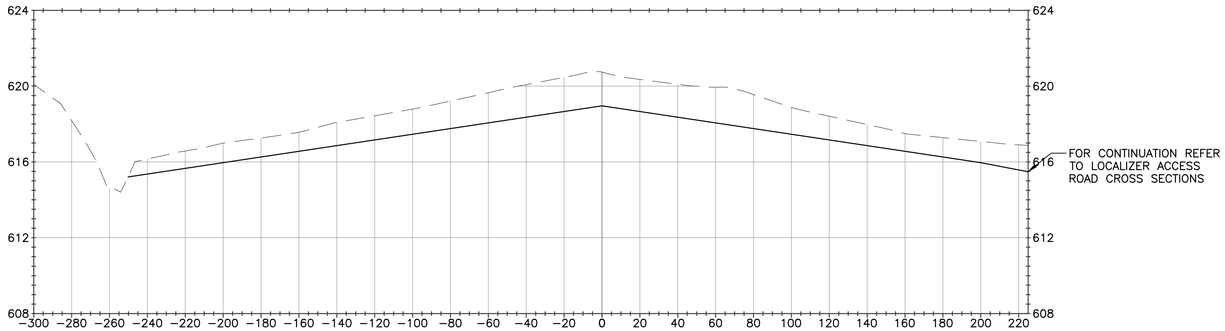

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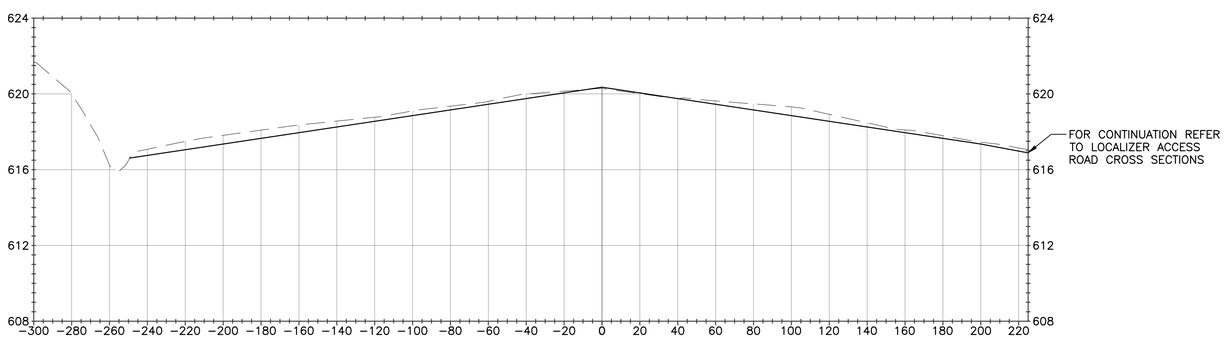

RUNWAY 18–36 – STA. 72+00.00

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VERTICAL 8' 4' 0

0 40' 80'

Revision	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

Issued

DMZ Dwn. DCD Chkd. DMZ Dsgn.

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THE STATE OF NEW HAMPSHIRE DAVID C. MAHAR 12257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 13

Project No.
179450522

Drawing No.	Sheet	Revision
X113	74 of 79	0

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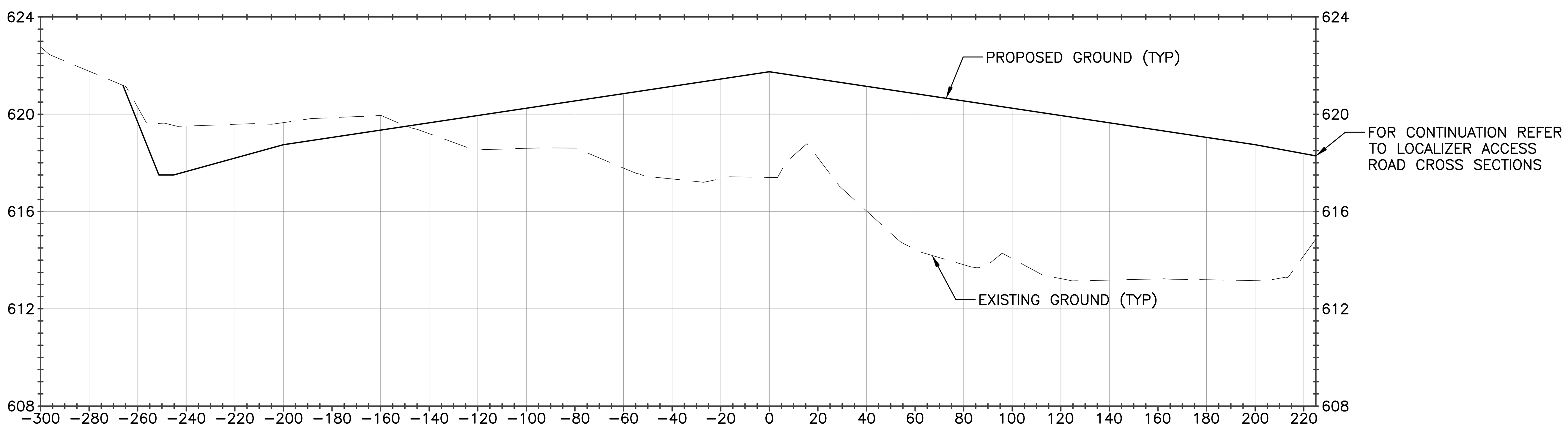
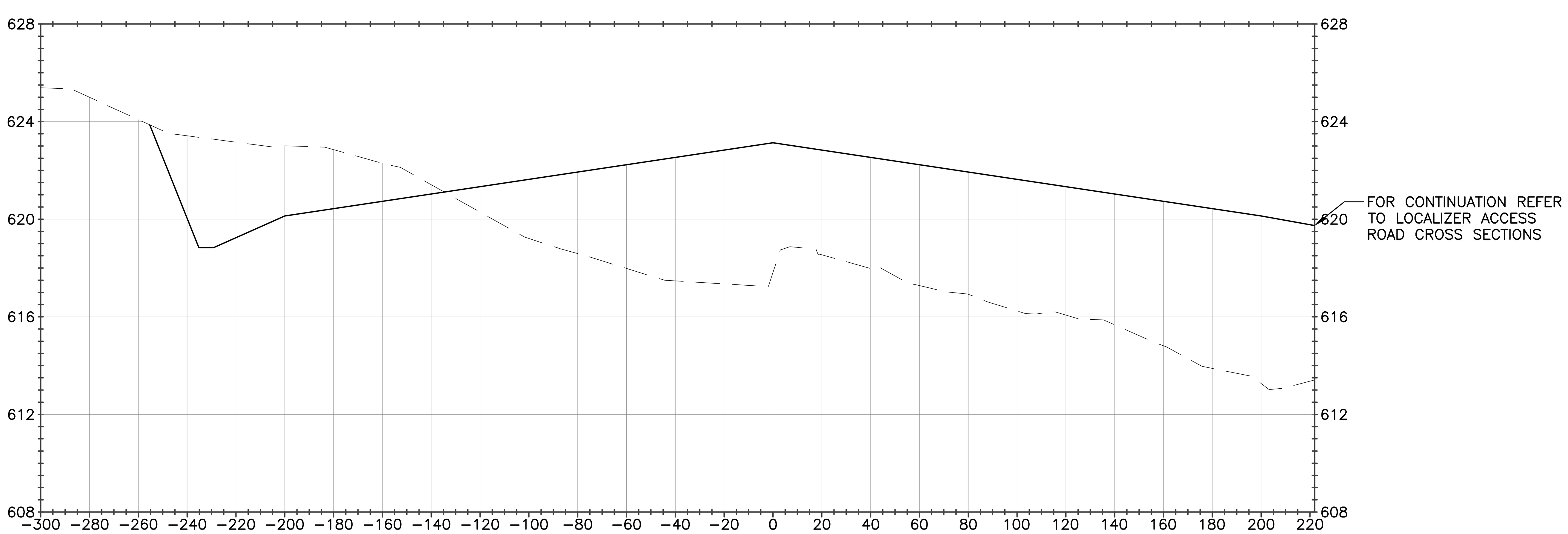


RUNWAY 18−36 − STA. 72+50.00



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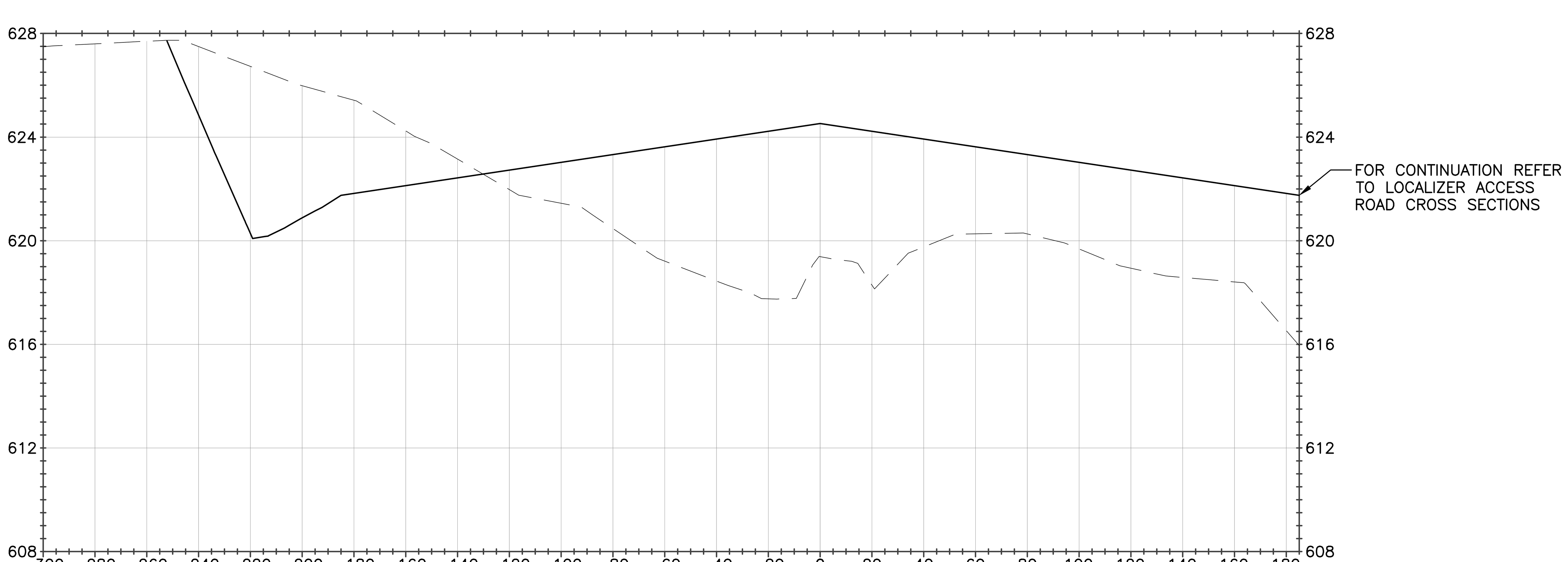

RUNWAY 18−36 − STA. 73+50.00

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1/29/2024 9:42 AM By: Kavanagh, Alexandra

ORIGINAL SHEET - ANSI D

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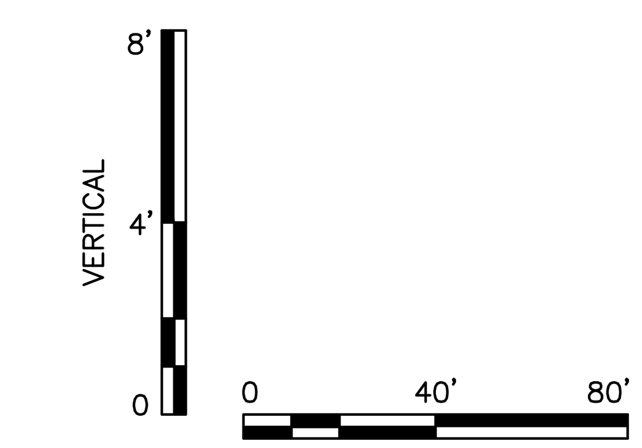

Revision | By | Appd. | YY.MM.DD

	By	Appd.	YY.MM.DD
0 ISSUED FOR BID	DMZ	LAM	24.01.31

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DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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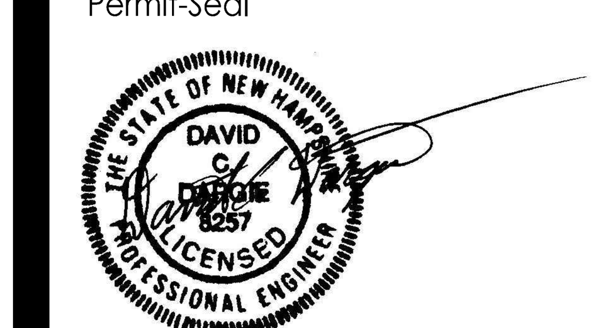


Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

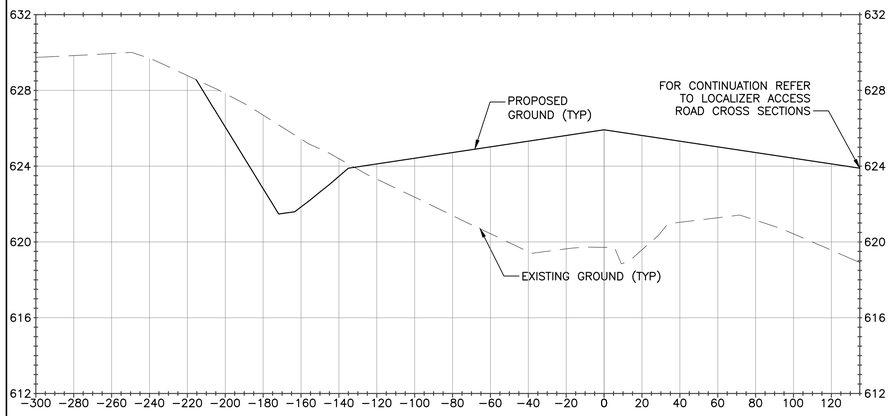
CROSS SECTIONS - 14

Project No.
179450522

Drawing No. X114

Sheet 75 of 79

Revision 0



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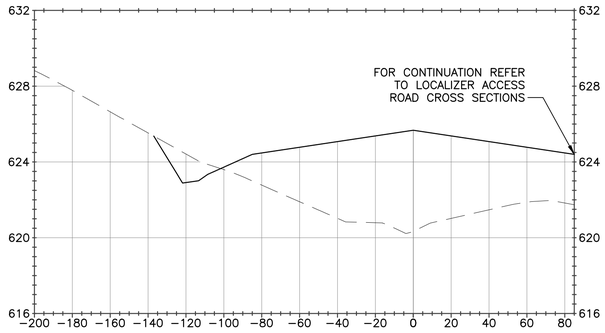

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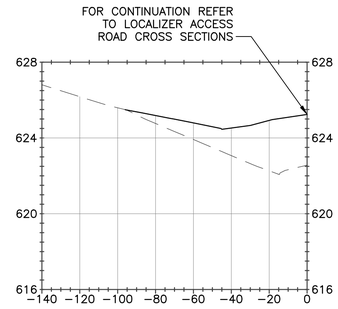

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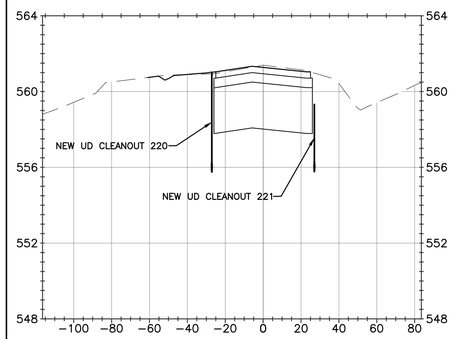

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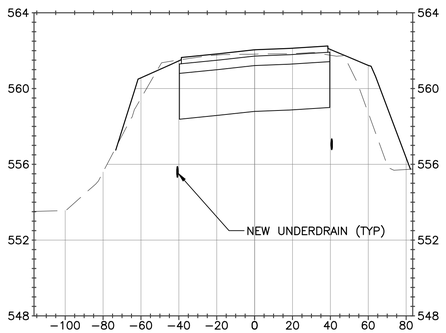

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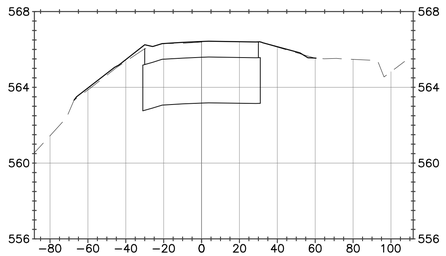

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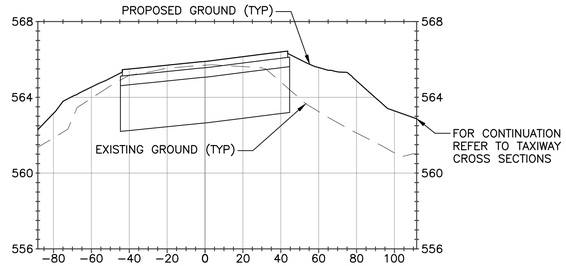

ECHO RAMP – STA. 621+50.00

VERTICAL 8' 4' 0

0 40' 80'

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0 ISSUED FOR BID	DMZ	LAM	24.01.31

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Dwn.	Chkd.	Dsgn.
DMZ	DCD	DMZ

Permit-Seal

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

CROSS SECTIONS - 15

Project No.
179450522

Drawing No.	Sheet	Revision
X115	76 of 79	0

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12/20/24 9:42 AM By: Kavanagh, Alexandra

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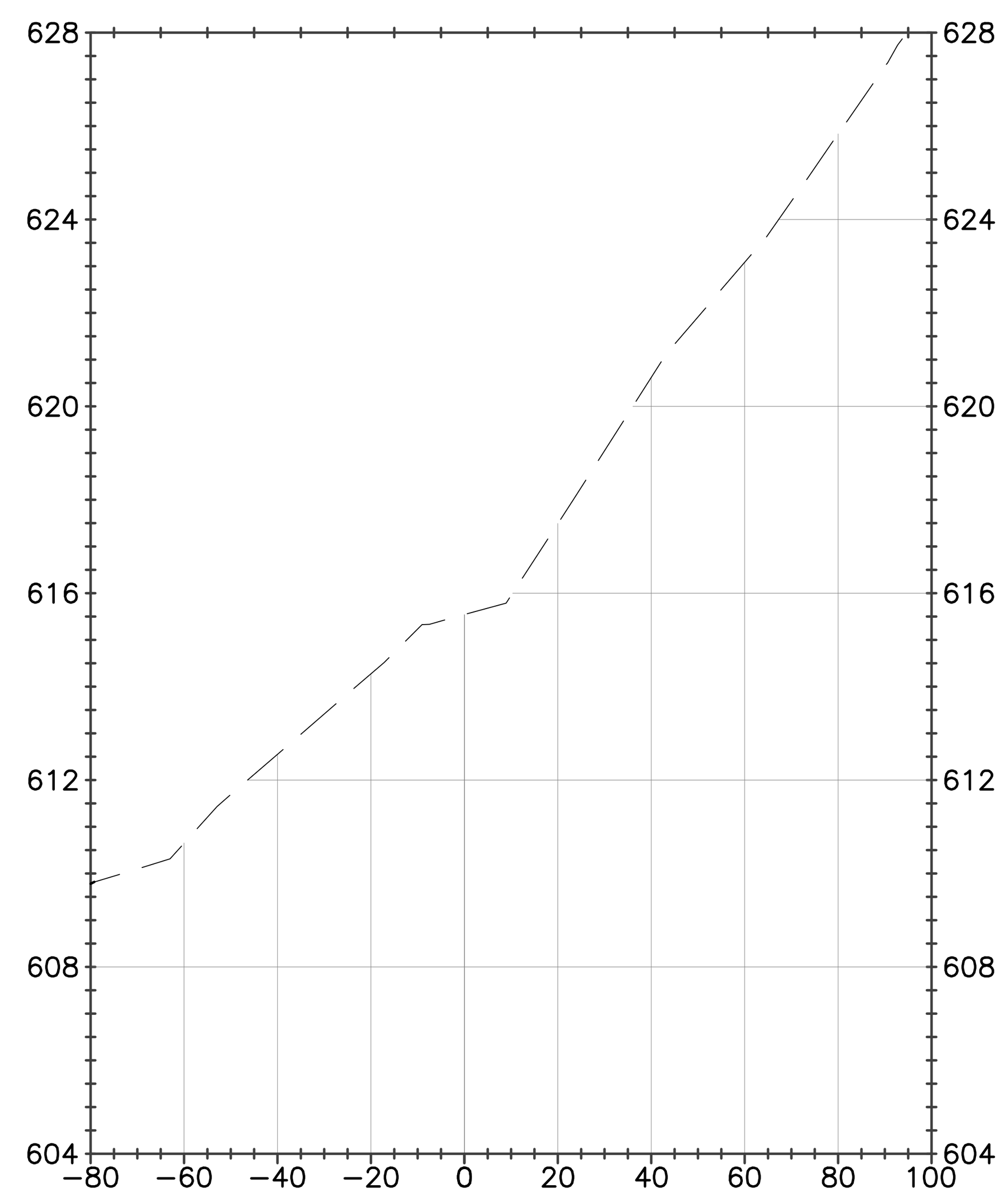

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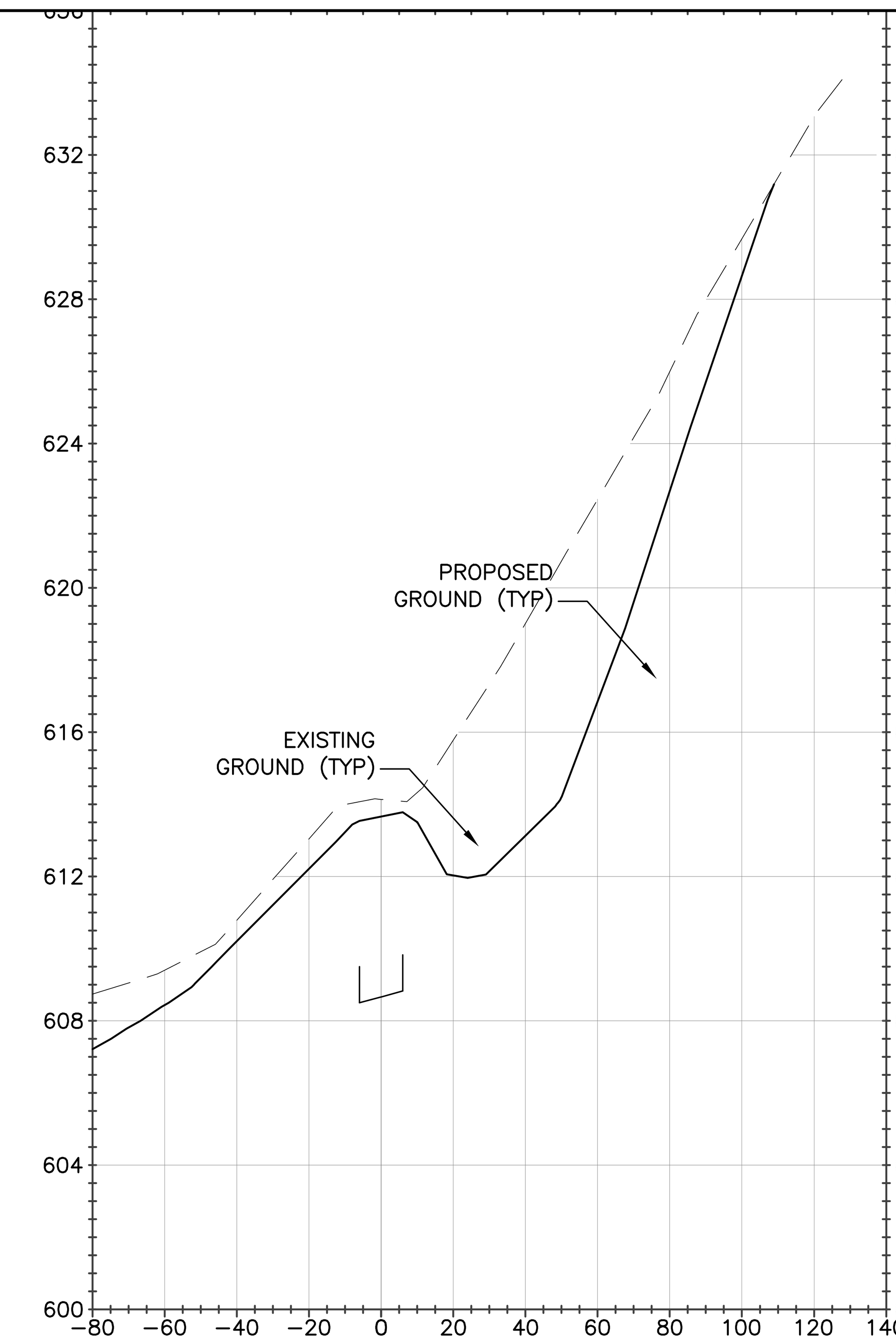

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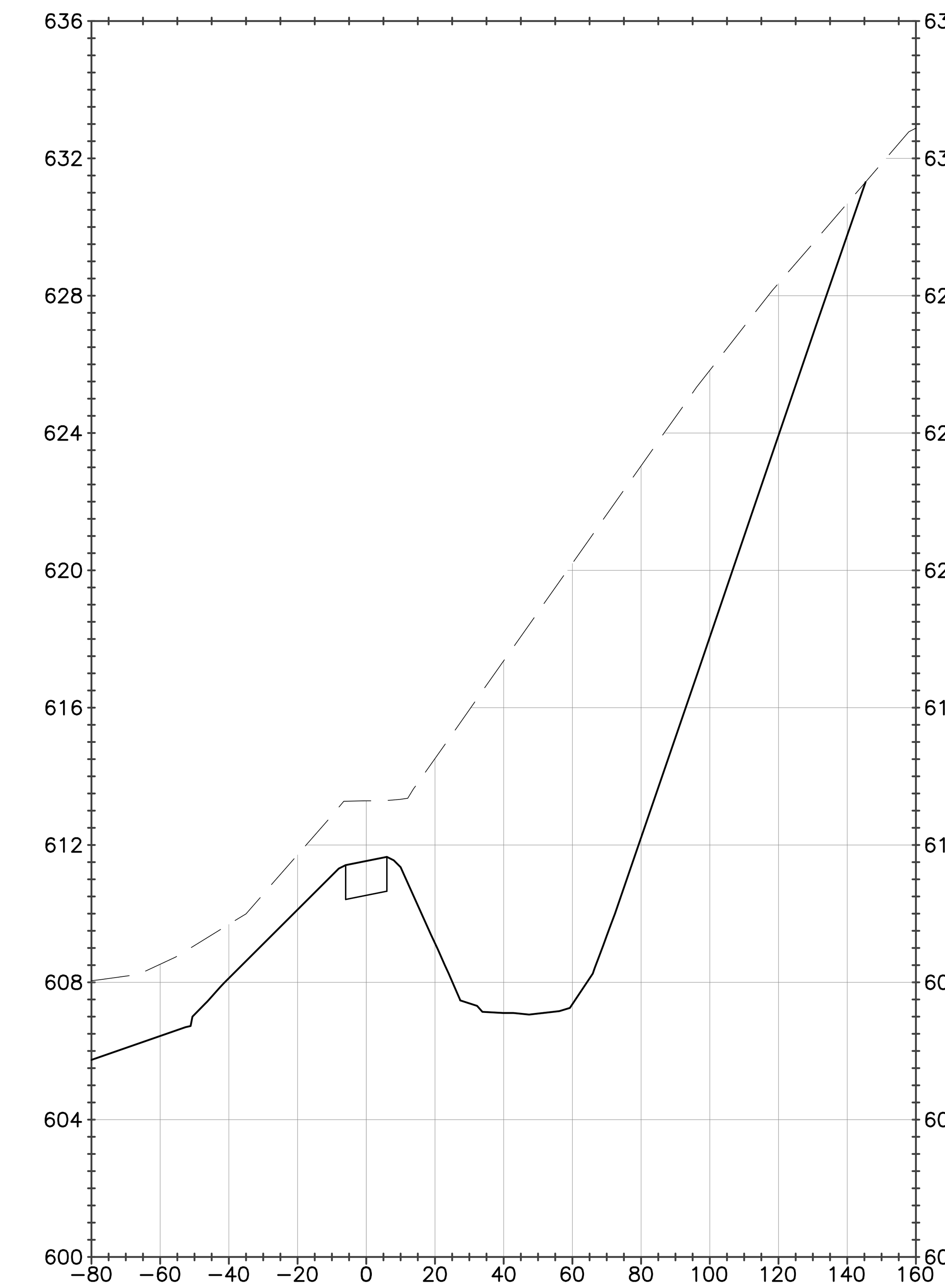

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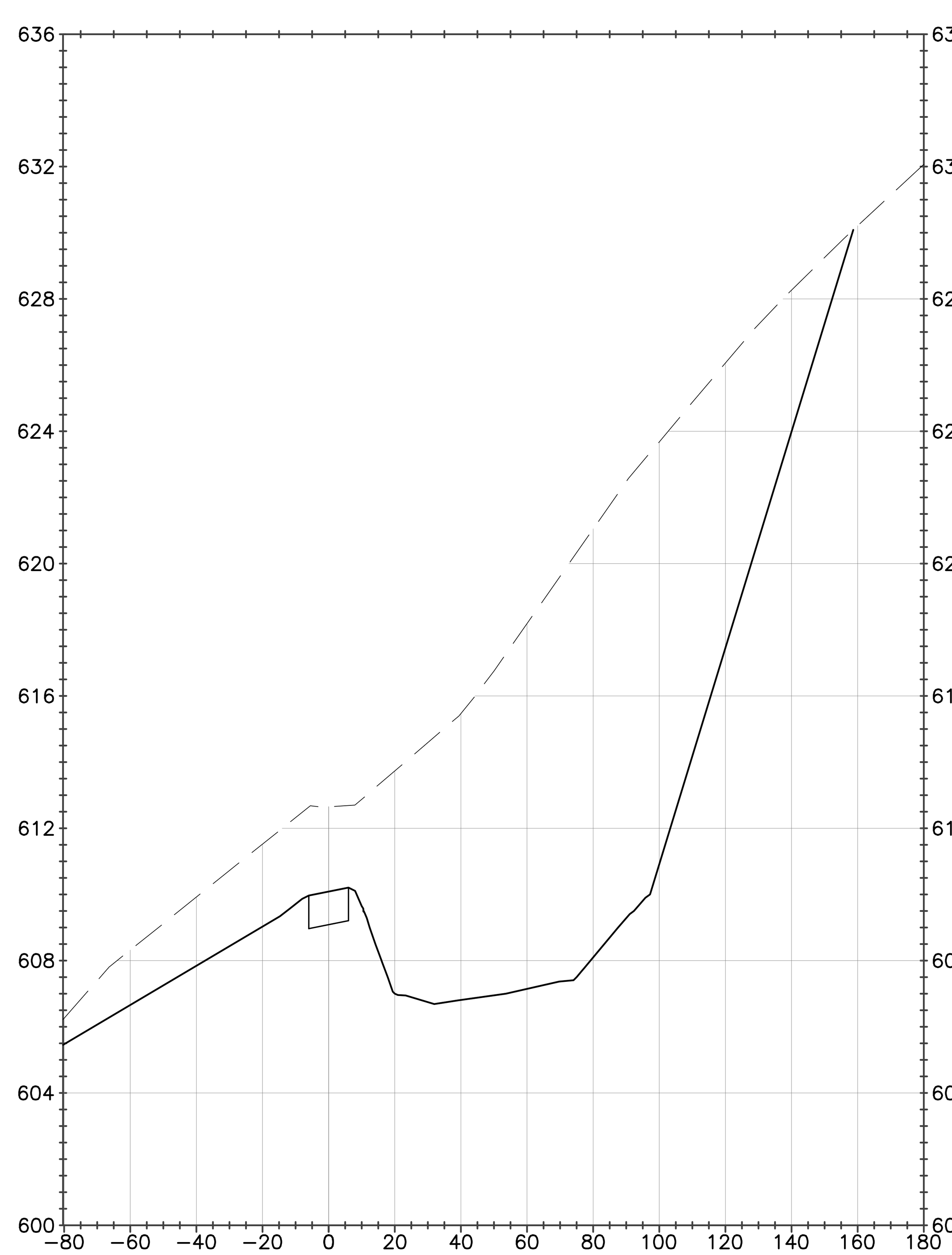

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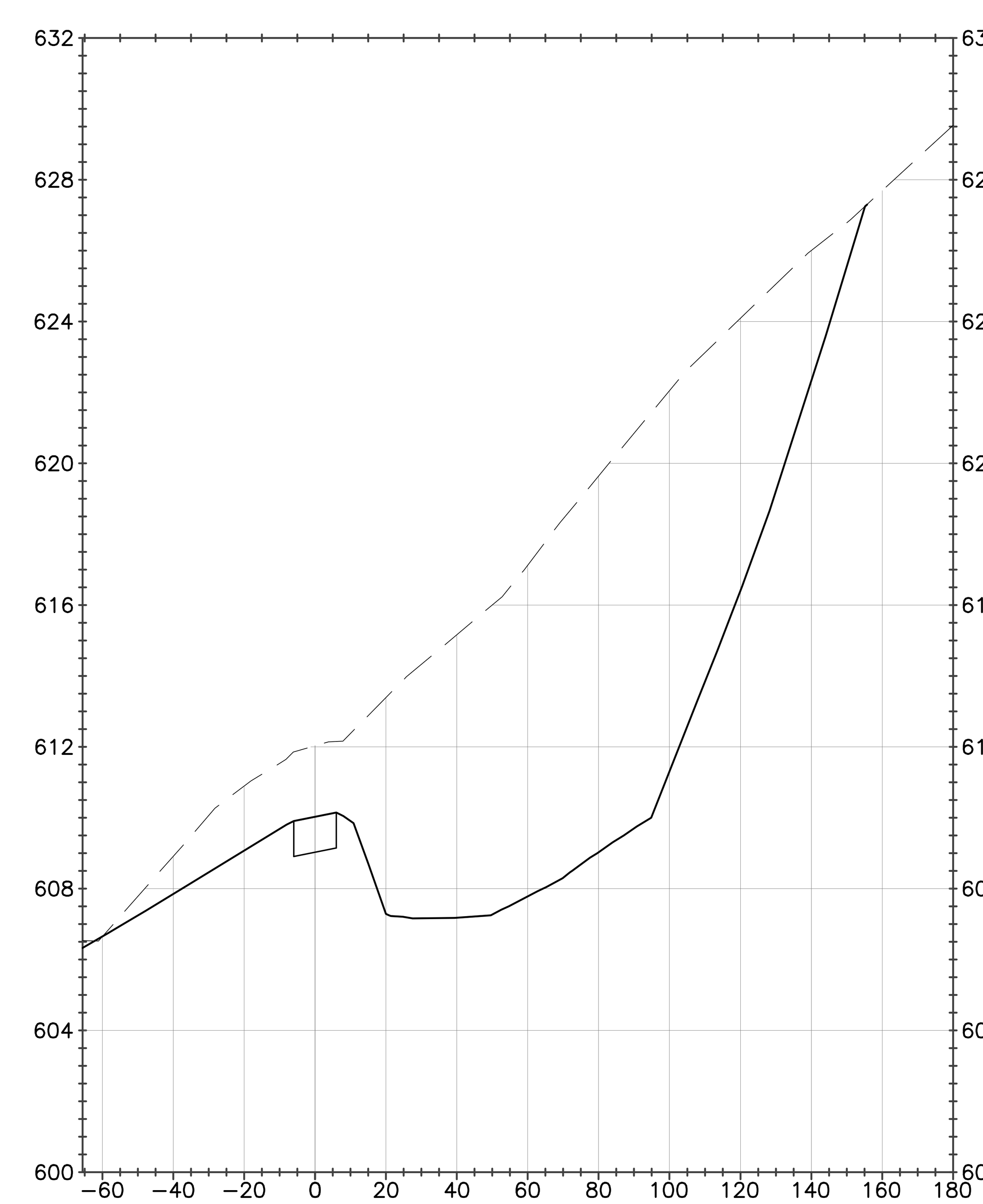

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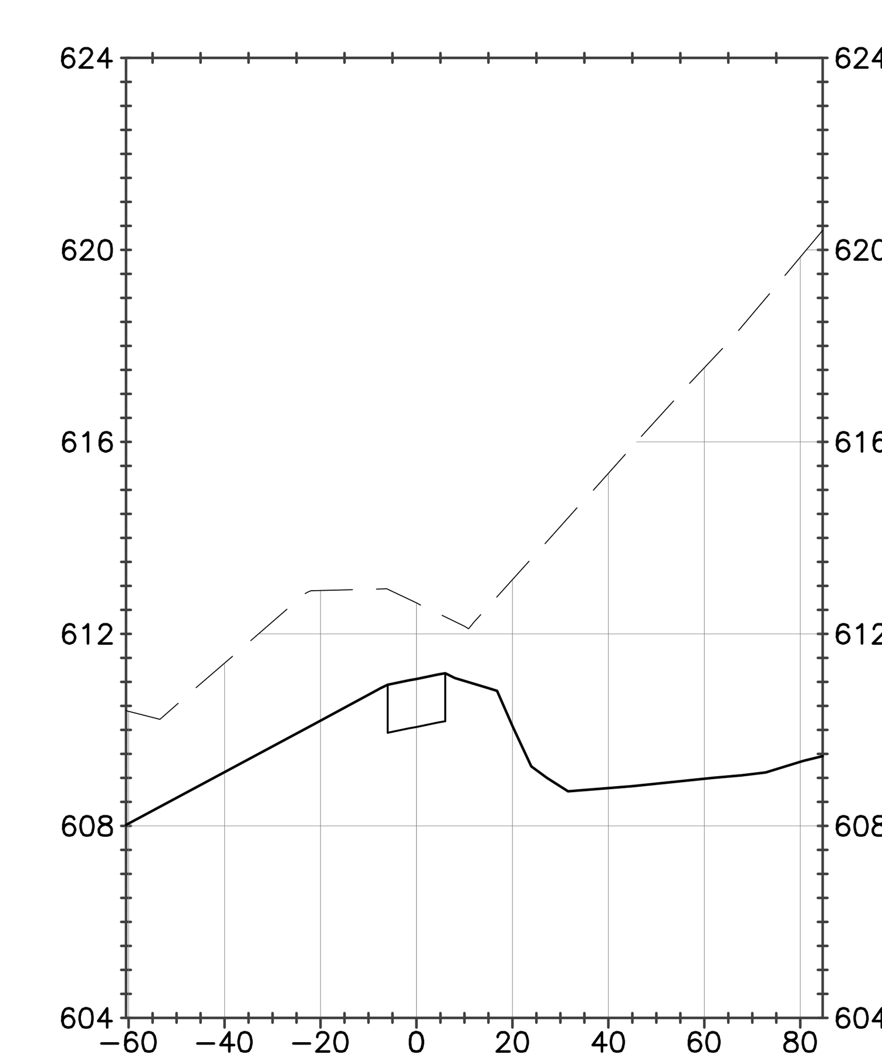

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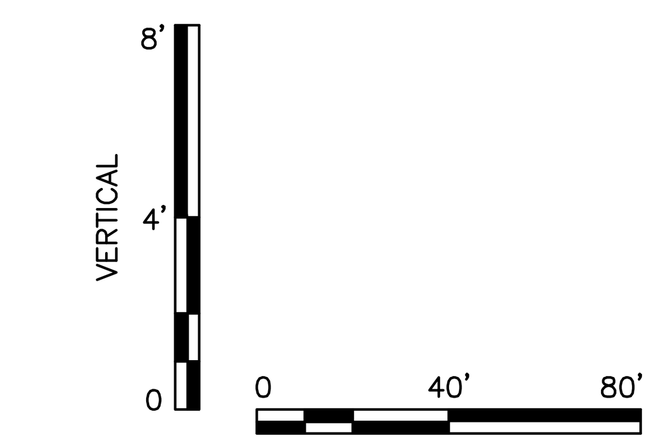

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Revision	By	Appd.	YY.MM.DD

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0 ISSUED FOR BID	DMZ	LAM	24.01.31

DMZ	DCD	DMZ
Dwn.	Chkd.	Dsgn.

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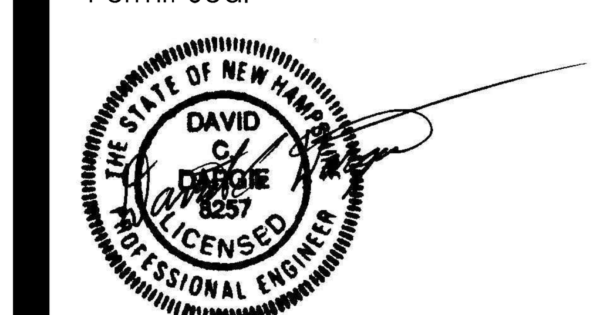

Client/Project

LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title

CROSS SECTIONS - 16

Project No.
179450522

Drawing No.	Sheet	Revision
X116	77 of 79	0

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1/29/2024 9:42 AM By: Kavanagh, Alexandra

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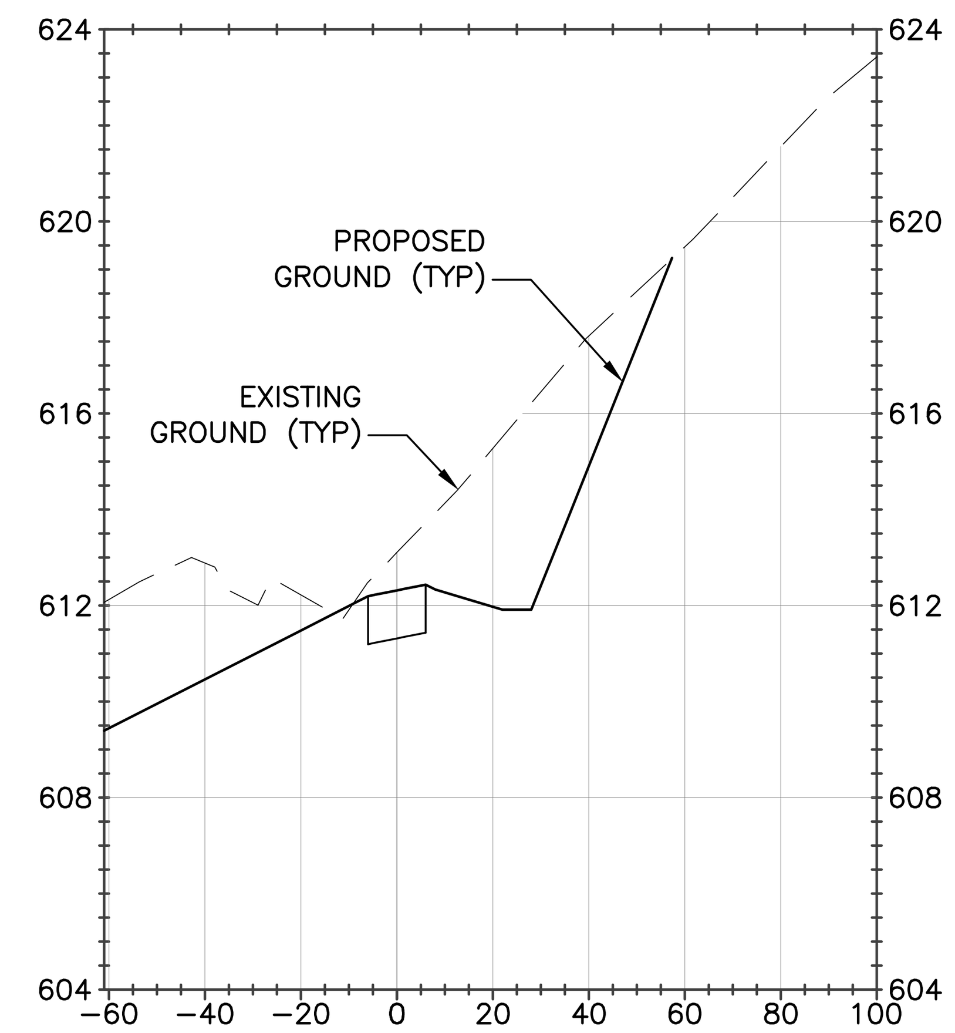

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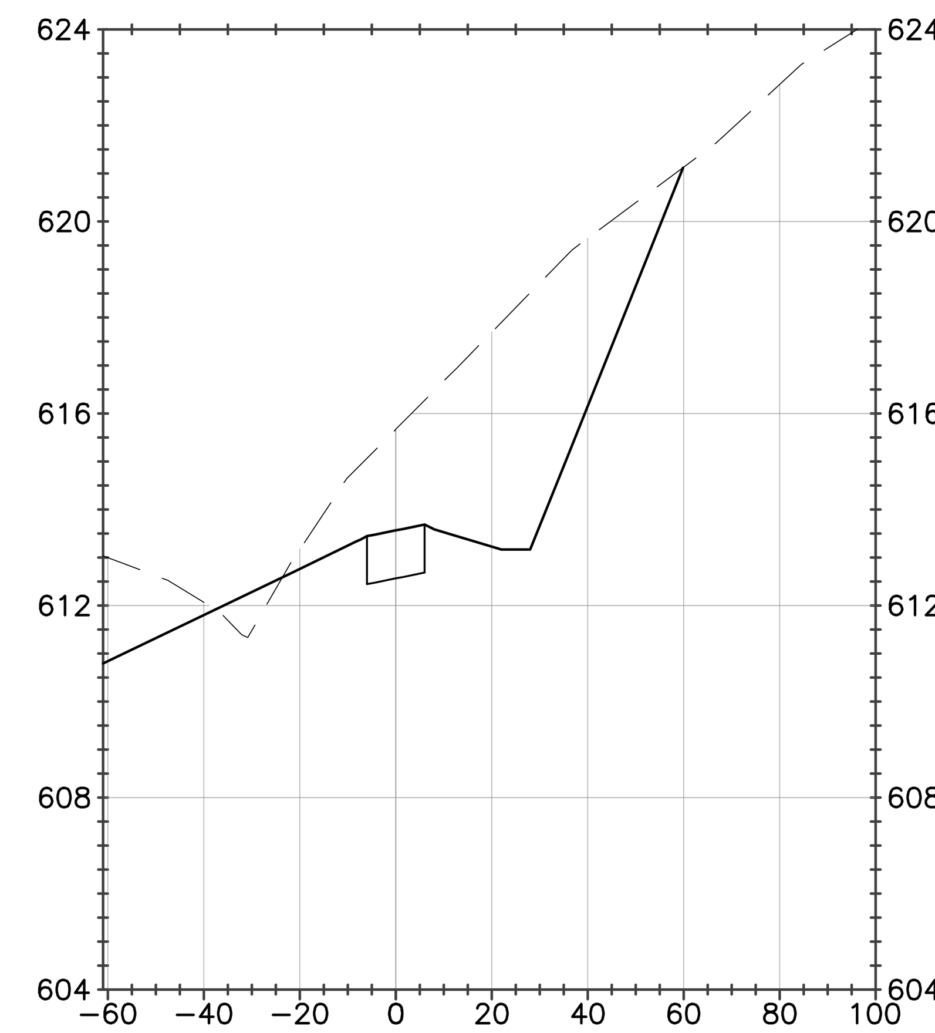

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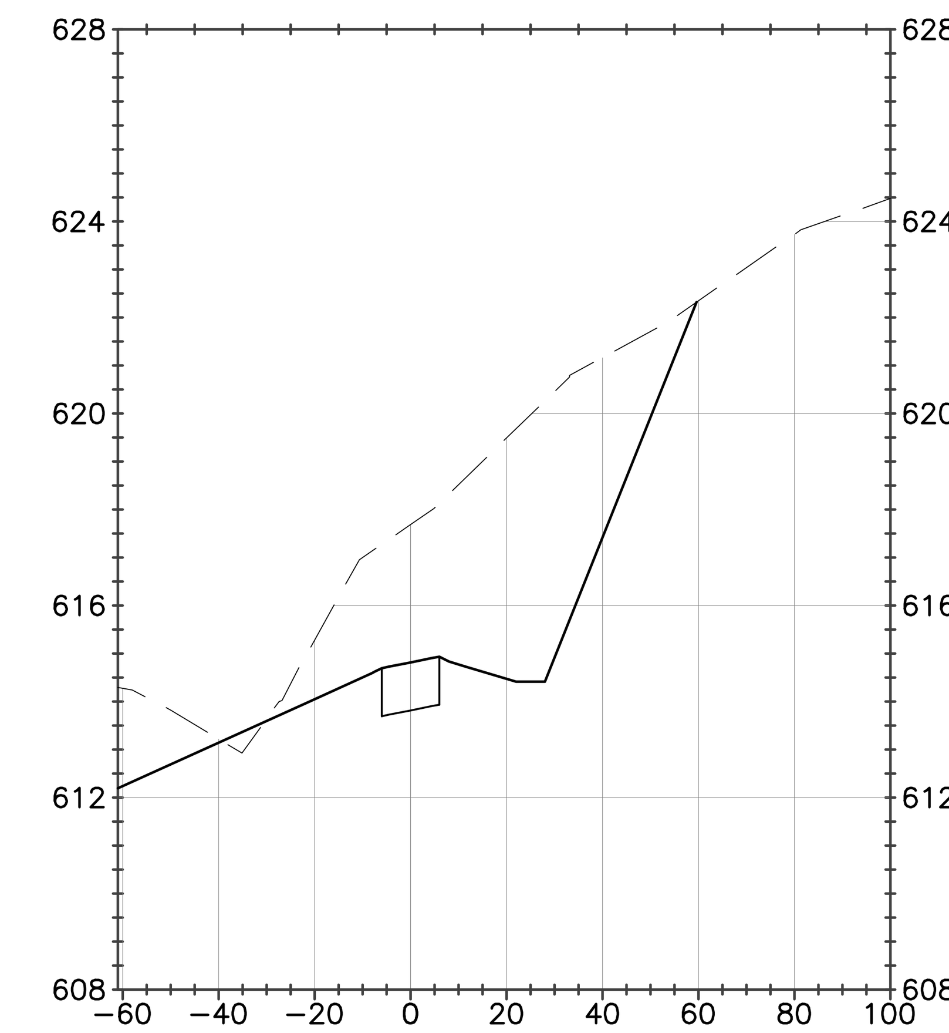

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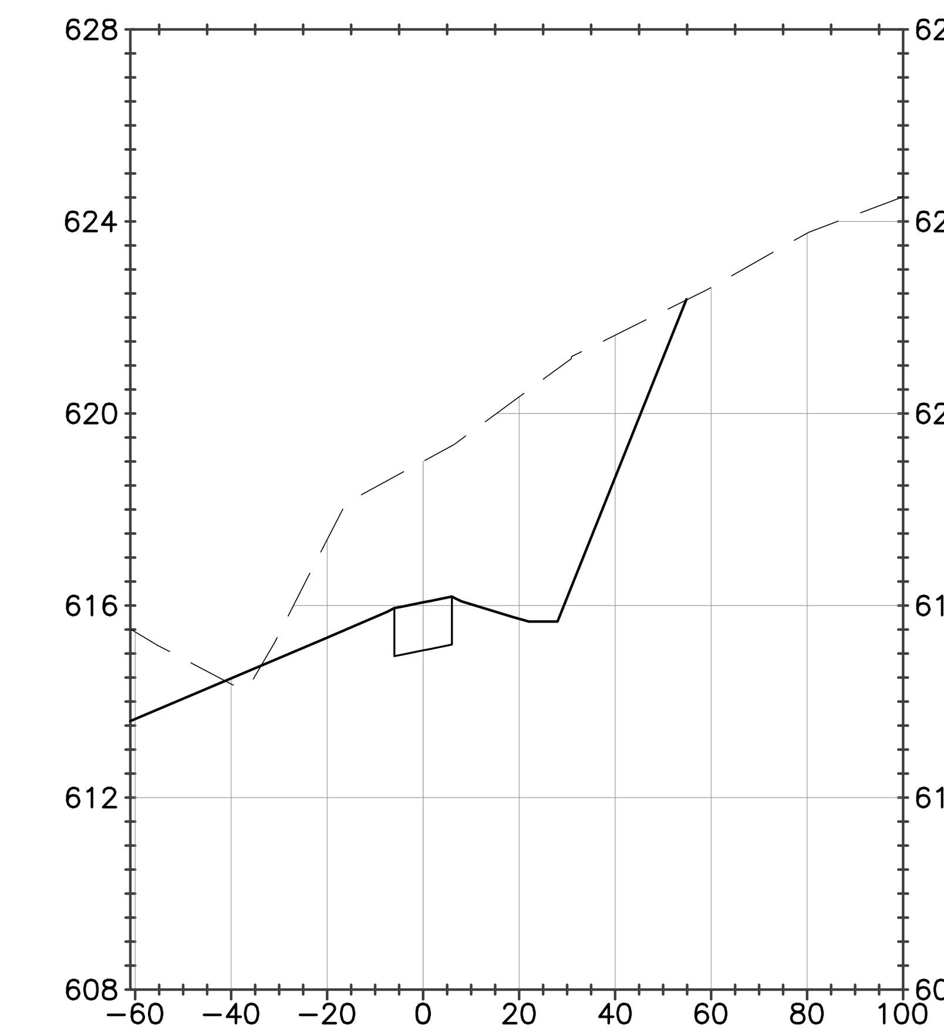

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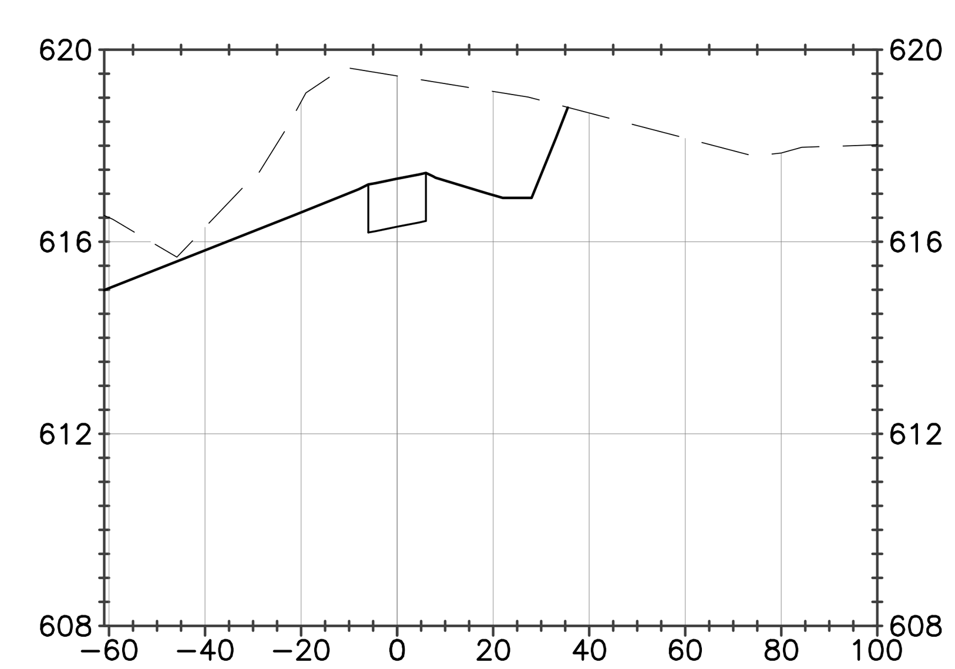

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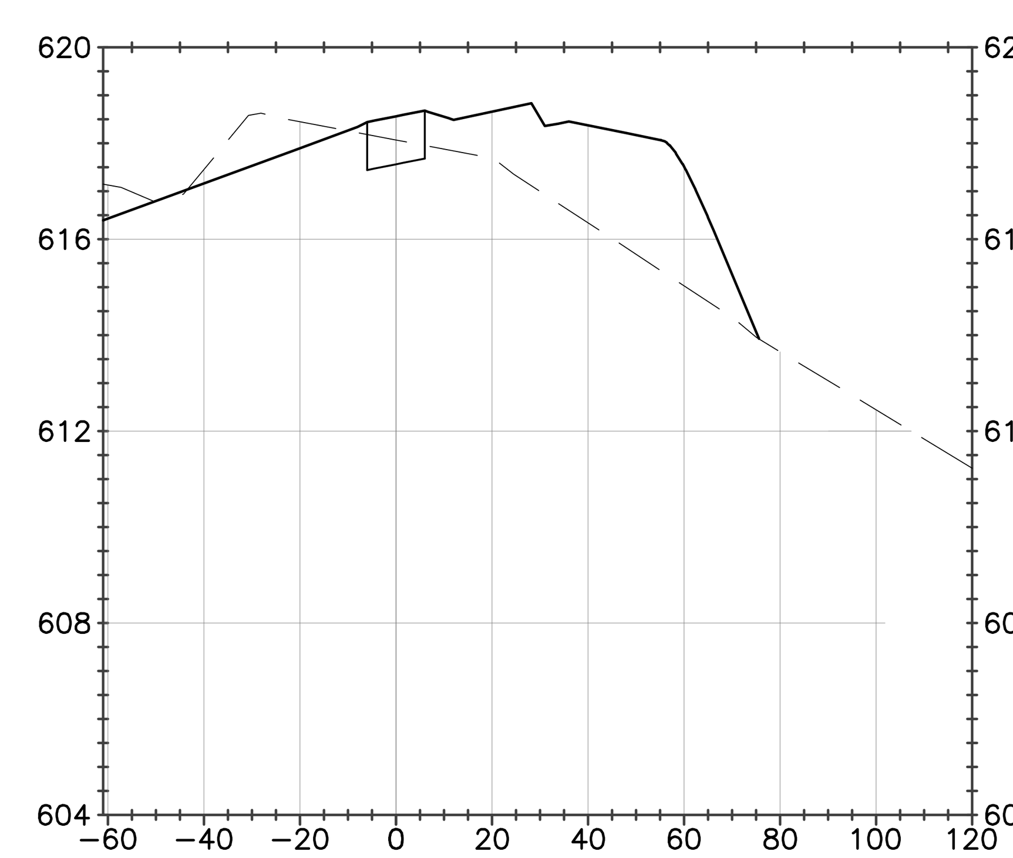

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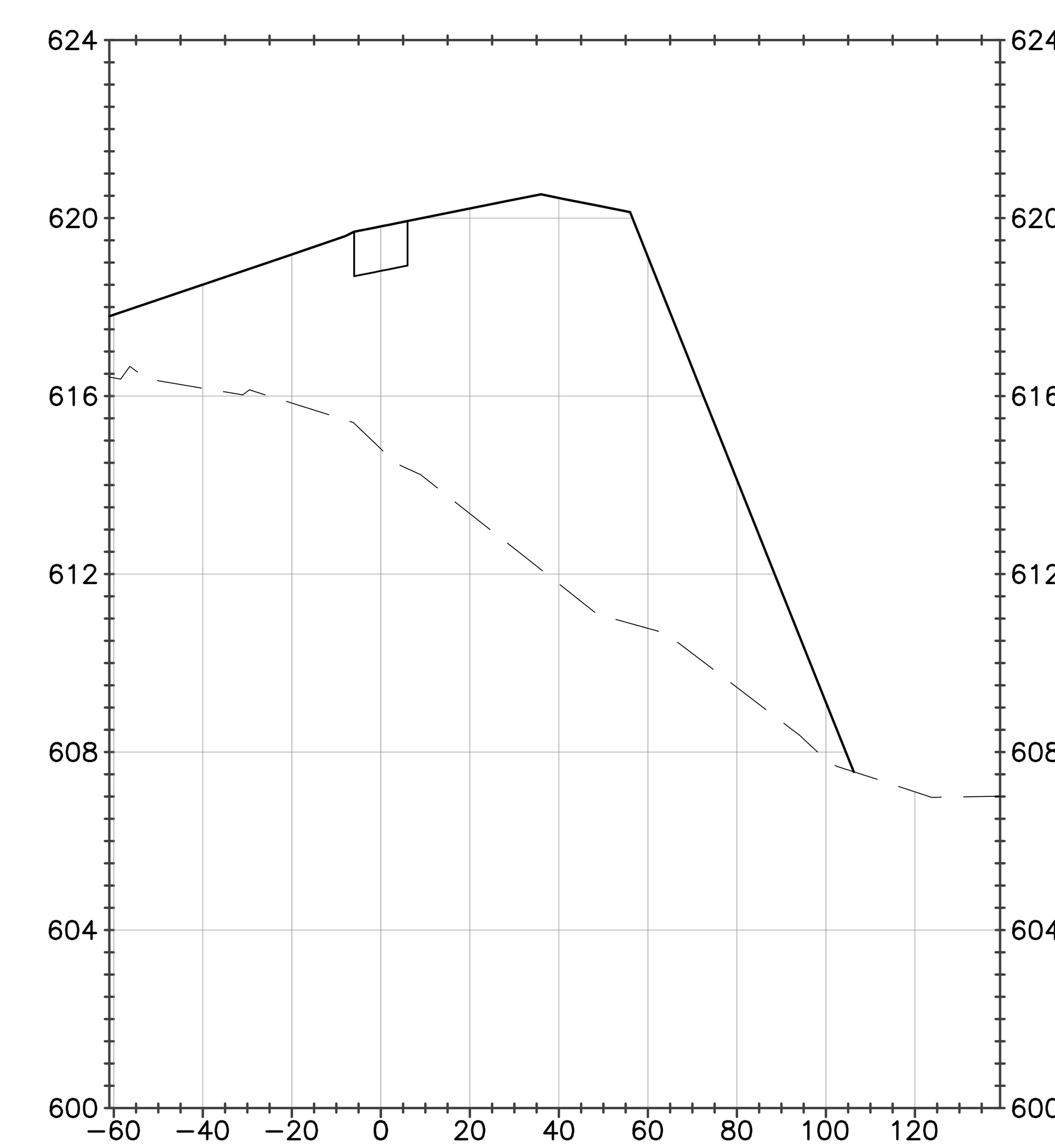

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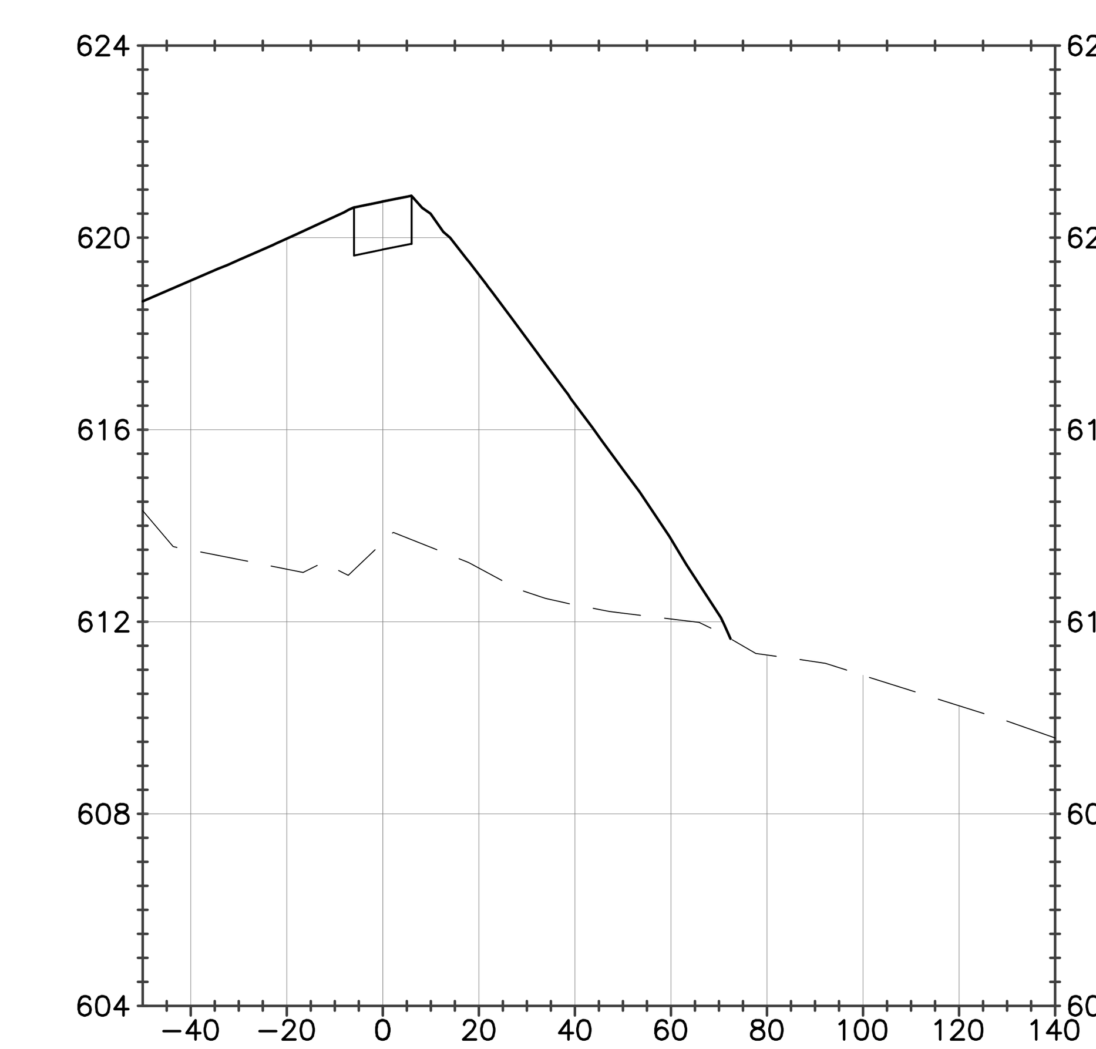

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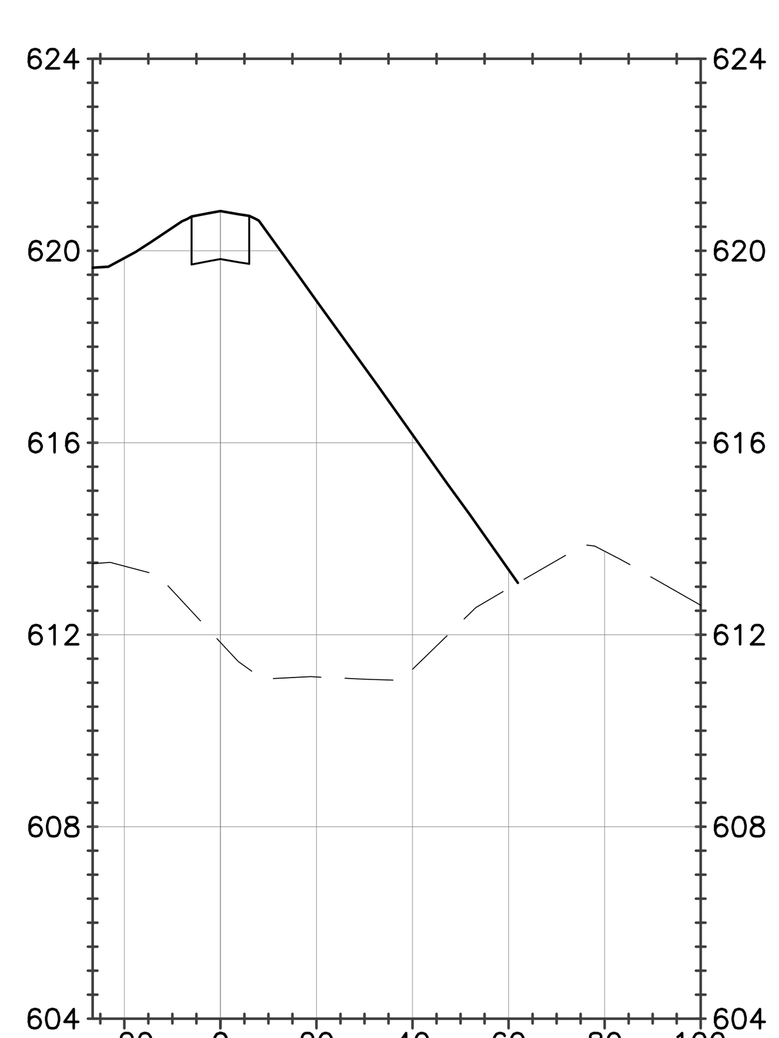

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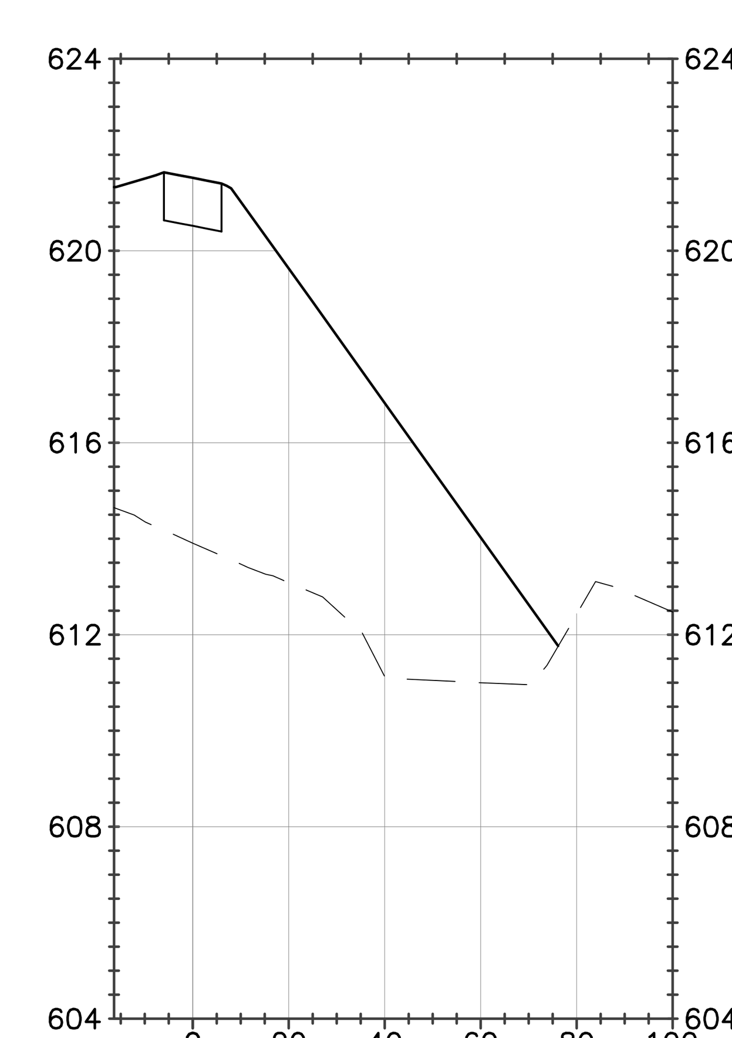

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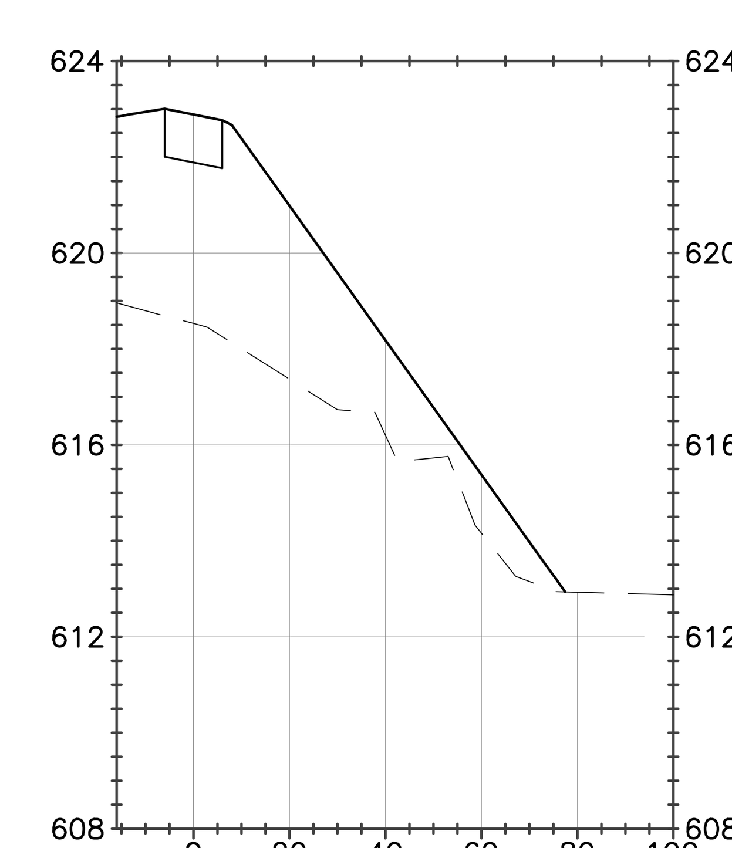

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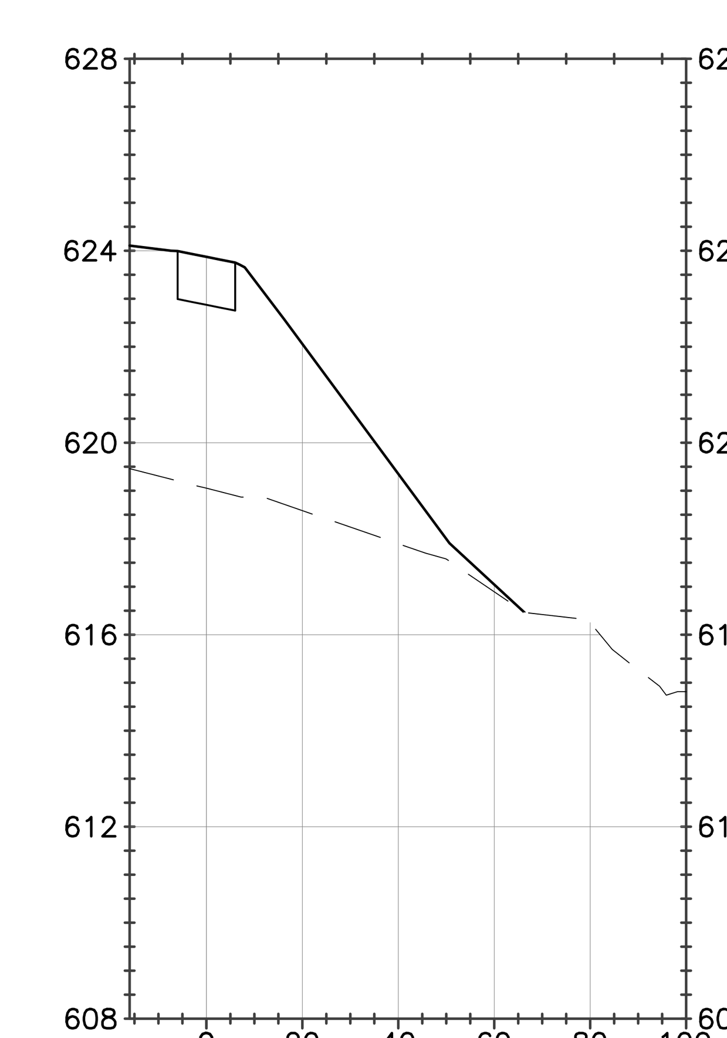

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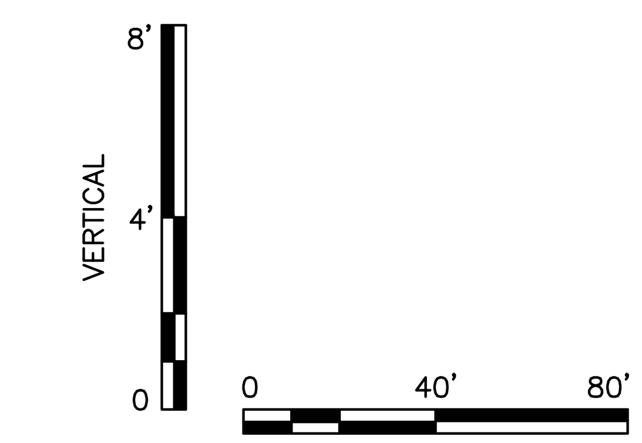

Revision | By | Appd. | YY.MM.DD

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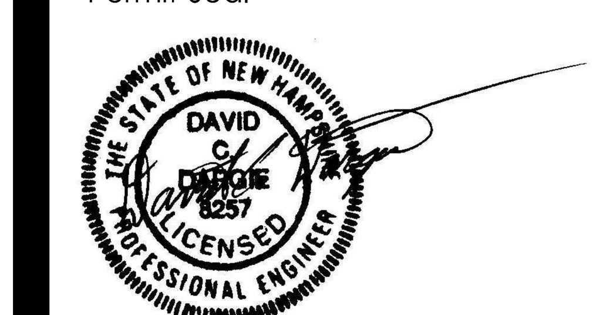

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 17

Project No.
179450522

Drawing No.	Sheet	Revision
X117	78 of 79	0

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1/29/2024 9:42 AM By: Kavanagh, Alexandra

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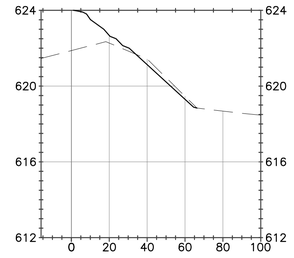

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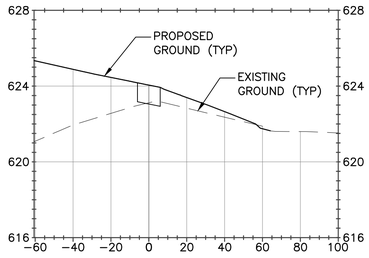

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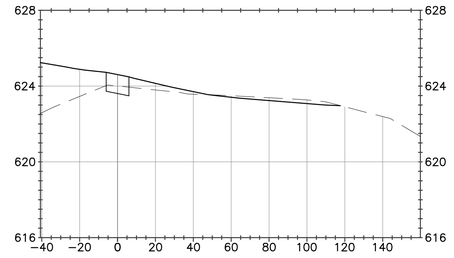

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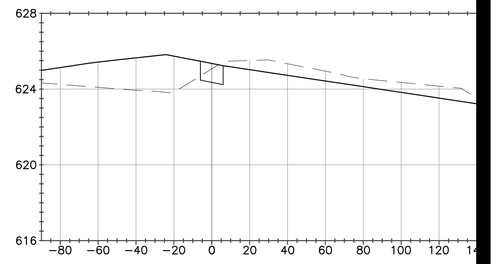

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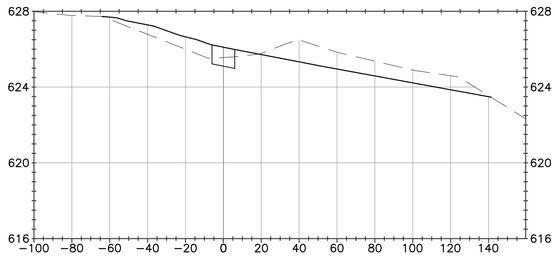

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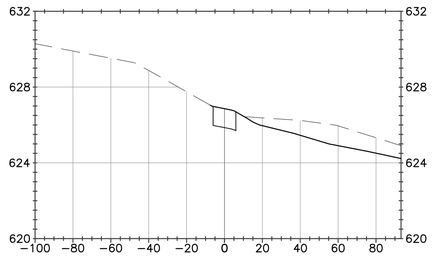

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THE STATE OF NEW HAMPSHIRE DAVID C. DEMERS 9257 LICENSED PROFESSIONAL ENGINEER

Client/Project
LEBANON MUNICIPAL AIRPORT
5 AIRPARK ROAD, WEST LEBANON, NH

EXTEND TAXIWAY 'A' & RELOCATE LOCALIZER

Title
CROSS SECTIONS - 18

Project No.
179450522

Drawing No.	Sheet	Revision
X118	79 of 79	0

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RELOCATION OF RUNWAY 18 LOCALIZER AND DME
LEBANON MUNICIPAL AIRPORT
LEBANON, NEW HAMPSHIRE
(VOLUME 2)

DRAWING NUMBER	DRAWING TITLE
LEB-1998376-G001	COVER SHEET
LEB-1998376-G002	GENERAL NOTES
LEB-1998376-G003	AIRPORT LAYOUT
LEB-1998376-C001	SITE PLAN
LEB-1998376-C002	SHELTER SITE PLAN
LEB-1998376-C003	LOC SITE PLAN
LEB-1998376-C004	METER SITE PLAN
LEB-1998376-C005	MISCELLANEOUS DETAILS
LEB-1998376-C006	LOCALIZER GROUND CHECK POINTS
LEB-1998376-0001	SHELTER EXTERIOR DETAILS
LEB-1998376-0002	SHELTER INTERIOR DETAILS
LEB-1998376-0003	LOC ANTENNA DETAILS
LEB-1998376-0003	DME ANTENNA DETAILS
LEB-1998376-S001	SHELTER FOUNDATION DESIGN
LEB-1998376-S002	LOC FOUNDATION DESIGN
LEB-1998376-E001	POWER WIRING DIAGRAM
LEB-1998376-E002	DME WIRING DIAGRAM
LEB-1998376-E003	LOC WIRING DIAGRAM

REV	APPROVED DATE	DESCRIPTION	JCN	REDLINE DATE	APVD
	01/30/2023	CONSTRUCTION, WR #20330	1998376		

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC

RUNWAY 18 LOCALIZER
AND DME
COVER SHEET

LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
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MK	MK	DC	ENGINEERING SERVICES NAVAIDS	01/30/2023	1998376	LEB-1998376-G001	

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THIS DRAWING PRODUCED ON NEW ENGLAND REGION MICROSTATION SYSTEM

GENERAL NOTES:

1. THIS DRAWING PACKAGE INDICATES WORK REQUIRED FOR THE RELOCATION OF THE LOCALIZER ANTENNAS, DME EQUIPMENT, AND INSTALLATION OF NEW LOCALIZER SHELTER SERVING RUNWAY 18 AT LEBANON MUNICIPAL AIRPORT IN LEBANON, NEW HAMPSHIRE.

2. WORK ASSOCIATED WITH THE LOCALIZER AND RELATED FACILITIES IS LOCATED ON THE LEBANON MUNICIPAL AIRPORT. NO MOVEMENT BY CONTRACTOR, SUBCONTRACTORS, OR DELIVERY VEHICLES SHALL BE MADE ON THE ACTIVE AIR OPERATIONS AREA (AOA) OR AIRCRAFT MOVEMENT AREA WITHOUT ESCORT BY THE FAA CONTRACTING OFFICER'S REPRESENTATIVE (COR), THE RESIDENT ENGINEER (RE), OR DESIGNATED CONTRACTOR ESCORT VEHICLE. THE CONTRACTOR SHALL CERTIFY IN WRITING THAT ALL DRIVING EMPLOYEES, SUBCONTRACTOR EMPLOYEES, AND DELIVERY EMPLOYEES HAVE READ AND UNDERSTAND THE FAA AIRPORT GROUND VEHICLE OPERATIONS GUIDE (DOT/FAA/ASY-300 98/001) PER FAA ORDER 5200.7A.

3. CONTRACTOR ACCESS ROUTES, STAGING AREAS, AND EMPLOYEE PARKING AREAS SHALL BE FINALIZED IN ADVANCE BY THE AIRPORT AUTHORITY.

4. CONTRACTOR'S VEHICLES SHALL BE EQUIPPED WITH AN APPROVED ROTATING BEACON AND/OR ORANGE AND WHITE FLAG. VEHICLES SHALL INCLUDE DECALLS WITH COMPANY LOGO ON THE EXTERIOR.

5. CONTRACTOR'S CREW SHALL BE EQUIPPED WITH A RADIO AND SHALL MONITOR AIR TRAFFIC ON THE APPROPRIATE FAA FREQUENCY. (COMMON TRAFFIC ADVISORY FREQUENCY 125.95)

6. WORK WITHIN DEFINED RUNWAY SAFETY AREA WILL REQUIRE A RUNWAY SHUTDOWN. ANY ACTIVITIES INVOLVING CRANES OR OTHER LARGE EQUIPMENT MAY ALSO REQUIRE A RUNWAY SHUTDOWN OR OTHER PROVISIONS. COORDINATE ALL SUCH ACTIVITIES AND REQUIRED SHUTDOWNS WITH THE COR/RE, LOCAL AIR TRAFFIC CONTROL, AND THE AIRPORT AUTHORITY AT LEAST 48 HOURS IN ADVANCE. THE CONTRACTOR SHALL ADHERE TO RUNWAY SHUTDOWN REQUIREMENT OUTLINED IN THE CONSTRUCTION SAFETY PHASING PLAN, MEET CONDITIONS IN AC 150/1520.2F OPERATIONAL SAFETY ON AIRPORTS DURING CONSTRUCTION.

7. WORK PERFORMED ADJACENT TO FAA EQUIPMENT MAY REQUIRE SHUTDOWN. COORDINATE ALL RELATED ACTIVITIES AND REQUIRED SHUTDOWNS WITH THE FAA SSC AT LEAST 48 HOURS IN ADVANCE.

8. THE CONTRACTOR SHALL MAINTAIN A CLEAN WORK SITE. EQUIPMENT AND MATERIAL SHALL BE REMOVED FROM THE WORK SITE AT THE END OF EACH WORK SHIFT. THE CONTRACTOR SHALL KEEP THE WORK SITE FREE OF CONSTRUCTION DEBRIS AND OTHER FOREIGN OBJECT DEBRIS (FOD) AT ALL TIMES. THE CONTRACTOR SHALL CONDUCT FOD INSPECTIONS OF ALL VEHICLES PRIOR TO DRIVING ON THE AOA. THE CONTRACTOR SHALL BE PREPARED TO REMOVE ANY DUST, DIRT, MUD, OR OTHER FOD TRACKED OR OTHERWISE LEFT ON THE AOA AT ALL TIMES.

9. THE CONTRACTOR SHALL STRICTLY COMPLY WITH ALL OSHA REGULATIONS. THE CONSTRUCTION SAFTEY PHASING PLAN AND SUBMITTED SAFTEY PLAN COMPLIANCE DOCUMENT AT ALL TIMES. THE CONTRACTING OFFICERS REPRESENTATIVE (COR) AND/OR RE RESERVES THE RIGHT TO SUSPEND THE PROJECT SHOULD HE OR SHE DETERMINE THAT AN UNSAFE CONDITION EXISTS.

10. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL MATERIAL UNLESS OTHERWISE INDICATED. THE CONTRACTOR SHALL PROVIDE ALL LABOR, EQUIPMENT, AND REQUIRED TEMPORARY POWER UNLESS OTHERWISE INDICATED. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL REQUIRED PERMITS.

11. ALL MATERIAL FURNISHED FOR THIS PROJECT IS INDICATED AS "GOVERNMENT FURNISHED MATERIAL (GFM)" AND LISTED IN GFM LIST. THE GFM LIST INCLUDES SPARES FOR SOME ITEMS. ALL SPARES SHALL BE RETURNED TO THE FAA, IN WORKING ORDER, AT THE CONCLUSION OF THE CONSTRUCTION.

12. THE CONTRACTOR SHALL LEGALLY DISPOSE OF AND WHERE POSSIBLE RECYCLE ALL MATERIAL AND EQUIPMENT NOT RETURNED TO OR RETAINED BY THE FAA.

13. IF CONDITIONS ARE DIFFERENT THAN THOSE INDICATED IN THE DRAWINGS OR SPECIFICATIONS, THE CONTRACTOR SHALL CONTACT THE CONTRACTING OFFICER'S REPRESENTATIVE (COR) PRIOR TO PROCEEDING WITH CONSTRUCTION.

14. THE CONTRACTOR SHALL PROVIDE AND MAINTAIN A PORTABLE TOILET FACILITY AT A LOCATION APPROVED BY THE AIRPORT AUTHORITY.

SITE WORK:

1. ALL DIMENSIONS, ELEVATIONS, CONTOURS, AND HEIGHTS INDICATED ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD BY THE CONTRACTOR.

2. ALL TRENCHES AND EXCAVATIONS WITHIN 150 FEET OF THE RUNWAY CENTERLINE AND 600 FEET FROM THE RUNWAY THRESHOLD (DEFINED AS THE RUNWAY SAFETY AREA) AND WITHIN 69 FEET FROM THE TAXIWAY CENTERLINE (DEFINED AS THE TAXIWAY SAFETY AREA) SHALL NOT BE LEFT OPEN OVERNIGHT AND SHALL BE BACKFILLED AND COMPACTED TO MATCH THE EXISTING GRADE BEFORE LEAVING THE SITE. STEEL PLATES MAY BE USED AS AN ALTERNATIVE ONLY WITH WRITTEN PERMISSION BY THE COR AND AIRPORT AUTHORITY.

3. EXISTING UTILITY LOCATIONS SHOWN ARE APPROXIMATE. OTHER UTILITIES MAY NOT BE SHOWN. THE CONTRACTOR SHALL FIELD LOCATE ALL SUBSURFACE UTILITIES PRIOR TO ANY EXCAVATION OR DIRECTIONAL BORING OPERATIONS. DIRECT EARTH BURIED (DEB) RUNWAY AND TAXIWAY LIGHTING POWER CABLES AND OTHER FAA FACILITY POWER CABLES MAY BE HIGH VOLTAGE, FORTY-EIGHT (48) HOUR (MINIMUM) NOTICE BY THE CONTRACTOR TO THE COR, THE AIRPORT AUTHORITY, AND THE FAA SSC IS REQUIRED FOR ALL UTILITY MARKING AND/OR FACILITY SHUTDOWNS.

4. THE CONTRACTOR SHALL BE PREPARED TO IMMEDIATELY REPAIR ANY UTILITIES DAMAGED DURING EXCAVATION OPERATIONS AND SHALL CONDUCT ALL SUCH REPAIRS AT CONTRACTOR EXPENSE.

5. ALL UNDERGROUND CABLE SHALL BE IN CONDUIT EXCEPT FOR BARE COPPER GROUND WIRE, GUARD WIRE, COUNTERPOISE, AND WHERE OTHERWISE INDICATED. UNDERGROUND CONDUIT SHALL BE 24 INCHES (MINIMUM) BELOW GRADE EXCEPT WHEN INTERFACING HANDHOLE ENTRANCES OR EXISTING CONDUIT AT OTHER DEPTHS OR WHERE OTHERWISE INDICATED. UNDERGROUND CONDUIT SHALL BE GALVANIZED RIGID STEEL CONDUIT (GRSC) EXCEPT WHERE OTHERWISE INDICATED. GRSC FITTINGS SHALL BE THREADED TYPE . EXPOSED THREADS SHALL BE SEALED WITH AN APPROVED SEALANT TO PREVENT CORROSION PRIOR TO BACKFILL OPERATIONS. CONDUITS SHALL BE CLEANED OF DEBRIS, AND A NYLON PULL WIRE SHALL BE INSTALLED IN ALL CONDUITS.

6. ALL EXTERIOR CONDUITS ENTERING BUILDINGS (EXCEPT THOSE WITH GROUNDING CONDUCTORS ONLY) SHALL HAVE EXPANSION/DEFLECTION COUPLINGS. AN APPROVED GROUND JUMPER SHALL BE INSTALLED BETWEEN METALLIC CONDUIT ON EACH SIDE OF COUPLING UNLESS COUPLING IS INTERNALLY GROUNDED.

7. CONCRETE CABLE/DUCT MARKERS SHALL BE INSTALLED WHERE INDICATED ON THE DRAWINGS AND BY THE COR. CABLE/DUCT MARKERS SHALL BE PIGMENTED ORANGE AND SHALL NOT EXTEND MORE THAN 1 INCH ABOVE FINAL GRADE.

8. BACKFILL FOR CABLE OR DUCT TRENCHES OR FOR OTHER EXCAVATIONS SHALL BE PLACED IN LAYERS NOT EXCEEDING 8 INCHES, AND EACH LAYER SHALL BE THOROUGHLY COMPACTED TO WITHIN 95% OF MAXIMUM DENSITY OF OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH AASHTO T-180. WHERE FILL IS REQUIRED IN THE RUNWAY/TAXIWAY SAFETY AREA, WORK SHALL COMPLY WITH FAA AC 150/5370-10 STANDARDS FOR SPECIFYING CONSTRUCTION ON AIRPORTS. IF REQUIRED, THE CONTRACTOR SHALL ARRANGE FOR AN INDEPENDENT FIELD TEST TO VERIFY PROPER COMPACTION.

9. THE EXISTING GRADE SURROUNDING THE FOUNDATION OR TRENCH WORK SHALL BE STABILIZED AND PROTECTED FROM EROSION DURING AND IMMEDIATELY AFTER COMPLETION OF THE FOUNDATION OR CONDUIT INSTALLATION AND ALL REQUIRED EXCAVATION AND BACKFILL.

10. ALL DISTURBED AREAS SHALL BE RESTORED TO PRIOR CONDITION AT A MINIMUM. FINAL CONDITION SHALL BE APPROVED BY THE FAA AND THE AIRPORT AUTHORITY.

11. ANY WORK WITHIN FIVE (5) FEET OF AN AIRPORT OF FAA FACILITY SHALL BE HAND DUG.

PHASING:

1. REFER TO CONSULTANT VOLUME 1 FOR THE CONSTRUCTION PHASING.

FOUNDATION WORK:

1. ALL CONCRETE WORK SHALL COMPLY WITH ACI-304, "RECOMMENDED PRACTICE FOR MEASURING, MIXING, AND PLACING CONCRETE", ACI-308, "STANDARD PRACTICE FOR CURING CONCRETE", AND ACI-347, "RECOMMENDED PRACTICE FOR CONCRETE FORMWORK".

2. CONCRETE SHALL MEET STATE OF NEW HAMPSHIRE DOT STANDARDS.

3. CONCRETE SHALL DEVELOP 4000 PSI IN 28 DAYS WITH A MAXIMUM SLUMP OF 3 INCHES AND A MAXIMUM AGGREGATE SIZE OF 3/4 INCHES, EXCEPT WHERE OTHERWISE INDICATED, REFERENCE P-610 FROM SPECIFICATIONS FOR MISCELLANEOUS STRUCTURES.

4. ALL REINFORCEMENT STEEL SHALL COMPLY WITH ASTM A-615, GRADE 60.

5. ALL ANCHOR BOLTS AND OTHER HARDWARE SHALL BE GALVANIZED PER ASTM, UNLESS OTHERWISE INDICATED.

6. EXPANSION ANCHORS, IF USED, SHALL BE HILTI HSL HEAVY DUTY ANCHORS OR EQUAL AND SHALL BE INSTALLED IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.

7. THE CONTRACTOR SHALL PREPARE THE BOTTOM OF ALL FOUNDATION EXCAVATIONS SUCH THAT THE FOUNDATION IS SET ON COMPACTED STRUCTURAL GRAVEL WITH A MINIMUM BEARING CAPACITY OF 3000 PSF.

8. ALL LAMP HOUSING ASSEMBLY FOUNDATIONS SHALL BE PRE-CAST.

EQUIPMENT INSTALLATION:

1. USE ANTI-SEIZE COMPOUND ON ALL THREADED PARTS.

2. ALL CHANNEL SHALL BE GALVINIZED STEEL, UNISTRUT OR APPROVED EQUAL.

3. ALL HARDWARE SHALL BE GALVINIZED STEEL, UNLESS OTHERWISE INDICATED.

4. USE GALVANIZED STEEL HARDWARE ON GALVANIZED STEEL MATERIALS, SUCH AS UNISTRUT AND ELECTRICAL BOXES.

ELECTRICAL WORK:

1. ALL ELECTRICAL WORK SHALL CONFORM TO FAA-C-1217G AND FAA-C-1391D SPECIFICATIONS AND IN NO CASE SHALL VIOLATE THE NATIONAL ELECTRIC CODE (NFPA 70, NEC).

2. THE CONTRACTOR SHALL MAKE ALL POWER SERVICE, CONTROL, AND GROUND TERMINATIONS.

3. ALL FLEXIBLE LIQUIDTIGHT CONDUIT SHALL BE PLASTIC PVC LIQUID TIGHT TYPE WITH CONTINUOUS, BUILT-IN, COPPER BONDING CONDUCTOR.

4. ALL CONTROL/DATA CABLE SHALL BE TWISTED SHIELDED.

5. ALL CIRCUITS SHALL HAVE INDIVIDUAL NEUTRAL AND GROUNDING CONDUCTORS; NO SHARED NEUTRALS OR GROUNDS WILL BE PERMITTED.

6. NEUTRAL CONDUCTORS SHALL REMAIN ISOLATED FROM GROUND IN ALL LOCATIONS EXCEPT AT POWER SERVICE ENTRANCE.

7. WHERE POSSIBLE, POWER CABLES AND CONTROL/DATA CABLES SHALL RUN IN CONDUIT INDEPENDENT OF EACH OTHER. SEPARATE POWER AND CONTROL/DATA CABLES IN COMMON HANDHOLES, ENCLOSURES, AND SHELTER SQUARE DUCT WIREWAY.

8. ALL CABLES SHALL BE PROPERLY COLOR CODED AND PERMANENTLY LABELED AT EACH END AND IN EACH HANDHOLE. ALL CABLES IN HANDHOLES SHALL BE LOOPED AROUND SEVERAL TIMES AND SECURED TO NONMETALLIC RACKS MOUNTED ON EACH SIDE.

9. A DYNAMOMETER GRADUATED TO ACTUALLY INDICATE THE PROPER TENSION FOR ANY CABLE BEING PULLED THROUGH UNDERGROUND CONDUIT OR DUCT SHALL BE USED UNLESS THE CONTRACTOR ADAPTS A HARNESS OF THE PROPER SIZED ROPE THAT WILL LIMIT THE TENSION OF THE PULL. ANY COMBINATION OF CABLES PULLED IN CONDUIT OR DUCT SHALL NOT EXCEED THE SUM OF THE INDIVIDUAL ALLOWABLE TENSION OF EACH CABLE PLUS 15%.

10. ALL SPLICES SHALL BE AVOIDED TO THE MAXIMUM EXTENT POSSIBLE. HIGH VOLTAGE SPLICES SHALL BE MADE ONLY WITH WRITTEN APPROVAL FROM THE COR. ALL OTHER UNDERGROUND SPLICES SHALL BE CONDUCTED IN HANDHOLES ONLY AND AS APPROVED BY THE COR.

11. PVC CONDUIT SHALL BE SCH 40 UNLESS OTHERWISE NOTED.

ELECTRICAL GROUNDING:

1. GROUNDING AND LIGHTNING PROTECTION SHALL MEET FAA STANDARD 019F, "LIGHTNING PROTECTION, GROUNDING, BONDING AND SHIELDING REQUIREMENTS FOR FACILITIES AND ELECTRONIC EQUIPMENT".

2. ALL GROUND RODS SHALL BE COPPER CLAD STEEL, 3/4 INCH DIAMETER AND 10 FEET LONG. GROUND RODS SHALL BE DRIVEN SUCH THAT THE TOP OF ROD IS NO LESS THAN 12 INCHES BELOW GRADE.

3. ALL UNDERGROUND GROUND CONNECTIONS SHALL BE EXOTHERMICALLY WELDED BELOW GRADE UNLESS OTHERWISE INDICATED; WELD INTEGRITY SHALL BE VERIFIED BY A HAMMER TEST.

4. ALL UNDERGROUND GRSC SHALL HAVE A EXOTHERMICALLY WELDED A #2 AWG BARE COPPER GROUND TO THE GROUNDING COUNTERPOISE AND/OR GROUND ROD AT EACH END.

5. UNDERGROUND GROUNDING CONDUCTORS SHALL BE 24 INCHES (MINIMUM) BELOW GRADE EXCEPT AT GROUND RODS AND AS OTHERWISE INDICATED.

6. UNUSED CONDUCTORS SHALL BE GROUNDED AT BOTH ENDS.

7. WHEN INSTALLING MULTIPLE GROUND CONNECTORS TO ONE GROUND LUG, THE CONTRACTOR MUST USE A CONNECTOR [BURNDY FRAMATOME #YCHC OR EQUAL] AND A "PIGTAIL" TO SPLICE THE GROUNDS PRIOR TO CONNECTING TO THE LUG.

8. OVERALL SHIELDED CABLES WITH NO INDIVIDUAL SHIELDS SHALL HAVE THE SHIELD GROUNDED ON ONE END ONLY.

9. OVERALL SHIELDED CABLES WITH INDIVIDUALLY SHIELDED PAIRS SHALL HAVE THE OVERALL SHIELD GROUNDED ON BOTH ENDS AND THE INDIVIDUAL SHIELDS GROUNDED ON ONE END ONLY.

10. IF THE MANUFACTURER OF THE EQUIPMENT GIVES SPECIFIC SHIELD GROUNDING INSTRUCTIONS THESE SHALL BE FOLOWED TO ENSURE CORRECT EQUIPMENT OPERATION.

11. A 1/0 AWG BARE COPPER STRANDED STRANDED GUARD WIRE SHALL BE INSTALLED OVER ALL BURIED BABLES AND CONDUCTORS NOT ROUTED IN GALVANIZED RIGID STEEL CONDUIT. THE GUARD WIRE SHALL BE EMBEDDED IN THE SOIL, A MINIMUM OF 10 INCHES ABOVE THE CABLE TO BE PROTECTED, AND LOCATED DIRECTLY ABOVE AND PARALELL TO THE LINES OR CABLES BEING PROTECTED. THE GUARD WIRE SHALL BE BONDED TO THE EARTH ELECTRODE SYSTEM (EES) AT EACH END AND TO GROUND RODS AT APPROXIMATELY 90-FOOT INTERVALS USING EXOTHERMIC WELDS. THE SPACING BETWEEN GROUND RODS SHALL VARY BY 10% TO 20% TO PREVENT RESONANCE. GROUND RODS SHALL BE INSTALLED APPROXIMATELY 6 FEET ON EITHER SIDE OF THE TRENCH. WHERE CABLES RUN ADJACENT TO THE EDGE OF A RUNWAY, THEY SHALL BE LOCATED 10 FEET FROM THE RUNWAY EDGE LIGHTS ON THE OUTSIDE OF THE EDGE LIGHTS.

TESTING:

1. THE CONTRACTOR SHALL TEST ALL EQUIPMENT, CABLES AND THE EARTH ELECTRODE SYSTEM IN COORDINATION WITH ON SITE FAA PERSONNEL.

2. THE CONTRACTOR SHALL PERFORM INSULATION RESISTANCE TESTS ON ALL WIRES INSTALLED. CONTROL CABLE SHALL BE TESTED PER FAA ORDER 6000.204, CHAPTER 3 PARAGRAPH 10 SECTIONS A.B. and C. POWER CABLE SHALL BE TESTED PER FAA ORDER 6950.22A, CHAPTER 3 PARAGRAPHS 3-2, 3-3, AND 3-4 AS APPLICABLE. THE CORRECT TESTING VOLTAGE MUST BE SELECTED USING GUIDANCE PROVIDED IN THE ORDERS TO PREVENT DAMAGE TO THE INSULATION.

3. THE CONTRACTOR SHALL TEST EACH EARTH ELECTRODE GROUNDING SYSTEM PER FAA HANDBOOK 010, CHAPTER 4 PARAGRAPH 2 SECTION 3. IF THE TEST RESULTS IN A READING HIGHER THAN 10 OHMS, THE CONTRACTOR SHALL REFER TO THE COR RE FOR FURTHER GUIDANCE. SUBMIT DETAILED DATA AND GRAPHS AS SHOWN IN THE STANDARD FOR EACH FACILITY.

4. ALL TESTS TO EQUIPMENT, CABLES AND THE EARTH ELECTRODE SYSTEM MUST BE PERFORMED IN THE PRESENCE OF THE FAA RE OR COR. TESTS WITHOUT THE COR OR RE PRESENT WILL BE REJECTED.

GOVERNMENT FURNISHED MATERIALS (GFM):

1. GFM WILL BE DELIVERED TO THE AIRPORT BY THE GOVERNMENT.

2. THE GFM SHALL BE INVENTORIED BY THE CONTRACTOR AND THE FAA RE UPON WHICH THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE GFM, STORAGE.

3. THE NEW 10'X16' FIBERGLASS EQUIPMENT SHELTER IS GOVERNMENT FURNISHED MATERIAL. THE GOVERNMENT IS RESPONSIBLE FOR PROVIDING THE CRANE TO OFFLOAD THE BUILDING. THE CONTRACTOR SHALL ASSIST IN SETTING THE BUILDING ON THE NEW FOUNDATION.

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC

RUNWAY 18 LOCALIZER AND DME GENERAL NOTES

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
	PROJECT ENGINEER	MGR: ENGINEERING CENTER
	DESIGNED MK	ISSUED BY: ENGINEERING SERVICES NAVAIDS
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THIS DRAWING PRODUCED ON NEW ENGLAND REGION MICROSTATION SYSTEM

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NOTES:

1. WORK WITHIN AREA 1 CONSISTS OF BUT IS NOT LIMITED TO:
   - REMOVAL AND SAFE STORAGE OF EXISTING LOCALIZER ANTENNA
   - DEMOLITION OF EXISTING LOCALIZER FOUNDATION
   - DEMOLITION OF EXISTING LOCALIZER SHELTER AND FOUNDATION
   - INSTALLATION OF NEW LOCALIZER SHELTER AND FOUNDATION
   - INSTALLATION OF NEW LOCALIZER ANTENNA AND FOUNDATION
   - INSTALLATION OF NEW POWER AND CONTROL CABLE FROM THE LOCALIZER ANTENNA TO THE LOCALIZER SHELTER

2. WORK WITIN AREA 2 CONSISTS OF BUT IS NOT LIMITED TO:
   - INSTALLING POWER CABLE FROM UTILITY POLE TO NEW METER SITE
   - INSTALLATION OF NEW POWER METER RACK
   - INSTALLATION OF POWER CONDUIT RUN BETWEEN POWER METER IN WORK AREA 2 TO THE LOCALIZER SHELTER IN WORK AREA 1.

3. WORK BETWEEN AREA 1 AND AREA 2 CONSISTS OF BUT IS NOT LIMITED TO:
   - TRENCHING AND INSTALLATION OF POWER CONDUIT AND CABLE

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC
RUNWAY 18 LOCALIZER AND DME AIRPORT LAYOUT

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
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	DESIGNED MK	ISSUED BY: ENGINEERING SERVICES NAVAIDS
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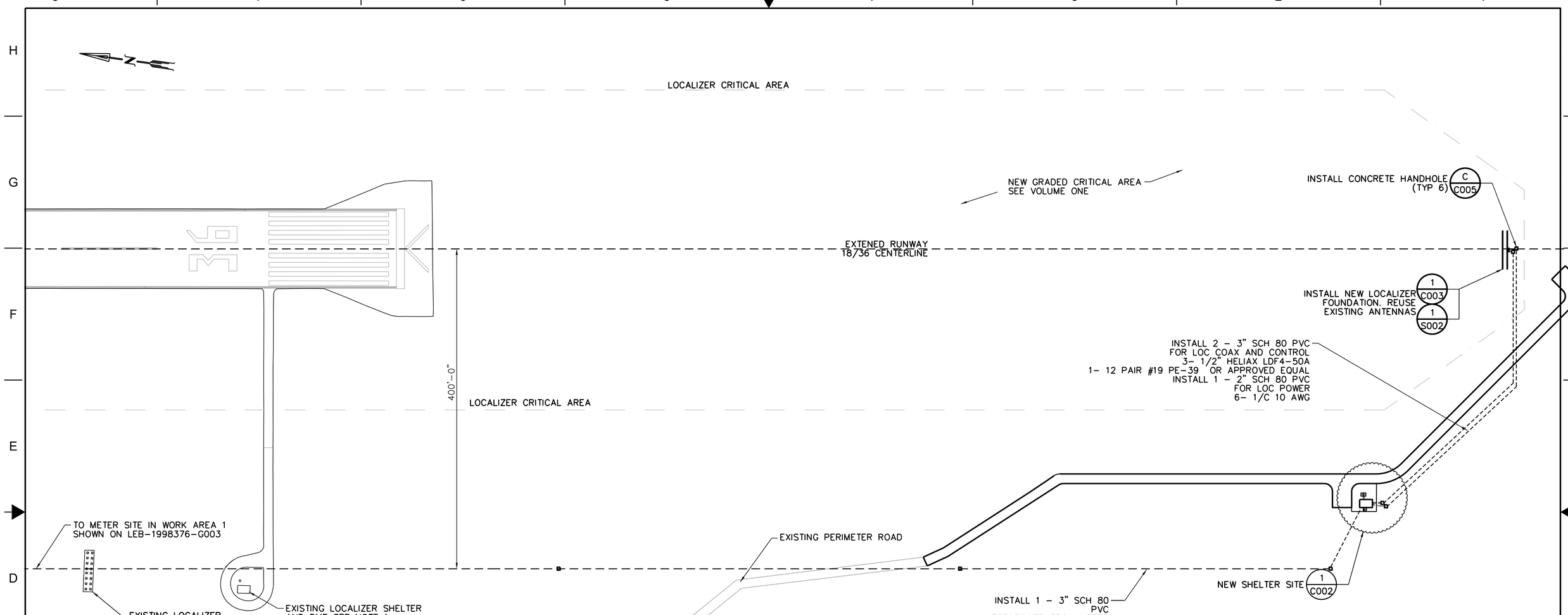

1 C001 LOCALIZER SITE PLAN
SCALE: 1" = 60'

NOTES:

1. CONTRACTOR TO REMOVE AND STORE EXISTING LOCALIZER ANTENNAS, LOCALIZER EQUIPMENT FROM WITHIN SHELTER, AND DME EQUIPMENT IN A DRY SECURE STORAGE CONTAINER ONSITE. FAA COR OR INSTALLATION PERSONNEL MUST BE PRESENT DURING EQUIPMENT REMOVAL AND STORAGE. EXISTING LOCALIZER SHELTER, ANTENNA AND DME FOUNDATION TO BE REMOVED AND SAFELY DISPOSED OF BY CONTRACTOR. EXISTING LOCALIZER POWER AND CONTROL TO BE ABANDONED IN PLACE.
2. CONTRACTOR SHALL MOVE EQUIPMENT FROM EXISTING SHELTER TO THE NEW SHELTER WITH FAA OVERSIGHT.
3. POWER SHALL COME FROM UTILITY POLE #16 ON AIRPORT ROAD. SEE AIRPORT DIAGRAM
4. ALL UNDERGROUND POWER WIRING SHALL BE XHHW–2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
5. ALL ABOVE GROUND POWER WIRING SHALL BE THWN–2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
6. THE EXISTING LOCALIZER AND DME POWER CABLE SHALL BE ABANDONED IN PLACE. SAFELY DISCONNECT LOCALIZER POWER CABLE FROM TRANSFORMER AT THE RUNWAY 18 GLIDESLOPE SITE. PRIOR TO DISCONNECTION, DENERGIZE TRANSFORMER AND REMOVE BOOT. GROUND CABLE TO GROUND ROD.
7. HANDHOLES MUST BE INSTALLED AT INTERVALS NO GREATER THAN 500' ALONG THE POWER CONDUIT RUN. SEE DRAWING LEB–1998376–C005 FOR HANDHOLE DETAILS.

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	01/30/2023	CONSTRUCTION, WR #20330	1998376		

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC
RUNWAY 18 LOCALIZER AND DME SITE PLAN

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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DESIGNED	MK	ISSUED BY	DATE 01/12/2024	JCN 1998376	
DRAWN	MK	ENGINEERING SERVICES NAVAIDS	DRAWING NO. LEB-1998376-C001		REV A
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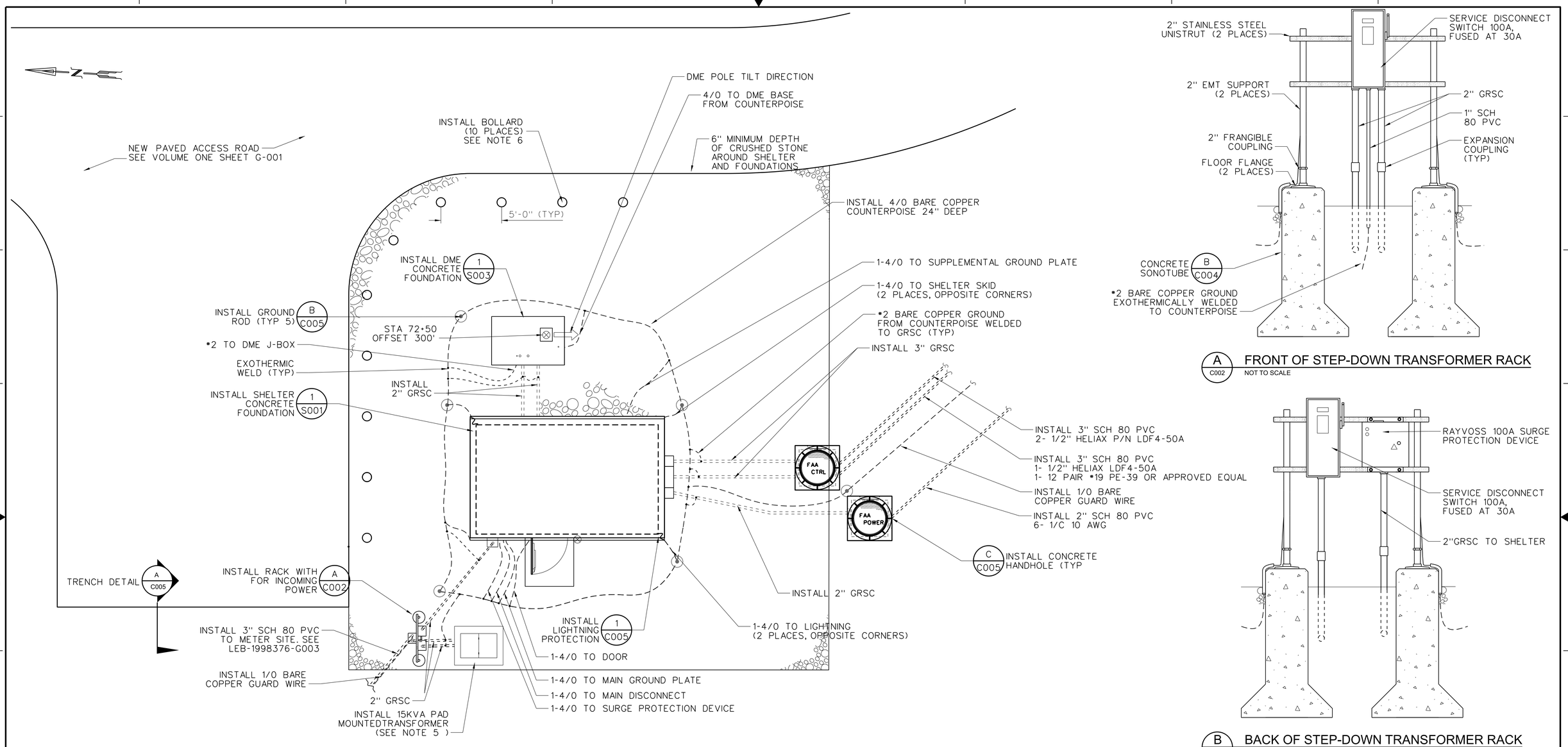

A C002 FRONT OF STEP-DOWN TRANSFORMER RACK
NOT TO SCALE

B C002 BACK OF STEP-DOWN TRANSFORMER RACK
NOT TO SCALE

NOTES:

1. ALL UNDERGROUND POWER WIRING SHALL BE XHHW-2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
2. ALL ABOVE GROUND POWER WIRING SHALL BE THWN-2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
3. STATIONS (STA) ARE BASED OFF THE RUNWAY THRESHOLD. OFFSETS ARE FROM RUNWAY CENTERLINE.
4. LOCALIZER SHELTER IS GFM. GOVERMENT WILL PROVIDE CRANE FOR ONE TIME OFF-LOADING OF SHELTER. TO BE COORDINATED WITH CONTRACTOR.
5. NEW TRANSFORMER SHALL BE PAD MOUNTED TO MANUFACTURERS SPECIFICATIONS. NEW TRANSFORMER SHALL BE 15KVA WITH COPPER WINDINGS AND LOAD BREAK ELBOWS FOR THE HIGH SIDE CONNECTION.
6. REFER TO PIPE BOLLARD DETAIL ON THE CIVIL AND MISCELLANEOUS DETAILS SHEET IN VOLUME 1.

C C002 TYPICAL BOLLARD DETAIL
NOT TO SCALE

REV	APPROVED DATE	DESCRIPTION	JCN	REDLINE DATE	APVD
	01/30/2023	CONSTRUCTION, WR #20330	1998376		

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC

RUNWAY 18 LOCALIZER AND DME SHELTER SITE PLAN

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
	PROJECT ENGINEER	MGR: ENGINEERING CENTER

DESIGNED MK | DRAWN MK | CHECKED DC
ISSUED BY: ENGINEERING SERVICES NAVAIDS
DATE 01/30/2023 | JCN 1998376
DRAWING NO LEB-1998376-C002 | REV

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EDM: lsk-1998376-c002.dgn

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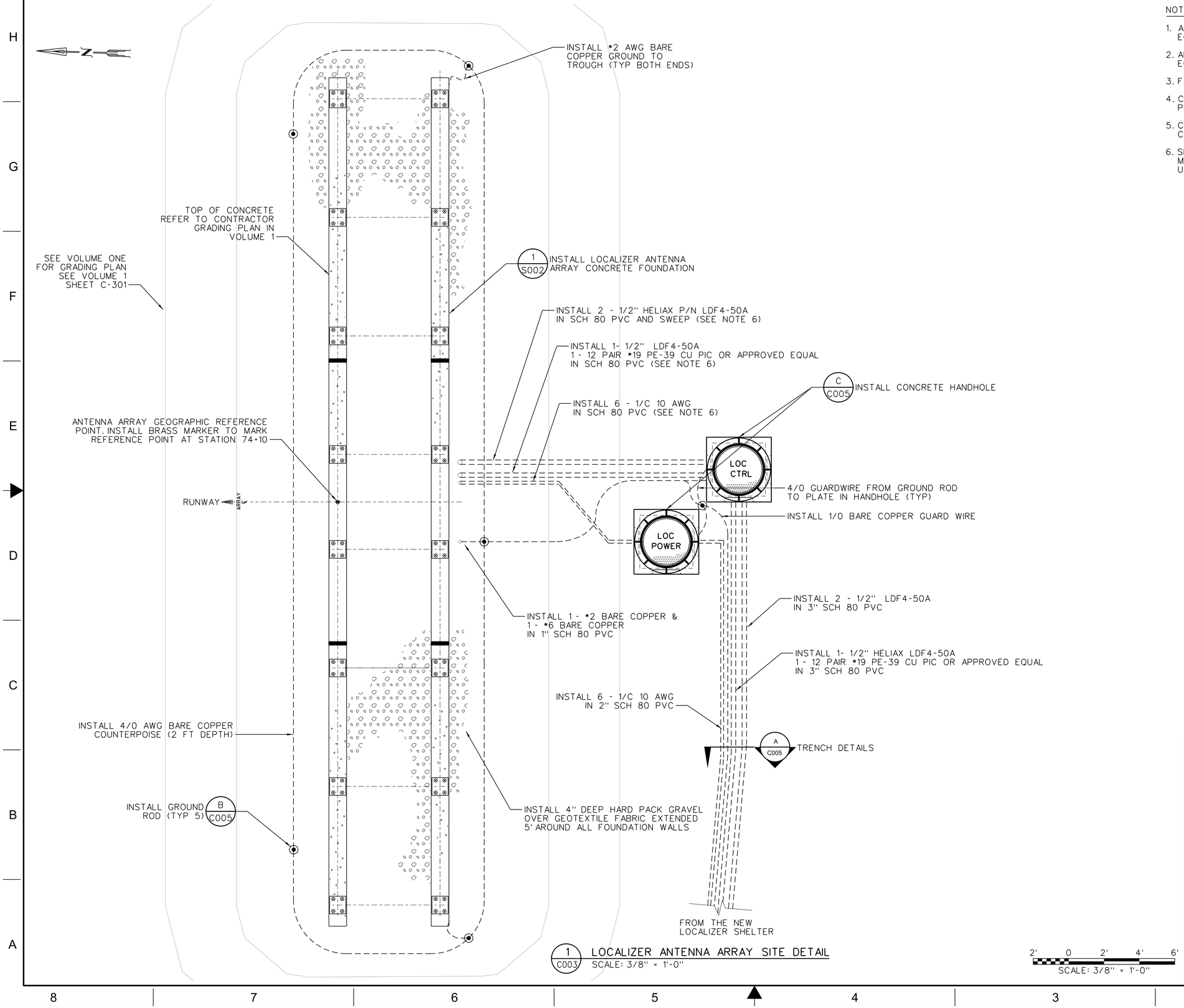

1 C003 LOCALIZER ANTENNA ARRAY SITE DETAIL
SCALE: 3/8" = 1'-0"

2' 0 2' 4' 6'
SCALE: 3/8" = 1'-0"

NOTES:

1. ALL UNDERGROUND POWER WIRING SHALL BE XHHW-2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
2. ALL ABOVE GROUND POWER WIRING SHALL BE THWN-2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
3. FAA WILL TERMINATE HELIAX AND CONTROL CABLE.
4. COMMSCOPE LDF4-50A CABLE RUNS MUST COME OFF OF THE SAME PRODUCTION REEL.
5. CONTRACTOR MUST LEAVE EXTRA WORKING SLACK OF CABLE. EXTRA CABLE SLACK TO BE LOOPED WITHIN HANDHOLES.
6. SIZE OF SCH 80 PVC FROM DISTRUBTION UNIT TO HANDHOLES MUST MATCH EXISTING PENETRATIONS IN THE BOTTOM OF THE DISTRIBUTION UNIT.

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	01/30/2023	CONSTRUCTION, WR #20330	1998376		

DEPARTMENT OF TRANSPORTATION
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LOC
RUNWAY 18 LOCALIZER AND DME LOC SITE PLAN

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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	PROJECT ENGINEER	MGR: ENGINEERING CENTER
	DESIGNED MK	ISSUED BY: ENGINEERING SERVICES NAVAIDS
	DRAWN MK	DATE 01/30/2023 JCN 1998376
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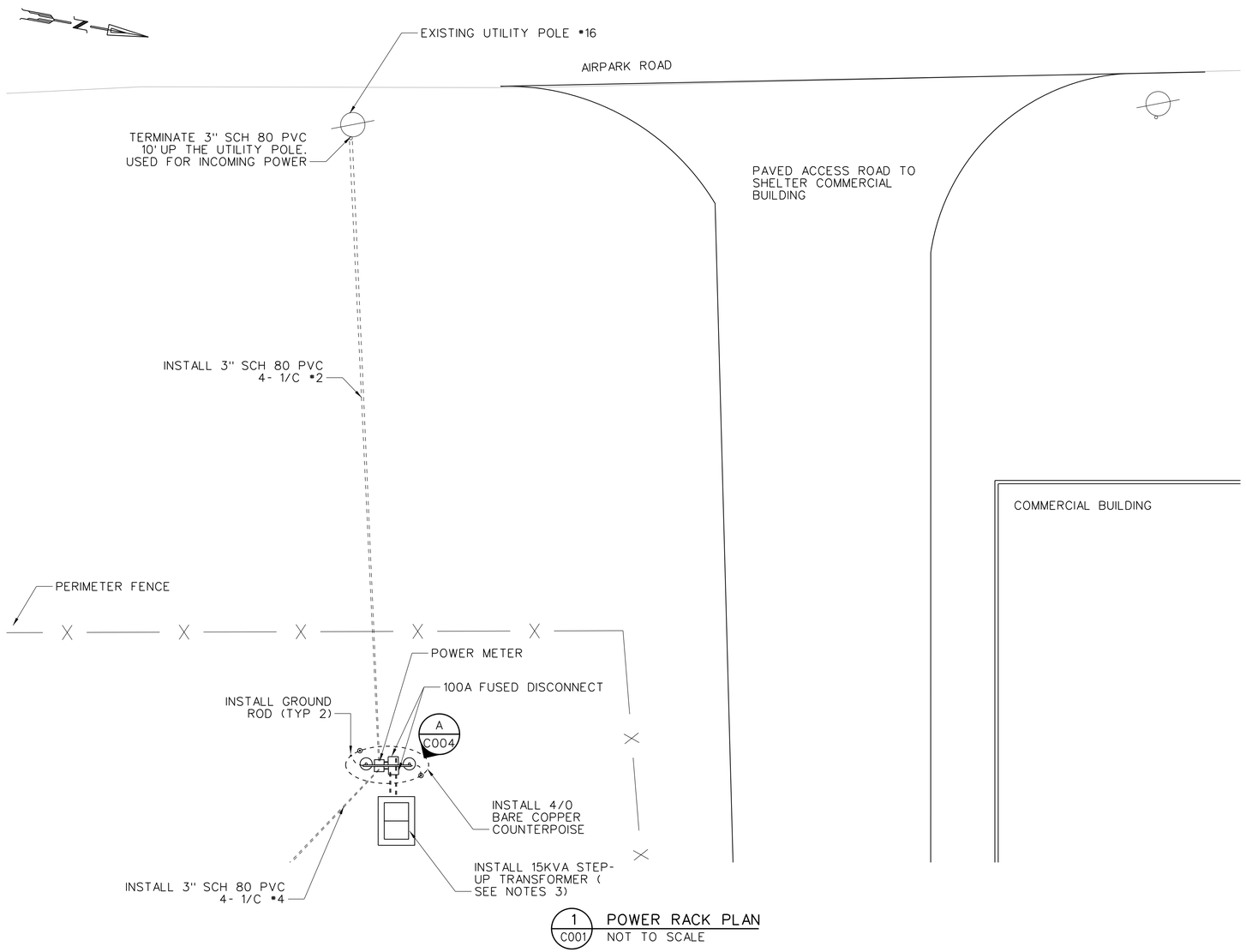
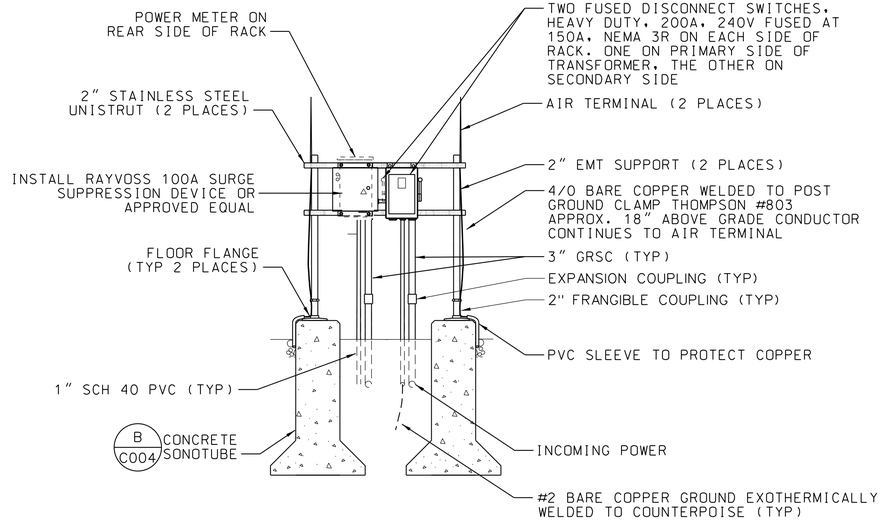
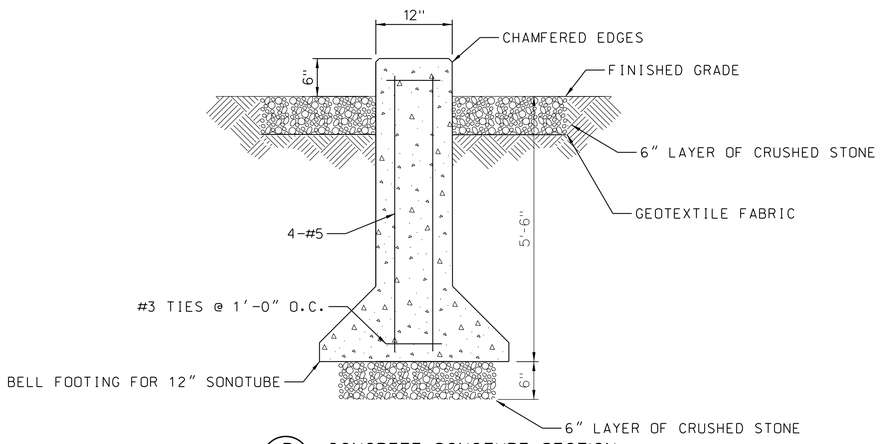


1 C001 POWER RACK PLAN
NOT TO SCALE



A C004 POWER RACK CROSS SECTION
NOT TO SCALE



B C004 CONCRETE SONOTUBE SECTION
NOT TO SCALE

NOTES:

1. ALL UNDERGROUND POWER WIRING SHALL BE XHHW-2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
2. ALL ABOVE GROUND POWER WIRING SHALL BE THWN-2 OR APPROVED EQUAL, UNLESS OTHERWISE INDICATED.
3. INSTALL TRANSFORMER PAD TO MANUFACTURERS SPECIFICATIONS. NEW TRANSFORMER SHALL BE 15KVA WITH COPPER WINDINGS AND LOAD BREAK ELBOWS FOR HIGH SIDE CONNECTION.

1' 0 1' 2' 5'
SCALE: 1/2" = 1'-0"

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	01/30/2023	CONSTRUCTION, WR #20330	1998376		

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LOC

RUNWAY 18 LOCALIZER AND DME METER SITE PLAN

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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DESIGNED	MK	ISSUED BY	DATE	01/30/2023	JCN	1998376
DRAWN	MK	ENGINEERING SERVICES NAVAIDS	DRAWING NO	LEB-1998376-C004		REV
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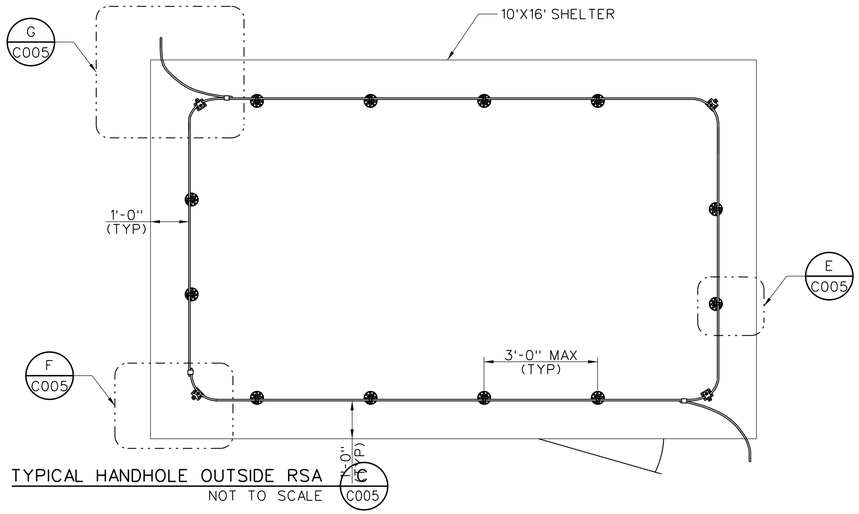
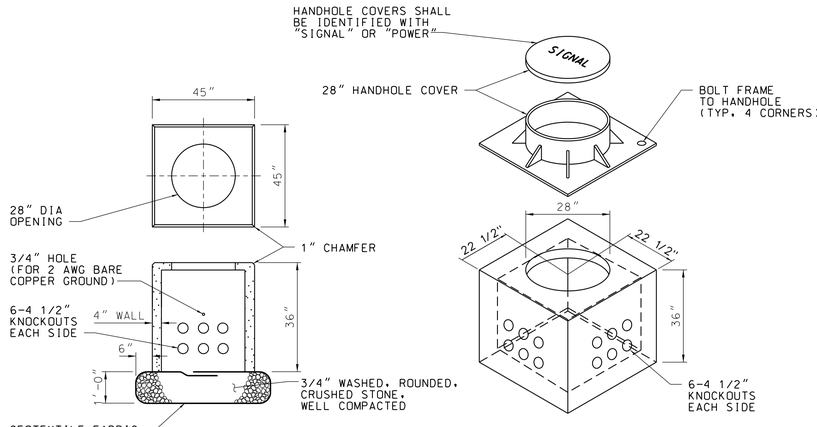


TYPICAL HANDHOLE OUTSIDE RSA
NOT TO SCALE

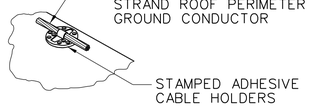
1 C005 SHELTER ROOF LIGHTNING PROTECTION PLAN
SCALE: 1/2" = 1'-0"



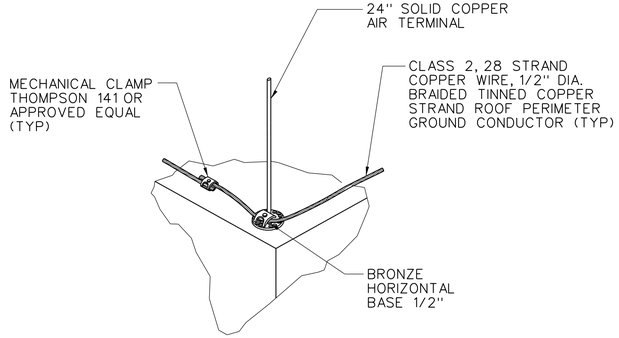
C C005 TYPICAL HANDHOLE OUTSIDE RSA
NOT TO SCALE

HANDHOLE NOTES:

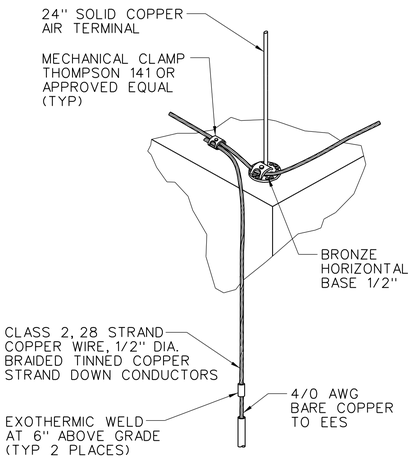
1. CONCRETE COMPRESSIVE STRENGTH - 3,000 PSI MINIMUM.
2. STEEL REINFORCEMENT - ASTM A615, GRADE 60, 1" MINIMUM COVER.
3. MINIMUM DESIGN LOAD - AASHTO HS20-44.
4. CAST GRAY IRON HANDHOLE FRAME AND COVER SHALL BE NEENAH HEAVY DUTY R-1640 SERIES OR APPROVED EQUAL.
5. CAST IRON FRAME SHALL BE MECHANICALLY FASTENED TO THE HANDHOLE.
6. A PULLEYE SHALL BE PROVIDED ON EACH WALL.
7. INSTALL A CRUSHED STONE SUMP UNDER ALL HANDHOLES. TOP, SIDES AND BOTTOM OF SUMP SHALL BE LINED WITH A WATER PERMEABLE GEOTEXTILE FABRIC.
8. AFTER INSTALLATION OF CONDUITS THROUGH KNOCKOUTS, GROUT AROUND CONDUIT.
9. CABLE SLACK LOOPS SHALL BE LABELED AND RACKED IN ALL HANDHOLES.
10. INSTALL ONE 3/4", 10 FOOT LONG GROUND ROD AT EACH HANDHOLE OR SET OF ADJACENT HANDHOLES. BOND THIS GROUND ROD TO EITHER THE GRSC OR THE 1/0 AWG BARE COPPER GUARD WIRE OVER ANY PVC CONDUIT.
11. HANDHOLES SHALL BE LOCATED OUTSIDE THE RUNWAY SAFETY AREA (RSA).
12. SEE NOTE 8 UNDER ELECTRICAL WORK ON DRAWING LEW-1898219-G002.



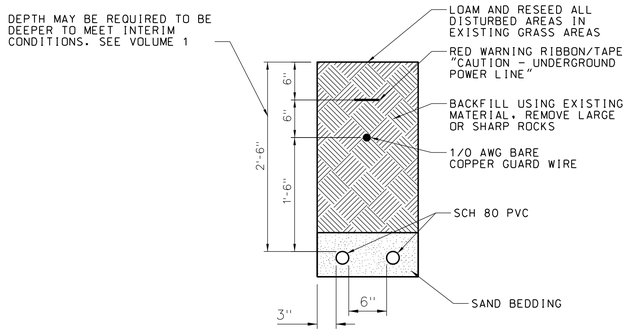
E C005 ROOF CONDUCTOR CONNECTION DETAIL
NOT TO SCALE



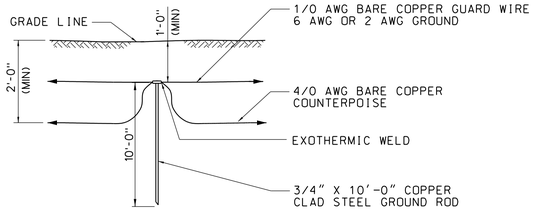
F C005 AIR TERMINAL CONNECTION DETAIL
NOT TO SCALE



G C005 AIR TERMINAL/DOWN CONDUCTOR CONNECTION DETAIL
NOT TO SCALE



A C005 TYPICAL TRENCH DETAIL
NOT TO SCALE



B C002 TYPICAL GROUND ROD INSTALLATION
NOT TO SCALE SEE NOTE 3

NOTES:

1. PROVIDE 6" MINIMUM CLEAR DISTANCE BETWEEN POWER AND CONTROL OR SIGNAL CONDUITS.
2. ALL HANDHOLES SHALL BE IDENTIFIED WITH THE APPROPRIATE INFORMATION ON A 1/16" (MINIMUM) THICK BRASS PLATE FASTENED TO THE COVER WITH A MINIMUM OF TWO 10-32 BRASS SCREWS.
3. FOR INSTALLATION OF GUARD WIRE AND GROUND ROD SPACING, SEE ELECTRICAL GROUNDING SECTION ON LEB-1998376-G002.

1' 0 1' 2' 5'
SCALE: 1/2" = 1'-0"

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	01/30/2023	CONSTRUCTION, WR #20330	1998376		

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC
RUNWAY 18 LOCALIZER AND DME MISC. DETAILS

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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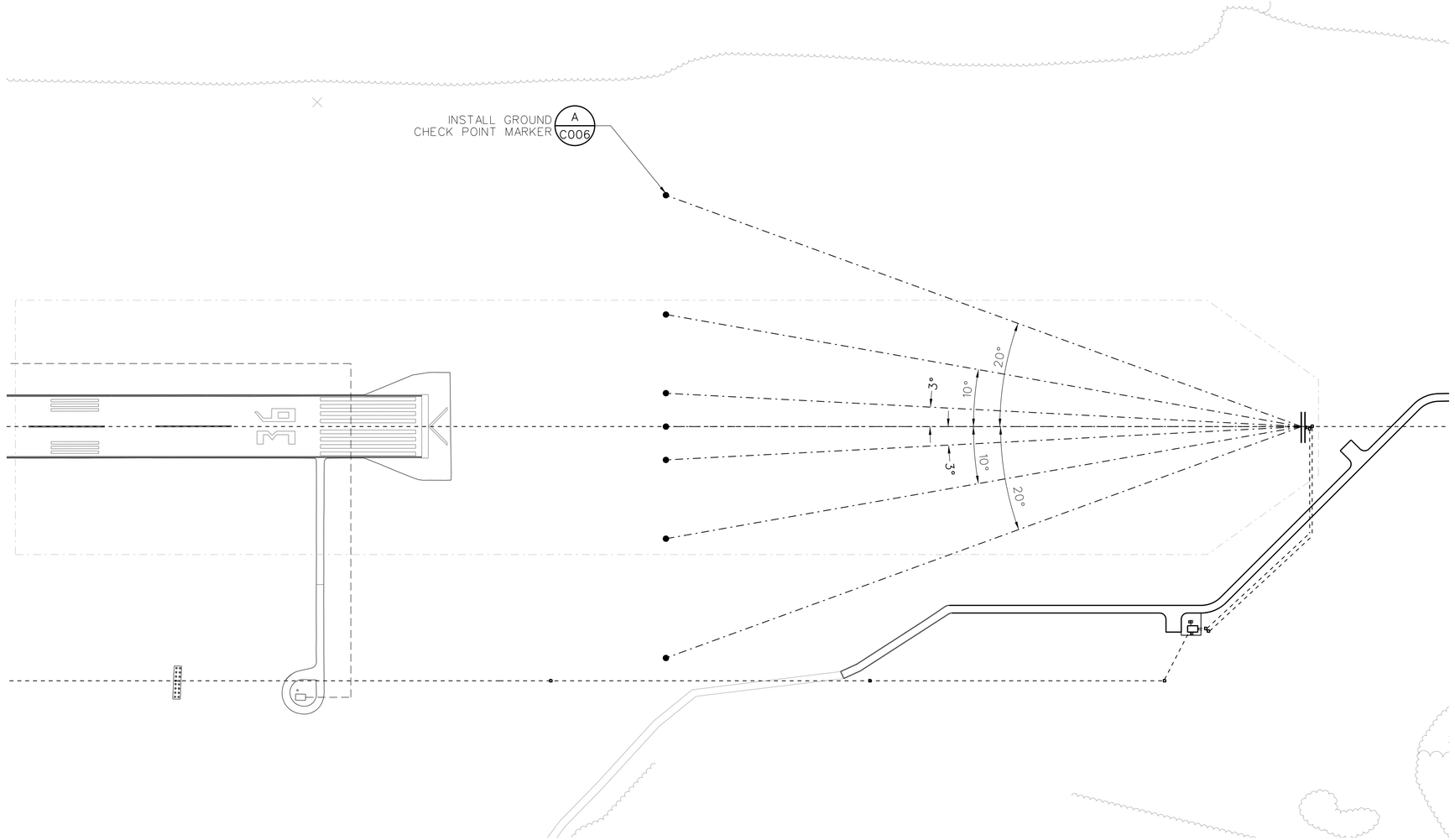
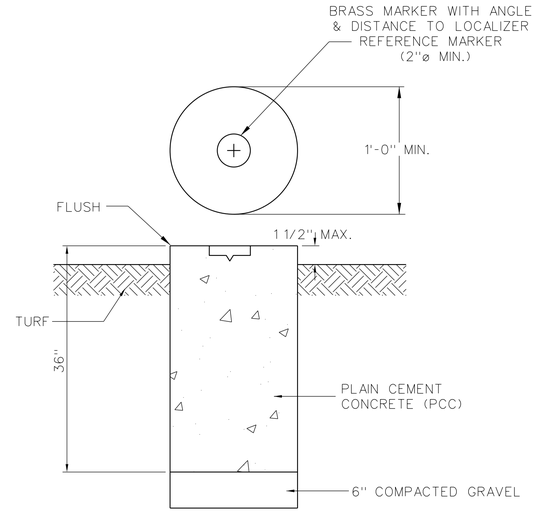


1 C006 PLAN - GROUND CHECK POINTS
SCALE: 1"=100'-0"



A C006 DETAIL - GROUND CHECK POINT MARKER
NOT TO SCALE

NOTES:

1. SEVEN LOCALIZER GROUND CHECK POINTS SHALL BE LAID OUT BY A SURVEYOR, LICENSED IN THE STATE OF NEW HAMPSHIRE. THE SURVEY SHALL ORIGINATE AT THE LOCALIZER ANTENNA ARRAY GEOGRAPHIC REFERENCE POINT (ALONG THE RUNWAY EXTENDED CENTERLINE AT STATION 74+10). GROUND CHECK POINTS SHALL BE LOCATED AT THE RUNWAY CENTERLINE, 3°, 10°, 20°, AND 30°. GROUND CHECK POINTS SHALL BE AT LEAST 1000 FEET FROM THE LOCALIZER GEOGRAPHIC REFERENCE POINT.
2. THE GROUND CHECK POINT AT CENTERLINE SHALL BE MARKED BY A PK NAIL IN THE RUNWAY PAVEMENT.
3. THE GROUND CHECK POINTS AT 3° SHALL BE MARKED BY A PK NAIL IF ON RUNWAY PAVEMENT OR A GROUND CHECK POINT MARKER IF ON THE GRASS.
3. GROUND CHECK POINTS LOCATED OFF PAVEMENT SHALL BE MARKED USING A GROUND CHECK POINT MARKER (DETAIL A)

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LOC
RUNWAY 18 LOCALIZER AND DME GROUND CHECK POINTS

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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	PROJECT ENGINEER	MGR: ENGINEERING CENTER

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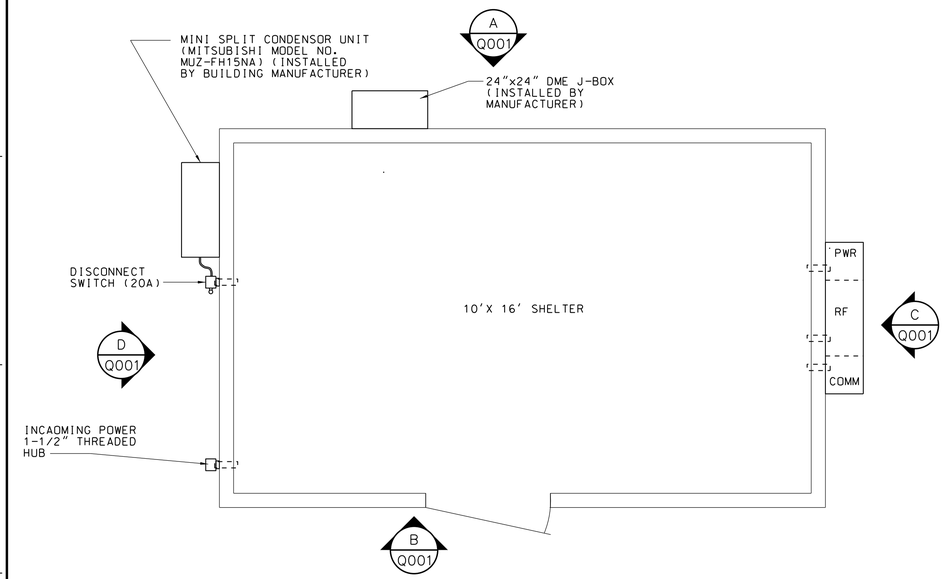
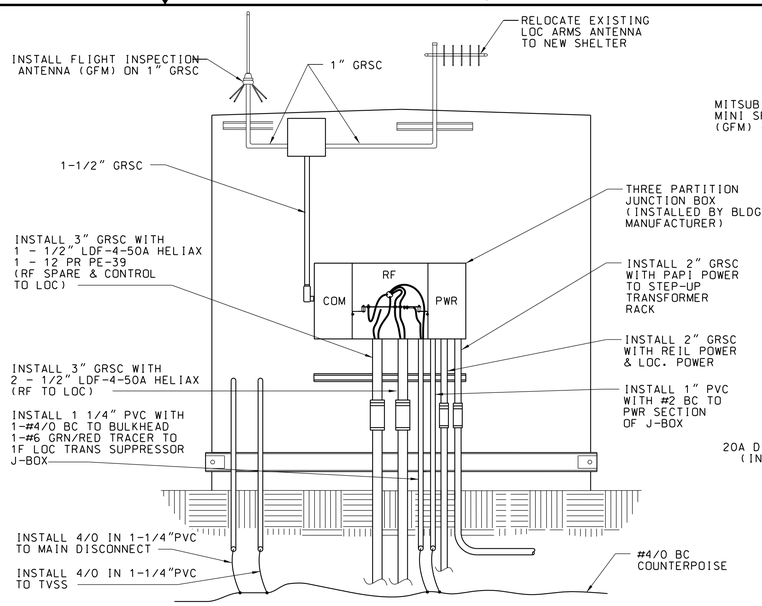
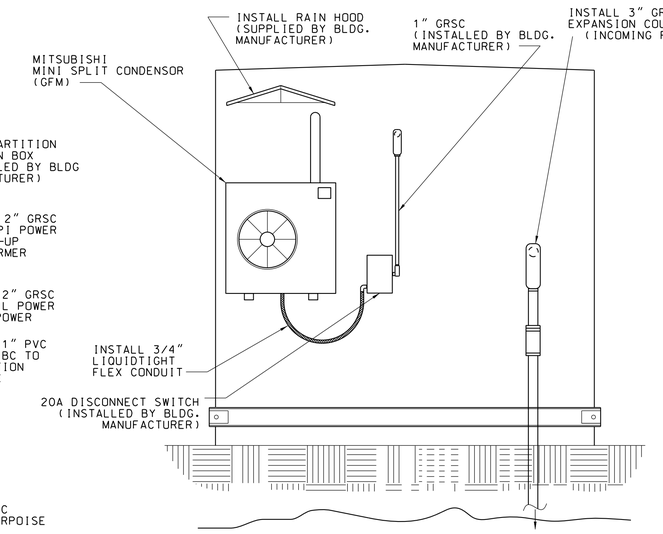


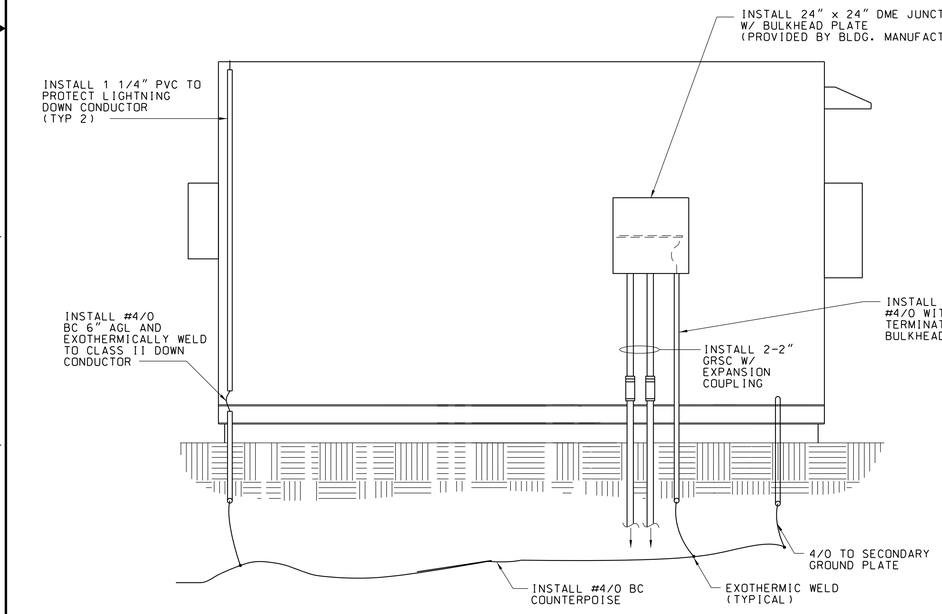
1 Q001 SHELTER PLAN
SCALE: 1/2" = 1'-0"



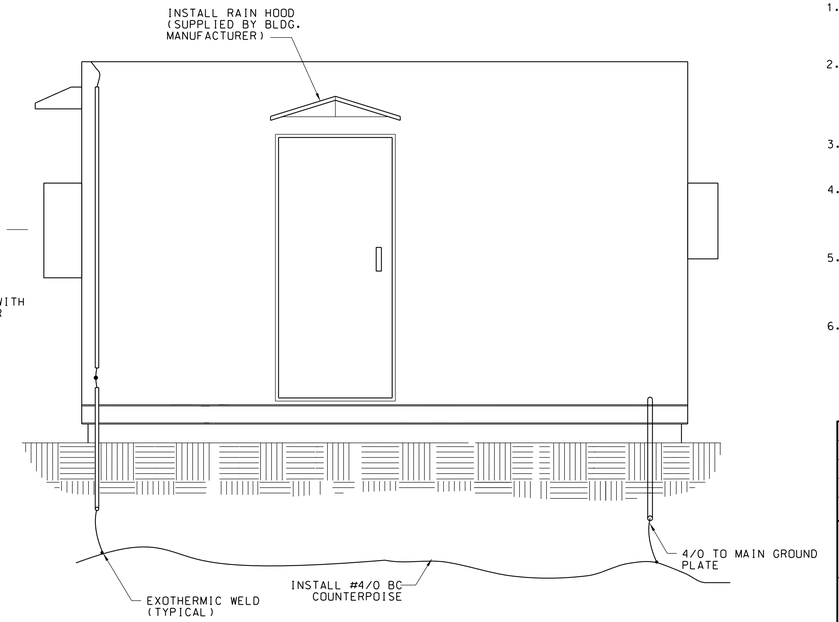
C Q001 EXTERIOR ELEVATION SOUTH WALL
SCALE: 1/2" = 1'-0"



D Q001 EXTERIOR ELEVATION NORTH WALL
SCALE: 1/2" = 1'-0"



A Q001 EXTERIOR ELEVATION EAST WALL
SCALE: 1/2" = 1'-0"



B Q001 EXTERIOR ELEVATION WEST WALL
SCALE: 1/2" = 1'-0"

1' 0 1' 2' 5'
SCALE: 1/2" = 1'-0"

NOTES:

1. THE CONTRACTOR SHALL REMOVE THE LOCALIZER AND DME EQUIPMENT FROM THE EXISTING LOCALIZER EQUIPMENT SHELTER IN COORDINATION WITH THE FAA. THE ELECTRONIC EQUIPMENT SHALL BE INSTALLED IN THE NEW SHELTER (ONCE IN PLACE).
2. THE CONTRACTOR SHALL INSTALL FLIGHT CHECK ANTENNA, INTERIOR LIGHT COVERS AND BULBS, TIE-DOWN PLATES, FIBERGLASS DOOR HOOD, EMERGENCY LIGHT BATTERY, AND ALL OTHER ITEMS SHIPPED WITH THE SHELTER. INSTALLATION SHALL BE ACCORDING TO MANUFACTURER'S SPECIFICATIONS. THESE ITEMS ARE SHIPPED LOOSE WITH THE SHELTER.
3. THE CONTRACTOR SHALL INSTALL THE LIGHTNING PROTECTION PACKAGE (ROOF COUNTERPOISE, LIGHTNING RODS, DOWN CONDUCTORS, ETC.) ON THE SHELTER ONCE SET IN PLACE. LIGHTNING PACKAGE IS GFM.
4. ALL UNDERGROUND CONDUITS TERMINATING AT THE SHELTER SHALL BE GRSC FOR AT LEAST THE LAST 10 FEET AND EXTEND 5 FEET BEYOND THE COUNTERPOISE UNLESS STATED OTHERWISE. ALL BURIED GRSC SHALL BE GROUNDED TO THE COUNTERPOISE WITH #2 BARE COPPER CONNECTED BY AN EXOTHERMIC WELD.
5. THE SHELTER MANUFACTURER WILL INSTALL INTERIOR EMT CONDUIT AND WIRING TO THE EXTENT POSSIBLE. ONCE THE ELECTRONIC EQUIPMENT IS INSTALLED IN THE SHELTER, THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL REQUIRED CONDUIT TO COMPLETE THE INSTALLATION TO THE DESIGNATED EQUIPMENT.
6. ALL CONDUITS ENTERING SHELTER OR JUNCTION BOXES FROM BELOW GRADE SHALL BE SEALED WITH DUCT SEAL.

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LOC
RUNWAY 18 LOCALIZER AND DME SHELTER EXTERIOR DETAILS

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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	PROJECT ENGINEER	MGR: ENGINEERING CENTER
	DESIGNED MK	DATE 01/30/2023 JCN 1998376
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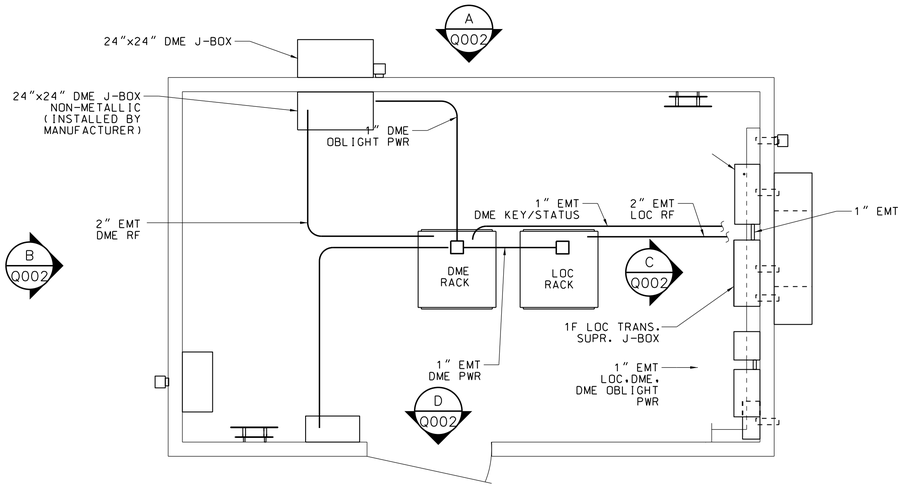
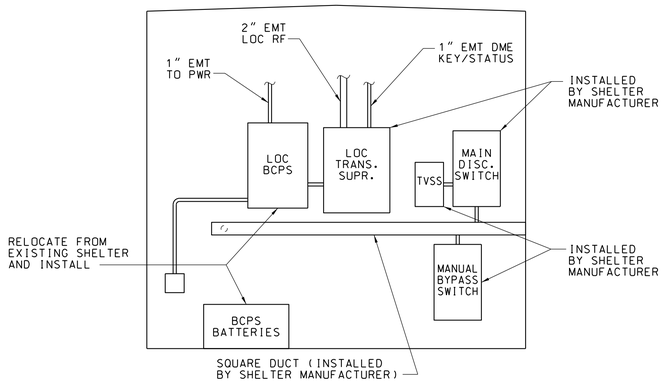
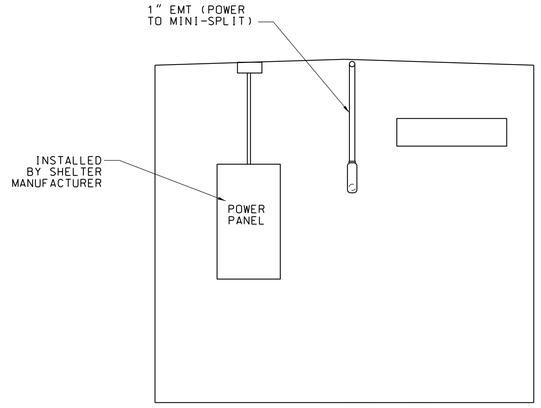


1 Q002 INTERIOR SHELTER PLAN
SCALE: 1/2" = 1'-0"



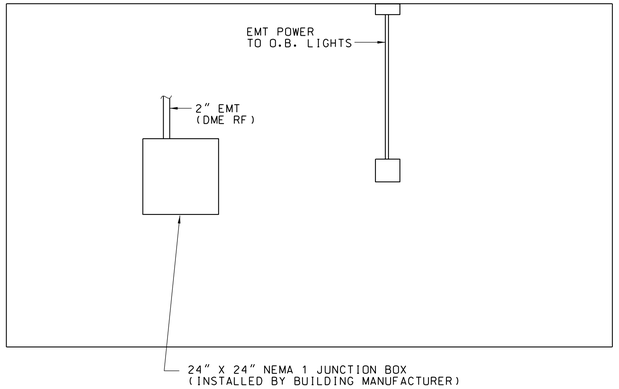
C Q002 INTERIOR ELEVATION RIGHT WALL
SCALE: 1/2" = 1'-0"



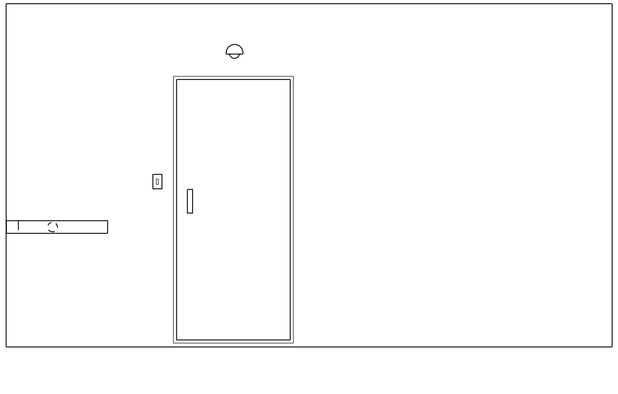
B Q002 INTERIOR ELEVATION LEFT WALL
SCALE: 1/2" = 1'-0"

NOTES:

1. THE CONTRACTOR SHALL REMOVE THE LOCALIZER AND DME EQUIPMENT FROM THE EXISTING LOCALIZER EQUIPMENT SHELTER IN COORDINATION WITH THE FAA. THE ELECTRONIC EQUIPMENT SHALL BE INSTALLED IN THE NEW SHELTER (ONCE IN PLACE).
2. THE CONTRACTOR SHALL INSTALL FLIGHT CHECK ANTENNA. INTERIOR LIGHT COVERS AND BULBS. TIE-DOWN PLATES. FIBERGLASS DOOR HOOD. EMERGENCY LIGHT BATTERY. AND ALL OTHER ITEMS SHIPPED WITH THE SHELTER. INSTALLATION SHALL BE ACCORDING TO MANUFACTURER'S SPECIFICATIONS. THESE ITEMS ARE SHIPPED LOOSE WITH THE SHELTER.
3. THE CONTRACTOR SHALL INSTALL THE LIGHTNING PROTECTION PACKAGE (ROOF COUNTERPOISE. LIGHTNING RODS. DOWN CONDUCTORS. ETC.) ON THE SHELTER ONCE SET IN PLACE. LIGHTNING PACKAGE IS GFM.
4. ALL UNDERGROUND CONDUITS TERMINATING AT THE SHELTER SHALL BE GRSC FOR AT LEAST THE LAST 10 FEET AND EXTEND 5 FEET BEYOND THE COUNTERPOISE UNLESS STATED OTHERWISE. ALL BURIED GRSC SHALL BE GROUNDED TO THE COUNTERPOISE WITH #2 BARE COPPER CONNECTED BY AN EXOTHERMIC WELD.
5. THE SHELTER MANUFACTURER WILL INSTALL ALL INTERIOR EMT CONDUIT AND WIRING TO THE EXTENT POSSIBLE. ONCE THE ELECTRONIC EQUIPMENT IS INSTALLED IN THE SHELTER. THE CONTRACTOR SHALL PROVIDE AND INSTALL ALL REQUIRED CONDUIT TO COMPLETE THE INSTALLATION TO THE DESIGNATED EQUIPMENT.
6. ALL CONDUITS ENTERING SHELTER SHALL BE SEALED WITH DUCT SEAL.



A Q002 INTERIOR ELEVATION REAR WALL
SCALE: 1/2" = 1'-0"



D Q002 INTERIOR ELEVATION FRONT WALL
SCALE: 1/2" = 1'-0"

1' 0 1' 2' 5'
SCALE: 1/2" = 1'-0"

REV	APPROVED DATE	DESCRIPTION	JCN	REDLINE DATE	APVD
	01/30/2023	CONSTRUCTION, WR #20330	1998376		

DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC
RUNWAY 18 LOCALIZER AND DME SHELTER INTERIOR DETAILS

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
	PROJECT ENGINEER	MGR: ENGINEERING CENTER

DESIGNED MK | DRAWN MK | CHECKED DC
ISSUED BY: ENGINEERING SERVICES NAVAIDS
DATE 01/30/2023 | JCN 1998376
DRAWING NO LEB-1998376-Q002 | REV

ISSUED FOR: CONSTRUCTION

THIS DRAWING PRODUCED ON NEW ENGLAND REGION MICROSTATION SYSTEM

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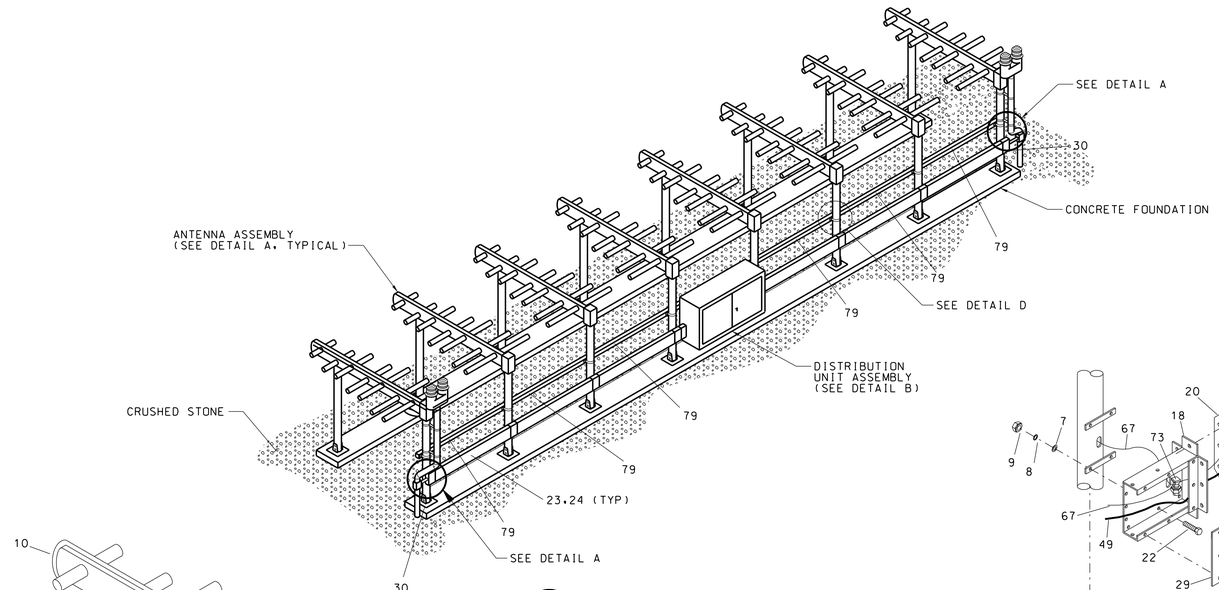
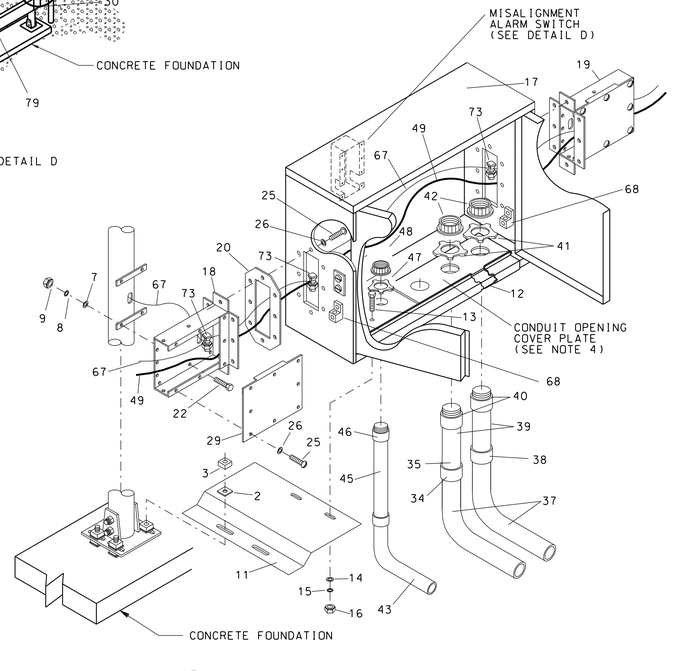
Plotted by: SRVC-CAEI-EDMS-COORD
EDM: lab-1998376-q002.dgn

ITEM	QTY & ELE	PARTS LIST DESCRIPTION	WPN
72	6	HEX NUT, #10 - 32	930001-0304
73	10	SPLIT BOLT CONNECTOR (KS17)	229911-0004
74	3	GROUND ROD, 3/4" x 10'	*

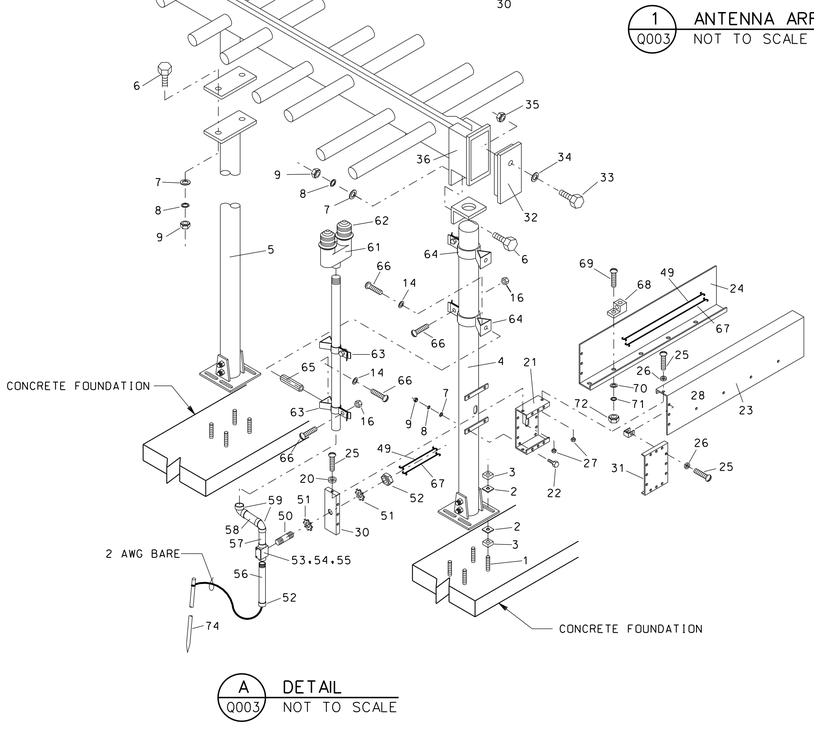
ITEM	QTY & ELE	PARTS LIST DESCRIPTION	WPN
1	64	ANCHOR BOLT, 5/8" - 11 x 10"	*
2	128	FLAT SQUARE WASHER, 5/8"	*
3	128	SQUARE NUT, 5/8" - 11	*
4	8	REAR SUPPORT ASSEMBLY	119006-0001
5	8	FRONT SUPPORT ASSEMBLY	119007-0001
6	32	HEX BOLT, 5/16" - 18 x 1 1/2"	919063-0032
7	64	FLAT WASHER, 5/16"	925000-0812
8	64	LOCK WASHER, 5/16"	926001-0083
9	64	HEX NUT, 5/16" - 18	930000-2314
10	8	ANTENNA ELEMENT	447837-0100
11	1	RIGHT DISTRIBUTION UNIT MOUNTING BRACKET	093431-0001
12	1	LEFT DISTRIBUTION UNIT MOUNTING BRACKET	093431-0002
13	36	HEX BOLT, 1/4" - 20 x 3/4"	919065-0005
14	52	FLAT WASHER, 1/4"	925001-0007
15	52	LOCK WASHER, 1/4"	926001-0082
16	44	HEX NUT, 1/4" - 20	930000-2254
17	1	DISTRIBUTION UNIT ASSEMBLY	119106-0001
18	1	RACEWAY, RIGHT CABLE ADAPTER	119233-0001
19	1	RACEWAY, LEFT CABLE ADAPTER	119233-0002
20	2	RACEWAY ADAPTER GASKET (D.U.)	265050-0001
21	6	RACEWAY, CABLE WRAPPER, 14" LONG	119010-0001
22	32	HEX BOLT, 5/16" - 18 x 1"	919063-0030
23	6	RACEWAY, CABLE SECTION TOP, 68" LONG	281620-0002
24	6	RACEWAY, CABLE SECTION BOTTOM, 68" LONG	281620-0003
25	178	MACHINE SCREW, #8 - 32 x 1/2"	915014-0045
26	178	FLAT WASHER, #8	925000-0807
27	70	SELF LOCKING NUT, #8 - 32	100482-0008
28	92	SPEED NUT, #8 - 32	100999-0001
29	2	RACEWAY ADAPTER COVER	488721-0001
30	2	RACEWAY END CAP	281621-0001
31	6	COVER, RACEWAY WRAPPER	488592-0001
32	8	WEATHER SHIELD CAP, SEE NOTE 4	265048-0001
33	16	HEX BOLT, 1/4" - 20 x 4 1/4"	919070-0024
34	16	FLAT WASHER, 1/4"	925000-0810
35	16	HEX NUT, 1/4" - 20	930026-0003
36	8	CHANNEL WEATHER CAP GASKET	265047-0001
37	2	4" SCH 40 PVC SWEEP ELL	*
38	2	CPLG, CND 4" PVC	*
39	2	4" SCH 40 PVC CONDUIT	*
40	2	4" MALE PVC ADAPTER	*
41	2	4" CONDUIT LOCKNUT	*
42	2	4" INSULATED BUSHING	*
43	1	1 1/4" SCH 40 PVC SWEEP ELL	*
44	1	1 1/4" PVC CONDUIT COUPLING	*
45	1	1 1/4" SCH 40 PVC CONDUIT	*
46	1	1 1/4" MALE PVC ADAPTER	*
47	1	1 1/4" CONDUIT LOCKNUT	*
48	1	1 1/4" INSULATED BUSHING	*
49	110'	POWER CABLE, #12 - 2UF	111456-0002
50	2	CONDUIT NIPPLE, 3/4" x 5" LONG	033586-0006
51	4	LOCKNUT, 3/4"	033514-0001
52	2	3/4" INSULATED BUSHING	033737-0002
53	2	3/4" UNILET "T"	033588-0001
54	2	UNILET COVER	033590-0001
55	2	COVER GASKET	264838-0002
56	2	CONDUIT, 3/4" x 30" LONG	033671-0004
57	2	CONDUIT NIPPLE, 3/4" x 3" LONG	033586-0001
58	2	CONDUIT NIPPLE, 3/4" x 10" LONG	033586-0005
59	4	45 DEGREE CONDUIT ELL	033754-0002
60	2	CONDUIT, 3/4" x 40" LONG	033671-0001
61	2	OBSTRUCTION LIGHT	035707-0001
62	4	LED LIGHT	
63	4	3/4" CONDUIT HANGER	033698-0002
64	4	2 1/2" CONDUIT HANGER	033698-0008
65	4	TAPPED HEX SPACER, 1 1/2" LONG	270706-6677
66	16	MACHINE SCREW, 1/4" - 20 x 1/2"	915016-0079
67	130'	#6 BARE WIRE	110041-0001
68	8	SOLDERLESS GROUND LUG (L70)	025986-0001
69	6	MACHINE SCREW, #10 - 32 x 1/2"	915025-0063
70	6	FLAT WASHER, #10	925000-0808
71	6	LOCK WASHER, #10	926001-0081



1 Q003 ANTENNA ARRAY ISOMETRIC
NOT TO SCALE



B Q003 DISTRIBUTION UNIT ASSEMBLY
NOT TO SCALE



A Q003 DETAIL
NOT TO SCALE

NOTE:

1. CONNECTION TO ITEM #67 MADE WITH ITEM 73 (SPLIT BOLT CONN.) INSIDE CABLE TROUGH.
2. ITEMS MARKED WITH AN ASTERISK (*) ARE CONTRACTOR FURNISHED.
3. THE CONTRACTOR SHALL VERIFY THE SIZE OF THE EXISTING POWER, CONTROL, SIGNAL, AND GROUND CONDUITS TO THE DISTRIBUTION UNIT. THE CONDUITS MAY VARY IN SIZE FROM WHAT IS INDICATED ON THE PARTS LIST (ITEM 37-48).
4. LOCATE CONDUITS TO MATCH EXISTING OPENINGS IN THE BOTTOM OF THE DISTRIBUTION UNIT.

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ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC
RUNWAY 18 LOCALIZER AND DME LOC ANTENNA DETAILS

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
	PROJECT ENGINEER	MGR: ENGINEERING CENTER
DESIGNED MK	ISSUED BY: ENGINEERING SERVICES NAVAIDS	DATE 01/30/2023 JCN 1998376
DRAWN MK		DRAWING NO. LEB-1998376-Q003 REV
CHECKED DC		

ISSUED FOR: CONSTRUCTION

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EDM: lab-1998376-q003.dgn

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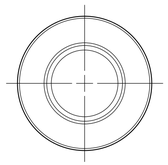

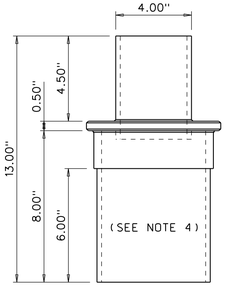

2 Q004 DME ANTENNA TOP CAP
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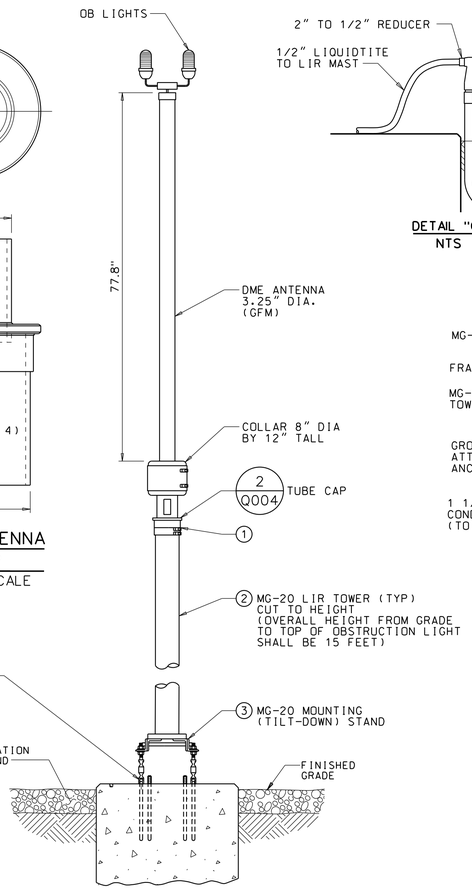

1 Q004 MG-20 (TILT-DOWN) LIR TOWER ELEVATION - DME
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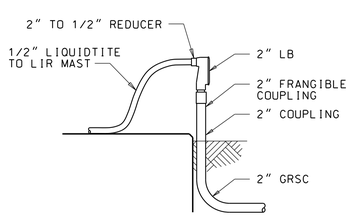
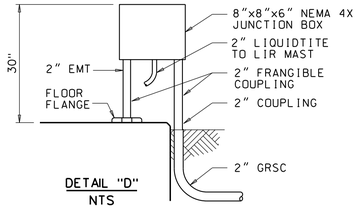
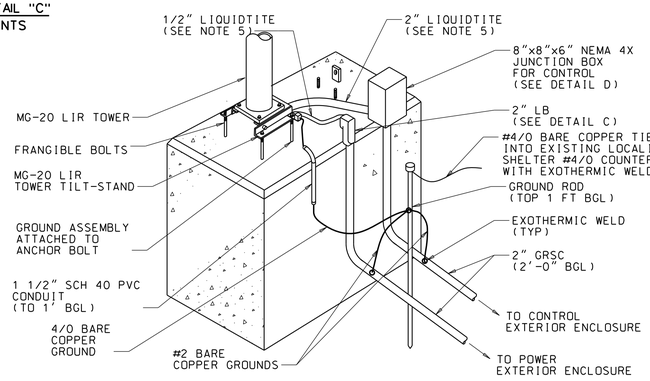


DETAIL "C"
NTS



DETAIL "D"
NTS



3 Q004 DME ANTENNA FOUNDATION ELEVATION
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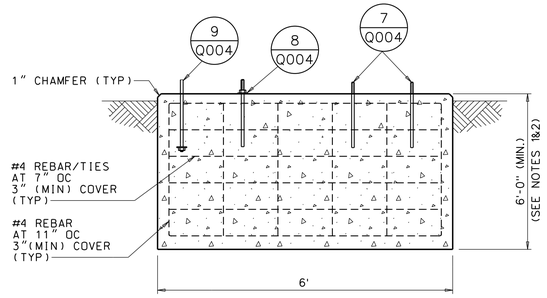
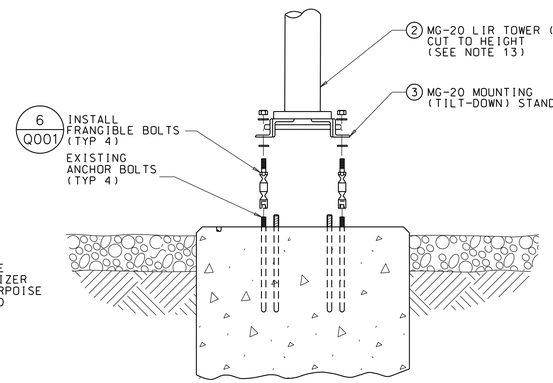
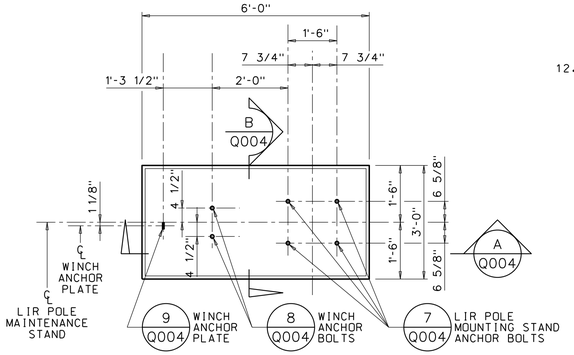


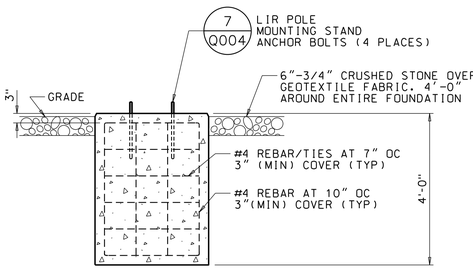
A Q001 FOUNDATION SECTION
NOT TO SCALE



4 Q004 TYPICAL FRANGIBLE BOLT INSTALLATION
NOT TO SCALE



5 Q004 FOUNDATION PLAN
NOT TO SCALE

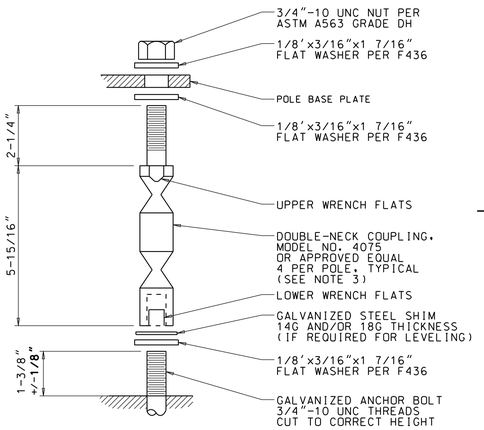


B Q004 FOUNDATION SECTION
NOT TO SCALE

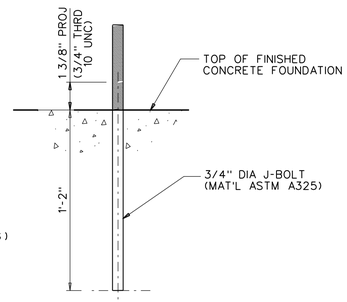
JAQUITH LIR MAST PARTS LIST		
ITEM #	DESCRIPTION	JAQUITH PART #
1	DME ANTENNA TOP CAP	L 2812 DME
2	A TUBE (MG-20 LIR TUBE)	L 9135
3	MG-20 MOUNTING STAND	L 2763
4	LIFTING/LOWERING DEVICE	L 5005
5	FRANGIBLE COUPLINGS	3 EACH

NOTES:

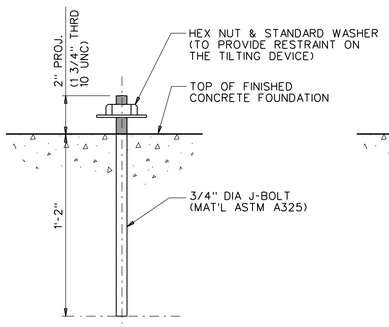
1. DESIGN LOAD FOR FOUNDATION: 25 PSF ON EXPOSED AREA OF STRUCTURE. MINIMUM SAFETY FACTOR FOR SOIL BEARING CAPACITY = 2.
2. CONCRETE FOUNDATION:
   A. CONCRETE STRENGTH = 3000 PSI@ 28 DAYS. (MIN.)
   B. SOIL BEARING CAPACITY = 3000 PSF. (MIN.)
   C. SECURELY PLACE ALL ANCHOR BOLTS PRIOR TO PLACING CONCRETE.
   D. PLACE ALL CONCRETE ON UNDISTURBED SOIL.
   E. REINFORCEMENT STEEL PER ASTM A 615, GR. 40; TIE WIRE TO BE 16 GAUGE OR LARGER ANNEALED IRON.
3. FRANGIBLE BOLT SHALL BE JAQUITH INDUSTRIES L-5023 OR APPROVED EQUAL.
4. DME ANTENNA CAP SHALL BE JAQUITH INDUSTRIES L-2812 DME OR APPROVED EQUAL.
5. LIQUIDTITE SHALL EXTEND 2' INTO LIR TOWER MAST. PROVIDE REDUCER TO TRANSITION FROM 2" LB TO 1/2" LIQUIDTITE
6. SITE GROUNDING DETAILS ON THIS DRAWING ARE SHOWN WITH ALL SURFACE AND SUBSURFACE EARTH MATERIAL RENDERED TRANSPARENT. ONLY EXTERIOR GROUNDING IS SHOWN: REFER TO EQUIPMENT INSTALLATION AND ELECTRICAL DRAWINGS FOR INTERIOR GROUNDING REQUIREMENTS.
7. GROUND RODS SHALL BE COPPER CLAD STEEL, 3/4 INCH DIAMETER AND 10 FEET LONG. GROUND RODS ARE SPACED NO CLOSER THAN 10 FEET APART. TOP OF GROUND ROD IS NO LESS THAN 12 INCHES BELOW GRADE.
8. UNDERGROUND GROUNDING CONDUCTORS SHALL BE 24 INCHES (MINIMUM) BELOW GRADE EXCEPT AT GROUND RODS AND AS OTHERWISE INDICATED.
9. ALL UNDERGROUND GROUND CONNECTIONS SHALL BE EXOTHERMICALLY WELDED UNLESS OTHERWISE INDICATED.
10. ALL UNDERGROUND GRSC SHALL BE GROUNDED TO THE GROUNDING COUNTERPOISE AND/OR GROUND ROD AT EACH END BY MEANS OF A #2 AWG BARE COPPER GROUND.
11. ALL ELECTRICAL AND ELECTRONICS GROUNDING SHALL MEET OR EXCEED ALL PROVISIONS OF THE LATEST EDITION OF: FAA-STD-019E, LIGHTING PROTECTION, GROUNDING, BONDING, AND SHIELDING REQUIREMENTS FOR FACILITIES: NFPA 70, NATIONAL ELECTRICAL CODE (NEC); NFPA 780, STANDARD FOR THE INSTALLATION OF LIGHTNING PROTECTION SYSTEMS
12. ALL DME LIR PARTS SHALL BE JAQUITH INDUSTRIES OR APPROVED EQUAL.



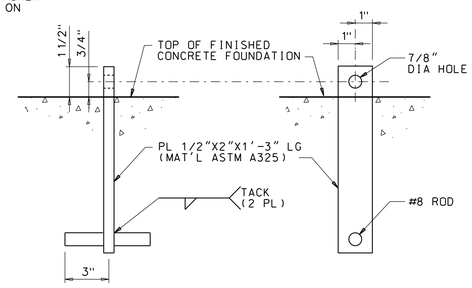
6 Q004 TYPICAL FRANGIBLE (GFM)
NO TO SCALE



7 Q004 ANCHOR BOLT
NOT TO SCALE



8 Q004 WINCH ANCHOR BOLT
NOT TO SCALE



9 Q004 WINCH ANCHOR PLATE
NOT TO SCALE

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LOC
RUNWAY 18 LOCALIZER AND DME
DME ANTENNA DETAILS

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
	PROJECT ENGINEER	MGR: ENGINEERING CENTER
	DESIGNED MK	ISSUED BY: ENGINEERING SERVICES NAVAIDS
	DRAWN MK	DATE 01/30/2023 JCN 1998376
	CHECKED DC	DRAWING NO LEB-1998376-Q004 REV

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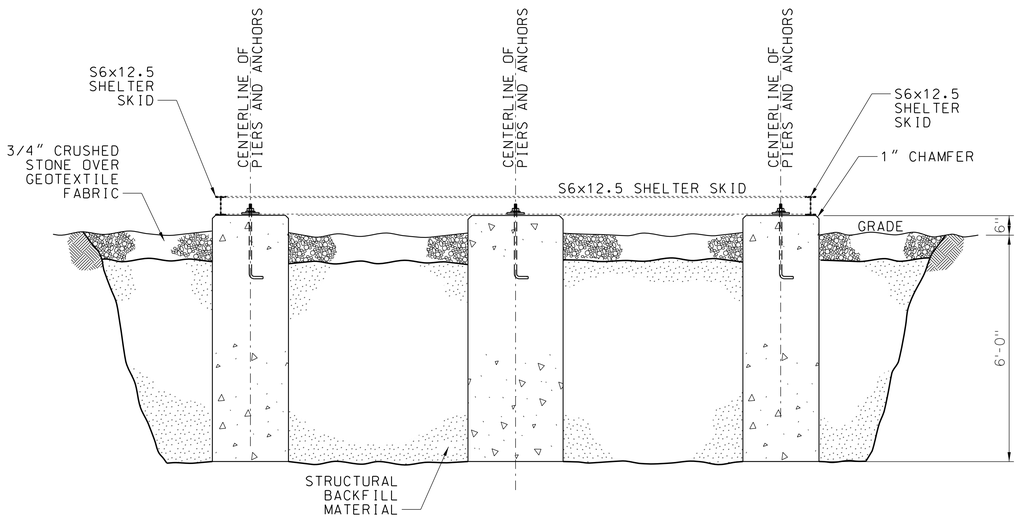
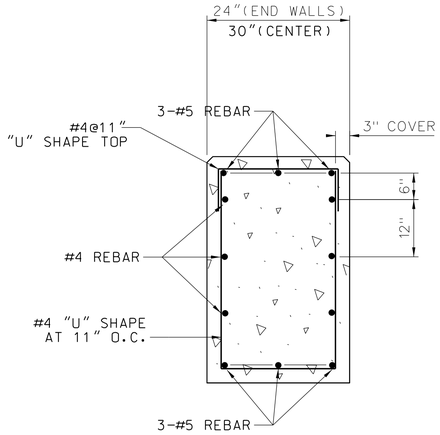
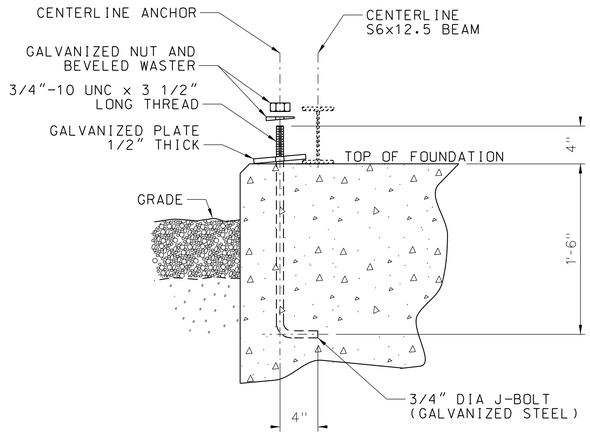


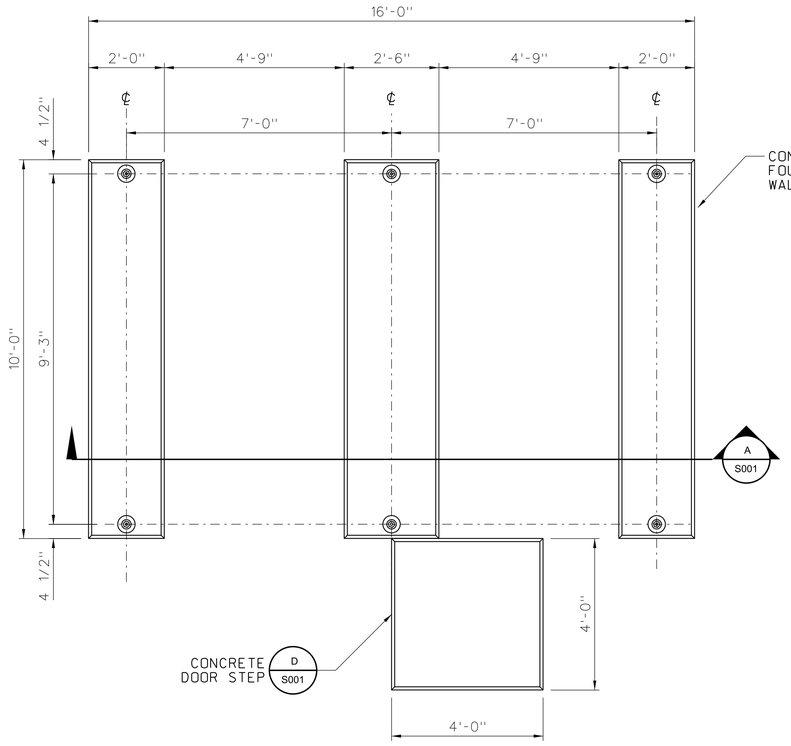
A S001 EQUIPMENT SHELTER FOUNDATION SECTION
SCALE: 1/2" = 1'-0"



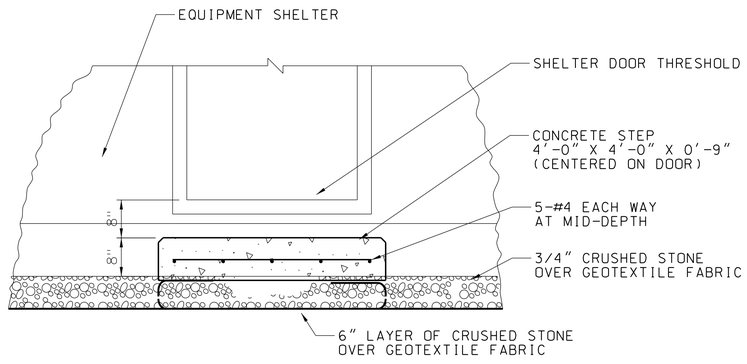
B S001 REINFORCEMENT DETAIL
NOT TO SCALE



C S001 ANCHOR BOLT DETAIL
SCALE: 1-1/2" = 1'-0"



1 C002 EQUIPMENT SHELTER FOUNDATION PLAN
SCALE: 1/2" = 1'-0"



D S001 CONCRETE DOOR STEP DETAIL
SCALE: 3/4" = 1'-0"

NOTES:

1. CONCRETE SHALL MEET STATE OF NEW HAMPSHIRE DOT STANDARDS.
2. CONCRETE SHALL DEVELOP 4000 PSI IN 28 DAYS WITH A MAXIMUM SLUMP OF 3 INCHES AND A MAXIMUM AGGREGATE SIZE OF 3/4 INCHES. ALL CONCRETE WORK SHALL COMPLY WITH ACI-304, "RECOMMENDED PRACTICE FOR MEASURING, MIXING, AND PLACING CONCRETE"; ACI-308, "STANDARD PRACTICE FOR CURING CONCRETE"; AND ACI-347, "RECOMMENDED PRACTICE FOR CONCRETE FORMWORK".
3. ALL REINFORCEMENT STEEL SHALL COMPLY WITH ASTM A615, GRADE 60.
4. FOUNDATION DESIGN ADAPTED FROM DUPONT BUILDING INC. STANDARD DRAWING 10X16STD3.
5. THE CONTRACTOR SHALL PREPARE THE BOTTOM OF THE FOUNDATION EXCAVATION SUCH THAT THE FOUNDATION IS SET ON COMPACTED STRUCTURAL GRAVEL WITH A MINIMUM BEARING CAPACITY OF 3000 POUNDS PER SQUARE FOOT.
6. CONCRETE DOOR STEPS SHALL BE INSTALLED AFTER SHELTER IS PUT IN PLACE TO ENSURE LINING UP WITH DOOR.

SCALE: 3/4" = 1'-0"
SCALE: 1/2" = 1'-0"
SCALE: 1 1/2" = 1'-0"

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LOC
RUNWAY 18 LOCALIZER AND DME SHELTER FOUNDATION DESIGN

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
	PROJECT ENGINEER	MGR: ENGINEERING CENTER
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	DRAWN MK	DATE 01/30/2023 JCN 1998376
	CHECKED DC	DRAWING NO LEB-1998376-S001 REV

ISSUED FOR: CONSTRUCTION

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EDM: lab-1998376-s001.dgn

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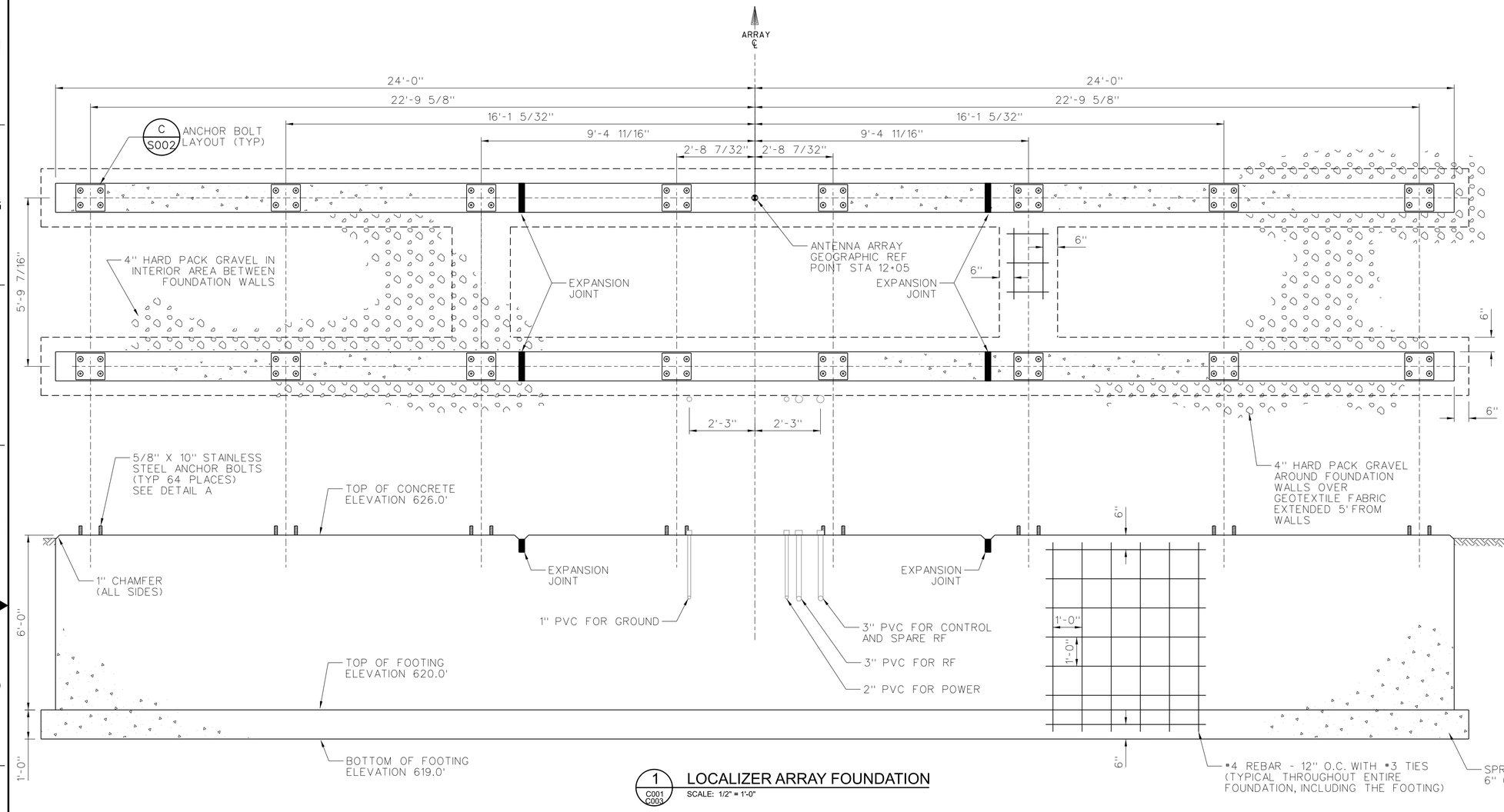
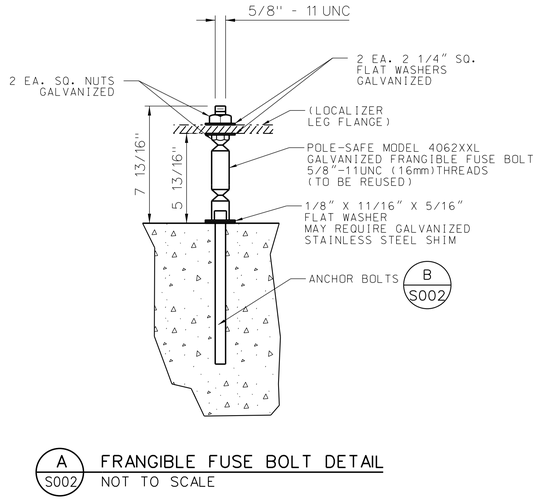


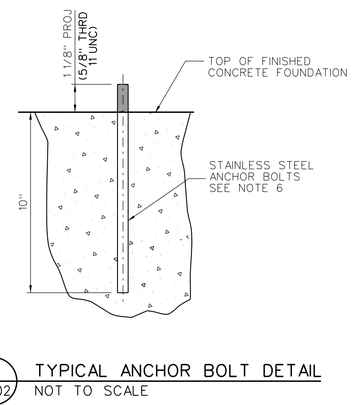
1 C001 C003 **LOCALIZER ARRAY FOUNDATION**
SCALE: 1/2" = 1'-0"

NOTES:

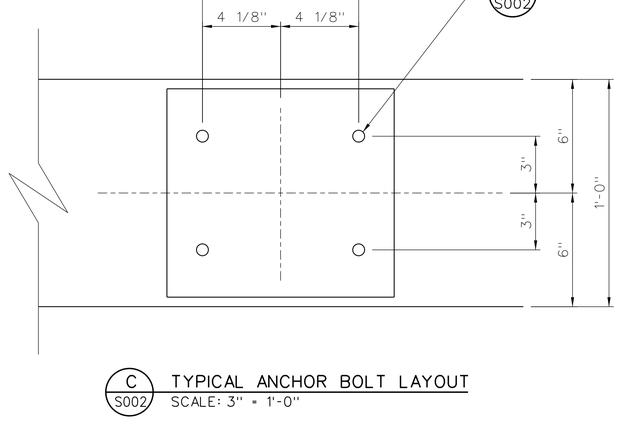
1. MAJOR AXIS OF ANTENNA ARRAY SHALL BE ALIGNED PERPENDICULAR TO EXTENDED RUNWAY CENTERLINE WITHIN +/- 0.05 DEGREES. ARRAY CENTER SHALL BE WITHIN +/- 3 INCHES FROM EXTENDED RUNWAY CENTERLINE.
2. DIMENSIONS ARE SYMMETRICAL ABOUT ARRAY/RUNWAY CENTERLINE.
3. MAXIMUM TOLERANCE FROM DIMENSIONS INDICATED SHALL BE AS FOLLOWS: FOUNDATION PIERS, FRONT TO REAR: 1/2 INCH; ANCHOR BOLTS: +/- 1/8 INCH; CONDUITS: +/- 1/8 INCH.
4. CONCRETE SHALL DEVELOP 4000 PSI IN 28 DAYS WITH A MAXIMUM SLUMP OF 3 INCHES AND A MAXIMUM AGGREGATE SIZE OF 3/4 INCHES. ALL CONCRETE WORK SHALL COMPLY WITH ACI-304, "RECOMMENDED PRACTICE FOR MEASURING, MIXING, AND PLACING CONCRETE"; ACI-308, "STANDARD PRACTICE FOR CURING CONCRETE", AND ACI-347, "RECOMMENDED PRACTICE FOR CONCRETE FORMWORK".
5. ALL REINFORCEMENT STEEL SHALL COMPLY WITH ASTM A615, GRADE 60.
6. ANCHOR BOLTS SHALL BE STAINLESS STEEL THREADED RODS AND SET IN TWO-PART EPOXY COMPOUND.
7. THE CONTRACTOR SHALL VERIFY POSITION OF THE POWER, CONTROL, SIGNAL, AND GROUND CONDUITS INTO THE BOTTOM OF THE DISTRIBUTION UNIT. THE CONDUITS MAY VARY IN POSITION FROM WHAT IS INDICATED ON THE DRAWING. LOCATE CONDUITS TO MATCH EXISTING OPENINGS IN THE DISTRIBUTION UNIT. MAKE EXISTING HOLES LARGER IF REQUIRED. EXPANSION COUPLINGS ARE NOT REQUIRED.
8. THE EXISTING GRADE SURROUNDING THE FOUNDATION SHALL BE STABILIZED AND PROTECTED FROM EROSION DURING AND IMMEDIATELY AFTER THE FOUNDATION INSTALLATION AND ALL REQUIRED EXCAVATION AND BACKFILL.
9. INSTALL BRASS MARKER TO DEPICT REFERENCE POINT.



A S002 **FRANGIBLE FUSE BOLT DETAIL**
NOT TO SCALE



B S002 **TYPICAL ANCHOR BOLT DETAIL**
NOT TO SCALE



C S002 **TYPICAL ANCHOR BOLT LAYOUT**
SCALE: 3" = 1'-0"

1' 0 1' 2' 5'
SCALE: 1/2" = 1'-0"

3" 0 3" 6" 9"
SCALE: 3" = 1'-0"

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DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC

RUNWAY 18 LOCALIZER AND DME LOC FOUNDATION DESIGN

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

REVIEWED BY	SUBMITTED BY	APPROVED BY
	PROJECT ENGINEER	MGR: ENGINEERING CENTER
	DESIGNED MK	ISSUED BY: ENGINEERING SERVICES NAVAIDS — DATE 01/30/2023 — JCN 1998376
	DRAWN MK	DRAWING NO LEB-1998376-S002 — REV
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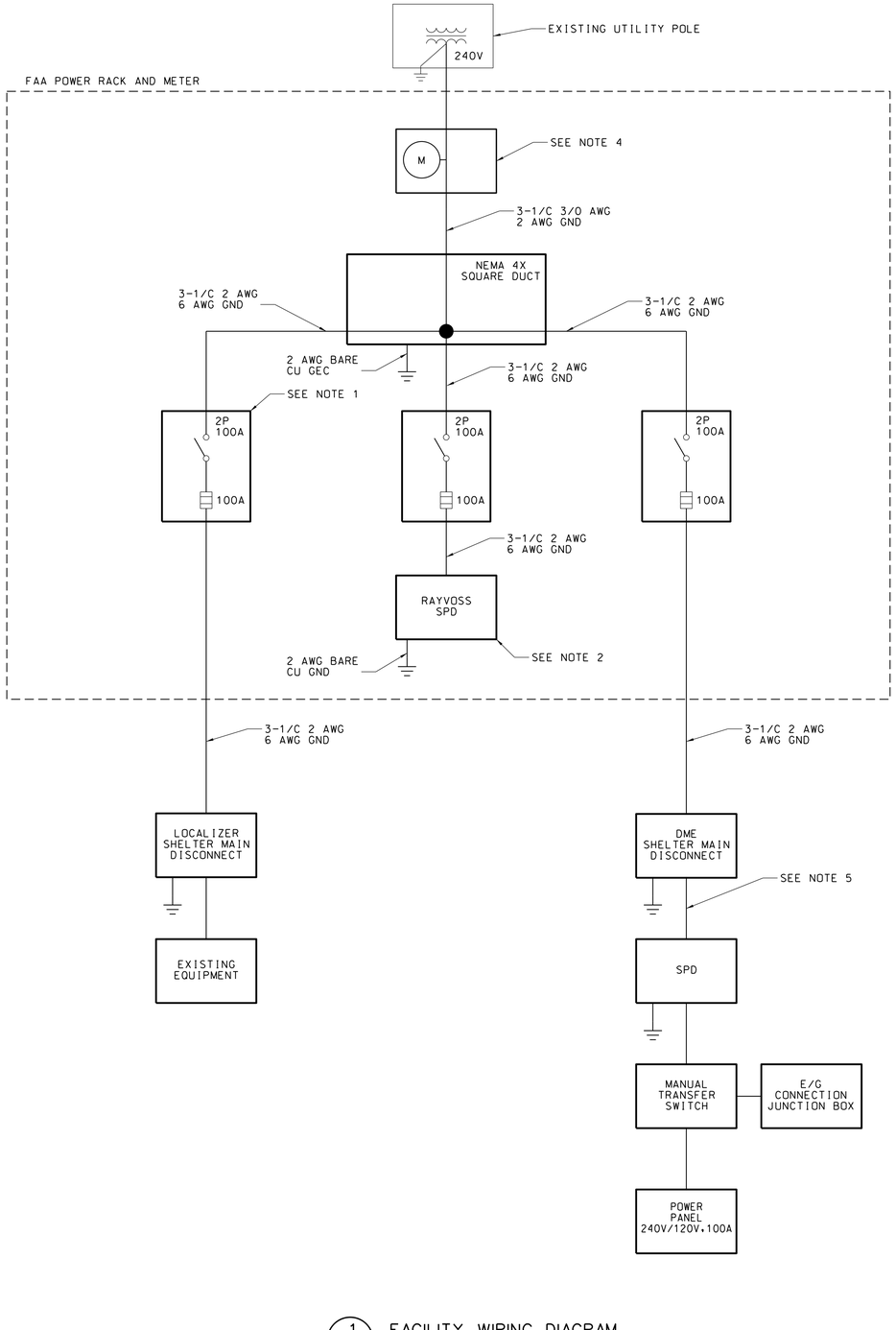

1 / E001 FACILITY WIRING DIAGRAM
NOT TO SCALE

LEGEND: (ONE LINE DIAGRAM)

- TRANSFORMER
- FUSED DISCONNECT SWITCH
- MULTITAP SPLICE
- GROUND CONNECTION TO EES
- M — UTILITY METER

NOTES:

1. METER SOCKET IS A 200A, NEMA 4X, 120/240, MANUAL BYPASS 200A BREAKER, 4 TERMINAL, RINGLESS. USE MILBANK P/N U3791N200-BL OR APPROVED EQUAL. GROUND METER TO NEUTRAL.
2. DME SHELTER WIRING FROM MAIN DISCONNECT TO THE POWER PANEL WILL BE FACTORY INSTALLED BEFORE DELIVERY. SHELTER GROUNDS WILL BE FIELD TERMINATED BY CONTRACTOR.

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LOC

RUNWAY 18 LOCALIZER AND DME ONE LINE DIAGRAM

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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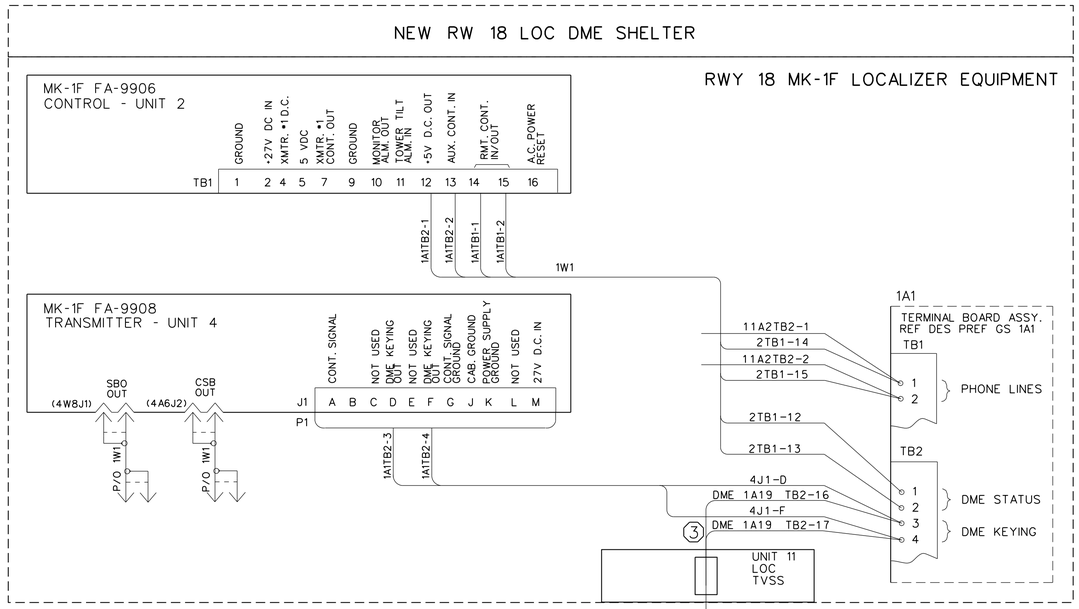
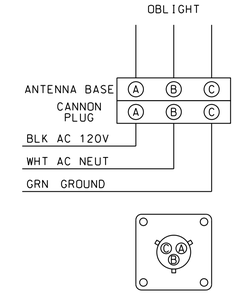
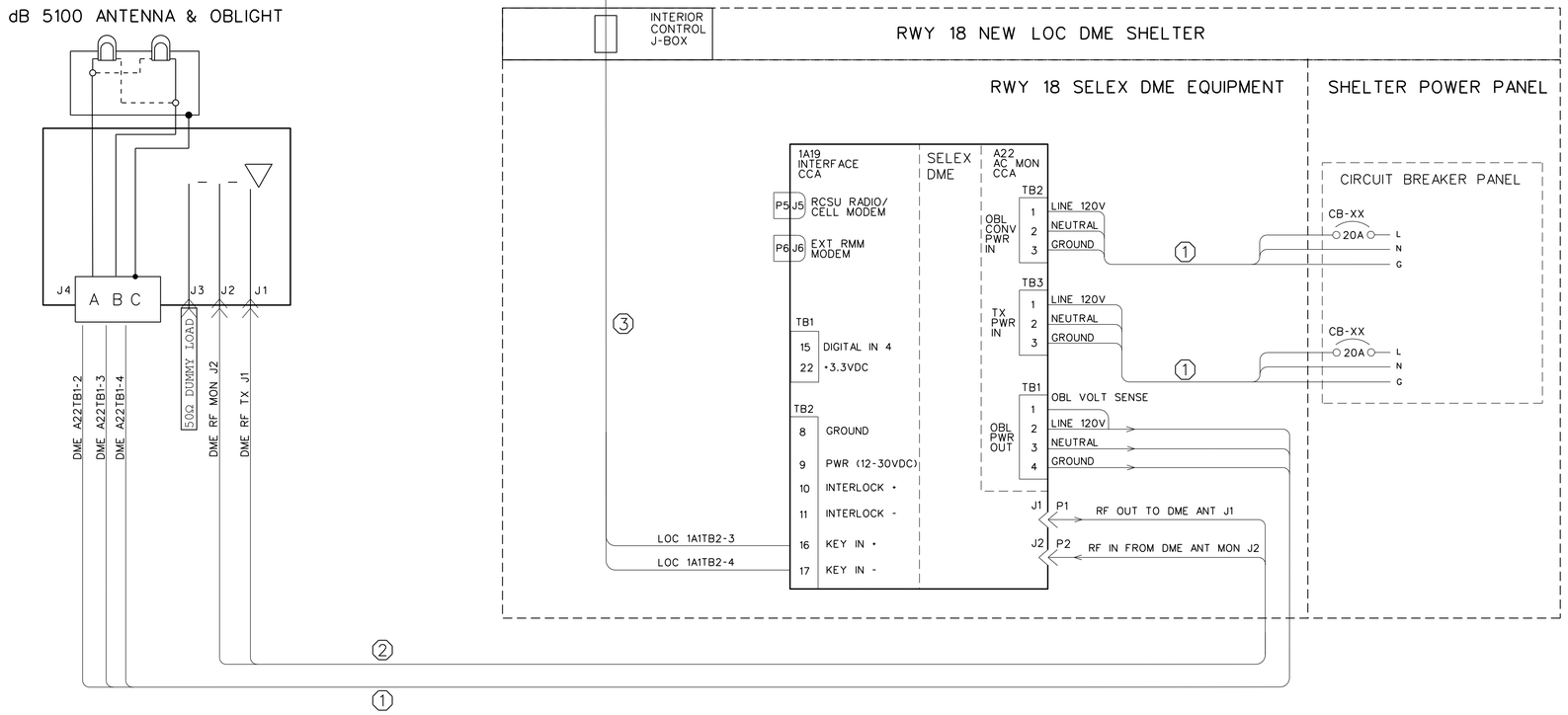


CABLE/WIRE SCHEDULE

	CABLE/WIRE TYPE	SIGNAL
1	3-1/C 12 AWG 600V, XHHW BLK/WHT/GRN	120V AC L1/N/GND
2	1/2" FSJ4-50B COAX 1/4" FSJ1-50A COAX	DME TX DME MON
3	1 PR 22 AWG TWISTED, SHIELDED CONTROL CABLE	DME IDENT +5VDC, GND
4	6 PR 19 AWG TWISTED, OVERALL SHLD PE-39 CONTROL CABLE	DME IDENT +5VDC, GND



2 / E002 OBSTRUCTION LIGHT CABLE CONNECTION
NOT TO SCALE



1 / E002 WIRING DIAGRAM
NOT TO SCALE

NOTES:

1. THE CONTRACTOR SHALL INSTALL:
   - POWER WIRING TO DME OBLIGHT FROM DME SHELTER
   - COAX CABLE TO DME ANTENNA (LEAVE ADEQUATE SLACK INSIDE OF SHELTER AND AT ANTENNA BASE. PROTECT FROM MOISTURE. TERMINATION BY OTHERS)
   - THE 6 PAIR CONTROL CABLE BETWEEN THE LOC SHELTER AND THE DME SHELTER.
2. THE CONTRACTOR SHALL TERMINATE THE 6 PAIR CONTROL CABLE IN THE INTERIOR J-BOX AT THE DME SHELTER BY REMOVING THE OUTER JACKET. CLEANING THE GEL FILLING. STRIPPING THE INSULATION FROM THE 19 AWG WIRES. AND THEN PUNCHING DOWN TO THE 66 BLOCK. THE COLOR CODE WILL START WITH WHITE OF WHITE/BLUE AND CONTINUE IN THE STANDARD TELCO CODE.
3. THE CONTRACTOR SHALL PULL THE 6 PAIR CONTROL CABLE IN TO THE LOC SHELTER INTERIOR BY REMOVING THE COVER FROM THE INSIDE J-BOX AND LEAVING AT LEAST SIX FEET OF CLEANED CONTROL CABLE INSIDE OF THE SHELTER. TERMINATION WILL BE DONE BY OTHERS.
4. CIRCUIT BREAKER NUMBERS ARE LISTED AS "XX" AND MUST BE UPDATED BY FAA INSTALLERS AFTER INSTALLATION.

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ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC
RUNWAY 18 LOCALIZER AND DME DME WIRING DIAGRAM

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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PROJECT ENGINEER		MGR: ENGINEERING CENTER	
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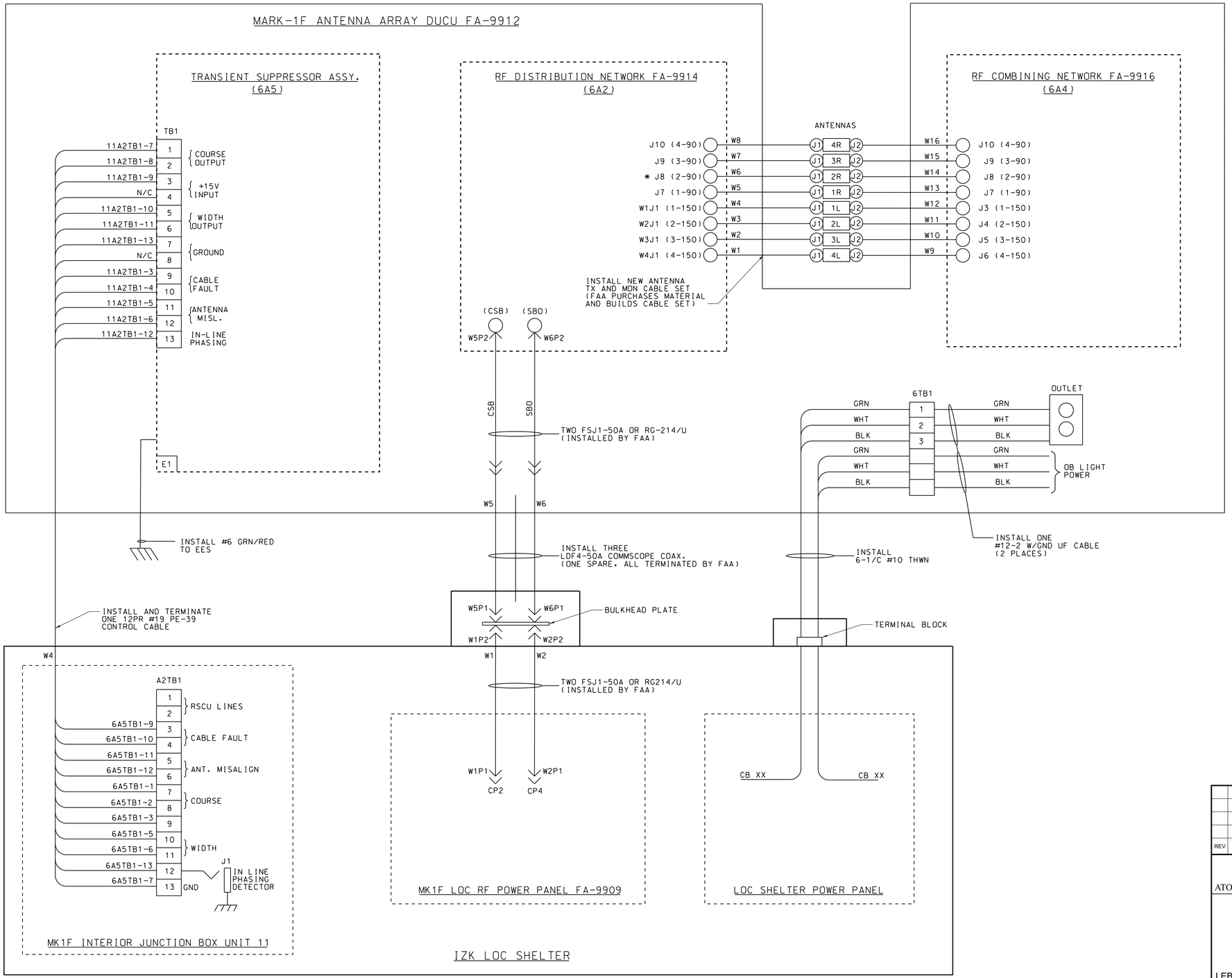

1 / E001 WIRING DIAGRAM MK 1F LOCALIZER
NOT TO SCALE

NOTES:

1. CONTRACTOR TASKS ON THIS DRAWING:
   - PURCHASE COMMSCOPE LDF4-50A, 12PR #19 PE-39 CONTROL CABLE, #10 THWN, AND 12/2 UF CABLE
   - INSTALL LDF4-50A FROM LOC OUTSIDE J-BOX TO ANTENNA ARRAY
   - SEAL ENDS OF LDF4-50A AND LEAVE FOR FAA TO TERMINATE
   - INSTALL 12PR #19 FROM LOC INSIDE J-BOX TO ANTENNA ARRAY
   - TERMINATE 12PR #19 AT INSIDE J-BOX A2TB1 AND ANTENNA ARRAY 6A5TB, INCLUDING GROUNDING OF CABLE SHIELD AND UNUSED CONDUCTORS AT ONE END OF THE RUN
   - INSTALL 6-1/C #10 THWN FROM SHELTER POWER PANEL TO LOC OUTSIDE J-BOX TERMINAL BLOCK
   - INSTALL 6-1/C #10 THWN FROM LOC OUTSIDE J-BOX TO ANTENNA ARRAY TERMINAL BLOCK
   - INSTALL ONE 12/2 UF CABLE FROM ANTENNA ARRAY TERMINAL BLOCK TO OB. LIGHT AND ONE TO THE CONVENIENCE RECEPTACLE
2. COMMSCOPE LDF4-50A CABLE RUNS MUST COME OFF OF THE SAME PRODUCTION REEL.
3. LDF4-50A CABLE ENDS MUST BE PROTECTED FROM WATER ENTRY AT ALL TIMES.
4. ALL CABLE AND WIRING MUST BE TESTED IN THE PRESENCE OF THE RESIDENT ENGINEER. REQUIRED TESTS AND METHODS ARE DESCRIBED ON THE GENERAL NOTES PAGE.

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	01/30/2023	CONSTRUCTION, WR #20330	1998376		

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FEDERAL AVIATION ADMINISTRATION
ATO - TECHNICAL OPERATIONS — EASTERN SERVICE AREA

LOC
RUNWAY 18 LOCALIZER AND DME ONE LINE DIAGRAM

LEBANON — LEBANON MUNICIPAL AIRPORT — NH

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	PROJECT ENGINEER	MGR: ENGINEERING CENTER

DESIGNED	DRAWN	CHECKED	ISSUED BY	DATE	JCN	DRAWING NO	REV
MK	MK	DC	ENGINEERING SERVICES NAVAIDS	01/30/2023	1998376	LEB-1998376-E003	

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