



Engineers Architects Planners

Acknowledgment

Number of pages including cover sheet: _____

To: **All Plan Holders**

Fax Number: _____

From: **Barry J. Hammer, P.E.
Gale Associates, Inc.**

Job Number: **776440**

Date: **May 5, 2009**

Message:

Attached is Addendum No. 1 to the Contract Documents for:

**RECONSTRUCT TOWER APRON
(APPROX. 850 LF X 250 LF)**

NHDOT NO. SBG 12-03-2009

Per the Contract Documents, all bidders shall acknowledge receipt of this addendum by printing their company name, date, and name of an authorized representative in the space provided below, signing this sheet and faxing to 603-471-1809 or emailing it to bjh@gainc.com at Gale Associates, Inc. no later than 11:00 a.m. on Monday, May 5, 2009.

Company Name:

Name of Authorized Representative:

Signature of Authorized Representative:

Date:

ADDENDUM NO. 1

**RECONSTRUCT TOWER APRON
(APPROX. 850 LF X 250 LF)**

**BOIRE FIELD
NASHUA, NEW HAMPSHIRE**

NHDOT NO. SBG 12-03-2009

The attention of all bidders submitting proposals for the above project is called to the following changes to the Contract Documents. The items set forth herein, whether of clarification, omission, addition, or substitution are to be included in and shall form a part of the proposal submitted.

Bidders shall acknowledge receipt of the Addendum by writing the words, "Addendum No. 1" and inserting a date of May 5, 2009 on the lines provided for such on Page P-1 of the Proposal Documents.

GENERAL

Addendum Item No. 1.1

CLARIFICATION. Temporary power for the engineer's field office shall be provided by the airport. Establishment of a temporary service with the utility company will not be required. However, the contractor will be required to make all required connections and modifications to establish power to the engineers office trailer.

Addendum Item No. 1.2

CLARIFICATION. Time limitations have been specified for the application of both M-007-1 Slurry Seal and P-620-1 Pavement Markings. Due to the total contract time specified and the restrictions on application of the aforementioned items Stop Work Order requests will be entertained by the Owner for the required waiting periods.

SPECIFICATIONS – INVITATION TO BID:

Addendum Item No. 1.3

REMOVE and REPLACE the second sentence of the second paragraph of section 11 on Page I-7 with the following:

"The Contract Time for Completion is seventy-five (75) calendar days."

SPECIFICATIONS – TECHNICAL SPECIFICATIONS:

Addendum Item No. 1.4

ADD the following paragraph after the last paragraph of section 001-2.1 *DESCRIPTION* on Page M-001-1 of the Specifications:

“It is proposed to electrify the existing India Ramp located west of the Runway 14 end. The work includes, but is not limited to installation of a new electrical service, installation of electrical wires in existing conduits and direct bury, and installation of apron electrical outlets.”

Addendum Item No. 1.5

REMOVE and **REPLACE** section 001-2.2 on Pages M-001-1 of Specification Section M-001 with the following:

“The project is being bid with one (1) alternate work item.

***Additive Alternate No. 1** - Alternate work item one (1) includes but is not limited; to the electrifying of the existing India Ramp.”*

Addendum Item No. 1.6

REMOVE and **REPLACE** the last two paragraphs of section 001-2.3 *WORK AREAS* on Pages M-001-2 of Specification Section M-001 with the following:

*“**Phase II-A Work Area** – In general, Phase II-A Work Area includes, but is not limited to items associated with the reconstruction of the ATCT Apron outside of Phase I-B Work Area. Work in this area includes, but is not limited to, earthwork, bituminous concrete paving, installation of drainage, underground cables and ducts, electrical apron outlets, high mast area lights, and pavement marking, installation of a new electrical service, removal of existing structures, pavements, and pipes, topsoiling, seeding, and other work as shown on the Plans, contained within the Specifications or as directed by the Engineer.*

Once the ATCT Apron has been completed and reopened to aircraft traffic, the Contractor shall remove the temporary Taxiway “D” and drainage structures and then grade, topsoil and seed the area as shown on the Plans, contained within the Specifications or as directed by the Engineer.

***Phase II-B Work Area** – In general, Phase II-B Work Area include, but is not limited to items associated with the electrifying of the existing India Ramp. Work in this area includes, but is not limited to, installation of a new electrical service , installation of underground cables, installation of new apron electrical outlets, topsoiling, seeding, and other work as shown on the Plans, contained within the Specifications or as directed by the Engineer.”*

Addendum Item No. 1.7

REMOVE and **REPLACE** section 001-2.4 *WORK AREA REQUIREMENTS* on Pages M-001-2 and M-001-3 of Specification Section M-001 in its entirety with the following:

"001-2.4 WORK AREA REQUIREMENTS.

General – The Contractor will be required to coordinate their construction activities on a daily basis with the Airport and the Engineer while working within all work areas. If requested, the Contractor shall make any reasonably requested adjustment to their construction schedule and or construction sequence to avoid interference with Airport operations.

Prior to working in any work area the Contractor shall install lighted barricades, mark restricted safety and object free areas and delineate haul routes as indicated on the Plans or as directed by the Engineer. The Contractor shall also confirm that proper NOTAMS have been issued and all other safety precautions have been implemented.

The Owner reserves the right to require the Contractor to install and maintain any protective measures in the interest of Airport safety.

Phase I-A Work Area. Phase I-A Work Area will require the closure of a portion of parallel Taxiway "A" between Taxiways "E" and "C", and the closure of Taxiway "D" and a portion of the apron west of the ATCT Apron. Prior to any closures and the start of any work, the Contractor shall verify that the proper NOTAMS have been issued. **The Contractor shall complete all work within Phase I-A Work Area within ten (10) calendar days.** These days need to be consecutive. The Contractor shall place lighted barricades as indicated on the Plans or as directed by the Engineer. The Contractor will be allowed to work in Phase I-B Work Area and Phase II-B Work Area while working in Phase I-A Work Area. The Contractor will not be allowed to work in Phase II-A Work Area while working in Phase I-A Work Area. During work in Phase I-A Work Area, the Contractor shall sequence all work such that the Airport, Airport tenants, and users have access to the runway, open taxiways, and open portions of aprons at all times.

The Contractor shall take the necessary precautions to protect existing structures, pavements, cables, and wires during the construction of the temporary Taxiway "D" and drainage.

Phase I-B Work Area. Phase I-B Work Area will require the closure of a portion of the ATCT Apron. Prior to any closures and the start of any work, the Contractor shall verify that the proper NOTAMS have been issued. **The Contractor shall complete all work within Phase I-B Work Area within ten (10) calendar days.** These days need to be consecutive. The Contractor shall place lighted barricades as indicated on the Plans or as directed by the Engineer. The Contractor will be allowed to work in Phase I-A Work Area and Phase II-B Work Area while working in Phase I-B Work Area. The Contractor will not be allowed to work in Phase II-A Work Area while working in Phase I-B Work Area, with the exception of the placement of the second lift of bituminous concrete pavement and pavement markings. During work in Phase I-B Work Area, the Contractor shall sequence all work such that the Airport, Airport tenants, and users have access to the runway, open taxiways, and open portions of aprons at all times.

The Contractor shall place the first lift of bituminous concrete pavement during Phase I-B Work Area. The Contractor shall sequence the application of the

- **Phase II-B Work Area**

Within the total specified Contract Time of seventy-five (75) Calendar Days”

Addendum Item No. 1.9

ADD as an Appendix to Specification Section P-152 the attached geotechnical report.

Addendum Item No. 1.10

REMOVE and **REPLACE** in its entirety Specification Section M-005 Apron Electrical Outlets with the attached Specification Section M-005 (Addendum #1).

Addendum Item No. 1.11

ADD the following sentence after the first sentence of section 701-2.2 on Page D-701-1 of the Specifications:

“All RCP shall be a minimum of Class IV pipe unless otherwise noted on the Plans.”

Addendum Item No. 1.12

REMOVE and **REPLACE** in its entirety Specification Section M-008 Apron Lighting with the attached Specification Section M-008.

Addendum Item No. 1.13

ADD after Specification Section M-008 (Addendum #1) the attached Specification Section M-009 Electrify India Ramp in its entirety.

Addendum Item No. 1.14

REMOVE and **REPLACE** in its entirety Specification Section L-109 Installation of Airport Transformer Vault and Vault Equipment with the attached Specification Section L-109.

CONTRACT DRAWINGS:

Addendum Item No. 1.15

REVISE Contract Drawing No. S1.1 with the attached Figures S1.1A, S1.1B, S1.1C, and S1.1D. The attached figures reference the corresponding Contract Drawing that the figure is associated with. The figures should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.16

REVISE Contract Drawing No. S1.3 with the attached Figures S1.3A, S1.3B, and S1.3C. The attached figures reference the corresponding Contract Drawing that the figure is associated with. The figures should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.17

REVISE Contract Drawing No. S2.1 with the attached Figure S2.1A. The attached figure references the corresponding Contract Drawing that the figure is associated with. The figure should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.18

REVISE Contract Drawing No. C1.1 with the attached Figure C1.1A. The attached figure references the corresponding Contract Drawing that the figure is associated with. The figure should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.19

REVISE Contract Drawing No. C2.1 with the attached Figure C2.1A. The attached figure references the corresponding Contract Drawing that the figure is associated with. The figure should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.20

REMOVE and **REPLACE** Contract Drawing No. C3.1 in its entirety with the attached Drawing No. C3.1 (Addendum #1).

Addendum Item No. 1.21

REVISE Contract Drawing No. C3.2 with the attached Figures C3.2A and C3.2B. The attached figures reference the corresponding Contract Drawing that the figure is associated with. The figure should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.22

REVISE Contract Drawing No. C4.1 with the attached Figures C4.1A and C4.1B. The attached figure references the corresponding Contract Drawing that the figure is associated with. The figure should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.23

REMOVE and **REPLACE** Contract Drawing No. L1.1 in its entirety with the attached Drawing No. L1.1 (Addendum #1).

Addendum Item No. 1.24

ADD the attached Contract Drawing No. L1.2 (Addendum #1) after Contract Drawing No. L1.1.

Addendum Item No. 1.25

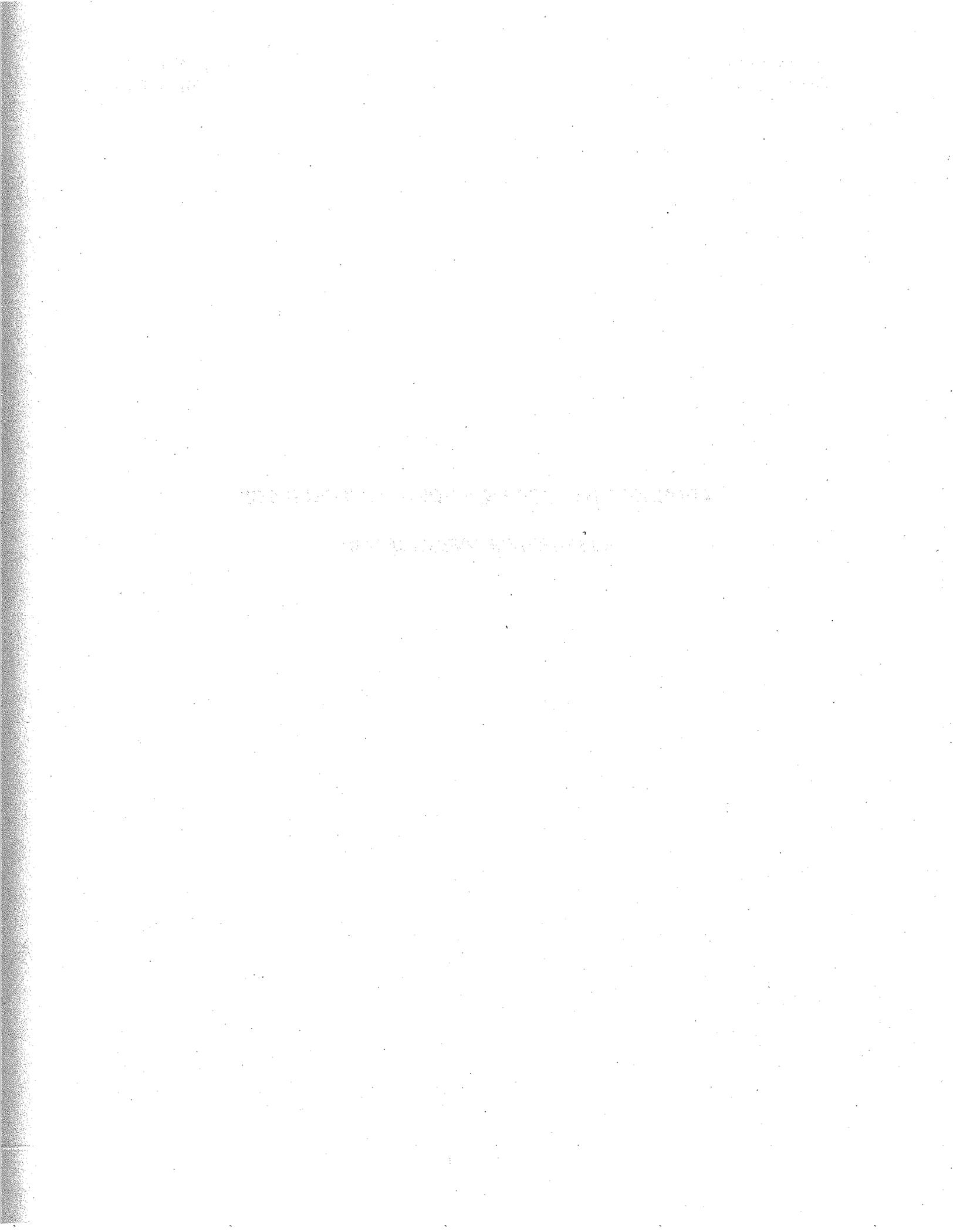
REVISE Contract Drawing No. L1.3 with the attached Figure L1.3A. The attached figure references the corresponding Contract Drawing that the figure is associated with. The figure should be inserted into the corresponding Contract Drawing.

Addendum Item No. 1.26

REMOVE and **REPLACE** Contract Drawing No. L3.2 in its entirety with the attached Drawing No. L3.1.

END OF ADDENDUM NO. 1

APPENDIX TO SPECIFICATIONS SECTION P-152
SUBSURFACE INVESTIGATION



**GEOTECHNICAL EXPLORATIONS,
TESTING & EVALUATION SERVICES
RECONSTRUCT TOWER APRON
BOIRE AIRFIELD – NASHUA MUNICIPAL AIRPORT
NASHUA, NEW HAMPSHIRE**

09-0234 S APRIL 16, 2009

Prepared for:
Gale Associates, Inc.
Attention: Mr. Barry Hammer
15 Constitution Drive
Bedford, NH 03110-6042

Prepared by:



10 Centre Road
Somersworth, NH 03878

TABLE OF CONTENTS

1.0 INTRODUCTION.....	1
1.1 Scope of Work.....	1
1.2 Site Conditions.....	1
2.0 EXPLORATION AND TESTING.....	2
2.1 Previous Work.....	2
2.1 Exploration.....	2
2.2 Laboratory Testing.....	2
3.0 SUBSURFACE CONDITIONS.....	2
3.1 Soils.....	2
3.2 Groundwater.....	3
4.0 EVALUATION.....	3
5.0 CLOSURE.....	5

Attachment A - Limitations

Sheet 1 – Exploration Location Plan

Sheets 2 and 3 – Exploration Logs

Sheet 4 - Key to Notes and Symbols

Appendix A

Laboratory Testing Results



• Geotechnical Engineering • Field & Lab Testing • Scientific & Environmental Consulting

09-0234 S

April 16, 2009

Gale Associates, Inc.
Attention: Mr. Barry Hammer
15 Constitution Drive
Bedford, NH 03110-6042

Subject: Geotechnical Explorations, Testing, and Evaluation Services
Reconstruct Tower Apron
Boire Airfield – Nashua Municipal Airport
Nashua, New Hampshire

1.0 INTRODUCTION

1.1 Scope of Work

In accordance with our Agreement dated April 10, 2009, we have provided geotechnical explorations, testing and evaluation services for the proposed Tower Apron project at Boire Airfield at Nashua Municipal Airport in Nashua, New Hampshire. The purpose of our services was to provide supplemental pavement explorations, perform laboratory testing, and evaluate the pavement reclaim blend process as it relates to the base material. The investigation has included the making of three pavement cores, three shallow explorations, laboratory testing of the existing soils, and review of previous explorations and laboratory testing performed by others. This report summarizes our findings and its contents are subject to the limitations set forth in Attachment A.

1.2 Site Conditions

We understand that the Tower Apron is to be reconstructed. The existing terminal apron consists of bituminous concrete pavement and is approximately 250 by 700 feet in plan dimensions.

The current existing site conditions are shown on the attached Gale Associates, Inc. "Soils Exploration Plan."

2.0 EXPLORATION AND TESTING

2.1 Previous Work

We understand that ten explorations consisting of pavement cores and soil test borings were performed by others to depths of 12 feet in March 2009. Laboratory testing performed by others included bituminous extraction/gradation testing on 5 samples of asphalt and soil gradation testing on a composite sample from the ten test borings.

2.1 Exploration

Three explorations (SWC-1 through SWC-3) were made at the site on April 13, 2009 by S. W. COLE ENGINEERING, INC. personnel. The pavement was cored at each of the explorations using a 10-inch diameter core barrel. The base and subgrade materials were sampled using hand excavation techniques. The exploration locations were selected by and established in the field by S. W. COLE ENGINEERING, INC. by taping from existing site features. The explorations were advanced to depths varying from 18.0 to 20.0 inches. The exploration locations are shown on the attached Gale Associates, Inc. "Soils Exploration Plan." Logs of the explorations are attached as Sheets 2 and 3. A key to the notes and symbols used on the logs is attached as Sheet 4.

2.2 Laboratory Testing

Soil samples recovered from the test borings were visually examined and classified in our laboratory. Laboratory testing was performed on selected soil and pavement samples. Three gradation tests (ASTM C-117 & C-136) were performed on base material obtained from explorations SWC-1 through SWC-3. Two gradation tests were performed on subgrade material obtained from explorations SWC-2 and SWC-3. Results of the gradation and bituminous extraction/gradation tests are presented in Appendix A.

3.0 SUBSURFACE CONDITIONS

3.1 Soils

Explorations SWC-1 through SWC-3 encountered 4.5 to 5.0 inches of bituminous asphalt pavement overlying 5.0 to 6.5 inches of pavement base material classified as sand and gravel with some silt. The subgrade material below the pavement base at SWC-1 through SWC-3 consists of gravelly sand with a trace to some silt. See the

attached logs for SWC-1 through SWC-3 for a more detailed description of the subsurface findings.

The explorations previously performed by others do not indicate pavement thickness at the borings. The borings indicated that 2 to 6 inches of "base course" material was encountered. The underlying materials are generally described as fine to course sand with varying proportions of gravel.

3.2 Groundwater

Groundwater was not observed within the depths explored at explorations SWC-1 through SWC-3. The test boring logs prepared by others indicate water at depths of 3.0 to 5.0 feet below the ground surface upon completion of the test borings.

Groundwater levels will fluctuate seasonally and based on rainfall and snowmelt.

4.0 EVALUATION

We performed blend analyses of the existing pavement and base materials to simulate the proposed reclamation of the existing pavement section during reconstruction. Our blend analyses were performed by mathematically blending gradation results on the existing base material with gradation results representing the existing pavement. The gradation of the reclaimed pavement can only be determined after the reclaiming/crushing process. Therefore, we used two methods to estimate the reclaimed pavement gradation. Method 1 included utilizing the bituminous extraction/gradation of the fine and coarse aggregate in the pavement. This method likely generates a finer gradation than the actual product. Method 2 included using our historical gradation data from crushing pavement cores in our laboratory to create an approximate 1½-inch minus crushed product. This method likely generates a somewhat coarser gradation than the actual product.

We understand that Gale Associates, Inc. plans to develop specification for a Reclaimed Base Course product for the new pavement base material. We understand that the gradation specification will be based the Federal Aviation Administration (FAA) Item P-209. We understand the product will not be required to meet the P-209 requirements for wear/abrasion and "flat and elongated" aggregate shape.

Based on the findings from explorations SWC-1 through SWC-3, the combined pavement and base material thickness exceeds 10 inches. Assuming a pavement thickness of about 4 inches, we estimate the combined pavement and base material thickness at the test boring locations performed by others to be as thin as 6 inches. It is our opinion that the variations in pavement and base material thickness are not clearly defined, thus it is not practical to use different reclaim depths. We performed blend analyses assuming a total reclaim grinding depth of 10 inches from the top of the pavement. Assuming a reclaim depth of 10 inches, we estimate the two following products:

- Crushed Asphalt and Existing Base Material at explorations SWC-1 through SWC-3. This blend of 4.5 to 5.0 inches of pavement with 5.0 to 6.5 inches of base material will result in a product that is finer than the gradation specification and will likely require amendment with 1½ inch crushed stone. We estimate that about 5 to 10% by volume of NHDOT #4 stone mixed with the 10 inches of asphalt/base blend will meet the gradation specification. Note: If reclaim was set to a shallower depth, the addition of 1½ inch crushed stone would still be required.
- Crushed Asphalt, Existing Base Material and Subgrade Material where pavement section is less than 10 inches. This blend of 4 inches of pavement, 2 to 4 inches of base material and up to 4 inches of subgrade material will result in a product that is finer than the gradation specification and will likely require amendment with 1½ inch crushed stone. We estimate that about 5 to 10% by volume of NHDOT #4 stone mixed with the 10 inches of asphalt/base blend will meet the gradation specification. Note: If reclaim was set to a shallower depth, not to incorporate the underlying subgrade, the addition of 1½ inch crushed stone would still be required.

The laboratory test results and blend analyses only represent the findings at the exploration locations. The explorations were widely spaced. It is possible that the in-situ conditions could vary between exploration locations. We recommend that an initial test section be reclaimed and that testing be performed to assess how well the field results compare to our preliminary laboratory testing. Adjustments may be needed based on actual field conditions.

The explorations did not encounter a traditional subbase course underlying the base course within the existing pavement section. Our blend analyses specifically apply to the base course and do not address the use of subbase course. Gale Associates, Inc. should evaluate the design loading and determine if a subbase material is required.

5.0 CLOSURE

We recommend that S. W. COLE ENGINEERING, INC. be onsite during earthwork construction to provide confirmation gradation testing of the blended product. S. W. COLE ENGINEERING, INC. is available to provide geotechnical observations and testing of soil, concrete, and asphalt materials during construction.

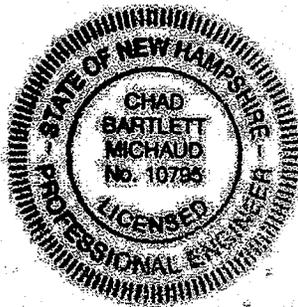
It has been a pleasure to be of assistance to you during this phase of your project. If you have any questions or require additional assistance, please do not hesitate to contact us.

Sincerely,

S. W. COLE ENGINEERING, INC.



Chad B. Michaud, P.E.
Senior Geotechnical Engineer



Attachment A
Limitations

This report has been prepared for the exclusive use of Gale Associates, Inc. for specific application to the proposed Tower Apron Reconstruction project at Boire Airfield at Nashua Municipal Airport in Nashua, New Hampshire. Our services were limited by Gale Associates, Inc. to subsurface exploration, laboratory testing and blend analyses services. Other pavement design and earthwork recommendations were not requested and will be performed by Gale Associates, Inc. S. W. COLE ENGINEERING, INC. has endeavored to conduct the work in accordance with generally accepted soil and foundation engineering practices. No warranty, expressed or implied, is made.

Recommendations contained herein are based on supplemental explorations and laboratory testing made by S. W. COLE ENGINEERING, INC. and explorations and laboratory testing performed by others. S. W. COLE ENGINEERING, INC is not responsible for the detail or accuracy of the information presented on the exploration logs or laboratory testing performed by others. 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. 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.

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.

S.W.COLE ENGINEERING, INC.'s scope of work 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 ENGINEERING, INC. 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 ENGINEERING, INC.

PROJECT / CLIENT: RECONSTRUCT TOWER APRON / GALE ASSOCIATES, INC.

 LOCATION: BOIRE AIRFIELD - NASHUA MUNICIPAL AIRPORT / NASHUA, NH

 PROJECT NO. 09-0234

HAND BORING SWC-1			
DATE: <u>04-13-09</u>		SURFACE ELEVATION: <u>N/A</u>	LOCATION: <u>SEE PLAN</u>
SAMPLE NO.	DEPTH	STRATUM DESCRIPTION	TEST RESULTS
	4.5	BITUMINOUS ASPHALT PAVEMENT	
1S		DARK GRAY-BROWN SAND AND GRAVEL WITH SOME SILT (BASE)	
	11.0		
2S		BROWN GRAVELLY SAND WITH SOME SILT (SUBGRADE)	
	15.0		
	20.0	BROWN SAND WITH SOME SILT AND TRACE GRAVEL (SUBGRADE)	
		BOTTOM OF EXPLORATION @ 20.0"	
COMPLETION DEPTH: <u>20.0"</u> DEPTH TO WATER: <u>FREE WATER NOT OBSERVED</u>			

HAND BORING SWC-2			
DATE: <u>04-13-09</u>		SURFACE ELEVATION: <u>N/A</u>	LOCATION: <u>SEE PLAN</u>
SAMPLE NO.	DEPTH	STRATUM DESCRIPTION	TEST RESULTS
	4.75	BITUMINOUS ASPHALT PAVEMENT	
1S		DARK GRAY-BROWN GRAVEL AND SAND WITH SOME SILT (BASE)	
	11.25		
2S		BROWN GRAVELLY SAND WITH SOME SILT WITH TRACE DARK BROWN SILTY SAND WITH ORGANICS POCKETS (SUBGRADE)	
	18.0		
		BOTTOM OF EXPLORATION @ 18.0"	
COMPLETION DEPTH: <u>18.0"</u> DEPTH TO WATER: <u>FREE WATER NOT OBSERVED</u>			



HAND BORING LOGS

PROJECT / CLIENT: RECONSTRUCT TOWER APRON / GALE ASSOCIATES, INC.

LOCATION: BOIRE AIRFIELD - NASHUA MUNICIPAL AIRPORT / NASHUA, NH

PROJECT NO. 09-0234

HAND BORING <u>SWC-3</u>			
DATE: <u>04-13-09</u>		SURFACE ELEVATION: <u>N/A</u>	LOCATION: <u>SEE PLAN</u>
SAMPLE NO.	DEPTH	STRATUM DESCRIPTION	TEST RESULTS
		BITUMINOUS ASPHALT PAVEMENT	
	5.0		
S1		DARK GRAY-BROWN GRAVEL AND SAND WITH SOME SILT (BASE)	
	10.0		
S2		BROWN GRAVELLY SAND WITH TRACE SILT (SUBGRADE)	
	19.0		
		BOTTOM OF EXPLORATION @ 19.0"	
COMPLETION DEPTH: <u>19.0"</u>		DEPTH TO WATER: <u>FREE WATER NOT OBSERVED</u>	



KEY TO THE NOTES & SYMBOLS
Test Boring and Test Pit Explorations

All 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. - based on laboratory unconfined compressive 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. based on 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. RQD is computed from recovered core samples.
- γ_T - total soil weight
- γ_B - buoyant soil weight

Description of Proportions:

- 0 to 5% TRACE
- 5 to 12% SOME
- 12 to 35% "Y"
- 35+% AND

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.

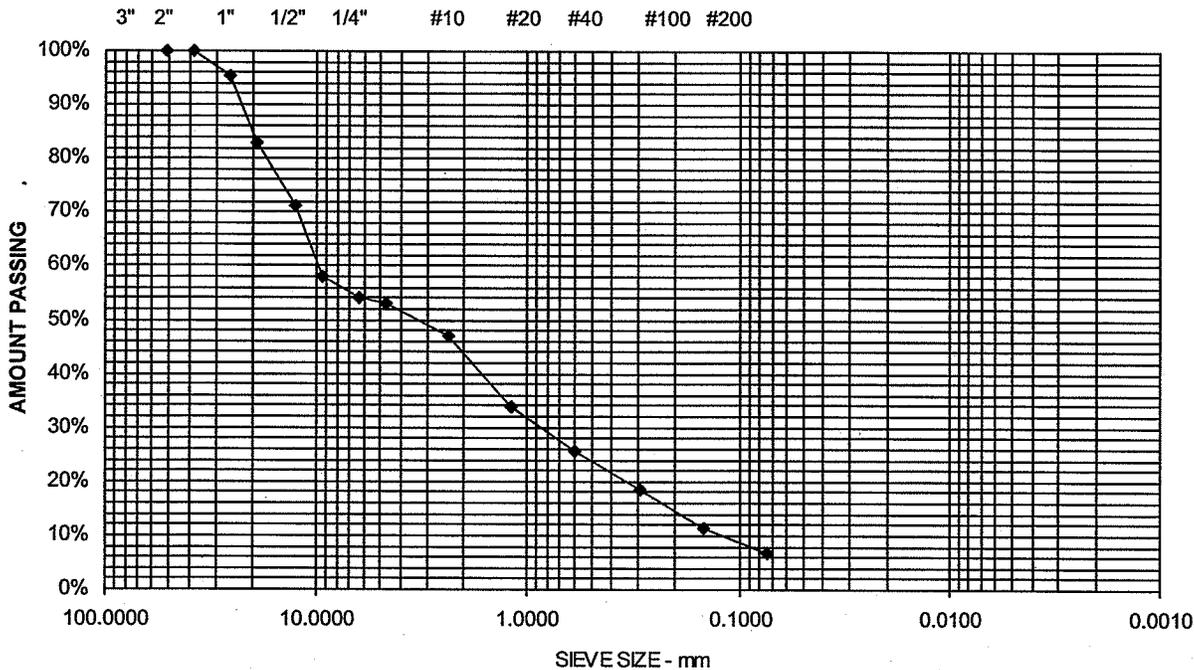
Although refusal may indicate the encountering of the bedrock surface, it may indicate the striking of large cobbles, boulders, very dense or cemented soil, or other buried natural or man-made objects or it may indicate the encountering of a harder zone after penetrating a considerable depth through a weathered or disintegrated zone of the bedrock.

Appendix A
Laboratory Testing Results

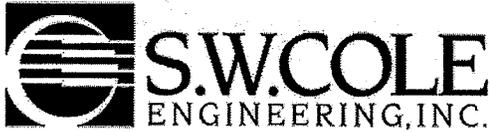
Project Name **NASHUA NH - TOWER APRON RECONSTRUCTION - BOIRE AIRFIELD - GEOTECHNICAL ENGINEERING SERVICES**
 Client **GALE ASSOCIATES INC**
 Exploration **SWC-1**
 Material Source **1S 4.5"-11"**

Project Number **09-0234**
 Lab ID **6299S**
 Date Received **4/14/2009**
 Date Complete **4/15/2009**
 Tested By **THOMAS MITCHELL**

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	95	
19.0 mm	3/4"	83	
12.5 mm	1/2"	71	
9.5 mm	3/8"	58	
6.3 mm	1/4"	54	
4.75 mm	No. 4	53	46.9% Gravel
2.36 mm	No. 8	47	
1.18 mm	No. 16	34	
600 μm	No. 30	26	
300 μm	No. 50	19	
150 μm	No. 100	11	
75 μm	No. 200	6.9	6.9% Fines



Comments:



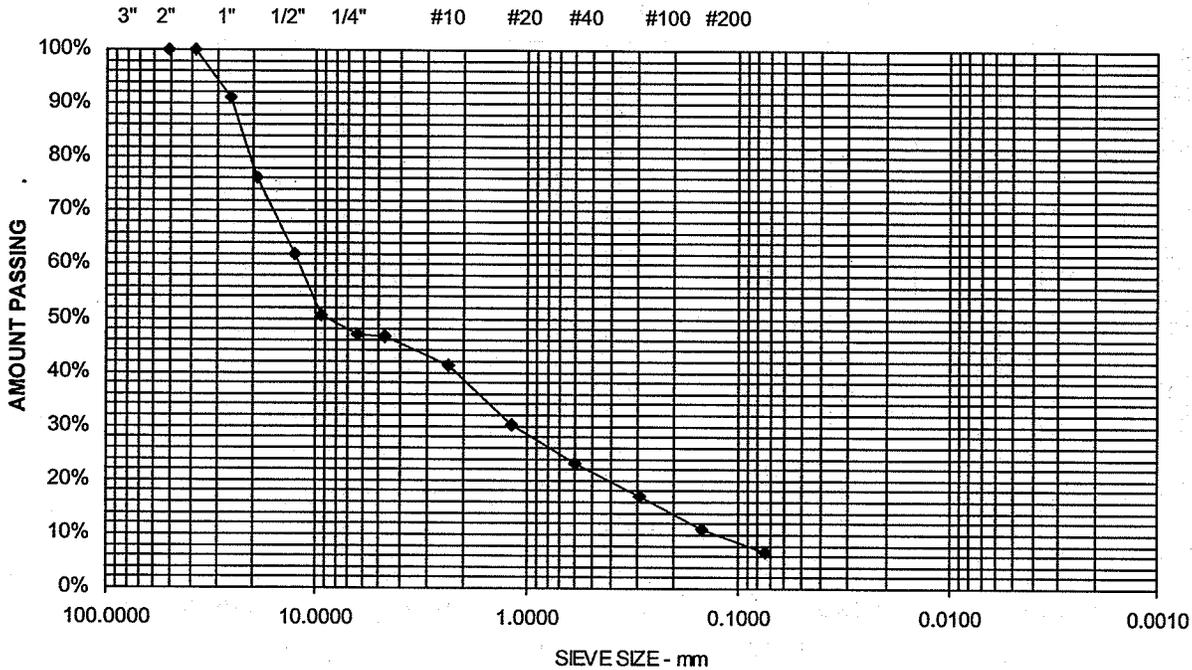
Report of Gradation

ASTM C-117 & C-136

Project Name NASHUA NH - TOWER APRON RECONSTRUCTION - BOIRE
 AIRFIELD - GEOTECHNICAL ENGINEERING SERVICES
 Client GALE ASSOCIATES INC
 Exploration SWC-2
 Material Source 1S 4.75"-11.25"

Project Number 09-0234
 Lab ID 6300S
 Date Received 4/14/2009
 Date Complete 4/15/2009
 Tested By THOMAS MITCHELL

<u>STANDARD DESIGNATION (mm/μm)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
50 mm	2"	100	
38.1 mm	1-1/2"	100	
25.0 mm	1"	91	
19.0 mm	3/4"	76	
12.5 mm	1/2"	62	
9.5 mm	3/8"	51	
6.3 mm	1/4"	47	
4.75 mm	No. 4	47	53.5% Gravel
2.36 mm	No. 8	41	
1.18 mm	No. 16	30	
600 μm	No. 30	23	
300 μm	No. 50	17	
150 μm	No. 100	11	
75 μm	No. 200	6.7	6.7% Fines



Comments:



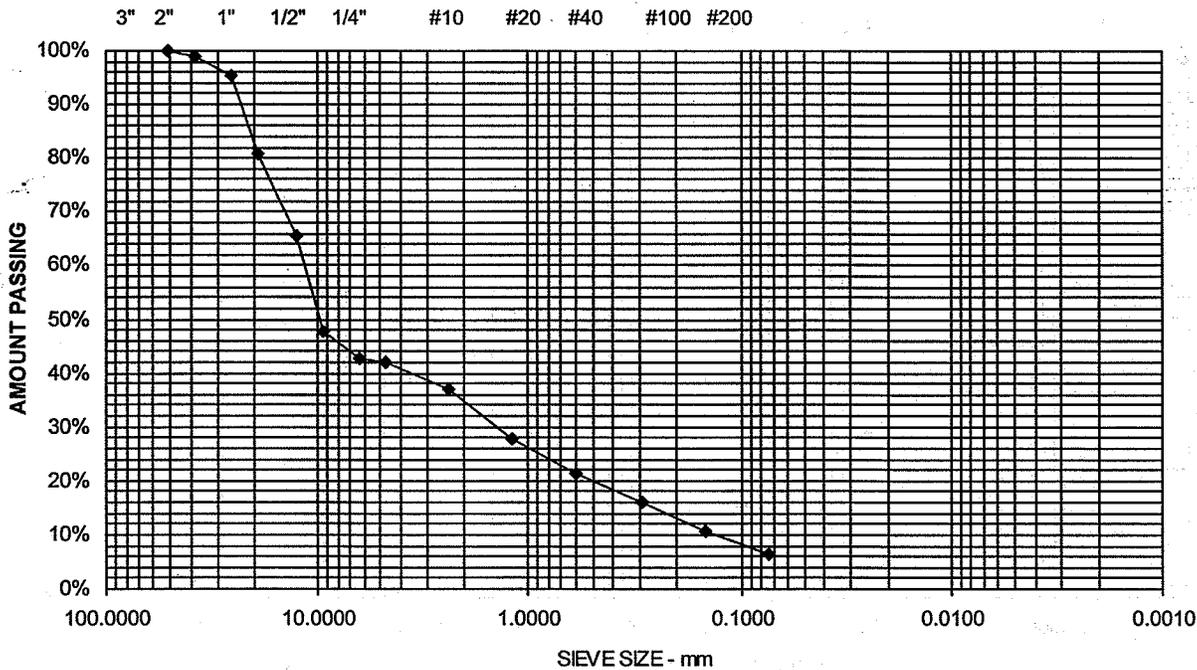
Report of Gradation

ASTM C-117 & C-136

Project Name NASHUA NH - TOWER APRON RECONSTRUCTION - BOIRE
AIRFIELD - GEOTECHNICAL ENGINEERING SERVICES
Client GALE ASSOCIATES INC
Exploration SWC-3
Material Source 1S 5"-10"

Project Number 09-0234
Lab ID 6301S
Date Received 4/14/2009
Date Complete 4/15/2009
Tested By THOMAS MITCHELL

<u>STANDARD DESIGNATION (mm/um)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
50 mm	2"	100	
38.1 mm	1-1/2"	99	
25.0 mm	1"	96	
19.0 mm	3/4"	81	
12.5 mm	1/2"	65	
9.5 mm	3/8"	48	
6.3 mm	1/4"	43	
4.75 mm	No. 4	42	58.2% Gravel
2.36 mm	No. 8	37	
1.18 mm	No. 16	28	
600 um	No. 30	22	
300 um	No. 50	16	
150 um	No. 100	11	
75 um	No. 200	6.4	6.4% Fines



Comments:

Sheet



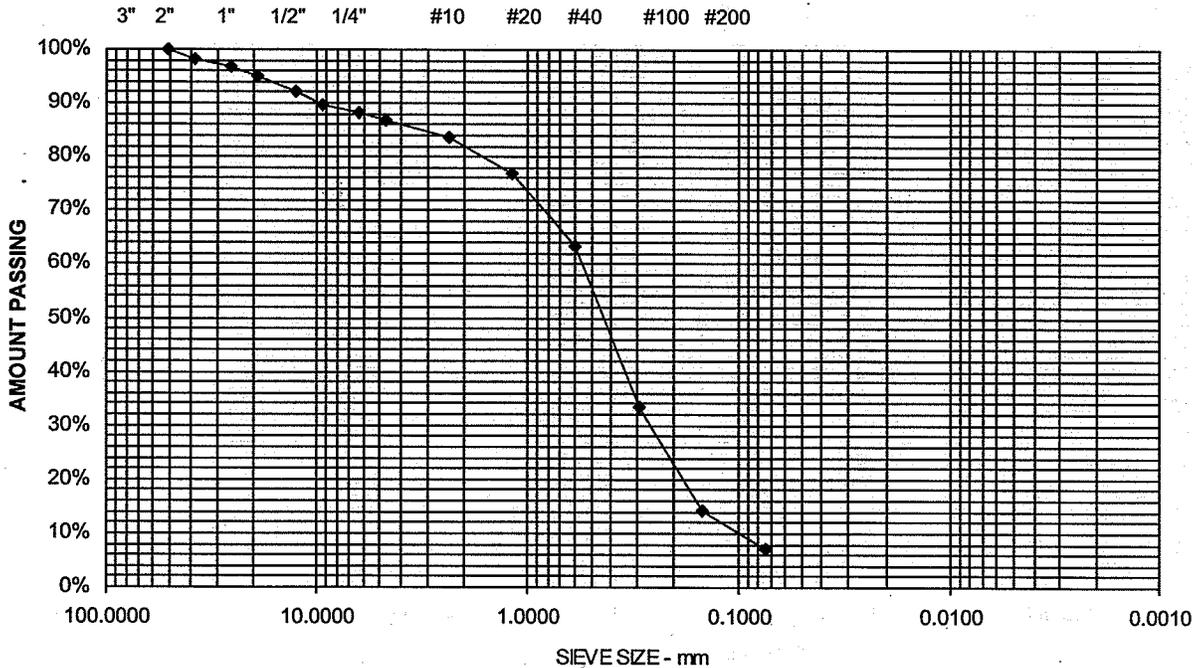
Report of Gradation

ASTM C-117 & C-136

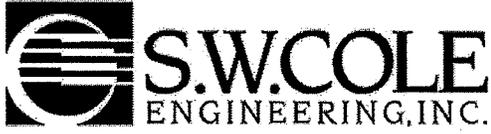
Project Name NASHUA NH - TOWER APRON RECONSTRUCTION - BOIRE AIRFIELD - GEOTECHNICAL ENGINEERING SERVICES
 Client GALE ASSOCIATES INC
 Exploration SWC-2
 Material Source 2S 11.25"-B.O.E.

Project Number 09-0234
 Lab ID 6302S
 Date Received 4/14/2009
 Date Complete 4/15/2009
 Tested By THOMAS MITCHELL

STANDARD DESIGNATION (mm/um)	SIEVE SIZE	AMOUNT PASSING (%)	
50 mm	2"	100	
38.1 mm	1-1/2"	98	
25.0 mm	1"	97	
19.0 mm	3/4"	95	
12.5 mm	1/2"	92	
9.5 mm	3/8"	90	
6.3 mm	1/4"	88	
4.75 mm	No. 4	87	13.2% Gravel
2.36 mm	No. 8	84	
1.18 mm	No. 16	77	
600 um	No. 30	63	
300 um	No. 50	34	
150 um	No. 100	14	
75 um	No. 200	7.2	7.2% Fines



Comments:



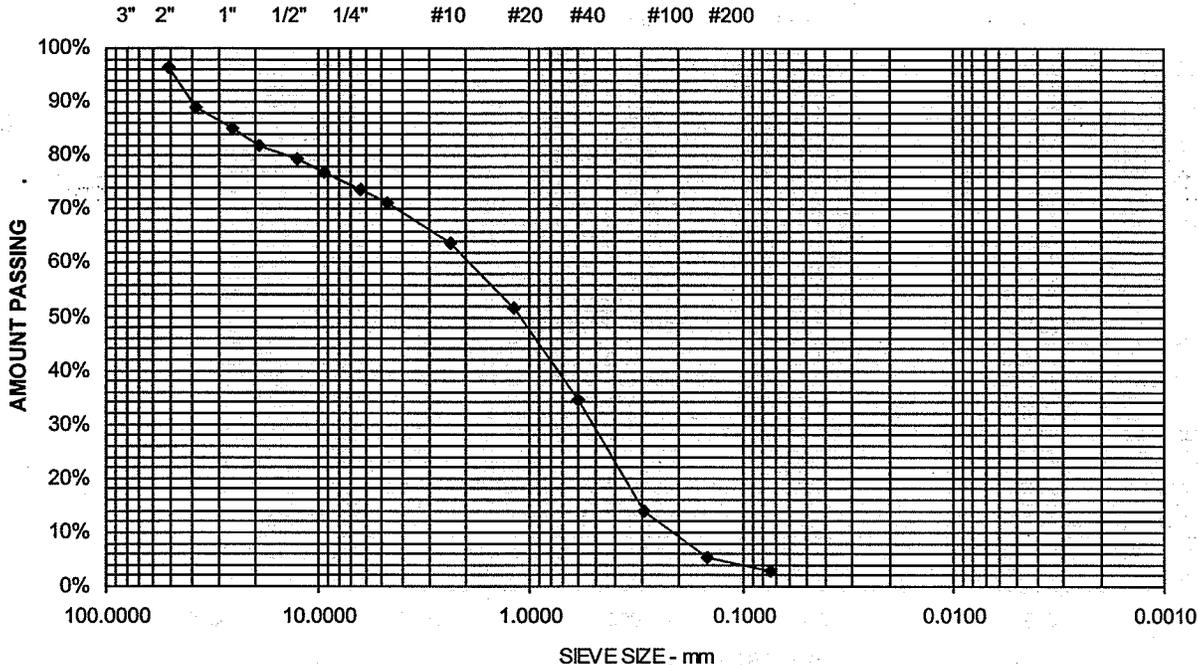
Report of Gradation

ASTM C-117 & C-136

Project Name NASHUA NH - TOWER APRON RECONSTRUCTION - BOIRE
AIRFIELD - GEOTECHNICAL ENGINEERING SERVICES
Client GALE ASSOCIATES INC
Exploration SWC-3
Material Source 2S 10"-B.O.E.

Project Number 09-0234
Lab ID 6303S
Date Received 4/14/2009
Date Complete 4/15/2009
Tested By THOMAS MITCHELL

<u>STANDARD DESIGNATION (mm/um)</u>	<u>SIEVE SIZE</u>	<u>AMOUNT PASSING (%)</u>	
50 mm	2"	96	
38.1 mm	1-1/2"	89	
25.0 mm	1"	85	
19.0 mm	3/4"	82	
12.5 mm	1/2"	79	
9.5 mm	3/8"	77	
6.3 mm	1/4"	74	
4.75 mm	No. 4	71	28.6% Gravel
2.36 mm	No. 8	64	
1.18 mm	No. 16	51	
600 um	No. 30	35	
300 um	No. 50	14	
150 um	No. 100	6	
75 um	No. 200	3.0	3% Fines



Comments:

Sheet

ITEM M-005 APRON ELECTRICAL OUTLETS

CONTRACT DOCUMENTS

005-0.1 This section of these Specifications is a part of the Contract Documents as defined in the General Provisions. All applicable parts of the balance of the Contract Documents are equally as binding for this section as for all other sections.

Attention shall be directed to the section of these Specifications entitled "Summary of Work and Special Work Requirements."

DESCRIPTION

005-1.1 The work under this section of these Specifications shall consist of the furnishing and installing of an apron electrical outlet system consisting of apron outlets, outlet enclosures, a new 200 ampere electrical distribution panel board on the exterior of the new electrical vault, a new E-Mon digital kilowatt meter, pull boxes, enclosures, explosion proof equipment, cable, wire, conduit, ducts, grounding, terminations, identification disk, and ancillary components to create a complete, working system.

All work shall be done in accordance with this Specification, details shown on the Plans, and as directed by the Engineer.

All wiring, conduit, connections, and other ancillary work as required to have a complete and operating electrical distribution system shall not be measured separately for payment but rather shall be considered incidental to Item M-005-1 Apron Electrical Outlet. Electrical cable and conduit installed after Panel 'AO' to apron outlets shall be measured for payment as follows:

- Electrical cables shall be specified and measured under Specifications section L-108 Underground Power Cable for Airports.
- Underground conduit shall be specified and measured under Specifications section L-110 Airport Underground Electrical Duct Banks and Conduits.

All materials to be installed within the access structure shall be explosion proof including but not limited to junction boxes, receptacles, fittings, and conduit.

MATERIALS

005-2.1 GENERAL. Airport lighting equipment and materials covered by Federal Aviation Administration (FAA) specification numbers shall have the prior approval of the FAA and be listed in the FAA's latest listing of approved Airport "Lighting Equipment".

All other equipment and materials not covered by FAA specification numbers shall be subject to acceptance through manufacturer's Certification of Compliance with the applicable specification as described herein.

Equipment and materials not specified herein should be furnished and installed in accordance with Sections L-108, L-109, and L-110 as well as the National Electrical Code.

005-2.2 CONCRETE STRUCTURES. Cast-in-place concrete structures shall conform to the details and dimensions shown on the Plans.

Precast concrete structures shall be provided 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 structures shall be designed to withstand a 30,000 lb. single-wheel load, unless otherwise shown on the Plans. Openings or knockouts shall be provided in the structure as detailed 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 Engineer shall be submitted by the Contractor to allow for a full evaluation by the Engineer. The Engineer shall review this information in accordance with the process defined in the General Provisions.

005-2.3 MORTAR. The mortar shall be composed of one part of Portland Cement and two parts of mortar sand, by volume. The Portland Cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144. Hydrated lime may be added to the mixture of sand and cement in an amount not to exceed 15 percent of the weight of cement used. The hydrated lime shall meet the requirements of ASTM C 6. The water shall be clean and free of deleterious amounts of acid, alkalies or organic material. If the water is of questionable quality, it shall be tested in accordance with AASHTO T-26.

115-2.4 CONCRETE. All concrete used in structures shall conform to the requirements of Item P-610, Structural Portland Cement Concrete.

115-2.5 FRAMES AND COVERS. The frames shall conform to one of the following requirements:

- a. Gray iron castings shall meet the requirements of ASTM A 48.
- b. Malleable iron castings shall meet the requirements of ASTM A 47.
- c. Steel castings shall meet the requirements of ASTM A 27.
- d. Structural steel for frames shall conform to the requirements of ASTM A-283, Grade D.
- e. Ductile iron castings shall conform to the requirements of ASTM A 536.
- f. Austempered ductile iron castings shall conform to the requirements of ASTM A 897.

All castings specified shall withstand a 30,000 lb single wheel load.

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 A 123.

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.

Each cover and frame shall be manufactured with a lift assisting spring, ductile iron safety bar, and pressure block.

005-2.6 JUNCTION BOX. Junction boxes to be installed in access holes shall be explosion proof and watertight. Junction boxes shall be UL listed and IEC certified. Other junction boxes shall be as specified in Section L-109.

005-2.7 RECEPTACLES. Receptacles to be installed in access holes shall be explosion proof and watertight. Receptacles shall be UL listed and IEC certified. Other receptacles shall be as specified in Section L-109.

005-2.8 GFCI OUTLETS. Outlets shall be commercial grade, ground fault circuit interrupters, 2-pole, and 3-wire, rated for 120V 20 amp GFCI devices. Each outlet shall be an individual NEMA configuration 5-20R. GFCI outlets shall be UL listed.

005-2.9 FASTENERS AND HARDWARE. All fasteners and hardware shall be stainless steel unless otherwise shown or directed.

005-2.10 CABLE CONNECTORS. Cable connectors shall be suitable for direct burial and waterproof.

005-2.11 SHRINK WRAP. All connections shall be sealed with heat applied "shrink wrap" tubing as manufactured by Sigmaform Corporation, or an approved equal. See Plans for details.

005-2.12 GROUND RODS. Ground rods shall be copper-clad steel rods 3/4 inch in diameter and 10 feet long.

005-2.13 GROUND WIRE. Bare copper wire for grounding shall be as sized on the Plans conforming to ASTM Specification B 3 and B 8. If no size is indicated, the ground wire shall be #8.

005-2.14 TAPE. Tape for electrical connections shall be rubber and plastic Scotch Electrical Tape Number 23 and 88 by Minnesota Mining and Manufacturing Company, or an approved equal.

005-2.15 WIRE. Wire shall be as specified in Specifications section L-108.

005-2.16 ELECTRICAL SERVICE AND DISTRIBUTION SYSTEM. The power for the Apron Outlet System shall be taken from the new electrical vault through a new 200 amp sub-panel.

005-2.17 PANEL BOARD. Panel board shall be provided with main breaker, or main lugs, and branch circuit breakers according to the schedules on the Plans, or included in the Specifications.

Panel board shall be provided with a top-mounted main breaker or remote main breaker-to-panel main lugs and branch circuit breakers according to the schedule on the Plans. New panel boards shall be NEMA 3R enclosed, for exterior use, with a lockable door.

The general requirements for the panels, including mounting and gutters, are shown on the Plans. The panel shall be mounted 6'-6" up to top of roughing cabinets, if possible. Gutters not less than five (5) inches will be considered to meet specifications if the breaker frame size is shown on the Plans. Handle ties will **NOT** be permitted anywhere.

All breakers shall be trip-free, suitable for switching, and thermal magnetic. All breakers in panels shall be bolted to buss. "Space" means provisions for adding breakers. Breakers, or busses, shall contain terminations or tapings designed for these attachments. All points of contact between buss and sub-bus shall be copper, full silvered between all contact surfaces. All breakers shall have a minimum capacity of 22,000 amperes at 240 volts AC. Higher IC breakers shall be provided if local utility available fault current with panel board Shop Drawings.

Breakers for the Apron Outlet System shall be Ground Fault Circuit Interrupter (GFCI) type.

A typewritten breaker panel legend shall be provided indicating fixture outlets, devices, machines, or apparatus served by each breaker and their location. This legend shall be labeled as shown on the Plans, with breakers numbered from top to bottom. The legend shall be mounted inside the door of the panel board in a transparent plastic cover.

For holding breakers in "ON" position, each panel board shall be provided with slip on screw set devices. These are to be used as described, to prohibit switching breakers unless clip is first removed. These devices shall not interfere with normal breaker tripping on overload conditions.

Built-in surge protection devices shall be provided at main electrical service panel.

005-2.18 OTHER ELECTRICAL EQUIPMENT. All other regularly used commercial items of electrical equipment not covered by FAA equipment specifications shall conform to the applicable rulings and standards of the Institute of Electrical Engineers or the National Electrical Manufacturers Association. When specified, test reports from a testing laboratory indicating that the equipment meets the specifications shall be supplied. In all cases, equipment shall be new and a first grade product. Where applicable, equipment and materials shall be UL listed for the intended use. This equipment shall be supplied in the quantities required for the specified project and shall incorporate the electrical and mechanical characteristics specified in the Proposal and Plans.

005-2.19 DIGITAL KILOWATT METER. The entire power usage of the Apron Outlet System shall be monitored by an E-Mon Digital Kilowatt Meter, or approved equal. The meter shall have an external display and shall be resettable only with a key or other security device.

005-2.20 SHOP DRAWINGS AND CERTIFICATIONS. The Contractor shall submit manufacturer's Shop Drawings and Certifications of Compliance on the following: Access structure and casting, Receptacles, Panel Board, Breakers, 600 Volt Insulated Wires, Cable

Connectors, Cable Plugs, Junction Box, Outlet Junction Box, Conduit, Splice Kits, Ground Rod, and Bare Copper Wire, Primer and Paint, and Shrink Wrap.

CONSTRUCTION METHODS

005-3.1 GENERAL. The Contractor shall furnish all materials to install new apron electrical outlets as directed by the Engineer and in accordance with the Contract Documents. The Contractor using the finish grade of the proposed pavement, or topsoil, shall determine the elevation of the electrical access structures. The Contractor shall furnish, install and connect all specified equipment, equipment accessories, conduit, cables, wires, boxes, covers, grounds and support necessary to insure a complete and operable apron electrical outlet and electrical outlet system as specified herein and shown on the Plans.

The installation includes complete installation in all respects, as shown on the Plans and/or as required to provide a fully functional system per the intent of the Contract Documents.

The Contractor shall excavate to the lines and grades as derived from the Plans and as directed by the Engineer. All unsuitable material excavated shall be properly disposed of off Airport property at no additional cost to the Owner.

Each outlet/fixture shall be secure, and properly oriented as directed by the Engineer.

005-3.2 PLACING ACCESS STRUCTURES. The new access structures shall be installed at the locations indicated on the Plans. The exact location and elevation of each structure shall be identified in the field by the Contractor and approved by the Engineer.

Each structure shall be installed in accordance with the details shown on the Plans and shall be placed on $\frac{3}{4}$ " stone bedding material and backfilled with material consisting of hard, durable particles so graded that 100% will pass a $\frac{1}{4}$ " inch sieve, and not more than 20% will pass a #200 sieve and shall be free from loam, silt, clay, or organic matter.

005-3.3 GROUNDING. Each light fixture shall be grounded in accordance with the details shown on the Plans.

005-3.4 BALANCING OF LOADS. The Contractor shall balance all loads between phases in all panels, etc., around the neutral. Neutral conducts shall be the same size as phase conductors unless specifically noted otherwise.

All circuits shall be distributed among the phases so as to restrict any phase load imbalance to less than 10% at any panel board.

005-3.5 IDENTIFICATION OF OUTLETS. Each outlet shall be identified by number and tagged with a non-corrosive disc with stamped numbers as detailed on the Plans. Each disc shall be securely attached to the fixture riser pole in a manner approved by the Engineer.

The tagged numbers shall correspond with the same label numbers on the cables and the same number on the breaker at the electrical service. No additional compensation shall be provided for this work, but rather it shall be considered incidental to the various lighting items.

METHOD OF MEASUREMENT

005-4.1 APRON ELECTRICAL OUTLET. The quantity of new Apron Electrical Outlets to be paid for shall be the number of new outlets installed complete, in accordance with the manufacturer's recommended installation procedures, the Plans, and as herein specified, including but not limited to: excavation, access structure, apron outlets, outlet enclosures, a new 200 ampere electrical distribution panel board on the exterior of the new electrical vault, a new E-Mon digital kilowatt meter, pull boxes, enclosures, explosion proof equipment, ground rod, electrical boxes, electrical outlets, electrical box covers, cables, cable connections, fittings, identification disk, ancillary components, and restoration, tested and ready for operation to the satisfaction of the Engineer.

Electrical cable and conduit installed after Panel 'AO' to apron outlets shall be measured separately for payment as follows:

- Electrical cables shall be specified and measured under Specifications section L-108 Underground Power Cable for Airports.
- Underground conduit shall be specified and measured under Specifications section L-110 Airport Underground Electrical Duct Banks and Conduits.

BASIS OF PAYMENT

005-5.1 APRON ELECTRICAL OUTLET. Payment will be made at the Contract unit price for each new Apron Electrical Outlet installed, measured as specified above, which prices and the payment thereof shall constitute full compensation for all labor, materials, equipment, incidentals and expenses necessary, to complete the installation, to the satisfaction of the Engineer.

Payment will be made under:

<u>ITEM</u>	<u>DESCRIPTION</u>	<u>UNIT</u>
M-005-1	Apron Electrical Outlet	Per Each

END OF ITEM M-005