

STATE OF MAINE
MAINE DEPARTMENT OF TRANSPORTATION
Letter of Transmittal

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Kate Maguire, Geotechnical Highway Program
Cody Russell, Geotechnical Highway Program
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Project Resident, Highway Program (Unknown as of 12/19/2017)

Author: Cody Russell, Geotechnical Highway Program

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Bridge #: N/A

Route: 201

WIN: 018622.00

Town: Hallowell

Attached is one (1) copy of Soils Report 2017-45, "GEOTECHNICAL DATA REPORT:
For the Reconstruction of: STATE ROUTE 201, HALLOWELL, MAINE" dated:
December 18, 2017.

This report is available in TEDOCS as Document # 1672484.

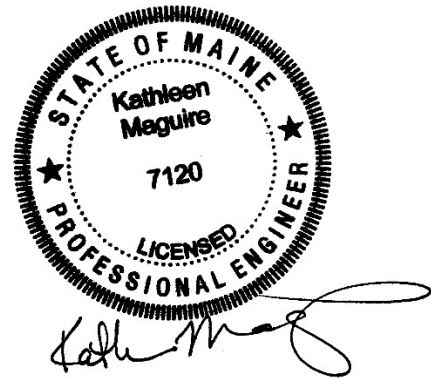
att: 1 of 2017-44

**MAINE DEPARTMENT OF TRANSPORTATION
HIGHWAY PROGRAM
GEOTECHNICAL SECTION
AUGUSTA, MAINE**

GEOTECHNICAL DATA REPORT

For the Reconstruction of:
**STATE ROUTE 201
HALLOWELL, MAINE**

Prepared by:
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Assistant Geotechnical Engineer



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Senior Geotechnical Engineer

Kennebec County
WIN 18622.00

December 18, 2017

Soils Report 2017-44
Fed No. STP-1862(200X)

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1.0 INTRODUCTION

The purpose of this Geotechnical Data Report is to present subsurface information to support the reconstruction of State Route 201 in Hallowell, Maine. This report presents the results of a limited geotechnical investigation performed along the project site and the results of a limited laboratory testing program conducted on soil samples recovered during the geotechnical investigation. State Route 201 is a Highway Corridor Priority 1 road.

As a part of this project a retaining wall will be constructed on the west side of the rail trail parking area along Water Street from approximately Station 26+90 to Station 28+90. The wall will be constructed using recycled granite curb blocks salvaged from the project.

2.0 GEOLOGIC SETTING

The project begins approximately 0.1 miles northerly of Winthrop Street and extends 0.42 miles southerly to the boat launch as shown on Sheet 1 – Location Map.

The Maine Geologic Survey (MGS) map titled Surficial Geology Augusta Quadrangle, Maine, Open-File No. 09-7 (2009) indicates the surficial soils consist of stream terraces along the majority of the project and Presumpscot Formation between Winthrop Street and Hinkley Road. Stream terraces deposits consist of sand and gravel deposited by the Kennebec River at elevations higher than the most recent flood plains. Presumpscot Formation deposits consist of glaciomarine silt, clay, and sand deposited on the late-glacial sea floor.

The MGS map titled Bedrock Geology Augusta Quadrangle, Maine, Open File No. 12-36 (2012) indicates that the bedrock in the northern portion of the project is intrusive Hallowell granite and bedrock in the southern portion of the project is stratified quartz-feldspar-biotite granofels and minor schist of the Mayflower Hill Formation.

3.0 SUBSURFACE INVESTIGATION

Subsurface conditions were explored by drilling twenty-one (21) test borings along the project. The boring locations are show on Sheets 2 through 6 – Boring Location Plans.

The MaineDOT drill crew drilled borings HB-HALL-101 through HB-HALL-117 on June 4, 2013 using solid stem auger techniques. Soil samples were obtained in boring HB-HALL-106 at 5-foot intervals using Standard Penetration Test (SPT) methods. The soil sampling was conducted using an automatic hammer to drive the split spoon. The calibrated hammer was found to deliver approximately 26 percent more energy during driving than the standard rope and cathead system. The SPT N_{60} -values shown on the boring log are corrected values computed by applying an average energy transfer factor of 0.756 to the raw field N-values. This hammer efficiency factor (0.756) and both the raw field N-value and the corrected N_{60} -value are shown on the boring log. In the remaining 100-series borings, soil samples were obtained from the auger flights for laboratory testing. No refusal surface was encountered in any of the 100-serise borings.

New England Boring Contractors drilled borings HB-HALL-201 through HB-HALL-204 on November 10 and 11, 2016 using solid stem auger techniques. Soil samples were obtained in the 200-series borings at 5-foot intervals using SPT methods. The soil sampling was conducted using a rope and cathead hammer system to drive the split spoon which does not require correction. Refusal surfaces were encountered in all of the 200-series borings. The bedrock was cored in borings HB-HALL-201 and HB-HALL-204 using an NQ 2-inch core barrel and the Rock Quality Designation (RQD) of the core was calculated.

Details and sampling methods used, field data obtained, and soil and bedrock conditions encountered are presented in the boring logs provided in Appendix A – Boring Logs. A Northeast Transportation Training and Certification Program (NETTCP) Certified Subsurface Inspector logged the subsurface conditions encountered in borings HB-HALL-101 through HB-HALL-117 and an experienced geotechnical engineer logged borings HB-HALL-201 through HB-HALL-204. The MaineDOT geotechnical engineer selected the boring location and drilling methods, designated type and depth of sampling techniques, reviewed boring logs and identified field testing requirements. The borings were located in the field using taped measurements at the completion of the drilling program.

4.0 LABORATORY TESTING

A laboratory testing program was conducted on selected soil samples recovered from the test borings to assist in soil classification, evaluation of engineering properties of the soils, and geologic assessment of the project site. Laboratory testing consisted of twelve (12) standard grain size analyses with natural water content. The results of soil tests are included as Appendix B – Laboratory Test Results. Moisture content information and other soil test results are also shown on the boring logs provided in Appendix A – Boring Logs.

5.0 RETAINING WALL REQUIREMENTS

A Recycled Granite Curb Wall with Granite Steps will be constructed on the west side of the rail trail parking area along Water Street from approximately Station 26+90 to Station 28+90. The wall will be constructed using recycled granite curb blocks salvaged from the project. No borings were conducted for the retaining wall. The retaining wall shall be constructed in conformance with the Contract Plans and the requirements of Special Provision 679 included in Appendix C – Special Provision. The proposed wall details are shown on Sheet 8 -Special Details Recycled Granite Curb Wall.

The Recycled Granite Curb Wall with Granite Steps shall have a minimum embedment of 2 feet below finished grade. The wall shall be founded on a 6-inch Concrete Leveling Pad bearing on a 12-inch Crushed Stone Leveling Pad on prepared native subgrade soils. The subgrade soils shall be proof-rolled using multiple passes of a static roller to identify loose or weaving areas and to achieve a firm and stable surface for construction. Any loose soils or soft or unsuitable materials encountered at the bearing elevation shall be removed and replaced with Crushed Stone ¾-Inch (MaineDOT 703.13). A 6-inch diameter positive Drainage System shall be installed behind the Recycled Granite Curb Wall as shown on the Plans.

Recycled Granite Curb sections shall be placed so their longest dimension is parallel to the face of the wall and their shortest dimension is the vertical dimension. Curb sections shall have a minimum length of 4 feet. The wall batter shall be 1 inch per curb section. The maximum offset in any unit horizontal joint shall be ¼-inch. Joints shall be level and horizontal. Vertical joints shall be separated a minimum of 2 feet horizontally from vertical joints in wall courses above and below. Gaps between courses vertically at the wall face and between adjacent curb sections in the same course horizontally shall not exceed ¾-inch. The exposed faces of each curb section shall be dressed to an appropriate true plane with no projections or depressions on those surfaces greater than ½-inch. Exposed faces and tops of adjacent curb sections shall be uniform in color and texture. The curb sections shall be installed to a tolerance of plus or minus ¾-inch in 10 feet in vertical alignment and horizontal alignment.

The top surface of each course shall be levelled transversely, perpendicular to the wall face, with shims placed between courses. Shims shall be placed as necessary for levelling, but shall not provide primary support for the overlying course. Shims shall not be movable by hand, and can be grouted in place. Shims shall be stone or another approved durable material and shall not be visible on the exposed face.

The top course of Recycled Granite Curb sections shall be grouted as needed to ensure that they cannot be moved under use. Grout used for this purpose shall not be visible on the exposed face.

Deadman Granite Curb sections shall be turned 90 degrees from the facing blocks with a minimum 5-foot embedment into the Backfill from the face of the wall and shall be spaced at 10 feet maximum horizontally and between a minimum of 15-inches and a maximum of 20-inches vertically. Deadmen pieces shall be connected to adjacent granite block pieces in the same course with steel dowels. Dowels shall be #4 steel bars or larger, Grade 60 steel, smooth, and 8-inches long. Dowels shall be embedded equally and centered vertically into adjacent granite pieces. Granite blocks shall be drilled approximately 6-inches from the exposed vertical face to receive the dowels and grouted in place using an approved non-shrink grout from the MaineDOT prequalified list.

Drainage Geotextile placement shall closely follow the erection of each row of Recycled Granite Curb. Drainage Geotextile shall be placed in accordance with Standard Specification Section 620. Drainage Geotextile shall cover all joint between Recycled Granite Curb sections. Drainage Geotextile overlaps between sections shall be 6-inches minimum.

Backfill placement shall closely follow the erection of each row of Recycled Granite Curb. The maximum lift thickness shall be 8 inches loose. Gravel Borrow Backfill shall be compacted in accordance with Section 203.12 except that the minimum required compaction shall be at least 92 percent of maximum density as determined by AASHTO T-180 Method C or D. The Contractor shall decrease the lift thickness if necessary to obtain the specified density. Backfill compaction shall be accomplished without disturbance or displacement of the Recycled Granite Curb sections. Sheepsfoot rollers will not be allowed. Full size, ride on compaction equipment will not be allowed within 5 feet of the back of the Recycled Granite

Curb sections. Compaction adjacent to the Recycled Granite Curb Wall shall be performed using hand-operated compaction equipment.

The moisture content of the Backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-180, Method C or D. At the end of the day's operations, the Contractor shall shape the last level of backfill so as to direct runoff of rain water away from the Recycled Granite Curb Wall face.

A total of 10 6-foot wide granite steps shall be constructed as shown on the Plans. Treads shall have a width of 1-foot and the step rise shall be 6-inches. The tread surface of the steps shall be dressed to an appropriate true plane with no projections or depressions on those surfaces greater than 1/2-inch. Exposed faces and tops of Granite Steps shall be uniform in color and texture. The Granite Steps shall be installed to a tolerance of plus or minus 3/4-inch in 10 feet in horizontal alignment. The Contractor shall furnish handrails for the Granite Steps. The handrails shall meet the 2010 ADA Standards for Accessibility design. The handrails shall be submitted to the Resident for Review.

A 3-foot high Cedar Rail Fence shall be installed at the top of the wall as shown on the Plans and Special Details in the Contract Documents. The Cedar Rail Fence shall be located 3-feet back from face of wall. Cedar Rail Fence shall be installed in accordance with Standard Specification Section 607.

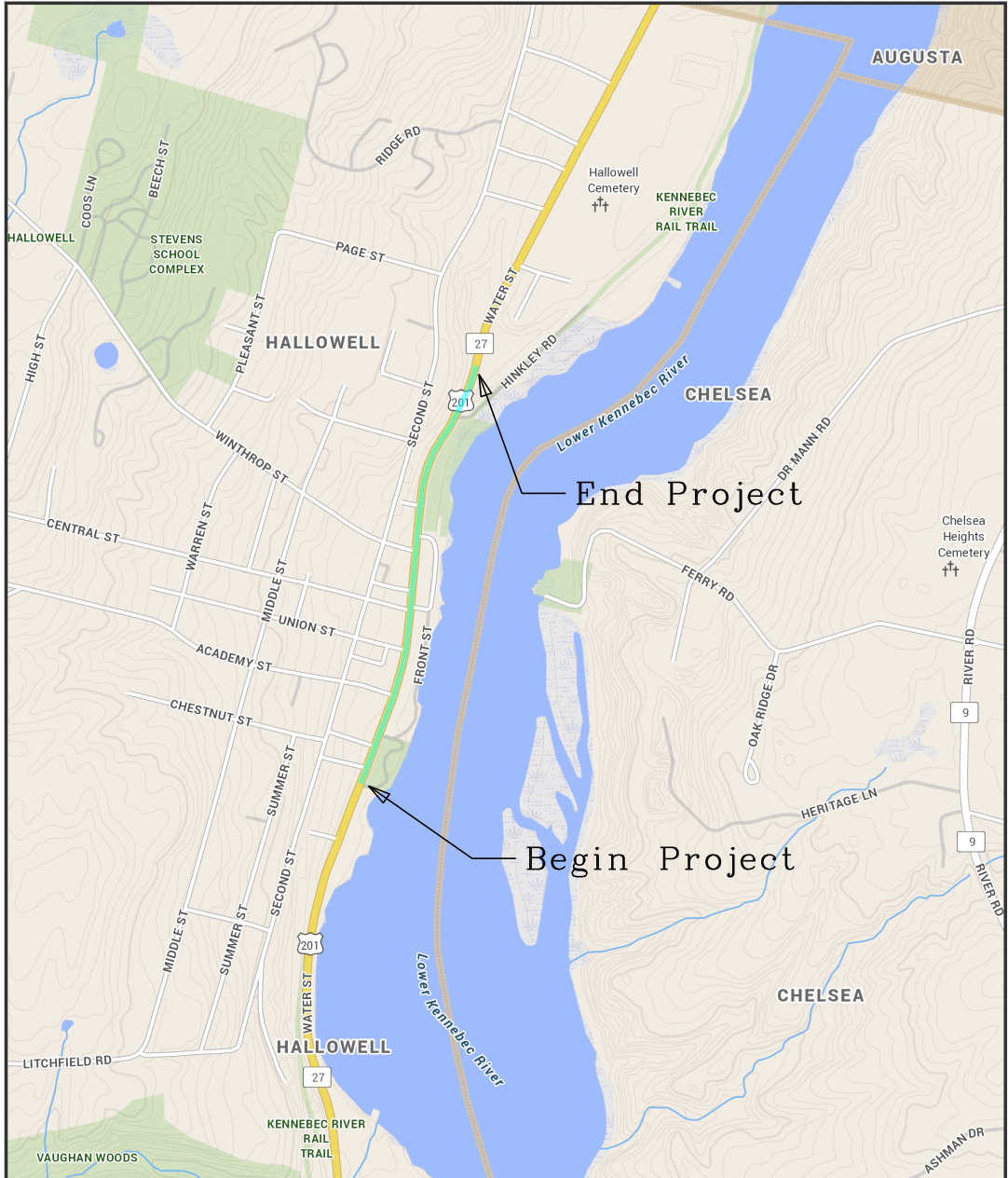
6.0 CLOSURE

This Geotechnical Data Report has been prepared for the use of the MaineDOT Highway Program for specific application to the proposed reconstruction of State Route 201 in Hallowell, Maine in accordance with generally accepted geotechnical and foundation engineering practices. No other intended use or warranty is expressed or implied.

MaineDOT conducted a limited number of soil explorations at discrete locations along the project and a limited number of laboratory tests. MaineDOT shall not be responsible for the Bidder's or Contractor's interpretations, estimates, or conclusions derived from the geotechnical information. Data provided may not be representative of the subsurface conditions between boring locations.

Sheets

HALLOWELL, MAINE



The Maine Department of Transportation provides this publication for information only. Reliance upon this information is at user risk. It is subject to revision and may be incomplete depending upon changing conditions. The Department assumes no liability if injuries or damages result from this information. This map is not intended to support emergency dispatch.

0.15 Miles
1 inch = 0.21 miles

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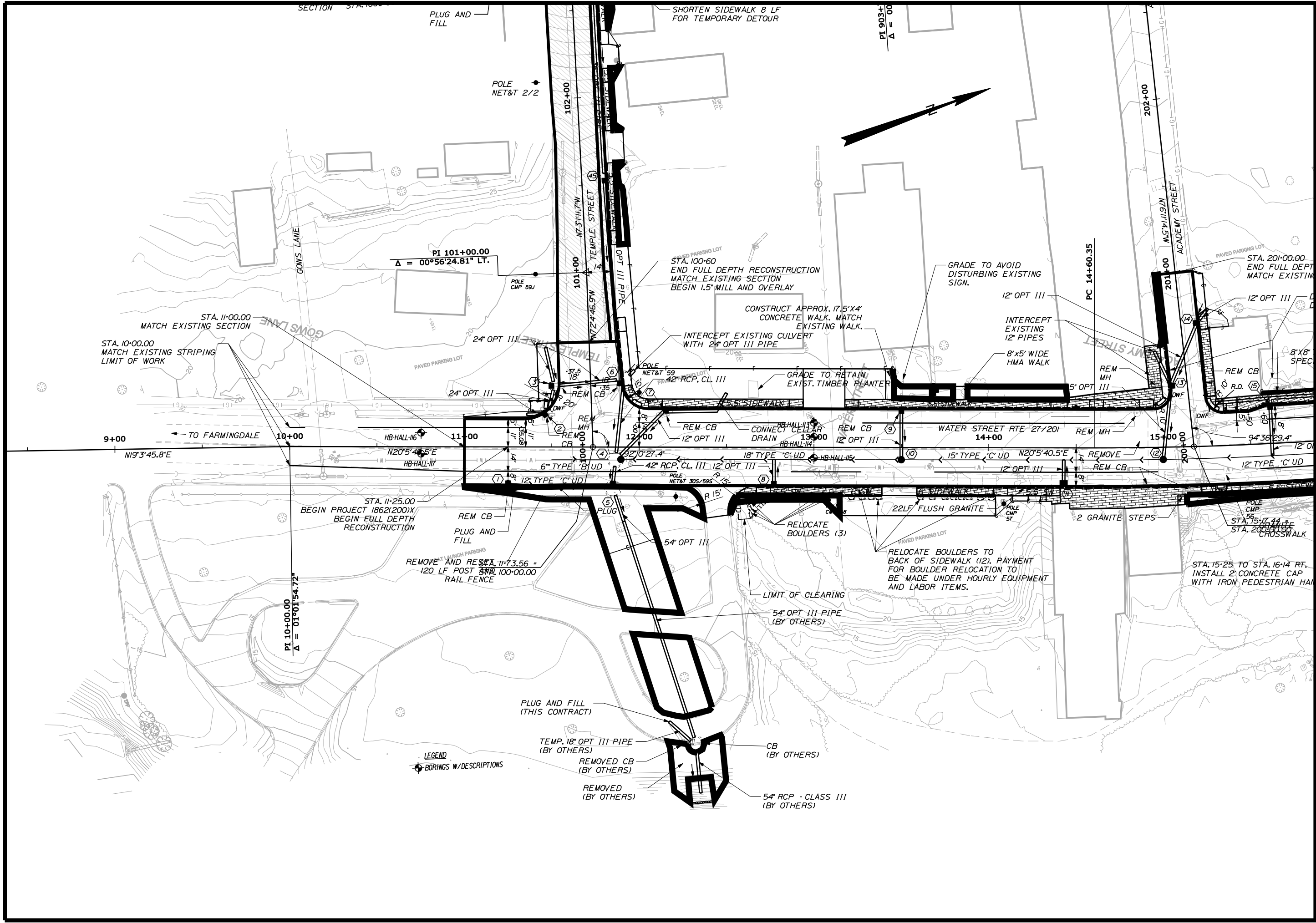
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Date: 12/15/2017

Username: Terry.White

Division: GEOTECH

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STATE OF MAINE
DEPARTMENT OF TRANSPORTATION
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HIGHWAY PLANS

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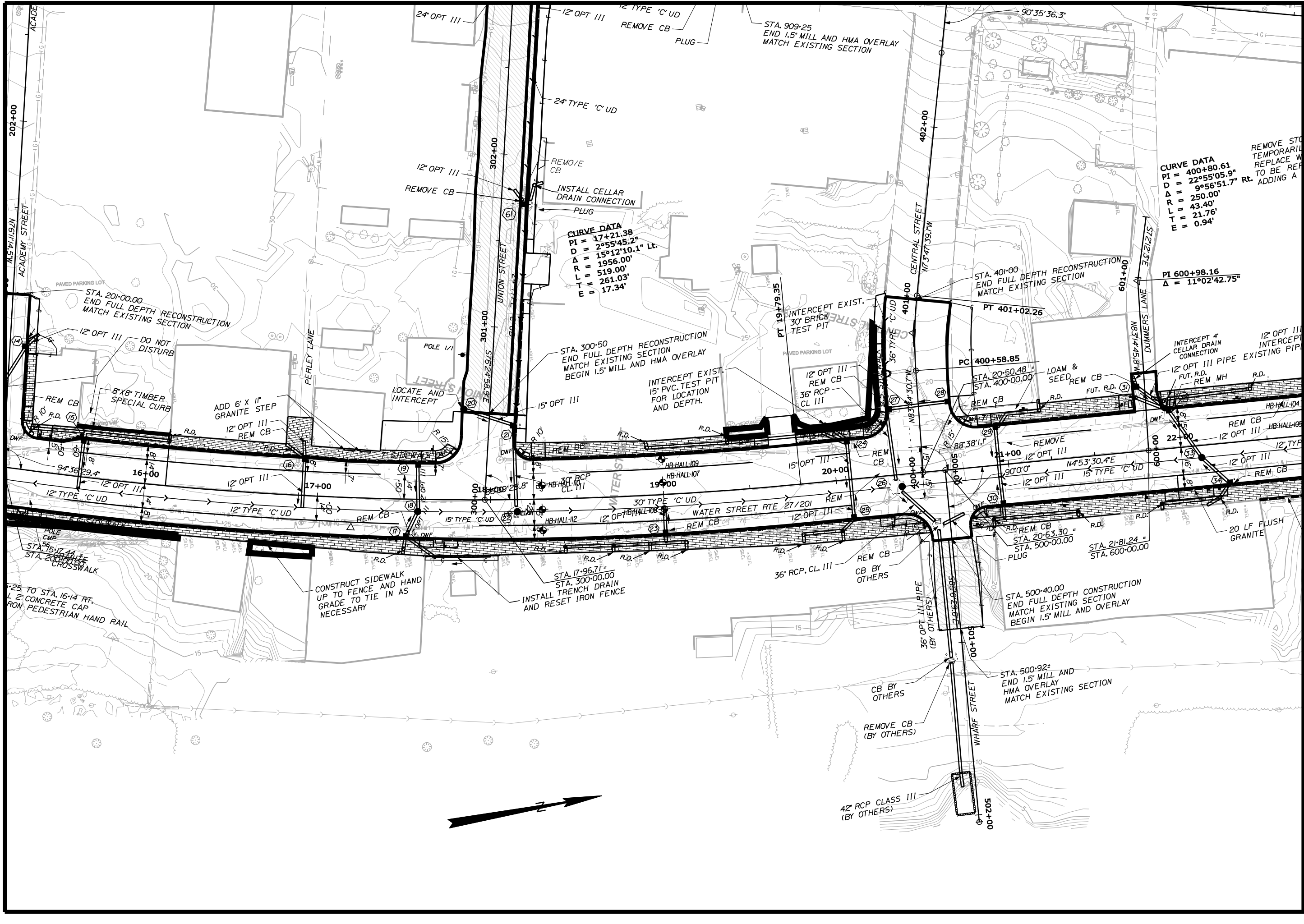
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HALLOWELL
ROUTE 201
BORING LOCATION PLAN

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DEPARTMENT OF TRANSPORTATION
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HALLOWELL
ROUTE 201
BORING LOCATION PLAN

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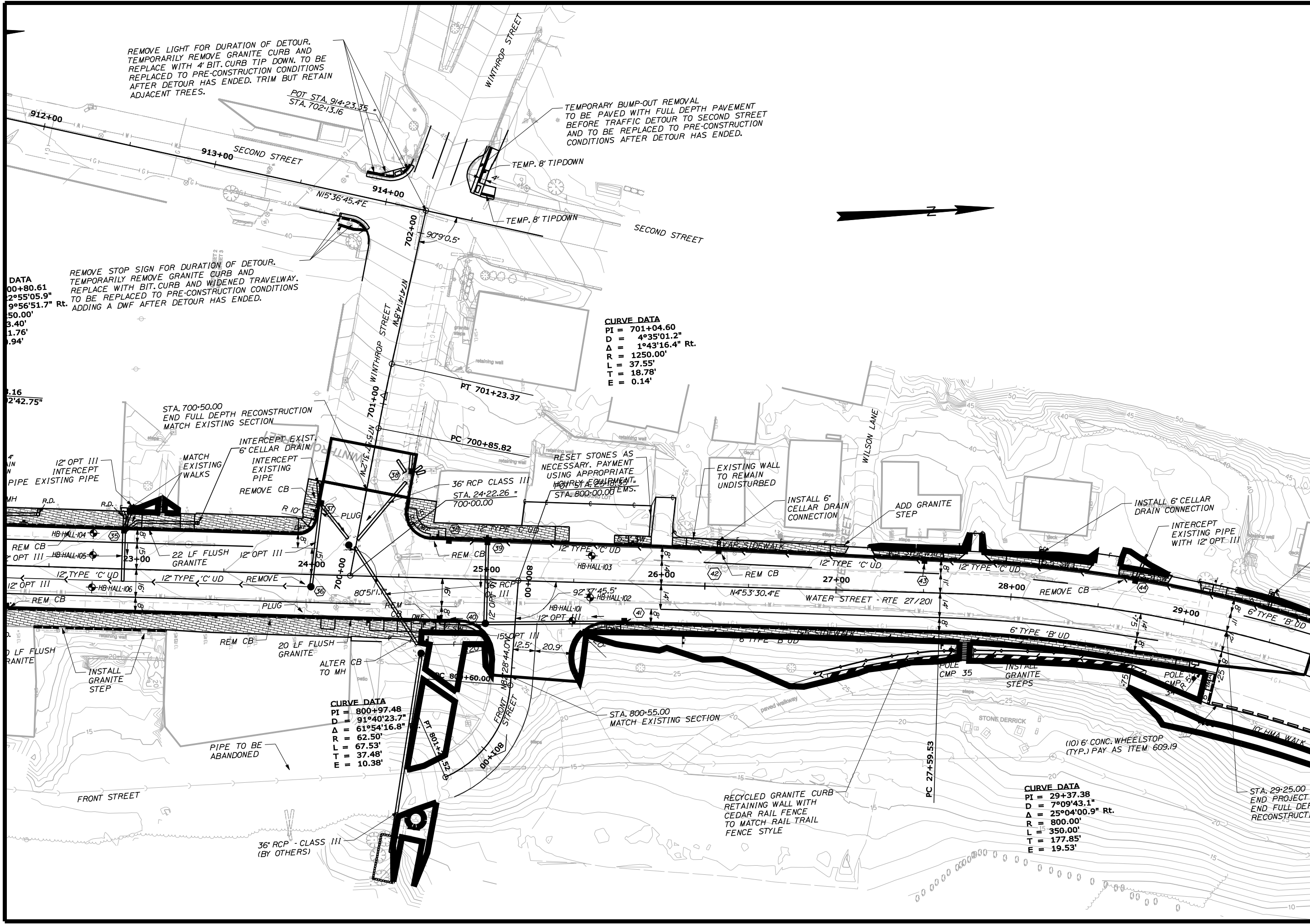
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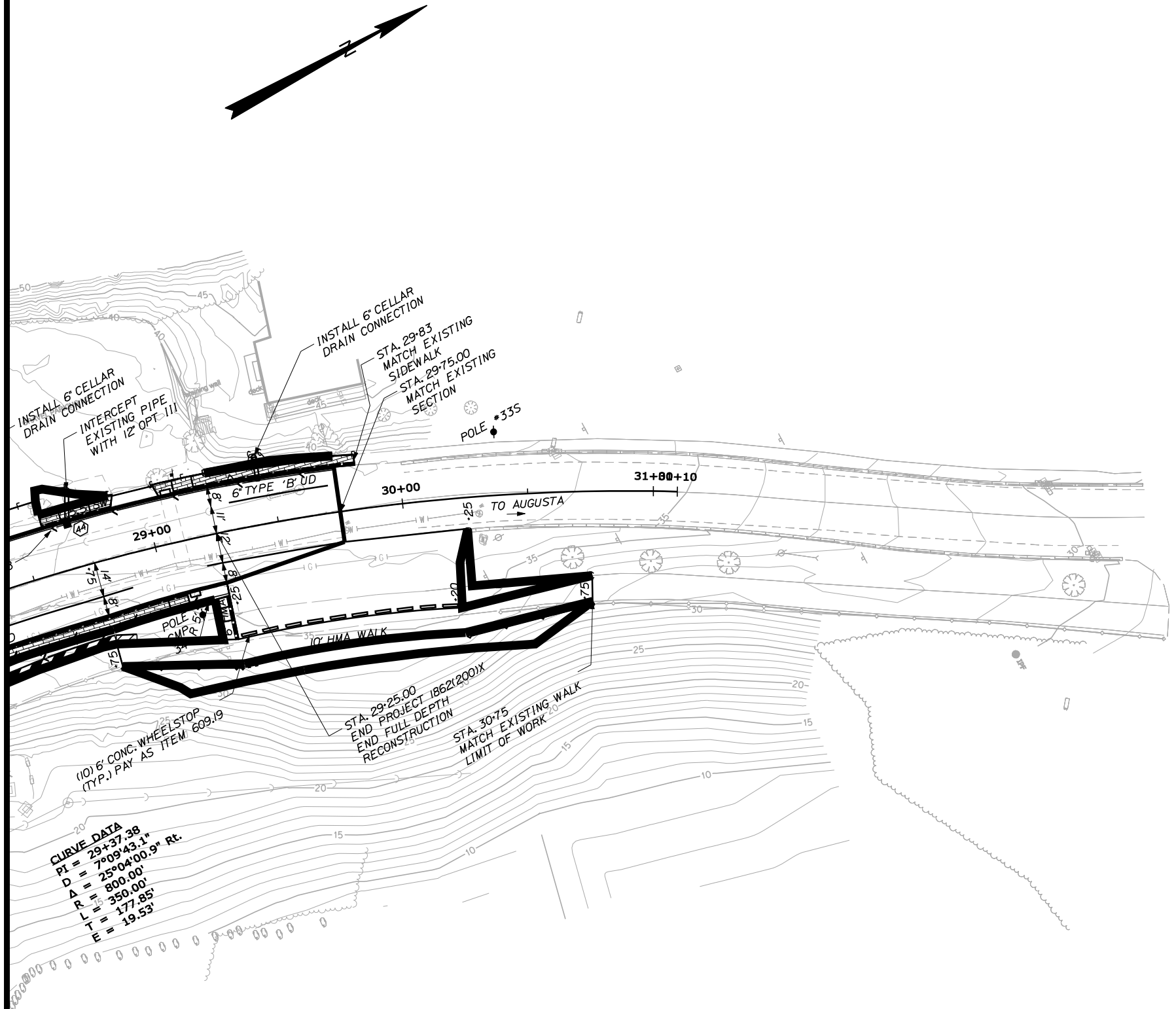
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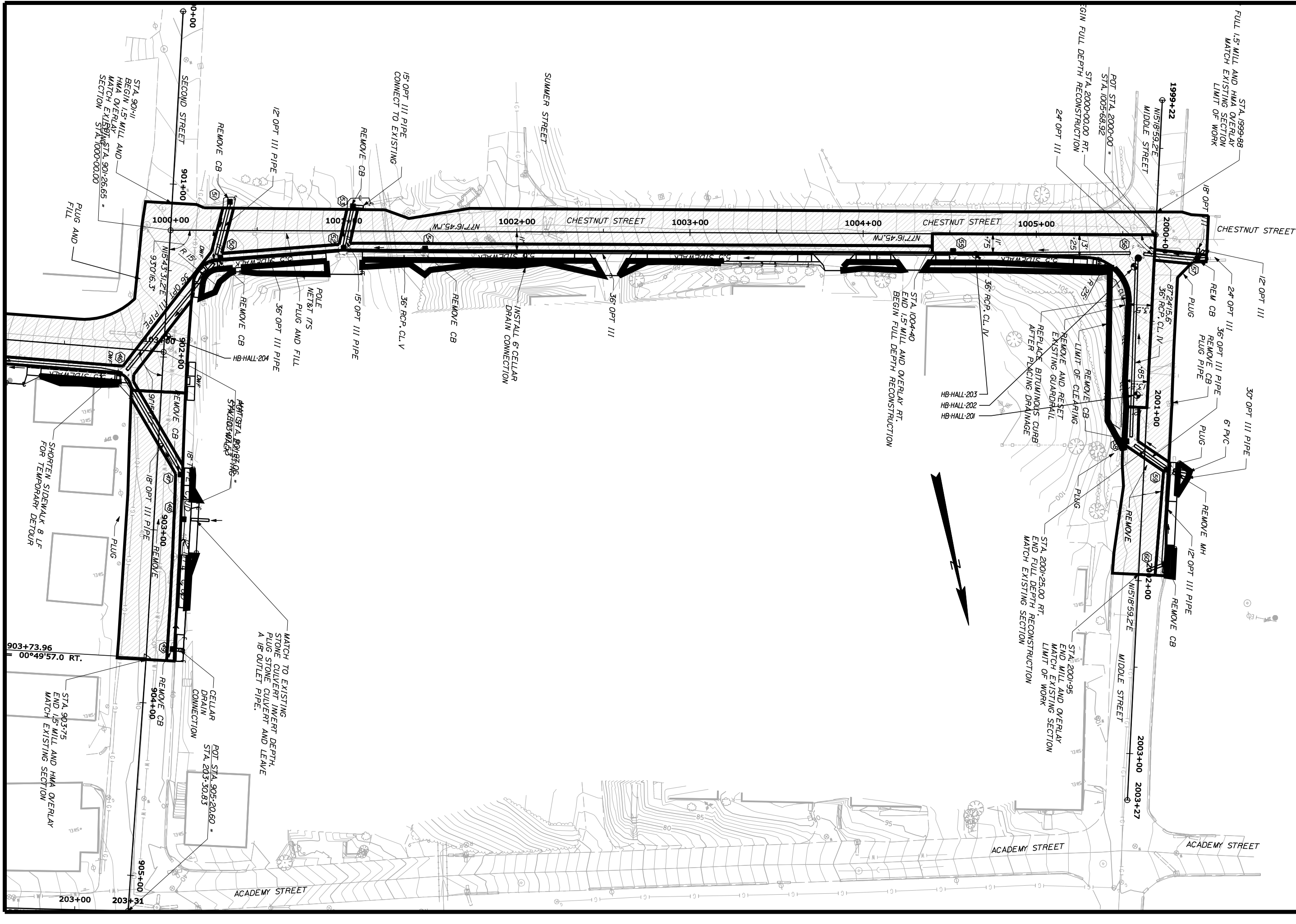


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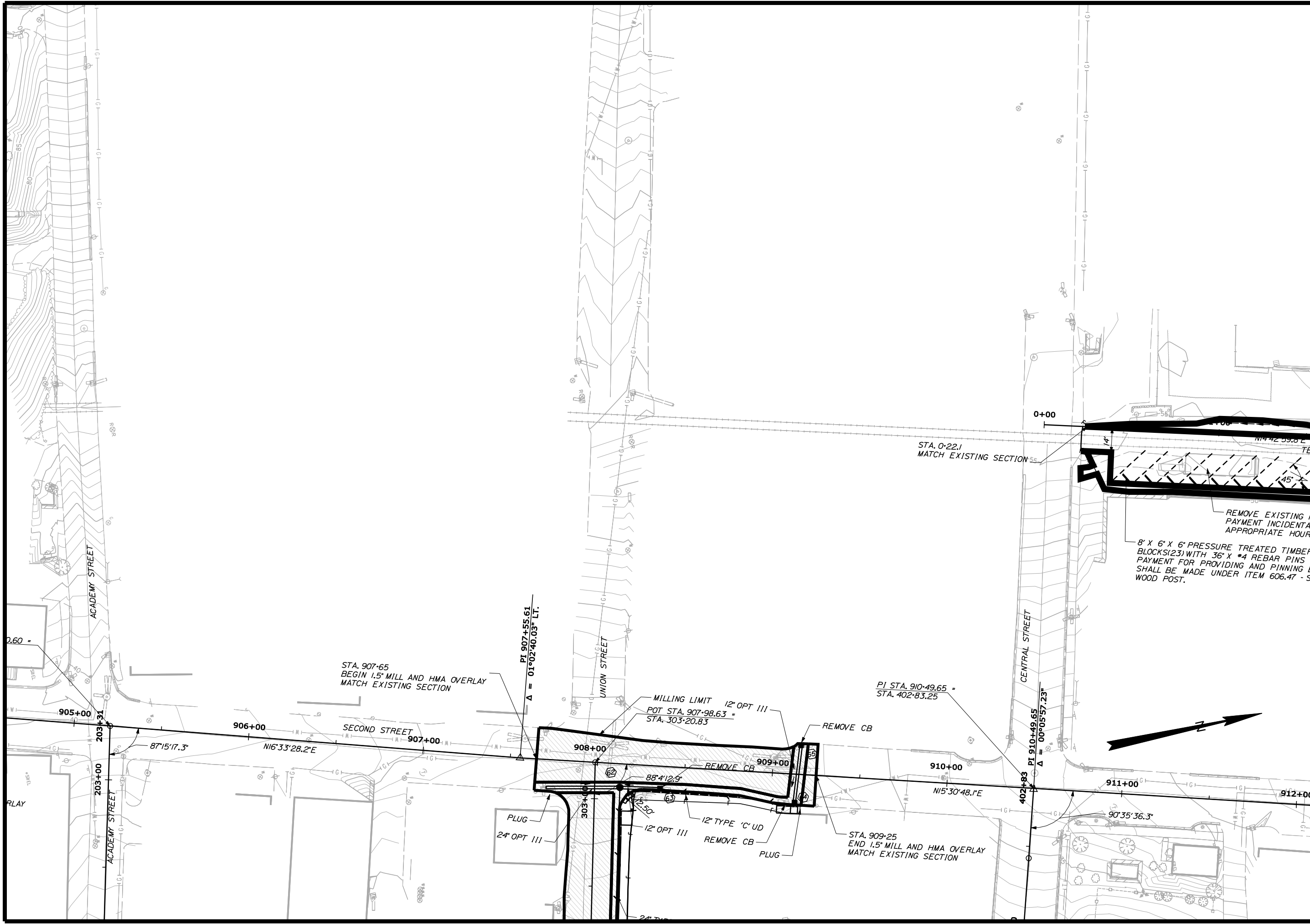
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BORING LOCATION PLAN



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STATE OF MAINE
 DEPARTMENT OF TRANSPORTATION
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C. RUSSELL	T. WHITE	NOV. 2017

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HALLOWELL
 ROUTE 201
 BORING LOCATION PLAN

SHEET NUMBER
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 OF 8

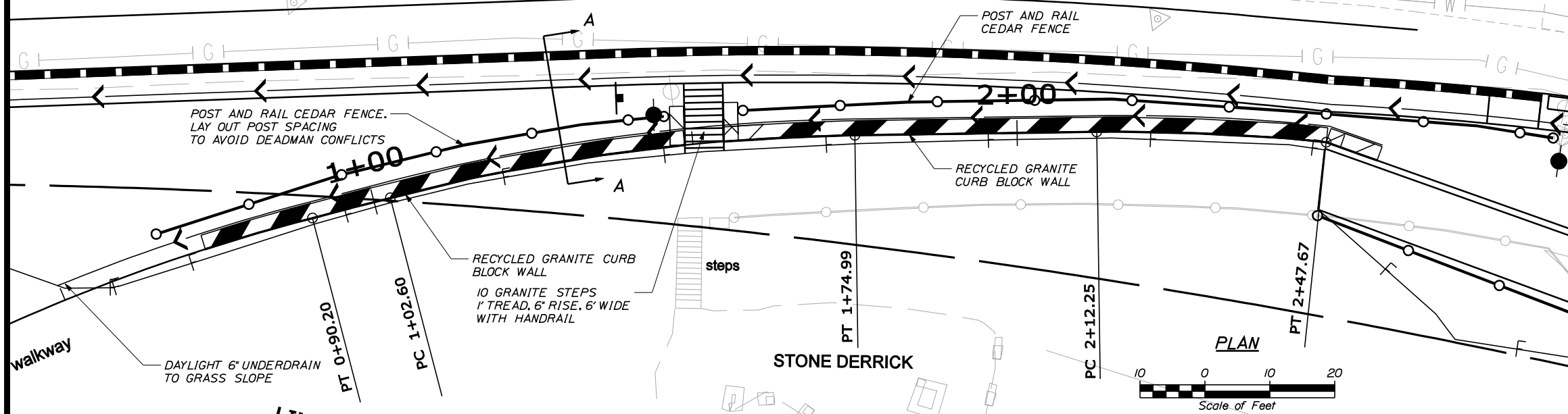
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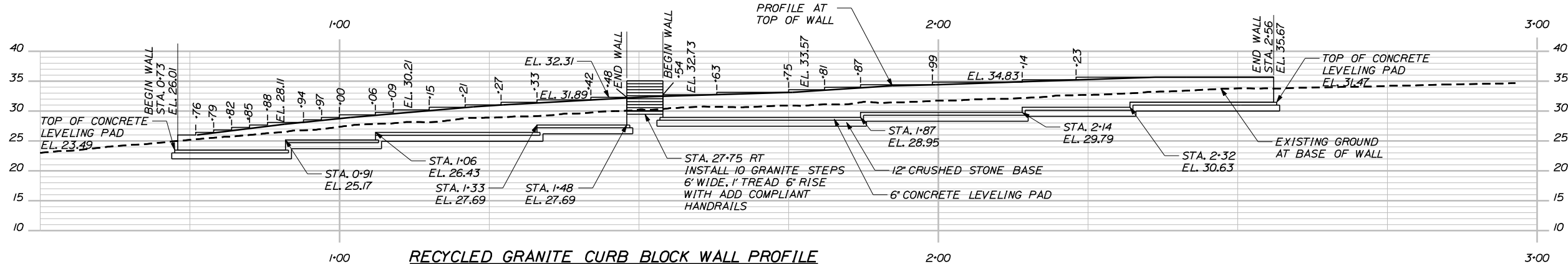
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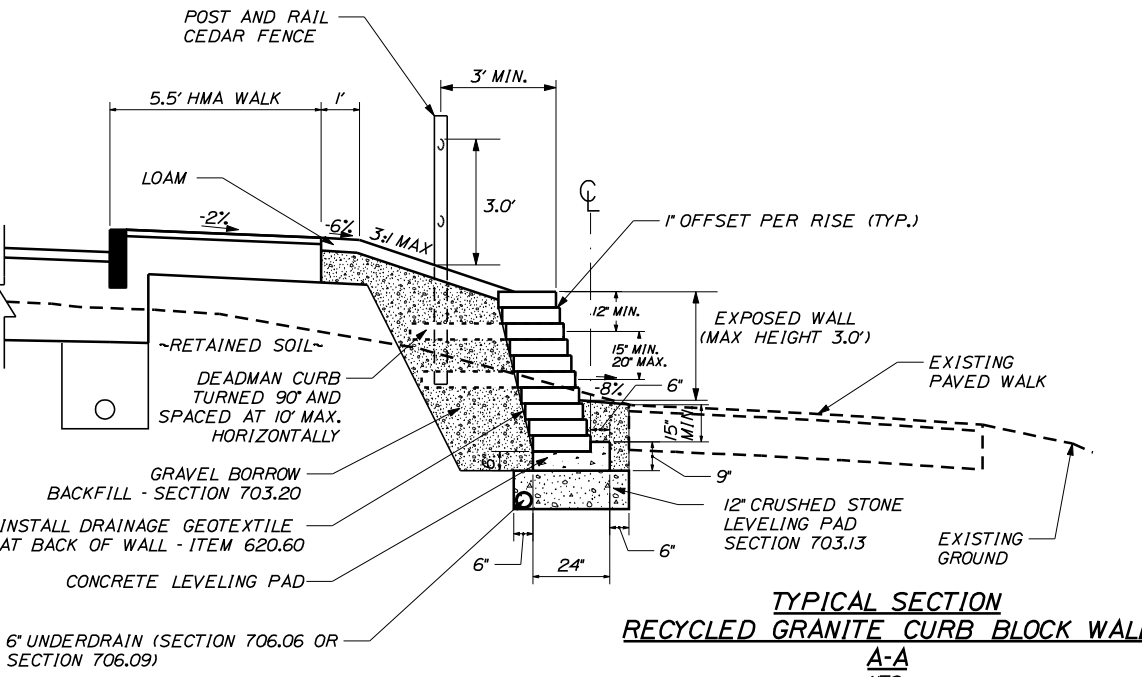
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PI () 0+45.44	530619.19672	1137515.98282
CC ()	530704.02196	1137808.33628
PT () 0+90.20	530664.23890	1137509.97692
Radius:	301.00	
Delta:	17°10'11.3" Right	
Length:	90.20	
Tangent:	45.44	
External:	3.41	
PC () 1+02.60	530676.52727	1137508.33840
Tangent Direction:	N 7°35'41.9" W	
Tangent Length:	12.40	
PI () 1+38.97	530712.58061	1137503.53107
CC ()	530716.31033	1137806.69776
PT () 1+74.99	530748.74131	1137507.44998
Radius:	301.00	
Delta:	13°46'49.0" Right	
Length:	72.39	
Tangent:	36.37	
External:	2.19	
PC () 2+12.25	530785.78701	1137511.46481
Tangent Direction:	N 6°11'07.0" E	
Tangent Length:	37.26	
PI () 2+29.98	530803.41178	1137513.37489
CC ()	530753.35603	1137810.71259
PT () 2+47.67	530820.69047	1137517.34069
Radius:	301.00	
Delta:	6°44'28.7" Right	
Length:	35.42	
Tangent:	17.73	
External:	0.52	
POE () 2+96.39	530864.26634	1137539.12209
Tangent Direction:	N 26°33'29.5" E	
Tangent Length:	48.72	

ALIGNMENT IS AN APPROXIMATION OF 1' OFFSET FROM EDGE OF RAIL TRAIL.



RECYCLED GRANITE CURB BLOCK WALL PROFILE



TYPICAL SECTION A-A RECYCLED GRANITE CURB BLOCK WALL

- THE CONTRACTOR SHALL FURNISH AND CONSTRUCT A RECYCLED GRANITE CURB WALL WITH GRANITE STEPS IN ACCORDANCE SPECIAL PROVISION 679 AS SHOWN ON THE PLANS AND SPECIAL DETAILS IN THE CONTRACT DOCUMENTS. THE CONTRACTOR SHALL SUBMIT SHOP DRAWINGS FOR THE RECYCLED GRANITE CURB WALL WITH GRANITE STEPS TO THE RESIDENT FOR REVIEW. SHOP DRAWINGS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF MAINE. PLAN DETAILS SHOWN ARE FOR ESTIMATING PURPOSES ONLY.
- BACKFILL SHALL MEET THE REQUIREMENTS OF SECTION 703.20 GRAVEL BORROW, EXCEPT THAT THE BACKFILL MATERIAL SHALL ONLY CONTAIN PARTICLES THAT WILL PASS THE 3-INCH SQUARE MESH SIEVE IN ACCORDANCE WITH SPECIAL PROVISION 679.
- ALL EXPOSED WALL FACES SHALL BE RECYCLED GRANITE CURB SALVAGED FROM THE PROJECT. DEADMEN AND OTHER BURIED CURBING MAY BE FROM AN ALTERNATE SOURCE AS NECESSARY TO MEET PROJECT MATERIAL REQUIREMENTS. BROKEN SECTIONS OF GRANITE CURB SHALL NOT BE ALLOWED UNLESS APPROVED BY THE RESIDENT.
- A DRAINAGE SYSTEM SHALL BE INCLUDED IN THE WALL CONSTRUCTION. THE DRAINAGE SYSTEM SHALL BE INCIDENTAL TO THE CONSTRUCTION OF THE WALL.
- A MINIMUM EMBEDMENT DEPTH OF 1.25 FEET AT THE TOE OF THE WALL IS REQUIRED IN THE CONSTRUCTION OF THE RECYCLED GRANITE CURB WALL WITH GRANITE STEPS.
- PROFILE IS AT FACE OF WALL APPROXIMATELY 1 FOOT OFF BACK EDGE OF EXISTING RAIL TRAIL.
- TOP ELEVATIONS ARE TOP OF RECYCLED GRANITE CURB.
- BOTTOM ELEVATIONS ARE TOP OF CONCRETE LEVELING PAD BELOW RECYCLED GRANITE CURB GRANITE BLOCKS.
- STATIONS ARE AT FACE OF LOWEST EXPOSED WALL COURSE.
- SALVAGED RECYCLED GRANITE CURB DIMENSIONS ARE APPROXIMATE BASED ON MAINE DOT STANDARD DETAIL 609(07) VERTICAL CURB TYPE 1.
- GRANITE BLOCK DEADMEN SHALL BE EMBEDDED A MINIMUM OF 5 FEET FROM THE FACE OF THE WALL.
- SALVAGED RECYCLED GRANITE CURB USED FOR WALL CONSTRUCTION SHALL HAVE A MINIMUM LENGTH OF 4 FEET UNLESS APPROVED BY THE RESIDENT.
- THE EXPOSED VERTICAL FACE OF THE SALVAGED RECYCLED GRANITE CURB PIECES SHALL BE THE TOP FACE OF THE ORIGINAL CURB.
- THE TOP SURFACE OF EACH COURSE SHALL BE LEVELLED TRANSVERSELY, PERPENDICULAR TO THE WALL FACE, WITH SHIMS PLACED BETWEEN COURSES. SHIMS SHALL NOT BE VISIBLE ON THE EXPOSED FACE. SHIMS SHALL BE STONE OR OTHER APPROVED DURABLE MATERIAL. SUFFICIENT SHIMS SHALL BE PLACED TO STABILIZE GRANITE PIECES AGAINST MOVEMENT.
- VERTICAL JOINTS SHALL BE SEPARATED A MINIMUM OF 2 FEET HORIZONTALLY FROM VERTICAL JOINTS IN WALL COURSES ABOVE AND BELOW.
- THE EXPOSED FACES OF EACH SALVAGED RECYCLED GRANITE CURB USED SHALL BE DRESSED TO AN APPROXIMATE TRUE PLANE WITH NO PROJECTIONS OR DEPRESSIONS ON THOSE SURFACES GREATER THAN 1/2-INCH. EXPOSED FACES AND TOPS OF ADJACENT RECYCLED GRANITE CURB SECTIONS SHALL BE UNIFORM IN COLOR AND TEXTURE.
- THE EXPOSED FACES OF RECYCLED GRANITE CURB SHALL BE CLEANED OF PAINT, DIRT AND OTHER DEBRIS PRIOR TO USE FOR WALL CONSTRUCTION.
- GAPS BETWEEN RECYCLED GRANITE CURB WALL COURSES VERTICALLY AT THE WALL FACE AND BETWEEN ADJACENT RECYCLED GRANITE CURB SECTIONS IN THE SAME COURSE HORIZONTALLY SHALL NOT EXCEED 3/4-INCH. THE MAXIMUM GAP HORIZONTALLY BETWEEN ADJACENT PIECES SHALL BE 1/4-INCH.
- GRANITE BLOCK DEADMEN PIECES SHALL BE CONNECTED TO ADJACENT GRANITE BLOCK PIECES IN THE SAME COURSE WITH STEEL DOWELS. DOWELS SHALL BE #4 BARS OR LARGER GRADE 60 STEEL, SMOOTH, AND 8-INCHES LONG. DOWELS SHALL BE EMBEDDED EQUALLY AND CENTERED VERTICALLY INTO ADJACENT GRANITE PIECES. GRANITE BLOCKS SHALL BE DRILLED APPROXIMATELY 6-INCHES FROM THE EXPOSED VERTICAL FACE TO RECEIVE THE DOWELS AND GROUTED IN PLACE USING AN APPROVED NON-SHRINK GROUT FROM THE MAINE DOT PREQUALIFIED LIST.
- THE CONTRACTOR SHALL FURNISH HANDRAILS FOR THE GRANITE STEPS. THE HANDRAILS SHALL MEET THE 2010 ADA STANDARDS FOR ACCESSIBILITY DESIGN. THE HANDRAILS SHALL BE SUBMITTED TO THE RESIDENT FOR REVIEW.
- THE CONTRACTOR SHALL FURNISH A 3-FOOT HIGH CEDAR RAIL FENCE LOCATED 3-FEET BACK FROM FACE OF WALL. THE CEDAR RAIL FENCE WILL BE PAID FOR UNDER ITEM NO. 607.22.

STATE OF MAINE DEPARTMENT OF TRANSPORTATION	STP-1862(200)X	WIN 18622.00	HIGHWAY PLANS
DATE	BY	PROJ. MANAGER	ERNE MARTIN
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X-18		CHECKED-REVIEWED	ALG
		DESIGN-DETAILED	
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		REVISIONS 4	
		FIELD CHANGES	
SIGNATURE		7960	
P.E. NUMBER			
DATE			
HALLOWELL WATER STREET SPECIAL DETAILS Recycled Granite Curb Wall with Granite Steps			
SHEET NUMBER 8			
OF 8			

Appendix A

Boring Logs

UNIFIED SOIL CLASSIFICATION SYSTEM				MODIFIED BURMISTER SYSTEM																											
MAJOR DIVISIONS		GROUP SYMBOLS	TYPICAL NAMES	Descriptive Term	Portion of Total (%)																										
COARSE-GRAINED SOILS (more than half of material is larger than No. 200 sieve size)	GRAVELS (more than half of coarse fraction is larger than No. 4 sieve size)	CLEAN GRAVELS	GW Well-graded gravels, gravel-sand mixtures, little or no fines. GP Poorly-graded gravels, gravel sand mixtures, little or no fines.	trace	0 - 10																										
		GRAVEL WITH FINES (Appreciable amount of fines)	GM Silty gravels, gravel-sand-silt mixtures. GC Clayey gravels, gravel-sand-clay mixtures.	little some	11 - 20 21 - 35																										
	SANDS (more than half of coarse fraction is smaller than No. 4 sieve size)	CLEAN SANDS	SW Well-graded sands, gravelly sands, little or no fines SP Poorly-graded sands, gravelly sand, little or no fines.	adjective (e.g. sandy, clayey)	36 - 50																										
		SANDS WITH FINES (Appreciable amount of fines)	SM Silty sands, sand-silt mixtures SC Clayey sands, sand-clay mixtures.	TERMS DESCRIBING DENSITY/CONSISTENCY																											
	<p>Coarse-grained soils (more than half of material is larger than No. 200 sieve): Includes (1) clean gravels; (2) silty or clayey gravels; and (3) silty, clayey or gravelly sands. Density is rated according to standard penetration resistance (N-value).</p> <table border="1"> <thead> <tr> <th>Density of Cohesionless Soils</th> <th>Standard Penetration Resistance N-Value (blows per foot)</th> </tr> </thead> <tbody> <tr><td>Very loose</td><td>0 - 4</td></tr> <tr><td>Loose</td><td>5 - 10</td></tr> <tr><td>Medium Dense</td><td>11 - 30</td></tr> <tr><td>Dense</td><td>31 - 50</td></tr> <tr><td>Very Dense</td><td>> 50</td></tr> </tbody> </table>				Density of Cohesionless Soils	Standard Penetration Resistance N-Value (blows per foot)	Very loose	0 - 4	Loose	5 - 10	Medium Dense	11 - 30	Dense	31 - 50	Very Dense	> 50															
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<p>Fine-grained soils (more than half of material is smaller than No. 200 sieve): Includes (1) inorganic and organic silts and clays; (2) gravelly, sandy or silty clays; and (3) clayey silts. Consistency is rated according to undrained shear strength as indicated.</p> <table border="1"> <thead> <tr> <th>Consistency of Cohesive soils</th> <th>SPT N-Value (blows per foot)</th> <th>Approximate Undrained Shear Strength (psf)</th> <th>Field Guidelines</th> </tr> </thead> <tbody> <tr><td>Very Soft</td><td>WOH, WOR, WOP, <2</td><td>0 - 250</td><td>Fist easily penetrates</td></tr> <tr><td>Soft</td><td>2 - 4</td><td>250 - 500</td><td>Thumb easily penetrates</td></tr> <tr><td>Medium Stiff</td><td>5 - 8</td><td>500 - 1000</td><td>Thumb penetrates with moderate effort</td></tr> <tr><td>Stiff</td><td>9 - 15</td><td>1000 - 2000</td><td>Indented by thumb with great effort</td></tr> <tr><td>Very Stiff</td><td>16 - 30</td><td>2000 - 4000</td><td>Indented by thumbnail</td></tr> <tr><td>Hard</td><td>>30</td><td>over 4000</td><td>Indented by thumbnail with difficulty</td></tr> </tbody> </table>				Consistency of Cohesive soils	SPT N-Value (blows per foot)	Approximate Undrained Shear Strength (psf)	Field Guidelines	Very Soft	WOH, WOR, WOP, <2	0 - 250	Fist easily penetrates	Soft	2 - 4	250 - 500	Thumb easily penetrates	Medium Stiff	5 - 8	500 - 1000	Thumb penetrates with moderate effort	Stiff	9 - 15	1000 - 2000	Indented by thumb with great effort	Very Stiff	16 - 30	2000 - 4000	Indented by thumbnail	Hard	>30	over 4000	Indented by thumbnail with difficulty
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FINE-GRAINED SOILS (more than half of material is smaller than No. 200 sieve size)	SILTS AND CLAYS (liquid limit less than 50)	ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity.	<p>Rock Quality Designation (RQD): RQD (%) = $\frac{\text{sum of the lengths of intact pieces of core} * > 4 \text{ inches}}{\text{length of core advance}}$ *Minimum NQ rock core (1.88 in. OD of core)</p> <table border="1"> <thead> <tr> <th>Rock Mass Quality</th> <th>RQD (%)</th> </tr> </thead> <tbody> <tr><td>Very Poor</td><td>≤25</td></tr> <tr><td>Poor</td><td>26 - 50</td></tr> <tr><td>Fair</td><td>51 - 75</td></tr> <tr><td>Good</td><td>76 - 90</td></tr> <tr><td>Excellent</td><td>91 - 100</td></tr> </tbody> </table>			Rock Mass Quality	RQD (%)	Very Poor	≤25	Poor	26 - 50	Fair	51 - 75	Good	76 - 90	Excellent	91 - 100														
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CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.																															
OL Organic silts and organic silty clays of low plasticity.																															
SILTS AND CLAYS (liquid limit greater than 50)	MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.	<p>Desired Rock Observations (in this order, if applicable): Color (Munsell color chart) Texture (aphanitic, fine-grained, etc.) Rock Type (granite, schist, sandstone, etc.) Hardness (very hard, hard, mod. hard, etc.) Weathering (fresh, very slight, slight, moderate, mod. severe, severe, etc.) Geologic discontinuities/jointing: -dip (horiz - 0-5 deg., low angle - 5-35 deg., mod. dipping - 35-55 deg., steep - 55-85 deg., vertical - 85-90 deg.) -spacing (very close - <2 inch, close - 2-12 inch, mod. close - 1-3 feet, wide - 3-10 feet, very wide >10 feet) -tightness (tight, open, or healed) -infilling (grain size, color, etc.) Formation (Waterville, Ellsworth, Cape Elizabeth, etc.) RQD and correlation to rock mass quality (very poor, poor, etc.) ref: ASTM D6032 and AASHTO Standard Specification for Highway Bridges, 17th Ed. Table 4.4.8.1.2A Recovery (inch/inch and percentage) Rock Core Rate (X.X ft - Y.Y ft (min:sec))</p>																													
	CH Inorganic clays of high plasticity, fat clays.																														
	OH Organic clays of medium to high plasticity, organic silts.																														
HIGHLY ORGANIC SOILS	Pt Peat and other highly organic soils.																														
<p>Desired Soil Observations (in this order, if applicable): Color (Munsell color chart) Moisture (dry, damp, moist, wet) Density/Consistency (from above right hand side) Texture (fine, medium, coarse, etc.) Name (sand, silty sand, clay, etc., including portions - trace, little, etc.) Gradation (well-graded, poorly-graded, uniform, etc.) Plasticity (non-plastic, slightly plastic, moderately plastic, highly plastic) Structure (layering, fractures, cracks, etc.) Bonding (well, moderately, loosely, etc.,) Cementation (weak, moderate, or strong) Geologic Origin (till, marine clay, alluvium, etc.) Groundwater level</p>				<p>Sample Container Labeling Requirements: WIN Blow Counts Bridge Name / Town Sample Recovery Boring Number Date Sample Number Personnel Initials Sample Depth</p>																											
<p>Maine Department of Transportation Geotechnical Section Key to Soil and Rock Descriptions and Terms Field Identification Information</p>																															

Maine Department of Transportation Soil/Rock Exploration Log US CUSTOMARY UNITS	Project: A 0.54 mile portion of Route 201 (Water Street) Location: Hallowell, Maine	Boring No.: <u>HB-HALL-106</u> WIN: <u>18622.00</u>
----------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------	--------------------------------------------------------

Driller: MaineDOT	Elevation (ft.): 23.2	Auger ID/OD: 5" Dia.
Operator: Giles/Daggett	Datum: NAVD88	Sampler: Standard Split Spoon
Logged By: B. Wilder	Rig Type: CME 45C	Hammer Wt./Fall: 140#/30"
Date Start/Finish: 6/4/2013; 09:30-10:00	Drilling Method: Solid Stem Auger	Core Barrel: N/A
Boring Location: 22+75, 11.0 ft Rt.	Casing ID/OD: N/A	Water Level*: 9.0 ft bgs.

Hammer Efficiency Factor: 0.756 Hammer Type: Automatic Hydraulic Rope & Cathead

Definitions: R = Rock Core Sample S_u = Peak/Remolded Field Vane Undrained Shear Strength (psf) T_v = Pocket Torvane Shear Strength (psf)
D = Split Spoon Sample SSA = Solid Stem Auger S_{u(lab)} = Lab Vane Undrained Shear Strength (psf) WC = Water Content, percent
MD = Unsuccessful Split Spoon Sample Attempt HSA = Hollow Stem Auger q_p = Unconfined Compressive Strength (ksf) LL = Liquid Limit
U = Thin Wall Tube Sample RC = Roller Cone N-uncorrected = Raw Field SPT N-value PL = Plastic Limit
MU = Unsuccessful Thin Wall Tube Sample Attempt WOH = Weight of 140lb. Hammer Hammer Efficiency Factor = Rig Specific Annual Calibration Value PI = Plasticity Index
V = Field Vane Shear Test, PP = Pocket Penetrometer WOR/C = Weight of Rods or Casing N₆₀ = SPT N-uncorrected Corrected for Hammer Efficiency G = Grain Size Analysis
MV = Unsuccessful Field Vane Shear Test Attempt WO1P = Weight of One Person N₆₀ = (Hammer Efficiency Factor/60%)*N-uncorrected C = Consolidation Test

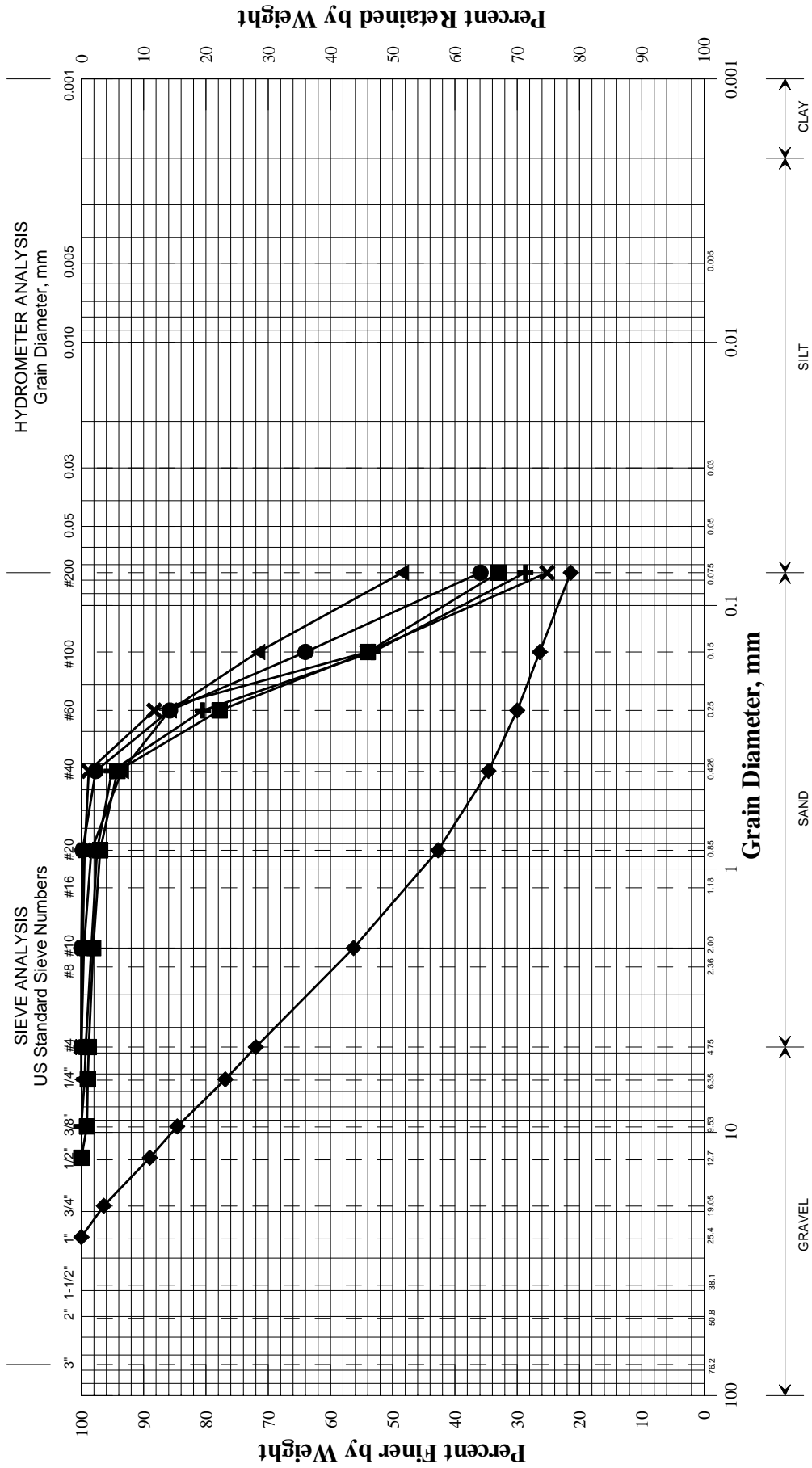
Depth (ft.)	Sample Information							Elevation (ft.)	Graphic Log	Visual Description and Remarks	Laboratory Testing Results/ AASHTO and Unified Class.
	Sample No.	Pen./Rec. (in.)	Sample Depth (ft.)	Blows (6 in.) Shear Strength (psf) or RQD (%)	N-uncorrected	N ₆₀	Casing Blows				
0								22.62	7" PAVEMENT		
	1D	24/9	1.00 - 3.00	9/14/5/5	19	24		20.50	Brown, dry, medium dense, Gravelly, fine to coarse SAND, trace silt, (Fill).	-0.58	
5	2D	24/16	5.00 - 7.00	WOH/2/2/3	4	5			Light brown, moist, loose, Silty fine SAND, trace medium to coarse sand.		-2.70
10	3D	24/18	10.00 - 12.00	1/1/1/1	2	3			Similar to above, except wet at 8.0 ft bgs.		-12.00
15									Bottom of Exploration at 12.00 feet below ground surface. NO REFUSAL		-12.00
20											
25											

Remarks:
Whipper Snappers

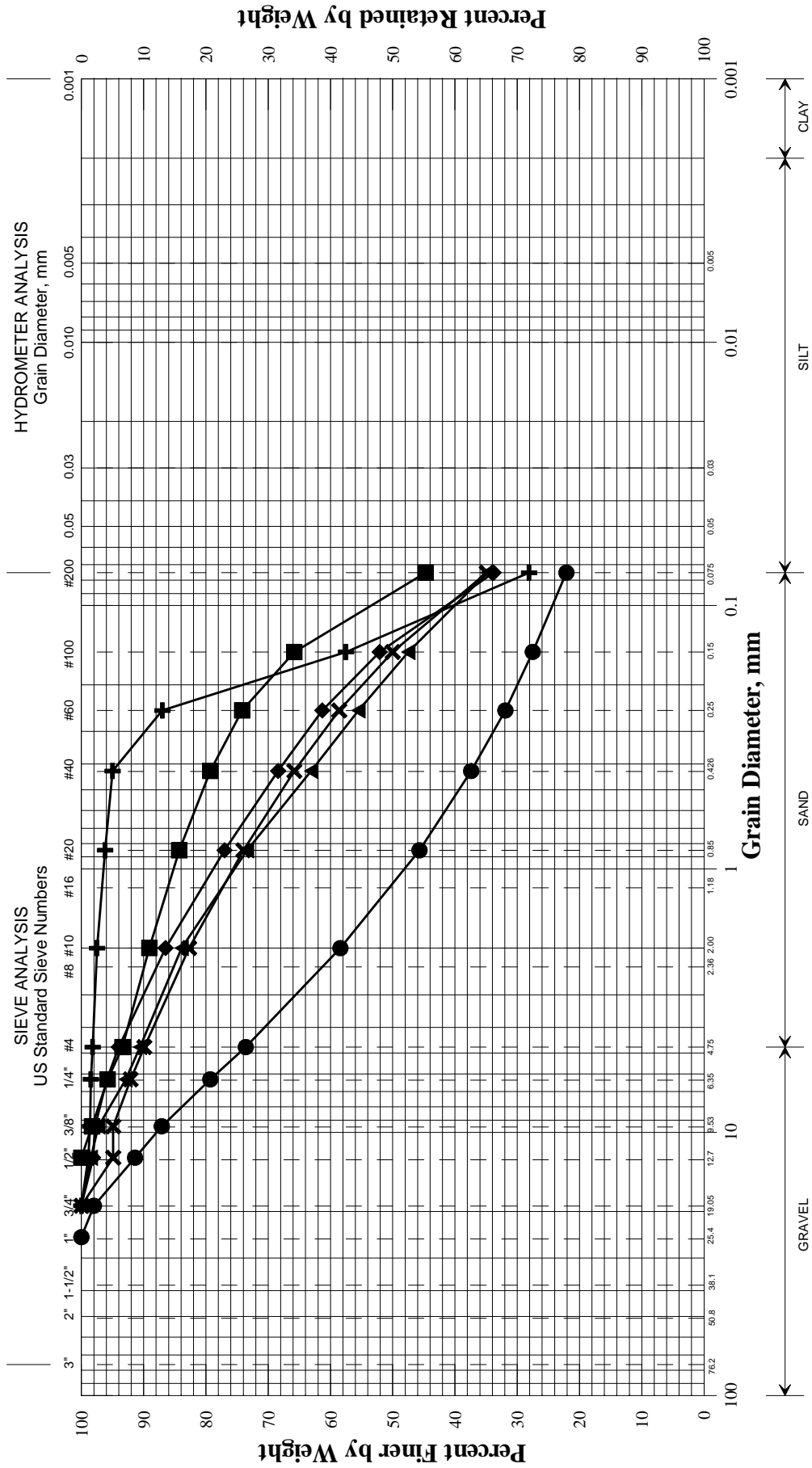
Appendix B

Laboratory Test Results

State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



State of Maine Department of Transportation
GRAIN SIZE DISTRIBUTION CURVE



UNIFIED CLASSIFICATION

Boring/Sample No.	Station	Offset, ft	Depth, ft	Description	W, %	LL	PL	PI
+	18+30	6.0 RT	2.5-5.0	SAND, some silt, trace gravel.	6.1			
◆	13+00	14.0 LT	2.4-5.0	SAND, some silt, trace gravel.	12.9			
■	13+00	6.0 LT	2.4-5.0	Silty SAND, trace gravel.	14.1			
●	13+0	6.0 RT	0.58-5.0	SAND, some gravel, some silt.	2.8			
▲	10+75	8.0 LT	0.58-3.2	SAND, some silt, trace gravel.	7.8			
×	10+75	4.0 RT	0.58-5.0	SAND, some silt, trace gravel.	10.1			

WIN	018622.00
Town	Hallowell
Reported by/Date	WHITE, TERRY A 6/27/2016

Appendix C

Special Provision

SPECIAL PROVISION
SECTION 679
FIELDSTONE RETAINING WALL
(Recycled Granite Curb Wall with Granite Steps)

The following replaces Section 679 in the Standard Specifications in its entirety:

679.01 Description. This work shall consist of construction of a Recycled Granite Curb Wall with Granite Steps in accordance with this Special Provision and in close conformance with the lines, grades, design and dimensions shown on the Plans and Special Details in the Contract Documents or as directed by the Resident. The Recycled Granite Curb Wall with Granite Steps is located on the west side of the rail trail parking area along Water Street.

The Recycled Granite Curb Wall with Granite Steps shall consist of the following components:

- **Foundation Soils** – Native soil mass for supporting the wall components.
- **Drainage System** – 6-inch underdrain pipe.
- **Crushed Stone Leveling Pad** – 12-inch thick bed of Crushed Stone.
- **Concrete Leveling Pad** – 6-inch thick Fill Concrete leveling pad.
- **Recycled Granite Curb** – Recycled granite curb salvaged from the project.
- **Curbing from Alternative Source** – Deadmen and other buried curbing necessary to meet project material requirements.
- **Reinforcing Dowels** – 8-inch long, #4 Reinforcing Steel bars to connect Deadmen to adjacent granite blocks.
- **Granite Steps** – 10 6-foot wide granite steps with ADA compliant handrails.
- **Geotextile** – Erosion Control geotextile.
- **Backfill** – Soil behind the Recycled Granite Curb Wall.
- **Cedar Rail Fence** – 3-foot high fence located 3-feet back from face of wall.

Included in the scope of the Recycled Granite Curb Wall construction are: all materials necessary for wall construction, all grading necessary for wall construction, compaction of the wall foundation soil, backfill, piped drainage, construction of leveling pads, granite steps, and Recycled Granite Curb Wall with Granite Steps installation. The top of the upper row of granite curb blocks shall be at or above the top of the face elevation shown on the Plans.

679.02 Materials. Materials for walls shall meet the requirements of the following sections of Division 700:

Crushed Stone ¾-Inch	703.13
Gravel Borrow	703.20
Underdrain Pipe	706.06 or 706.09
Reinforcing Steel	709.01
Drainage Geotextile	722.02

679.031 Concrete Leveling Pad. The Concrete Leveling Pad shall be Fill Concrete conforming to the requirements of Section 502 Structural Concrete. Unless otherwise specified, concrete for leveling pads shall be accepted under Method “C” requirements.

679.032 Recycled Granite Curb. The Recycled Granite Curb shall be salvaged from the project. The exposed vertical face of the wall made up of salvaged granite curb sections shall be the top face of the original curb. The exposed faces of Recycled Granite Curb shall be cleaned of paint, dirt and other debris prior to use for wall construction.

679.033 Curbing from Alternative Source. Deadmen and other buried curbing may be from an alternate source as necessary to meet project material requirements. Curbing from an alternate source shall be approved by the Resident before construction. Proposed materials must be submitted to the Resident two weeks prior to use by the Contractor. The exposed faces of curbing from an alternative source shall be cleaned of paint, dirt and other debris prior to use for wall construction.

679.034 Drainage Geotextile. A Drainage Geotextile shall be place between the Recycled Granite Curb Wall and the Backfill material as shown on Plans and Special Details in the Contract Documents. Drainage Geotextile shall consist of a geotextile approved by the Geotechnical Engineer.

679.035 Backfill. Backfill material placed behind the Recycled Granite Curb Wall shall meet the requirements of Section 703.20 Gravel Borrow, except that the backfill material shall only contain particles that will pass the 3-inch square mesh sieve.

679.036 Drainage System. A positive Drainage System to drain water from behind the wall shall be included in the Recycled Granite Curb Wall.

679.04 Design Requirements. The Recycled Granite Curb Wall design is shown on the Plans and Special Details in the Contract Documents.

679.05 Submittals. The Contractor shall submit to the Resident a Materials Certification Letter certifying that the applicable materials for construction of the Recycled Granite Curb Wall comply with this Special Provision with Section 700 of the Standard Specifications. The Contractor is required to submit a grain size distribution curve (ASTM D 422) and a moisture-density relationship curve (AASHTO T-180) for acceptance of the proposed Backfill material. A copy of all test results performed by the Contractor or his supplier necessary to assure contract compliance shall also be furnished to the Resident. The Resident will base acceptance upon the Materials Certificate Letter, accompanying test reports, and visual inspection.

No less than two (2) weeks prior to commencing construction of the Recycled Granite Curb Wall, the Contractor shall submit Shop Drawings showing the details of the Recycled Granite Curb Wall including plan and elevation views of the wall containing elevations at the top of the leveling pads, the distance along the face of the wall to all steps in the leveling pads, the location of the original and final ground lines, details of the granite steps, and details of the fencing at the top of the wall.

All Shop Drawings shall be signed and sealed by a Professional Engineer licensed in the State of Maine.

The Contractor shall submit the manufacturer's information for the proposed Drainage Geotextile material to the Resident for approval by the Geotechnical Engineer. Drainage Geotextile material and placement shall be in conformance with the requirements of Section 620 – Geotextiles.

679.06 Construction. The Recycled Granite Curb Wall with Granite Steps shall have the following construction requirements:

1. Excavation. The excavation and use as fill or disposal of all excavated material shall meet the requirements of Standard Specification Section 203 - Excavation and Embankment, except as modified herein.
2. Foundation Soils. The native soil mass for supporting the Recycled Granite Curb Wall components shall have sufficient strength to maintain global stability of the Recycled Granite Curb Wall. Foundation soils shall be brought to the desired grade as required for the wall dimensions shown on the Plans and Special Details in the Contract Documents or as directed by the Resident. Prior to Crushed Stone Leveling Pad placement the foundation soils shall be proof-rolled with multiple passes of a static roller to identify loose or weaving areas that require over-excavation and replacement and to achieve a firm and stable surface. Any loose soils or soft or unsuitable materials encountered at the bearing elevation shall be removed and replaced with Crushed Stone ¾-Inch.
3. Underdrain. A 6-inch diameter positive Drainage System in accordance with Standard Specification Section 706.06 or 706.09 shall be installed behind the Recycled Granite Curb Wall as shown on the Plans and Special Details in the Contract Documents or as directed by the Resident.
4. Crushed Stone Leveling Pad. The 12-inch thick Crushed Stone Leveling Pad shall be constructed as shown on the Plans and Special Details in the Contract Documents. The Crushed Stone shall meet the requirements of Standard Specification Section 703.13. Prior to Concrete Leveling Pad placement, the Crushed Stone Leveling Pad shall be proof-rolled with multiple passes of a static roller to achieve a firm and stable surface.
5. Concrete Leveling Pad. The 6-inch thick Concrete Leveling Pad shall be constructed using Fill Concrete as shown on the Plans and Special Details in the Contract Documents. Dimensions may be modified with approval of the Resident and Geotechnical Engineer. The Concrete Leveling Pad shall be cast to the design elevations as shown on the Plans. The allowable elevation tolerances from the design elevations are +0.01 feet and -0.02 feet. Concrete Leveling Pads which do not meet this requirement shall be repaired or replaced as directed by the Resident at no additional cost to the Department. Steps in the Concrete Leveling Pad shall have a minimum overlap of 6 inches. The Concrete Leveling Pad shall extend a minimum of 3-inches beyond the Recycled Granite Curb sections in all directions. Placement of Recycled Granite Curb Wall may begin after the strength of the Concrete

Leveling Pad reaches 1000 psi or is adequate to support the proposed loads. Contractor may begin placement of Recycled Granite Curb Wall after 12 hours at his own risk.

6. Installation of Recycled Granite Curb sections. Recycled Granite Curb sections shall be installed as shown on the Plans and Special Details in the Contract Documents with the facing blocks placed so their longest dimension is parallel to the face of the wall and their shortest dimension is the vertical dimension. Recycled Granite Curb sections shall have a minimum length of 4 feet unless approved by the Resident.

Recycled Granite Curb sections shall be placed so the wall has a batter of 1 inch per Curb section. The maximum offset in any unit horizontal joint shall be ¼-inch. Joints shall be level and horizontal. Vertical joints shall be separated a minimum of 2 feet horizontally from vertical joints in wall courses above and below. Gaps between Recycled Granite Curb Wall courses vertically at the wall face and between adjacent Recycled Granite Curb sections in the same course horizontally shall not exceed ¾-inch.

The exposed faces of each Recycled Granite Curb sections shall be dressed to an approximate true plane with no projections or depressions on those surfaces greater than ½-inch. Exposed faces and tops of adjacent Recycled Granite Curb sections shall be uniform in color and texture. The Recycled Granite Curb sections shall be installed to a tolerance of plus or minus ¾-inch in 10 feet in vertical alignment and horizontal alignment.

The top surface of each course shall be levelled transversely, perpendicular to the wall face, with shims placed between courses. Shims shall be placed as necessary for levelling, but shall not provide primary support for the overlying course. Shims shall not be movable by hand, and can be grouted in place. Shims shall be stone or another approved durable material and shall not be visible on the exposed face.

The top course of Recycled Granite Curb sections shall be grouted as needed to ensure that they cannot be moved under use. Grout used for this purpose shall not be visible on the exposed face.

7. Installation of Deadmen. Deadman Granite Curb sections shall be turned 90 degrees from the facing blocks with a minimum 5-foot embedment into the Backfill from the face of the wall and shall be spaced at 10 feet maximum horizontally and between a minimum of 15-inches and a maximum of 20-inches vertically. Granite block deadmen pieces shall be connected to adjacent granite block pieces in the same course with steel dowels. Dowels shall be #4 steel bars or larger, Grade 60 steel, smooth, and 8-inches long. Dowels shall be embedded equally and centered vertically into adjacent granite pieces. Granite blocks shall be drilled approximately 6-inches from the exposed vertical face to receive the dowels and grouted in place using an approved non-shrink grout from the MaineDOT prequalified list.
8. Drainage Geotextile Placement. Drainage Geotextile placement shall closely follow the erection of each row of Recycled Granite Curb. Drainage Geotextile shall be placed in accordance with Standard Specification Section 620. Drainage Geotextile shall cover all

joint between Recycled Granite Curb sections. Drainage Geotextile seam laps shall be 6-inches minimum.

9. Backfill Placement. Backfill placement shall closely follow the erection of each row of Recycled Granite Curb. The maximum lift thickness shall be 8 inches loose. Gravel Borrow Backfill shall be compacted in accordance with Section 203.12 except that the minimum required compaction shall be at least 92 percent of maximum density as determined by AASHTO T-180 Method C or D. The Contractor shall decrease the lift thickness if necessary to obtain the specified density. Backfill compaction shall be accomplished without disturbance or displacement of the Recycled Granite Curb sections. Sheepsfoot rollers will not be allowed. Full size, ride on compaction equipment will not be allowed within 5 feet of the back of the Recycled Granite Curb sections. Compaction adjacent to the Recycled Granite Curb Wall shall be performed using hand-operated compaction equipment. Whenever a compaction test fails, no additional backfill shall be placed over the area until the lift is recompacted and a passing test achieved.

The moisture content of the Backfill material prior to and during compaction shall be uniform throughout each layer. Backfill material shall have a placement moisture content less than or equal to the optimum moisture content. Backfill material with a placement moisture content in excess of the optimum moisture content shall be removed and reworked until the moisture content is uniform and acceptable throughout the entire lift. The optimum moisture content shall be determined in accordance with AASHTO T-180, Method C or D. At the end of the day's operations, the Contractor shall shape the last level of backfill so as to direct runoff of rain water away from the Recycled Granite Curb Wall face.

10. Granite Steps and Handrails. A total of 10 6-foot wide granite steps shall be constructed as shown on the Plans and Special Details in the Contract Documents. Treads shall have a width of 1-foot and the step rise shall be 6-inches. The tread surface of the steps shall be dressed to an approximate true plane with no projections or depressions on those surfaces greater than 1/2-inch. Exposed faces and tops of Granite Steps shall be uniform in color and texture. The Granite Steps shall be installed to a tolerance of plus or minus 3/4-inch in 10 feet in horizontal alignment. The Contractor shall furnish handrails for the Granite Steps. The handrails shall meet the 2010 ADA Standards for Accessibility design. The handrails shall be submitted to the Resident for Review.
11. Cedar Rail Fence. A 3-foot high Cedar Rail Fence shall be installed at the top of the wall as shown on the Plans and Special Details in the Contract Documents. The Cedar Rail Fence shall be located 3-feet back from face of wall. Cedar Rail Fence shall be installed in accordance with Standard Specification Section 607.

679.07 Method of Measurement. Recycled Granite Curb Wall with Granite Steps shall be measured by the Square Foot of front surface not to exceed the dimensions shown on the Contract Plans unless authorized by the Resident. Vertical and horizontal dimensions will be from the edges of the blocks. Vertical dimension for measurement for payment shall be the height of the front face above the concrete leveling pad. No field measurements for computations will be made unless the Resident specifies, in writing, a change in the limits indicated on the Plans.

679.08 Basis of Payment. The accepted quantity of Recycled Granite Curb Wall with Granite Steps will be paid for at the contract unit price per Square Foot complete in place. Payment shall be full compensation for furnishing all labor, equipment and materials for wall construction, all grading and compaction, construction of leveling pads, underdrain, geotextile, reinforcing steel, shims, grout, granite steps, handrails, Recycled Granite Curb Wall with Granite Steps installation, and other incidentals. Cedar Rail Fence shall be paid for under Item No. 607.22.

There will be no allowance for excavating and backfilling for the Recycled Granite Curb Wall beyond the limits shown on the Plans and Special Details in the Contract Documents, except for excavation required to remove unsuitable subsoil in preparation for the foundation. Payment for excavating unsuitable subsoil shall be full compensation for all costs of pumping, drainage, sheeting, bracing and incidentals for proper execution of the work and will be paid as Common Excavation in accordance with Standard Specification Section 203.

Payment will be made under:

	<u>Pay Item</u>	<u>Pay Unit</u>
679.20	Recycled Granite Curb Wall with Granite Steps	Square Foot