SUPPLEMENTAL HYDROGEOLOGIC ASSESSMENT

Background

In September 2012, on behalf of Harold MacQuinn, Inc. (MacQuinn), Summit Environmental Consultants (Summit) completed a Hydrogeologic Assessment for a parcel of property being proposed for a Gravel Pit Expansion. Currently, Gravel Extraction is permitted on Lot 33 and a portion of Lot 31 on the Town of Lamoine Tax Map 3. The approved (permitted) gravel pit is known as the Kittridge Pit. The expansion being proposed includes an additional 39 acres on Lot 31 (known as the Miro Lot). The September 2012 Hydrogeologic Assessment is on file at the Town of Lamoine.

As part of the Lamoine Planning Board Application review process, a Public Hearing was held on January 8, 2013 to allow interested parties to provide comments on the gravel extraction application. Following subsequent discussions with the Planning Board concerning comments received at the Public Hearing, the Planning Board retained Ransom Consulting Inc. (Ransom) to provide a Peer Review of the Hydrogeologic Assessment completed by Summit.

Ransom's Peer Review findings were provided in an April 16, 2013 letter report to the Planning board. A copy of the Ransom Peer Review is included as Attachment 1. On May 21, 2013, Mr. Robert Gerber of Ransom presented the findings of the Peer Review to the Planning Board. Based on the findings presented in the Peer Review and discussions held during the May 21, 2013 Planning Board meeting, the following recommendations were made for additional investigations and data collection.

- Install a series of monitoring wells to establish the elevations of a shallow (perched) water table and the deep water table underlying the proposed gravel pit expansion.
- Delineate the clay unit under the perched water table that is related to Cold Spring located approximately 1,000 feet southeast of the eastern boundary of the proposed pit expansion and discuss potential impacts to Cold Spring from proposed gravel extraction.
- Complete a water balance calculation for the area surrounding Cold Spring using flow measurements in Archers Brook and an associated tributary.

This Supplemental Hydrogeologic Assessment provides the results of investigations to address these recommendations.

Monitoring Well Installation

East Coast Exploration (ECE) was retained by MacQuinn to complete borings and monitoring well installations. Soil borings advanced adjacent to Mill Road and on the Blueberry Field Access Road were completed using a hollow stem auger technique. Remaining borings were advanced using a "drive and wash" technique.

Hollow stem auger drilling advances a flight of augers and samples can be collected by tooling lowered inside the auger "hollow stem". The drive and wash technique advances a 3-inch diameter steel casing by washing out soil from within the casing and driving (pounding) the casing with a 300-pound hammer.

Soil samples were continuously obtained during advancement of borings through a combination of split spoon samples and collection of wash water cuttings. Split spoon sampling consists of lowering a 24-inch long, 2-inch diameter steel sampler inside the auger or casing and driving the sampler ahead of the drilling equipment using a 140-pound hammer. The sampler is retrieved and opened ("split") along seams running the length of the sampler. Samples are then observed and classified on boring logs. The auger or casing is advanced and the process is repeated.

Wash samples are obtained by advancing a drill bit a specified distance (typically 5 feet) and circulating (washing) the samples into a bucket until the wash water is relatively free of sediment. The contents of the bucket are then removed, visually observed and recorded on boring logs. The casing is driven through the interval and the process is repeated.

Locations of borings and monitoring wells are shown on the Site Plan included as Figure 1. The following explorations were completed as part of this investigation.

- PB-4 is the easternmost location of the 4 locations recommended by Ransom and the Planning Board. This location is near the eastern boundary of the proposed gravel pit expansion. Shallow (PB-4S) and deep (PB-4D) monitoring wells were installed at this location. The shallow well is approximately 33 feet deep and the deep well is approximately 105 feet deep.
- PB-2 and PB-3 are also locations proposed by Ransom and the Planning Board to assess shallow and deep water table elevations. Deep monitoring wells were installed at these locations. Monitoring well PB-2 is 179 feet deep and PB-3 is 169 feet deep. A clay unit was not encountered so only a deep well was installed.
- PB-1 is the westernmost location proposed by Ransom and the Planning Board. Bedrock was encountered in this boring at approximately 132 feet below ground

surface. The monitoring well is 146.5 feet deep. A clay unit was not encountered so only a deep well was installed.

- MW-4 is located at the eastern side of a planned extraction area within the approved Kittridge Pit area. This location is approximately 300 feet west of existing monitoring well MW-2 located in the "blueberry field" east of the Kittridge Pit. A monitoring well 64 deep was installed at this location.
- "Blueberry Field Access Road Boring" is located between MW-2 and MW-3 on the access road that begins at Mill Road, serves the Cold Spring structures and continues north to the blueberry field east of the Kittridge Pit. This soil boring was advanced to evaluate shallow (i.e. 20 feet) subsurface conditions. A monitoring well was not installed at this location.
- The "Mill Road" boring is located just off of Mill Road near Archers Brook. This boring was advanced to determine shallow subsurface material at this location to assist with the water balance assessment.
- Test pit excavations conducted by MacQuinn on an approximately 4 acre area at the eastern boundary of the Kittridge Pit. Test pits were excavated to depths on the order of 15 feet to characterize materials that are planned to be excavated. Test pits were completed prior to our Site investigations.

All monitoring wells were completed with 2-inch diameter PVC screen and riser. A locking steel protective casing was installed at each location. Copies of boring logs and well completion logs are included in Attachment 2.

Perched Water Table and Extent of Clay Unit

The September 2012 Hydrogeologic Assessment interpreted that Cold Spring was being fed by a perched water table within granular material on top of a low permeability unit (clay). The Ransom Peer Review agreed that a perched water table existed in the vicinity of Cold Spring, but data was limited with respect to the extent of the clay and therefore, the potential effect on Cold Spring from excavation at the eastern end of the proposed expansion area was not well supported.

The recommended location of monitoring wells PB-1 through PB-4 allow for development of a cross section from east to west through the proposed expansion area. In addition, the "Blueberry Field Access Road Boring" and MW-4 provide additional data that can be used in conjunction with Cold Spring monitoring well data to develop a plan view of the extent of the clay unit.

Approximately 10 feet of firm to very stiff, olive colored clay was encountered in the Blueberry Access Road boring. Boring PB-4 located at the eastern boundary of the proposed expansion encountered approximately 2 feet of stiff, olive colored clay at a

depth of 33-35 feet below ground surface. This clay unit exhibits the same characteristics as the clay encountered in the Blueberry Field Access Road Boring and is considered to be the same unit underlying Cold Spring and encountered in MW-3 and Cold Spring monitoring wells. A photograph of the clay is included in Attachment 3 for reference.

Monitoring well PB-4S was installed to a depth of 33 feet below ground surface at the top of the clay unit. This well has been dry during October and November 2013.

Soil sampling at monitoring well MW-4 located 500 feet north-northwest of the Blueberry Field Access Road Boring and at a similar ground surface elevation did not encounter clay to a depth of 64 feet below ground surface. Likewise, clay was not reported in the boring log for monitoring well MW-2 located 700 feet north-northeast of the Blueberry Field Access Road boring. The clay unit was not encountered at locations PB-1, PB-2 and PB-3. It should also be noted that clay was not encountered in test pit excavations within the 4 acre permitted area on the eastern boundary of the Kittridge Pit.

Geologic cross sections were prepared to depict subsurface geologic conditions and relationships. The cross section lines are shown on the Site Plan and the sections are shown on Figures 2 and 3. These data are consistent with the general geologic depositional environment and energy environments associated with the delta and esker formation and correlate well with the Maine Geological Survey surficial geology mapping for the area.

Data indicate that the clay unit is truncated north of the Blueberry Field Access Road boring, thins to the west and pinches out on the flank of the delta/esker deposit. The clay extends southward across Mill Road toward a large bog located several hundred feet south of Mill Road. An interpreted plan view of the extent of the olive colored clay in the vicinity of Cold Spring is shown on Figure 4.

Deep Water Table

Five (5) monitoring wells (PB-1, PB-2, PB-3, PB-4D and MW-4) were installed to the deep water table as part of this investigation. These wells along with previously installed wells MW-2 and OW-1 provide good control points for establishing the deep water table elevation in the site vicinity. Table 1 presents depth to water and water table elevations. Figure 5 is an interpretive ground water contour map of the deep water table. Note that a ground water divide is present near the eastern boundary of the Kittridge pit and proposed expansion area. This divide provides a component of flow to the east toward Archers Brook. However, flow under the majority of the

Kittridge pit and expansion area is westward toward the Jordan River. The presence of this divide is consistent with flow observed in Archers Brook which is discussed in the next section.

The deep water table is well below the elevation of Cold Spring (i.e., greater than 40 feet lower) and is a separate and distinct water table from the perched water table supporting Cold Spring.

Water Balance

As an independent means of assessing a potential recharge area for Cold Spring, a water balance was completed using flow measurements at the spring and Archers Brook. In simple terms, the water withdrawn from Cold Spring plus the increase in flow along Archers Brook (between an upstream and downstream location relative to Cold Spring) is supported by discharging ground water assuming that measurements are made during a period not significantly affected by recent precipitation events.

Using an average precipitation of 44 inches per year and assuming that 20-40% of precipitation infiltrates to the underlying water table (in a sand and gravel surficial material), it is calculated that 0.5 to 1.0 gallon per minute of recharge (on an annual average) would occur from each acre within a contribution area.

Normally, it is assumed that ground water contribution to a stream occurs from both sides of the stream within its watershed. However, geologic mapping indicates that surficial materials on the east side of Archers Brook are low permeability silt and clay and may have limited ability to contribute a significant base flow of ground water to Archers Brook. A boring was advanced near Archers Brook along Mill Road (see Site Plan) to characterize surficial materials. This boring showed that only a thin veneer of topsoil and silty fine sand is present over a blue/gray marine clay. Based on the soil encountered in this boring, the water balance assumes no ground water base flow ocurs from the east side of Archers Brook and the contribution area is west of Archers Brook.

Based on topography, data from Cold Spring monitoring wells, data collected from this investigation, the presence of a large bog south of Mill Road and anecdotal information that a dewatering trench south of Mill Road resulted in a significant reduction of spring flow, the contribution area to Cold Spring and Archers Brook was assumed to include an area south of Mill Road.

Finally, data from this investigation indicate that the clay layer underlying the perched water table is truncated north of the Blueberry Field Access Road boring. However, the

deep water table data indicates a flow divide exists near the eastern boundary of the Kittridge Pit and given the deep water table elevation relative to Archers Brook, it is apparent that the easterly component of flow from the deeper aquifer is contributing a significant volume of flow to the northern portion of Archers Brook via an unnamed tributary.

Based on the considerations presented above, the contribution area to Archers Brook for the water balance study is estimated to be on the order of 165 acres. The area of contribution for Cold Spring is estimated to be on the order of 38 acres. Figure 6 shows the interpreted extent of contribution to Archers Brook and Cold Spring.

Upstream flow measurements were taken from a culvert where Archers Brook crosses Mill Road (designated location A). A downstream location for flow measurements was established just north of the confluence of Archers Brook and an unnamed tributary stream (designated location B). Separate measurements from the tributary stream upstream of the confluence (location C) and Archers Brook upstream of the confluence (location D) were also made during the study. Photographs of the measuring locations are included in Attachment 3.

Flow measurements were collected on August 26, 2013. Measurements were made with a combination of constructed weirs, direct collection at the culvert outfall (bucket and stopwatch) and with a digital stream flow meter (FloMate 2000). At locations where a flow meter measurement was taken, stream channel dimensions were measured with a tape measure and a cross sectional area of the channel was calculated. A worksheet showing channel dimensions and flow meter readings is included in Attachment 4.

Archers Brook is a relatively small brook with several inches of flowing water in most locations and channel widths of 1-3 feet within a bank-top to bank-top width of 5-10 feet.

At location A, due to the small flow volume at the culvert, it was determined that the digital flow meter readings were below the recommended measurement range and flow was collected in a 5-gallon bucket and timed with a stopwatch. Flow at the culvert outfall was approximately 1.5 gallons per minute (gpm). Flow in the unnamed tributary (location C) was measured by constructing a weir in the channel (see photo in Attachment 3) and using a bucket and stopwatch. Flow was measured at approximately 30 gpm at location C. Flow in Archers Brook immediately upstream of the confluence (location D) was measured with a flow meter and using channel dimension collected at that location, flow was calculated to be approximately 28 gpm. Flow in Archers Brook north of the confluence of the unnamed tributary and the Brook

(location B) was measured with the flow meter. Calculated flow at location B was 52 gpm, similar to the sum of flow at locations C and D (58 gpm).

According to Cold Spring records, an average daily flow of 17,404 gallons (or about 12 gpm) occurred between August 2012 and July 2013. During our field work, overflow from the spring via an outfall pipe at the spring house structure was not observed over an approximately 6 hour period during the day. This suggests that significant excess ground water is not discharging via the spring house. As a result, the total discharge of ground water to Archers Brook in the Study Area is estimated to be on the order of 65 to 70 gpm.

Given an overall contribution area of 165 acres, the average recharge per acre is on the order of 0.42 gpm. Assuming a flow to Cold Spring of approximately 12 gpm and a contribution area of 38 acres, a recharge rate of 0.32 gpm per acre is calculated. The recharge rates per acre are near the low range of what might be expected, suggesting that the actual contribution area may be smaller or that less recharge is occurring per acre than estimated. The water balance also suggests that the interpreted extent of the clay unit is reasonable and that a significantly larger extent of clay would not be required to account for the flow observed at Cold Spring and Archers Brook.

Conclusions and Recommendations

1) The extent of the olive colored clay underlying the perched water table only extends to the vicinity of boring location PB-4 near the eastern boundary of the proposed gravel pit expansion. This clay was absent at locations PB-1, PB-2, PB-3 and MW-4. It was also not reported present at monitoring well MW-2.
2) Excavation of sand and gravel within the proposed expansion area is not expected to adversely affect recharge to Cold Spring.
3) The deep water table is separate and distinct from the perched water table supporting Cold Spring.
4) The water balance is in reasonable agreement with the interpreted extent of the olive colored clay and overall contribution area for Archers Brook and Cold Spring.
5) The deep water table underlying the proposed expansion area ranges from approximately elevation 88 feet mean sea level (msl, NGVD29 datum) to 23 feet msl. A divide appears to be present near the eastern boundary of the Kittridge Pit and expansion area resulting in a component of flow to the east toward Archers Brook, but with flow under the majority of the Site being westward toward the Jordan River.

Recommendation

1) Revise the Grading Plan to reflect a 5-foot separation from the deep water table and maintain excavation to an elevation of no deeper than 155 feet msl within 1200 feet of Cold Spring where perched water supporting Cold Spring is present.

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TABLES

TABLE 1: Monitoring Well Groundwater Data Summary Table
Kittridge Pit - Route 184, Lamoine, Maine

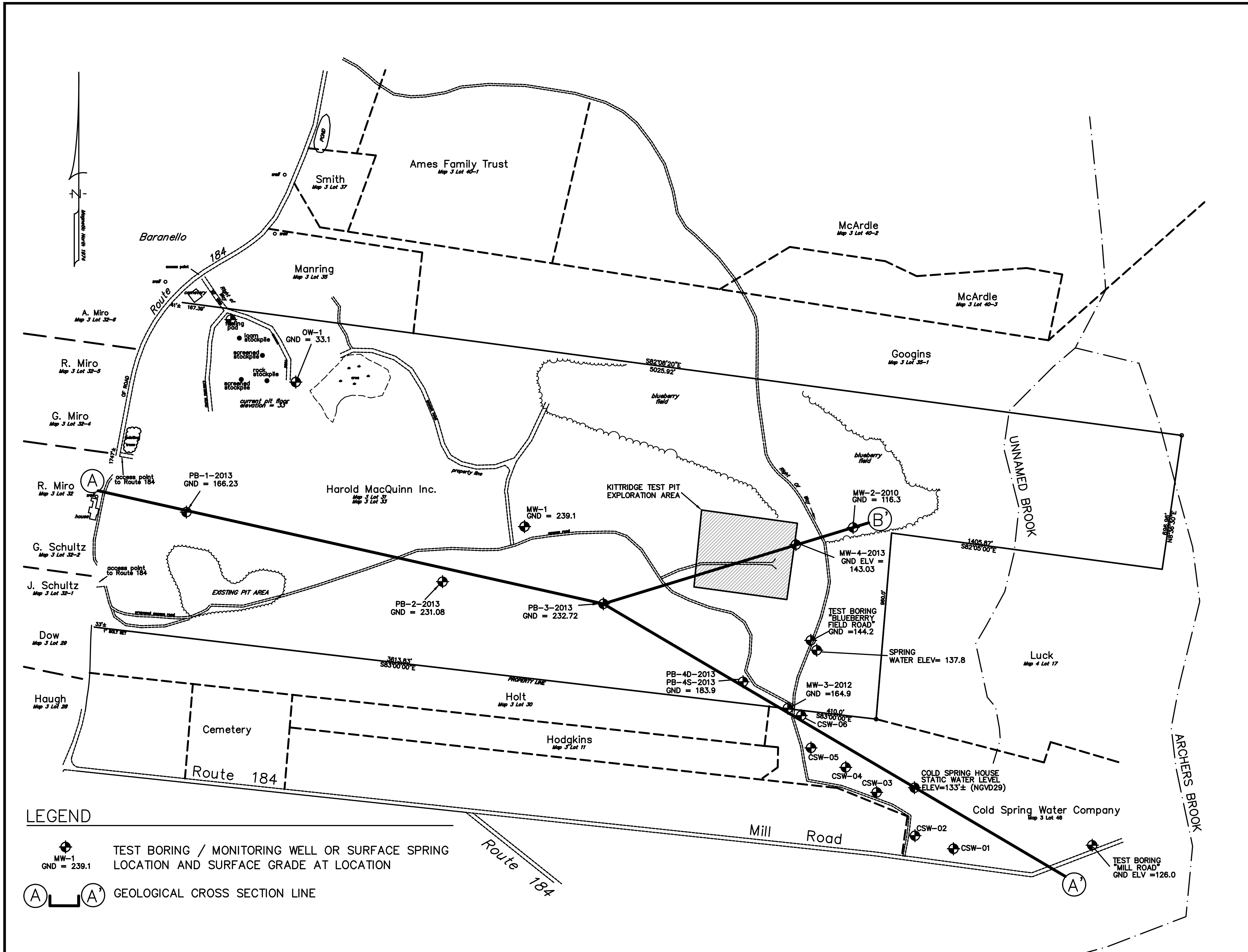
Monitoring Well	OW-1		MW-1		MW-2-2010		MW-3-2012		MW-4-2013	
Date of Installation	December 2004		October 7, 2010		August 27, 2012		August 28, 2013		November 18, 2013	
Top of PVC Casing Elevation	37.8		242.1		116.3		167.87		145.39	
Existing Grade	33.1		239.1		116.3		164.9		143.0	
Date of Measurement	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)
5/17/2004	NM	NM	Dry to 100.7	<141.4	NM	NM	NM	NM	NM	NM
12/9/2004	Dry to 14.53	<23.3	NM	NM	NM	NM	NM	NM	NM	NM
6/7/2005	13.41	24.39	NM	NM	NM	NM	NM	NM	NM	NM
11/2/2005	12.57	25.23	NM	NM	NM	NM	NM	NM	NM	NM
4/20/2006	11.75	26.05	NM	NM	NM	NM	NM	NM	NM	NM
11/15/2006	11.58	26.22	NM	NM	NM	NM	NM	NM	NM	NM
5/17/2007	11.18	26.62	NM	NM	NM	NM	NM	NM	NM	NM
11/19/2007	Dry to 14.53	<23.3	NM	NM	NM	NM	NM	NM	NM	NM
4/16/2008	Dry to 14.53	<23.3	NM	NM	NM	NM	NM	NM	NM	NM
10/30/2008	Dry to 14.53	<23.3	NM	NM	NM	NM	NM	NM	NM	NM
4/28/2009	Dry to 14.53	<23.3	NM	NM	NM	NM	NM	NM	NM	NM
11/2/2009	10.61	27.19	NM	NM	NM	NM	NM	NM	NM	NM
4/22/2010	9.83	27.97	NM	NM	NM	NM	NM	NM	NM	NM
12/8/2010	Dry to 14.53	<23.3	NM	NM	27.52	88.78	NM	NM	NM	NM
5/2/2011	Dry to 14.53	<23.3	NM	NM	25.72	90.58	NM	NM	NM	NM
10/28/2011	Dry to 14.53	<23.3	NM	NM	27.38	88.92	NM	NM	NM	NM
4/4/2012	Dry to 14.53	<23.3	NM	NM	28.12	88.18	NM	NM	NM	NM
8/8/2012	Dry to 14.53	<23.3	NM	NM	29.72	86.58	NM	NM	NM	NM
8/27/2012	NM	<23.3	NM	NM	NM	NM	Dry to 58	<109.9	NM	NM
9/7/2012	NM	NM	Dry to 100.7	<141.4	30.04	86.26	Dry to 58	<109.9	NM	NM,
11/12/2013	NM	NM	Dry to 100.7	<141.4	30.08	86.22	Dry to 58	<109.9	NM	NM
11/22/2013	Dry to 14.53	<23.3	Dry to 100.7	<141.4	30.18	86.12	Dry to 58	<109.9	57.83	87.56

Monitoring Well	PB-1-2013		PB-2-2013		PB-3-2013		PB-4S-2013		PB-4D-2013	
Date of Installation	November 25, 2013		November 19, 2013		November 15, 2013		October 25, 2013		October 25, 2013	
Top of PVC Casing Elevation	168.73		233.53		235.07		186.91		186.78	
Existing Grade	166.23		231.08		232.72		183.90		183.99	
Date of Measurement	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)	Depth to Water Level from TOC (ft)	Groundwater Level Elevation (ft)
11/12/2013	NM	NM	NM	NM	NM	NM	Dry to 35.6	<151.3	100.6	86.18
11/22/2013	131.55	37.18	153.88	79.65	154.9	80.17	Dry to 35.6	<151.3	100.54	86.24

NOTES:
NM = Not Measured

1. Elevations based on NGVD 29 datum. Elevations provided by Herrick and Salsbury
2. At MW-1, periodic measurement by MacQuinn personnel indicated that this well continued to be dry.

FIGURES



KITTRIDGE PIT AND EXPANSION SITE PLAN

ROUTE 184 – LAMOINE, MAINE

PREPARED FOR
HAROLD MAQUINN, INC.

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SCALE: 1" = 500'
CADD: NA
DRAWN BY: BMD
CHECKED BY: MAD
DATE: DECEMBER 2013
PN: 11-3240.5

FIGURE 1

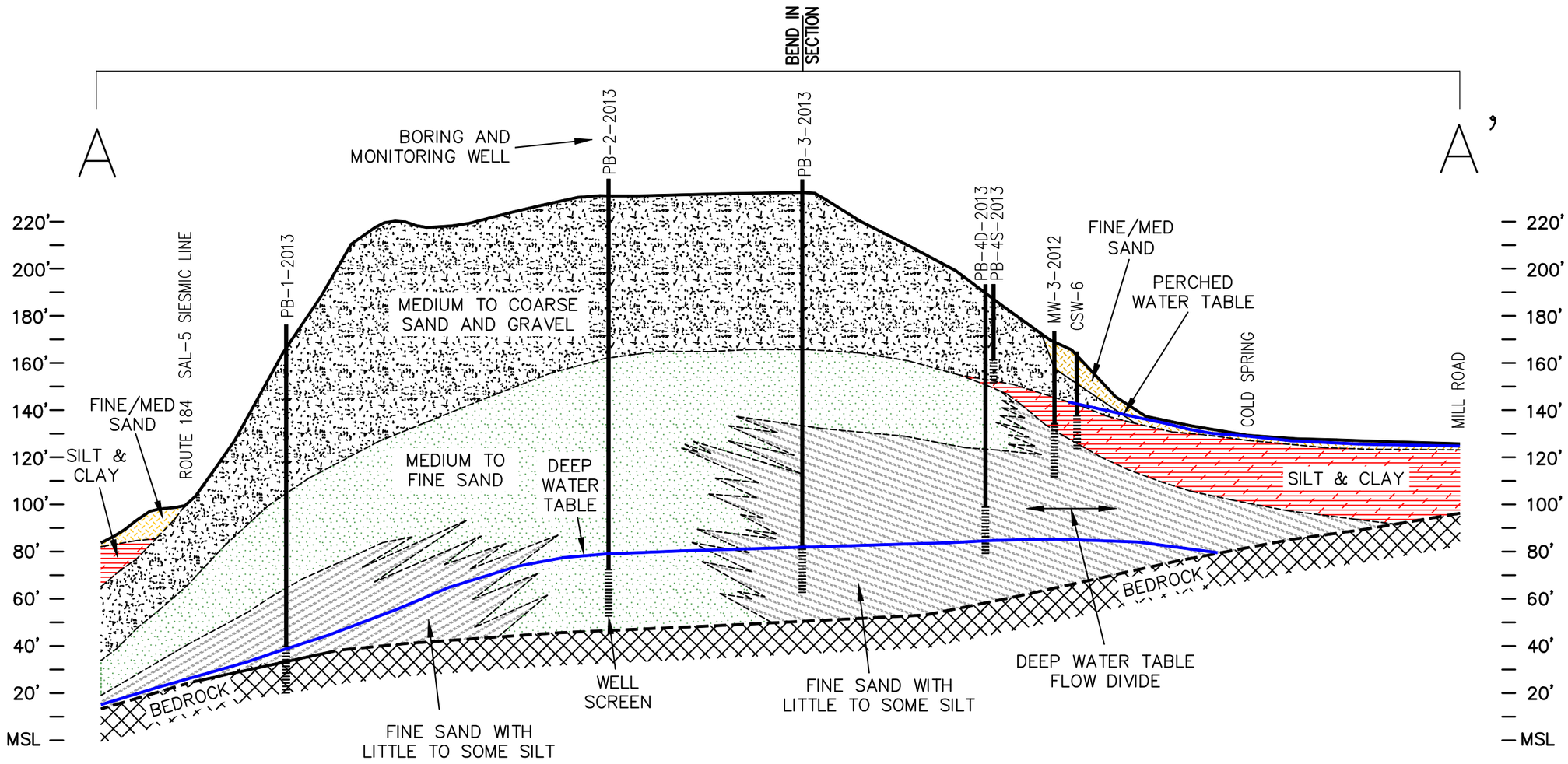

FIGURE 2
GEOLOGICAL CROSS SECTION A – A'

KITTRIDGE PIT – ROUTE 184 – LAMOINE, MAINE

640 MAIN ST.
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DATE: DEC. 2013	DRAWN BY: SBM	SCALE: AS NOTED
JOB NO.: 11-3240.5	CHECKED BY: MAD	CADD: N/A

LEGEND

- FINE TO MEDIUM SAND
- MEDIUM TO COARSE SAND AND GRAVEL
- SILT AND CLAY
- MEDIUM TO FINE SAND
- FINE SAND WITH LITTLE TO SOME SILT
- BEDROCK
- WATER TABLE ELEVATION
- GEOLOGICAL CONTACT (DASHED WHERE INFERRED)

10x VERTICAL EXAGGERATION

VERT. SCALE: 1" = 50'
0 25 50 100

HORIZ. SCALE: 1" = 500'
0 250 500 1000

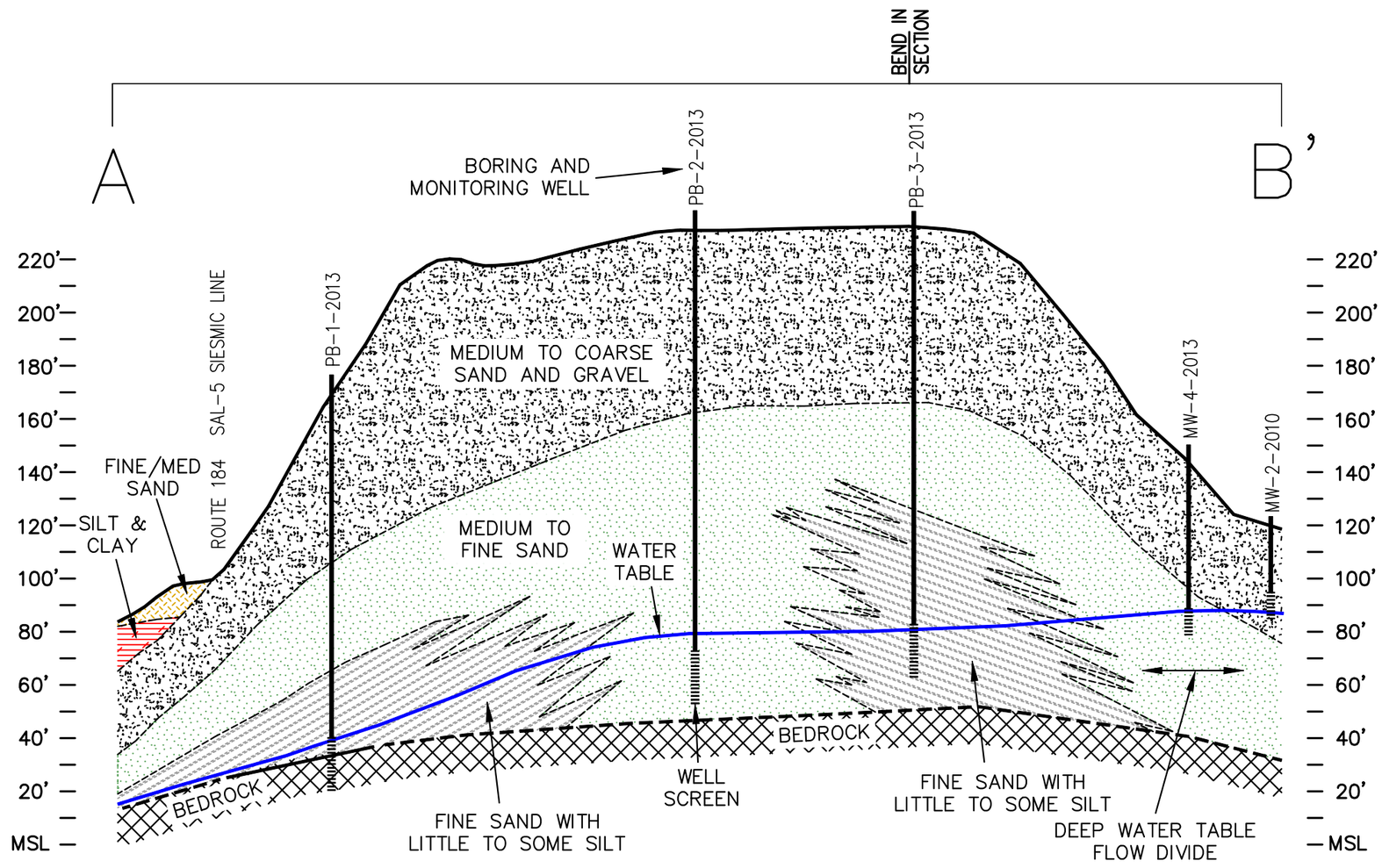

FIGURE 3
GEOLOGICAL CROSS SECTION A – B'

KITTRIDGE PIT – ROUTE 184 – LAMOINE, MAINE

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LEGEND

- FINE TO MEDIUM SAND
- MEDIUM TO COARSE SAND AND GRAVEL
- SILT AND CLAY
- MEDIUM TO FINE SAND
- FINE SAND WITH LITTLE TO SOME SILT
- BEDROCK
- WATER TABLE ELEVATION
- GEOLOGICAL CONTACT (DASHED WHERE INFERRED)

10x VERTICAL EXAGGERATION

VERT. SCALE: 1" = 50'
100
50
25
0

HORIZ. SCALE: 1" = 500'
0
250
500
1000

SCALE: 1" = 500'

0 250 500 1000

N

NORTH

EXISTING KITTRIDGE PIT

PROPOSED EXPANSION AREA

UNNAMED BROOK

ARCHERS BROOK

MILL ROAD

INTERPRETED EXTENT OF OLIVE COLORED CLAY IN VICINITY OF COLD SPRING

BOG [138.8]

OW-1 [23.3]

PB-1-2013 [37.2]

PB-2-2013 [79.6]

PB-3-2013 [80.2]

PB-4S-2013 [DRY]

PB-4D-2013 [86.2]

MW-2-2010 [86.1]

MW-4-2013 [87.6]

TEST BORING "BLUEBERRY FIELD ROAD"

SPRING STATIC WATER LEVEL [137.8]

MW-3-2012 [< 109.9 - DRY]

CSW-06 [135.99]

CSW-05 [122.94]

CSW-04 [134.54]

CSW-03 [133.59]

CSW-02 [133.28]

CSW-01 [133.34]

COLD SPRING HOUSE STATIC WATER LEVEL [133 ±]

TEST BORING "MILL ROAD"

PZ-2003-3

PZ-2003-2

75 100 125 150 175

FIGURE 4
INTERPRETED EXTENT OF OLIVE COLORED CLAY IN VICINITY OF COLD SPRING

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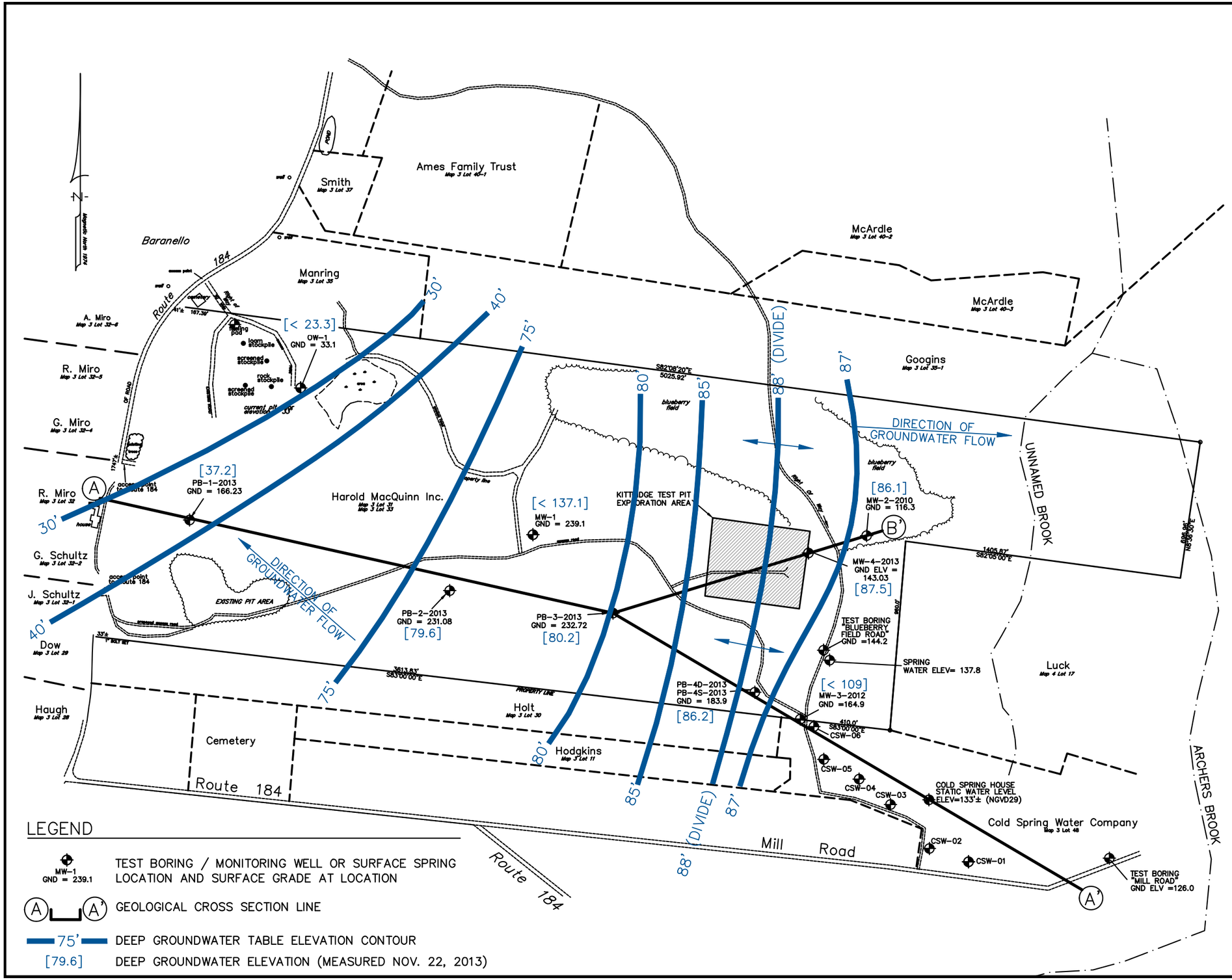
JOB NO.: 11-3240.5	CHECKED BY: MAD	CADD: N/A

NOTES

1) BASE PLAN AND TOPOGRAPHIC COUTOURS IN NGVD29 DATUM PROVIDE BY HERRICK & SALBURY, INC. ELEVATIONS BASED ON UNITED STATED GEOLOGICAL SURVEY (USGS) DATABASE. GENERAL STREAM LOCATIONS APPROXIMATED BASED ON USGS TOPOGRAPHIC MAP AND SURVEYED STREAM LOCATIONS NEAR STREAM FLOW MEASURING POINTS A, B, C & D.

— 125 — TOPOGRAPHIC COUNTOUR (FEET)

INTERPRETED EXTENT OF OLIVE COLORED CLAY IN VICINITY OF COLD SPRING



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DATE: DECEMBER 2013
PN: 11-3240.5

DRAWN BY: BMD
CHECKED BY: MAD

SCALE: 1" = 500'
CADD: NA

KITTRIDGE PIT AND EXPANSION
DEEP GROUNDWATER TABLE CONTOUR MAP

ROUTE 184 – LAMOINE, MAINE

PREPARED FOR
HAROLD MAQUINN, INC.

FIGURE 5

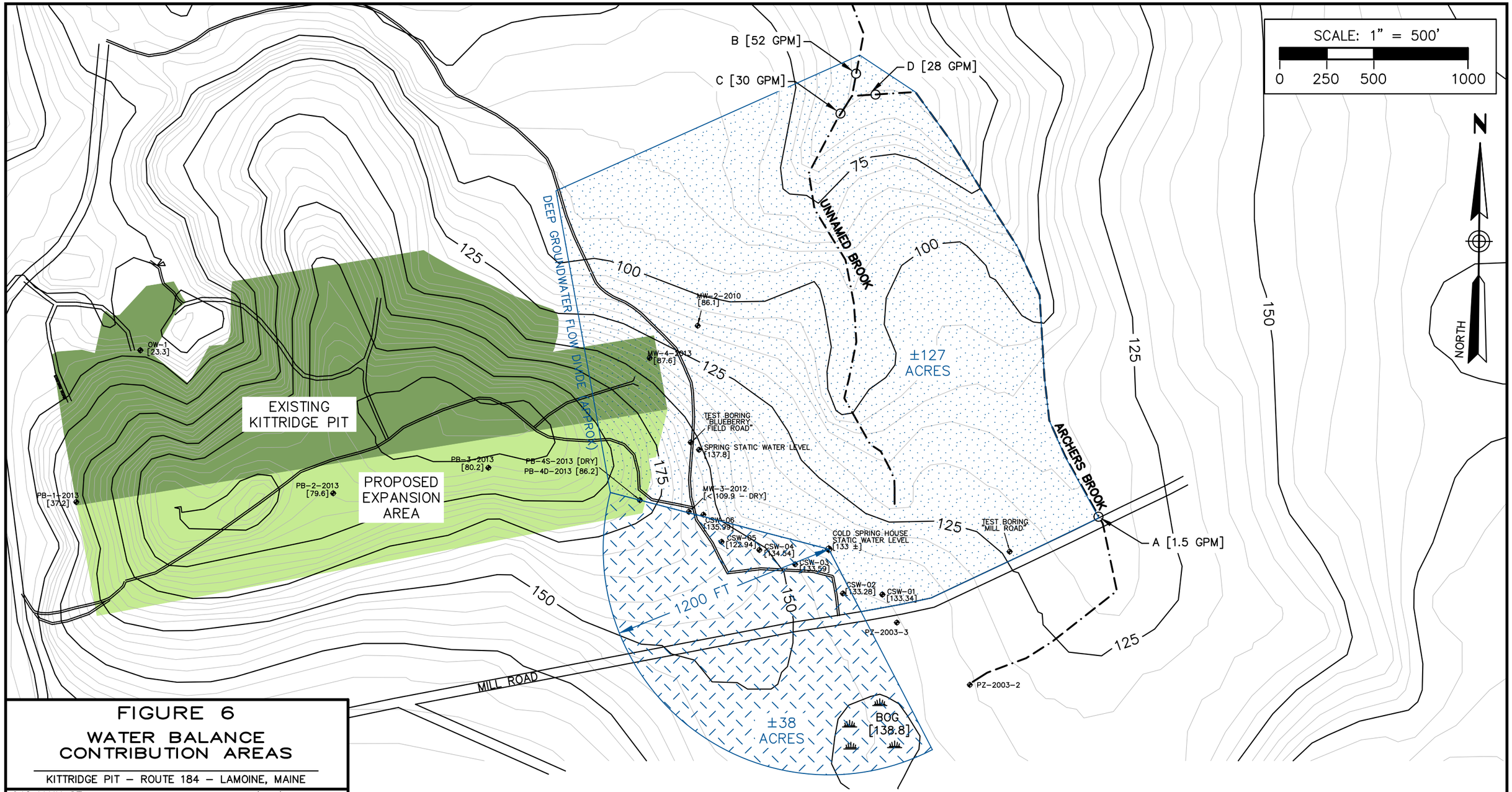

FIGURE 6

WATER BALANCE CONTRIBUTION AREAS

KITTRIDGE PIT – ROUTE 184 – LAMOINE, MAINE

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APPROXIMATE COLD SPRING CONTRIBUTION AREA (± 38 ACRES)

APPROXIMATE ARCHER BROOK CONTRIBUTION AREA (± 127 ACRES)

O
A [1.5 GPM]
BROOK FLOW MEASURING POINT & FLOW MEASURED ON AUGUST 26, 2013

—125—
TOPOGRAPHIC COUNTOUR (FEET)

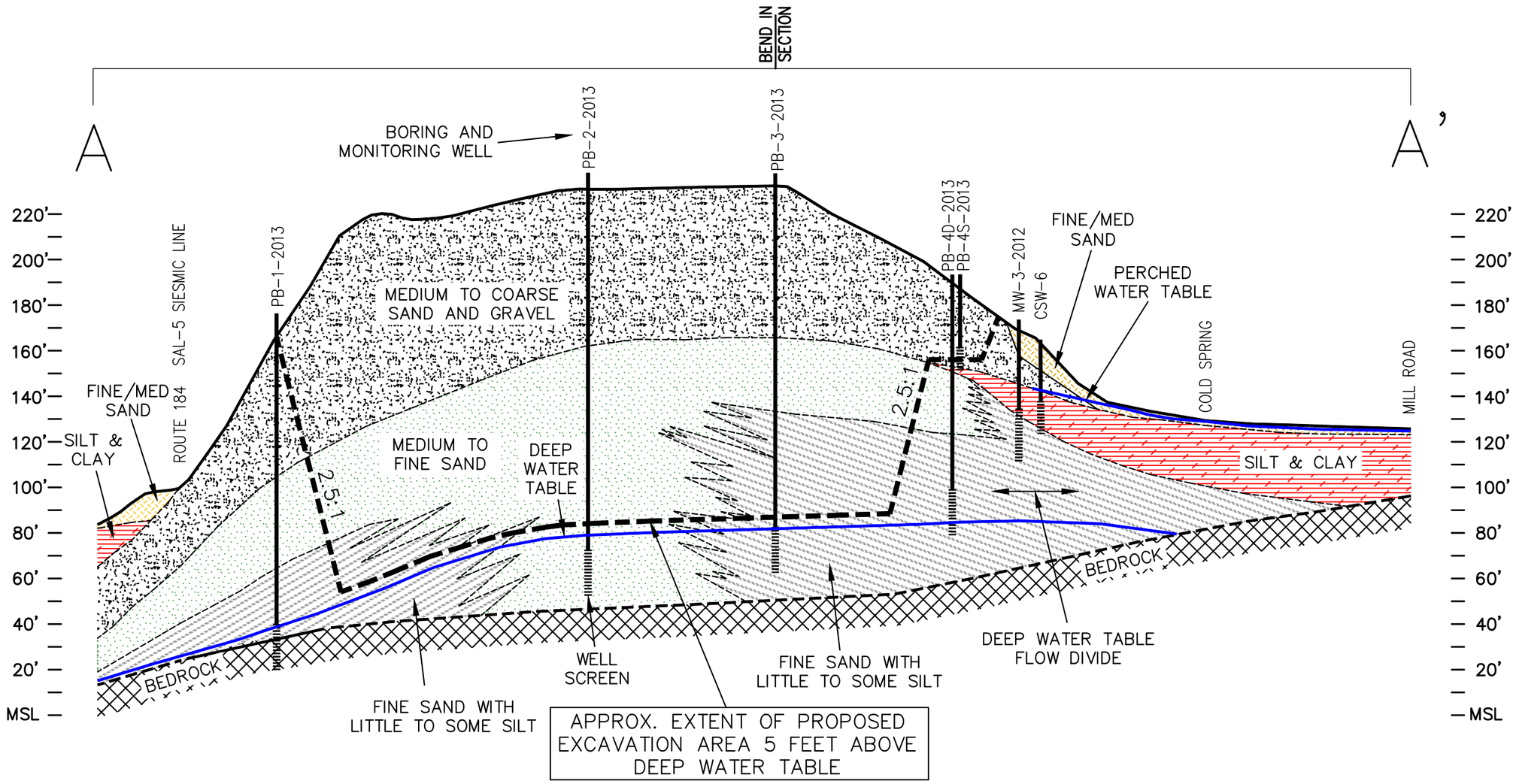

FIGURE 7
EXTENT OF EXCAVATION AREA ON CROSS SECTION A–A'

KITTRIDGE PIT – ROUTE 184 – LAMOINE, MAINE

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Tel.: (207) 795-6009
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www.summitenv.com
Summit Environmental Consultants
A CES, Inc. Company

DATE: DEC. 2013	DRAWN BY: SBM	SCALE: AS NOTED
JOB NO.: 11-3240.5	CHECKED BY: MAD	CADD: N/A

LEGEND

- FINE TO MEDIUM SAND
- MEDIUM TO COARSE SAND AND GRAVEL
- SILT AND CLAY
- MEDIUM TO FINE SAND
- FINE SAND WITH LITTLE TO SOME SILT
- BEDROCK
- WATER TABLE ELEVATION
- GEOLOGICAL CONTACT (DASHED WHERE INFERRED)

10x VERTICAL EXAGGERATION

VERT. SCALE: 1" = 50'
0 25 50 100

HORIZ. SCALE: 1" = 500'
0 250 500 1000

ATTACHMENT 1

RANSOM CONSULTING PEER REVIEW

RANSOM
Consulting, Inc.

Consulting
Engineers
and Scientists

April 16, 2013

R131.06049.001

Mr. John S. Holt, Chair
Lamoine Planning Board
606 Doughlas Highway
Lamoine, ME 04605

Re: Peer Review of MacQuinn Gravel Pit Expansion Application

Dear Mr. Holt:

In accordance with Ransom Consulting, Inc.'s (Ransom) proposal of March 14, 2013, and the Lamoine Planning Board's acceptance of that proposal in an April 3, 2013 email, Ransom has completed Task 1 of the work scope. This report summarizes our review of written documents submitted to the Board as part of its review of the proposal of Harold MacQuinn, Inc., to expand its gravel pit by moving into the area shown on the attached Figure 1 and apparently part of Lamoine Tax Map 3, Lots 31 and 33. Specifically, Ransom's work includes a review and analysis of a report by Summit Environmental Consultants, Inc. (Summit), of September 2012 (beginning on P. 74 of the Record), a rebuttal by Dr. Willem Brutsaert (Brutsaert) dated January 2013 (beginning on P. 228 of the Record), and a surrebuttal by Summit to Brutsaert's testimony, dated Feb. 1, 2013 (beginning on P. 221 of the record). These three reports contained tables, boring logs, groundwater elevations, maps, and other references and my analysis is based on the data contained in or referenced by these pieces of the record. Ransom's task was to analyze the record and identify, to the extent possible, the potential groundwater impact.

One of the first tasks that we undertook was to assemble all of the data into ArcGIS so that everything could be correctly georeferenced. We noticed that the November 2011 LiDAR GIS products were available from the Maine Office of GIS so we downloaded the new topographic maps and hillshade representations of topography. We georeferenced the data points contained in the three reports by aligning data with identifiable points on the 2003 orthophotograph or the USGS 7.5' topographic map of the area. Therefore, we transferred Summit's "site boundaries, cross section locations, and data points" from the various maps to the ArcGIS environment. A map in the Record that showed the proposed final topographic configuration of the completed pit was on P. 136 of the Record and was a map prepared by Summit called "Post Development Drainage Plan." We assume that this represents the final outcome of the project that is before the Board for approval.

400 Commercial Street, Suite 404, Portland, Maine 04101, Tel (207) 772-2891, Fax (207) 772-3248
Pease International Tradeport, 112 Corporate Drive, Portsmouth, New Hampshire 03801, Tel (603) 436-1490
12 Kent Way, Suite 100, Byfield, Massachusetts 01922, Tel (978) 465-1822
2127 Hamilton Avenue, Hamilton, New Jersey 08619, Tel (609) 584-0090
60 Valley Street, Building F, Suite 106, Providence, Rhode Island 02909, Tel (401) 433-2160

www.ransomenv.com

Using the LiDAR-determined ground surface, we estimated the ground elevation for each geologic data point, and then subtracted the depths to different features of interest to find the depths to such features as: 1) an upper, or perched water table in fine-grained glaciomarine sediments; 2) the position of the uppermost glaciomarine fine-grained sediment; 3) any deeper identified water table in the sand and gravel aquifer; and 4) the top of bedrock. Additional data points were added along the Jordan River, Archers Brook, Blunts Pond, and a few other small unnamed streams and tributaries that were obviously in glaciomarine fine-grained sediments. The purpose of these points was to add additional data points to the top of glaciomarine fine-grained sediments, and a perched water table elevation. Although most of the ground elevations that were surveyed at the Summit data points (after changing from NGVD29 to NAVD88 datum = 0.64' difference) were in close agreement with the LiDAR (95% of LiDAR points are supposed to be within +/- 0.5' of true ground surface), one point, MW-3-2012 has a difference in estimated ground elevation of about 27 feet, suggesting that either the survey data at MW-3-2012 are off either vertically or horizontally or MW-3-2012 was not plotted at the correct location on the Summit maps. We also note that on our maps we abbreviate the name for "glaciomarine fine-grained sediments" to "clay" simply for the purpose of fitting the text easily into the figures. We understand that the glaciomarine sequence is not all clay and that silty fine sands, silts, and clay-silts are stratified to form the unit and the texture is variable from place to place and one depth to another.

We put together all of the viable data for each of the four groups of data—shallow water table; deep water table; top of clay; and top of bedrock—in the program SURFER9 to contour the data using the minimum curvature algorithm, then blanked out large areas of the contour map where no data existed as we did not want to extrapolate far without data. By digitizing the location of the Summit Geologic Sections AA' and BB', we brought those into SURFER as *.bln files and used them to cut "slices" through the four data sets, giving us the elevation profiles of each data set along each of the two cross sections, in the general vicinity of where data existed. These data sets consist of sets of coordinates of distance from the beginning of the section and elevation of the data in NAVD88 feet. These data sets were then combined in EXCEL to show the estimated positions in cross section.

In reviewing the data and comparing the Summit interpretations to those of Brutsaert, the thing that struck us was that there are obviously two different water tables in the vicinity of the proposed gravel pit expansion. Cold Spring, which is located at the intersection of Geologic Cross Sections AA' and BB' and is the source of a small community water supply in Lamoine, is formed by springs that exit at the interface of a sand and gravel layer that pinches out over an underlying glaciomarine fine-grained sediment layer, which we will call "clay" for short, but understand the caveat we gave in the previous paragraph. All indications are that this water table that supplies Cold Spring is a perched or "shallow" water table. Boring logs and monitoring wells MW-1 and MW-3-2012 suggest a deeper water table in sand and gravel underlies the "clay" layer. In other words, the clay layer is sandwiched into the sand and gravel and a monitoring well that has a screen set deep into the clay layer shows up as "dry". Monitoring well OW-1 (the one in the existing Kittridge Pit) finds a groundwater table at about elevation 25' NAVD88. Given the knowledge and approximate inclination and distribution of the "clay" layer in the sand and gravel, the question is how important this clay

layer is to diverting precipitation recharge going down through the gravel pit area from the surface sands and gravels towards the Cold Spring area. As described below, it appears that the clay layer is sloped upward from Cold Springs into the pit area and it is not a stretch to conclude that Cold Spring is recharged by groundwater that percolates into the sand and gravel of the pit area, travels downward and hits the clay layer that slopes toward Cold Spring, and then flows down along this clay layer, concentrating and developing a more defined perched water table as it nears the Spring. How much of this clay layer can be removed before Cold Spring has a "significant impact"?

Figure 1 shows the proposed pit expansion area, the locations of Geologic Cross Sections AA' and BB' (the same as used by Summit), and a contour map of the top of the "clay" unit inferred from a few boring logs, and data points located along streams in obvious glaciomarine sediment terrain. Notice how the clay layer is interpreted to slope upward from the Cold Spring area (at the juncture of the two cross sections) toward the middle of the pit expansion area but remain well below the ground surface. **Figure 2** is a color-coded digital terrain model that accentuates with color the differences in the ground surface elevation. Otherwise, the information is the same as on **Figure 1**. **Figure 3** is a shaded relief model developed from the LiDAR data that is quite informative as to what is happening geologically. Notice the rather smoothed ground surface on the southeast side of the large raised mound of sand and gravel on the western end of Cross Section AA'. We interpret this rounded shoulder to be beach deposits in sand and gravel on top of the clay unit. The beach was formed immediately after deglaciation when the relative sea level dropped fairly rapidly from Elevation 240' at the time of deglaciation toward where it is today at 0'.

The important difference between the Summit interpretation and the Brutsaert interpretation has to do with whether or not the clay layer under the beach deposits extends into the gravel pit area and is important to the hydrology of Cold Spring. Summit's Geologic Cross Section AA' as shown on P. 231 of the Record (**Attachment 1**) suggests that the clay layer just laps up on the side of the esker, but does not penetrate into it. Summit's written analysis does not seem to put any weight on a clay layer penetrating into the gravel pit, either, despite boring log descriptions (**Attachment 2**) that suggest some type of fine-grained glaciomarine deposits being encountered at depth in borings near the expansion area. We have attached several pages from a well-known reference on glacial geomorphology by Embleton & King (**Attachment 3**). If you look at pages 475 and 476 of that reference and the figure on page 475, you can see how having an inclined clayey layer embedded in an esker is certainly possible.

It is easier to see what we are talking about by looking at our renditions of Geologic Cross Sections AA' and BB'. In Section AA' (**Figure 4**) we have drawn the topography of the ground surface with great precision, based on the November 2011 LiDAR. Notice that there is a lot of vertical exaggeration, so slopes look much steeper than they would be in a 1:1 scale. The green line is the inferred top of "clay" or the fine-grained glaciomarine sediments that we believe are important to the recharge capability of the springs to the east of the pit. The blue line is the shallow water table that would occur near the top of the "clay" unit. The orange line is the water table in the lower sand and gravel (beneath the "clay" unit under the eastern half

of the pit expansion area). Notice it is annotated within the pit expansion area itself as being a maximum because no water table was found in borings that were terminated at that depth. The estimated top of bedrock is shown by the lower red line. Because of the scarcity of the data points and the broad brush contouring, some of the lines fall above the ground surface lines in places but that is only an artifact of the methodology we have had to use to interpret widely-scattered data points. We know the lines are above ground surface in places but it is not important to the overall point to try to force them down to the ground surface. Cold Spring is located at the distance of about 6250' from the start of the AA' line. Section BB' (**Figure 5**) is not nearly as important to the issue as Section AA', so although we have provided Section BB' here to be complete, we do not need to discuss it here.

On Cross Section AA' we have sketched in the approximate sideways projected position of the bottom of the pit expansion in a black dashed line. The important thing to note here is that if the pit is developed as suggested by P. 136 of the Record, that a lot of the glaciomarine unit that is inferred to slope upward from Cold Spring into the pit area will be removed. If this unit is removed, the effect of this low permeability layer in encouraging downward percolating recharge to flow toward Cold Springs could be lost. If that happens, the flow of the spring could be greatly reduced.

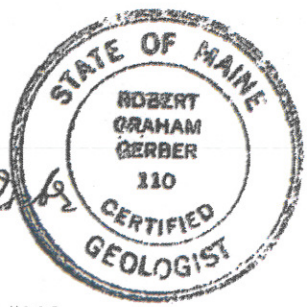
With all of the foregoing in mind, and feeling that there should be some requirement for the applicant to prove as part of the approval process that he can really excavate the pit to the elevations shown on the plan on P. 136 of the Record and maintain 5' of separation to the average seasonal high water table, we have developed a proposed plan of additional exploration that will assist the Board in answering the most important questions pertaining to the groundwater impact of this proposed expansion: 1) where are the shallow and deep water tables within this pit; and 2) would excavation in the eastern half of the pit expansion area significantly affect the recharge for Cold Spring?

Figure 6 shows the location of 4 proposed exploration points. To try to capture the essential information at each point, two monitoring wells may be necessary. The idea would be to advance a boring at each location that would go at least 5 feet into the permanent (deep) water table in sand and gravel beneath any glaciomarine fine-grained sediment units. The boring should be logged continuously as it is advanced. It may be possible to do this through air rotary drilling methods, as we have found that this is a reliable means of drilling through thick esker sediments with boulders in a relatively quick and cheap fashion, provided the driller is experienced in logging surficial material in an air rotary hole and can differentiate the fine-grained units from the glaciofluvial sand and gravel. A monitoring well can then be completed in the hole and the casing either partially or totally withdrawn. Having determined the depth to the glaciomarine unit (if one is encountered), a separate hole should be drilled 10 feet away from the first that penetrates only 5' into that unit and a well installed in that hole. Since the existing data suggest that any glaciomarine units are likely to be relatively shallow, those wells should be installed with hollow-stem auger and continuous split-spoon samples taken as the augers are advanced, then the well installed inside the augers.

At the proposed locations on **Figure 6**, we expect that the glaciomarine unit may only be encountered in PB-3 and PB-4. Regardless of what is found in drilling deep at each of the locations, shallow holes should be drilled at PB-3 and PB-4 with auger borings and wells installed into the top 5 feet of any fine-grained glaciomarine units encountered down to elevation 150'. Shallow wells only need to be installed at PB-1 and PB-2 if glaciomarine units are encountered in those holes above the elevation of the deep water table. The hole locations and elevations should be surveyed upon completion by survey-grade GPS equipment. After completing the borings and taking at least 2 separate water level readings a week apart, the geologic consultant for the Applicant should summarize the new geologic data and water levels and write a report that focuses on whether there is a glaciomarine layer in the eastern part of the gravel pit expansion area that is contributing to Cold Spring recharge, and whether, if that unit were removed, the Cold Spring flow would decrease and the approximate magnitude of that decrease. The exploration program we have suggested here is an absolute minimum. Depending on what is found in the field, the Applicant may want to acquire additional data to support whatever findings his consultants will ultimately make. This work would be better done now at the time of seasonal high water table, than in late summer at time of low water table, because there may not be any measurable water in the top of the clay layer then, although there may be water there at other times of the year. The Applicant's geologist should take into account the time of year the water level data are acquired and adjust for conditions that may occur in other seasons.

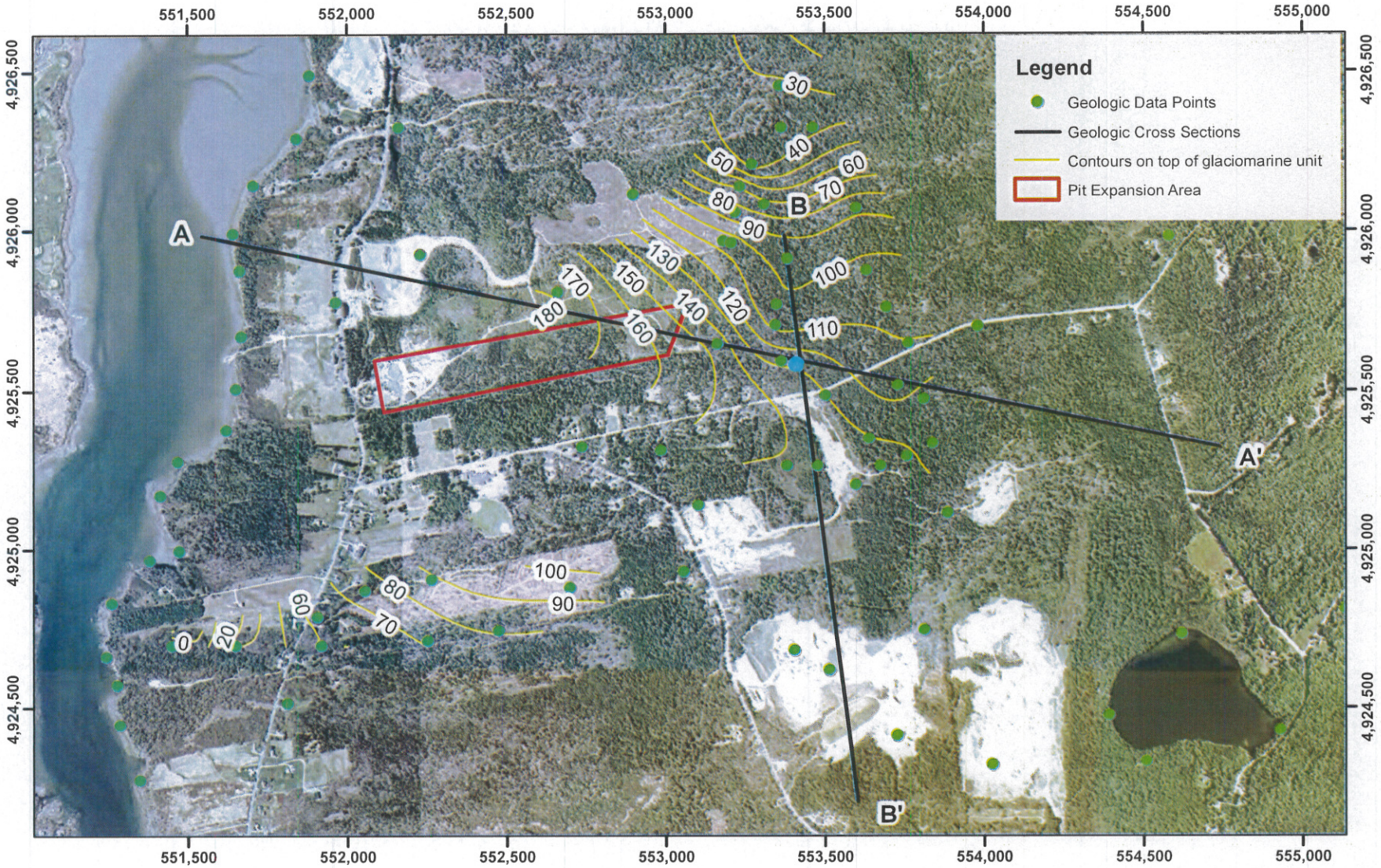
Sincerely,

Ransom Consulting, Inc.



Robert G. Gerber, Certified Geologist #110
Senior Engineer & Geologist

Attachments: Figures 1-6; Attachments 1-3

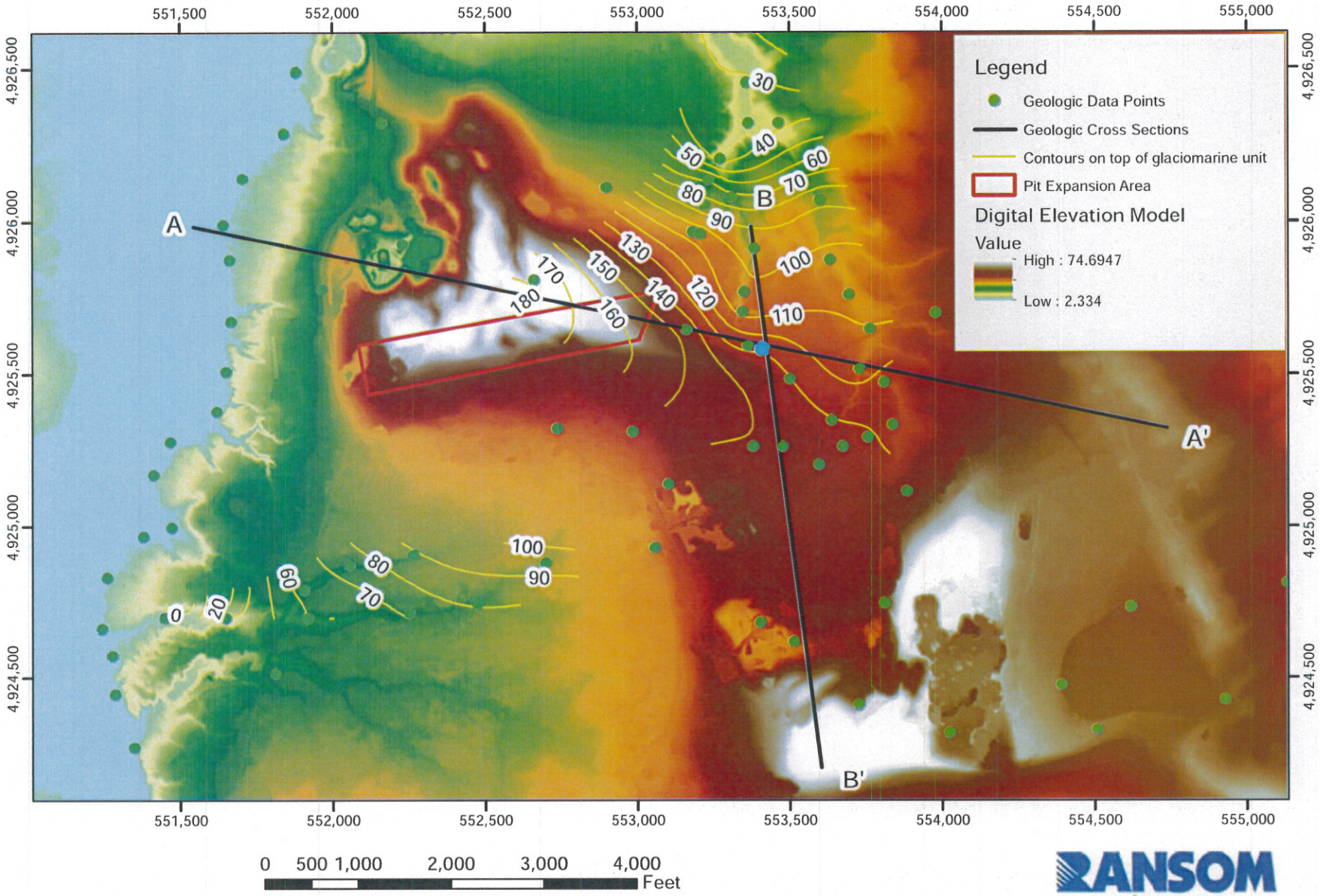


0 500 1,000 2,000 3,000 4,000 Feet

Elevation Contours on Top of Glaciomarine Unit
Town of Lamoine, MacQuinn Gravel Pit Expansion Review
Orthophoto is 2003 2-ft pixel density
Grid is UTM, NAD83, 19N, meters
RGG 4-15-13 131.06066

RANSOM Consulting, Inc.

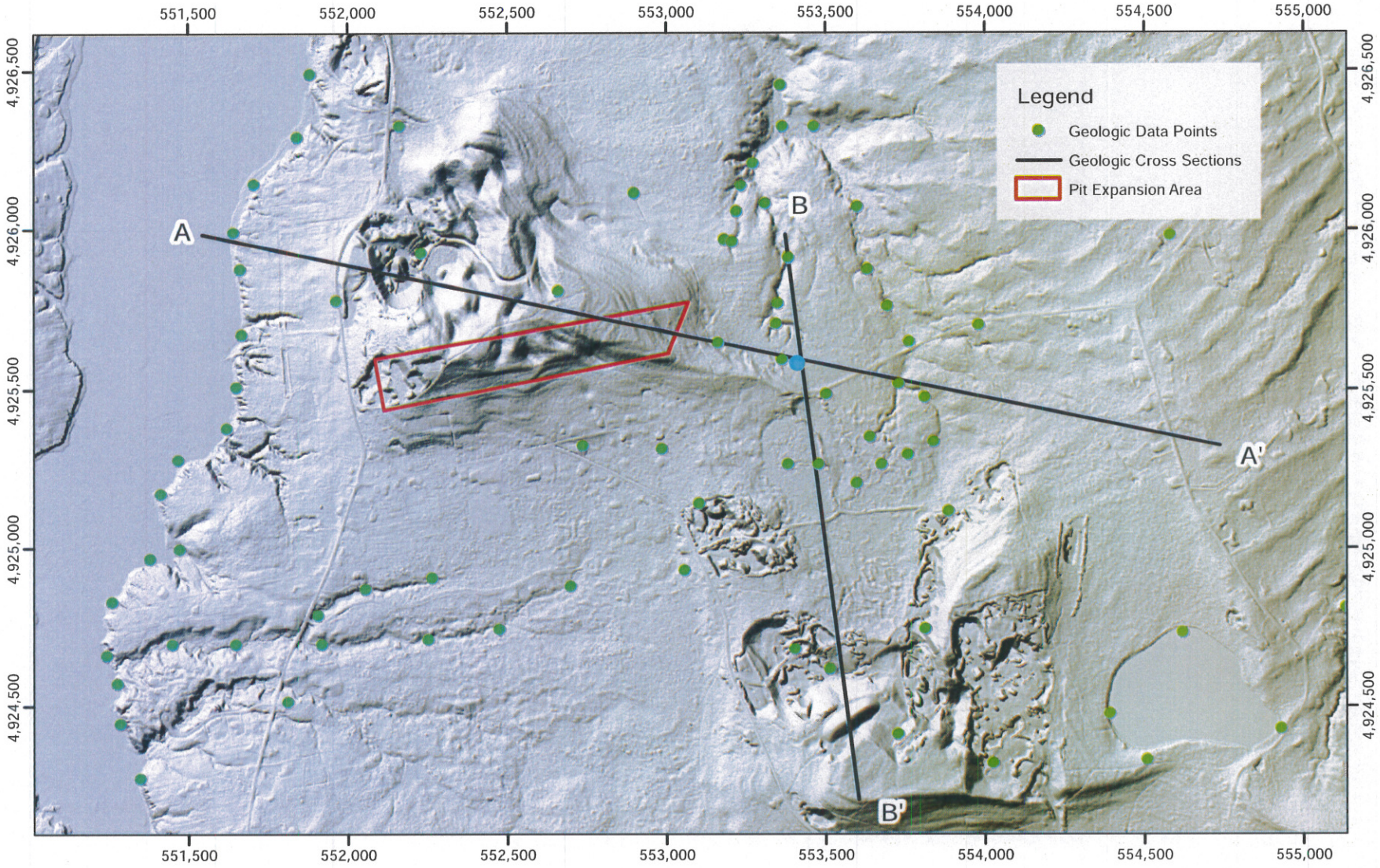
Figure 1



Elevation Contours on Top of Glaciomarine Unit
Town of Lamoine, MacQuinn Gravel Pit Expansion Review
Digital Elevation Model Developed from 2-m LiDAR
Grid is UTM, NAD83, 19N, meters
RGG 4-15-13 131.06066

RANSOM Consulting, Inc.

Figure 2



RANSOM Consulting, Inc.

Elevation Contours on Top of Glaciomarine Unit
Town of Lamoine, MacQuinn Gravel Pit Expansion Review
2-meter Hillshade from LiDAR taken November 2011
Grid is UTM, NAD83, 19N, meters
RGG 4-15-13 131.06066

Figure 3

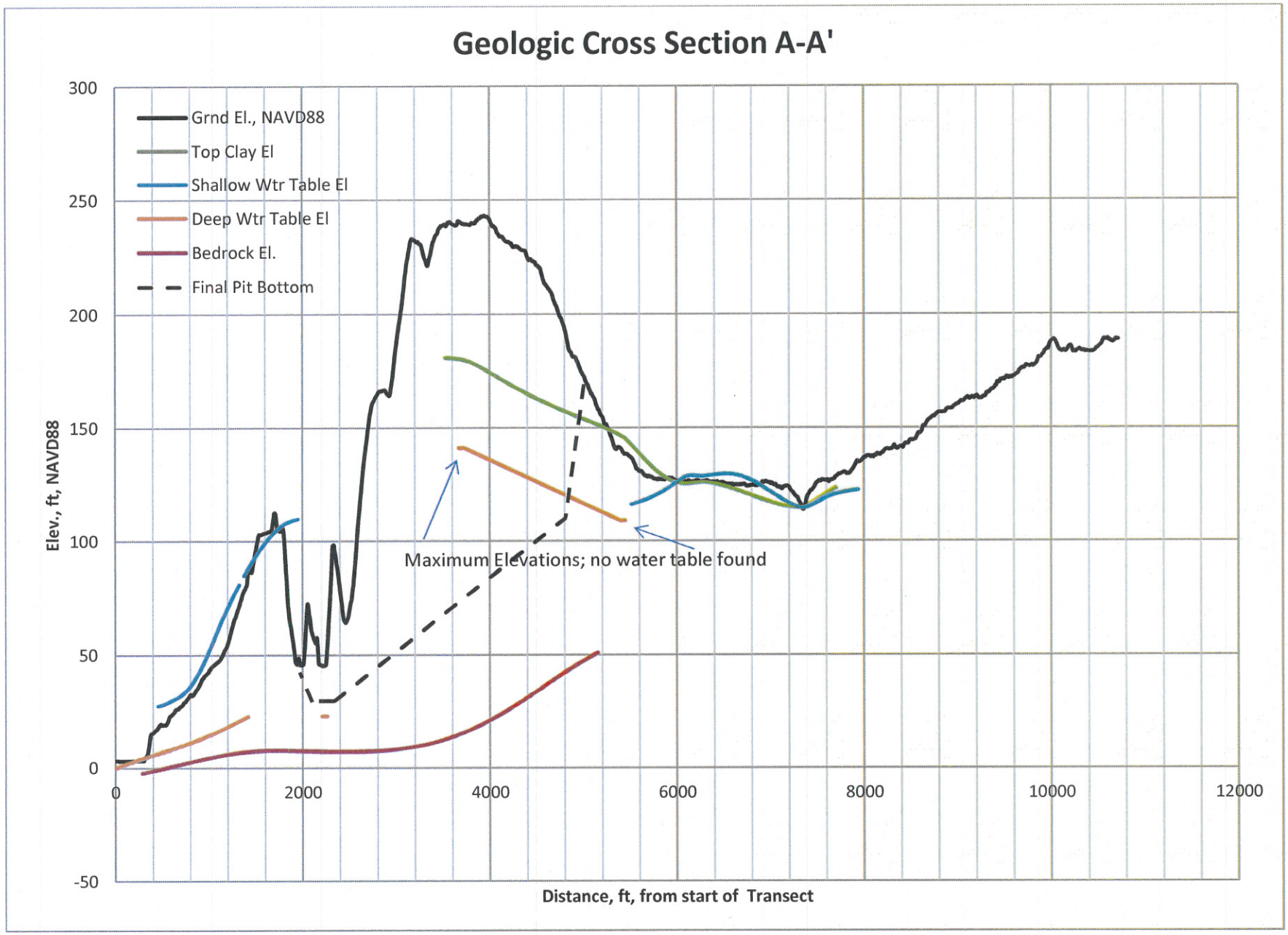

Geologic Cross Section A-A'
Grnd El., NAVD88
Top Clay El
Shallow Wtr Table El
Deep Wtr Table El
Bedrock El.
Final Pit Bottom
Maximum Elevations; no water table found
Elev., ft, NAVD88
Distance, ft, from start of Transect
300
250
200
150
100
50
0
-50
0
2000
4000
6000
8000
10000
12000

Figure 4

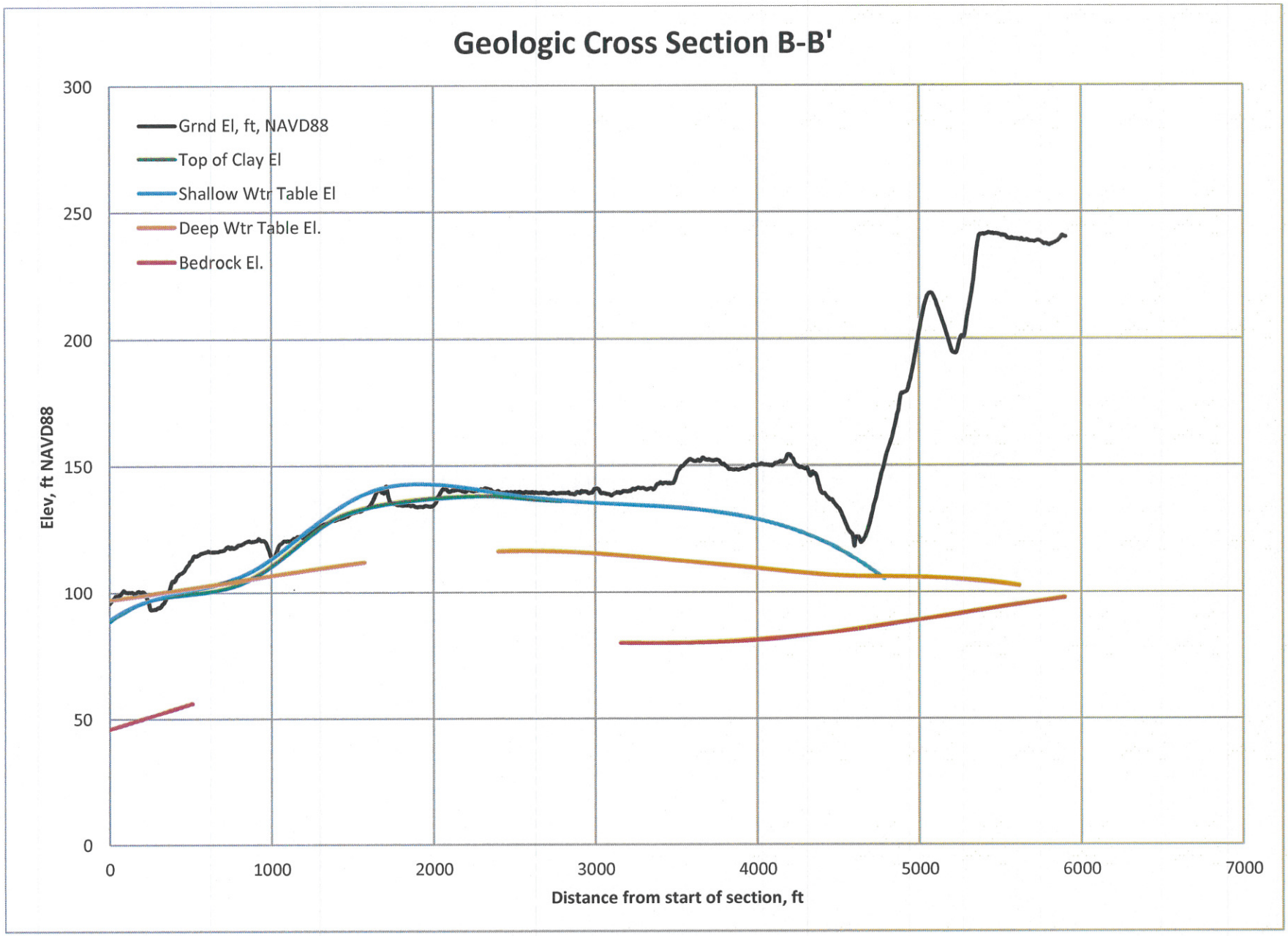
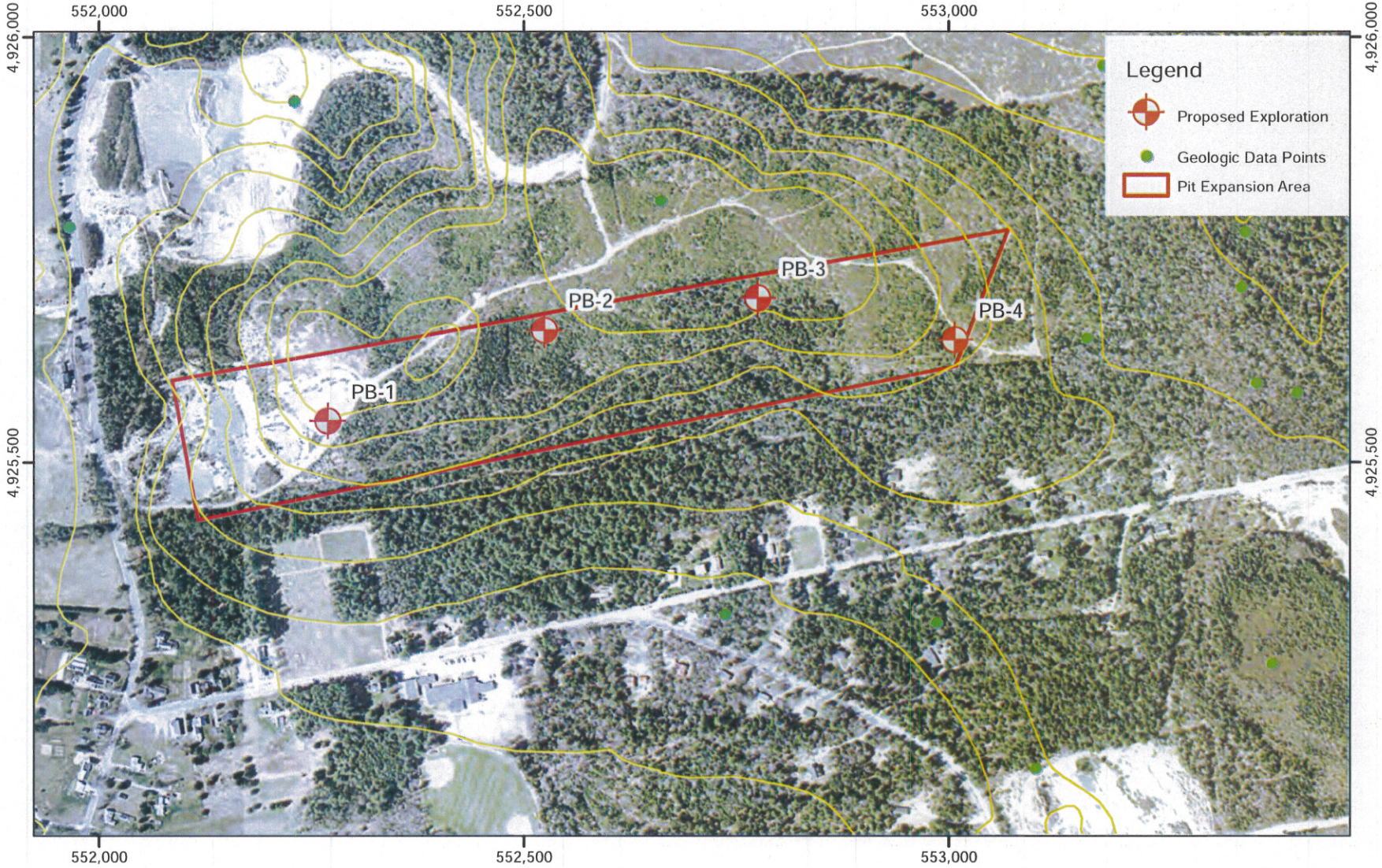

Geologic Cross Section B-B'
Grnd El, ft, NAVD88
Top of Clay El
Shallow Wtr Table El
Deep Wtr Table El.
Bedrock El.
Elev, ft NAVD88
300
250
200
150
100
50
0
0
1000
2000
3000
4000
5000
6000
7000
Distance from start of section, ft

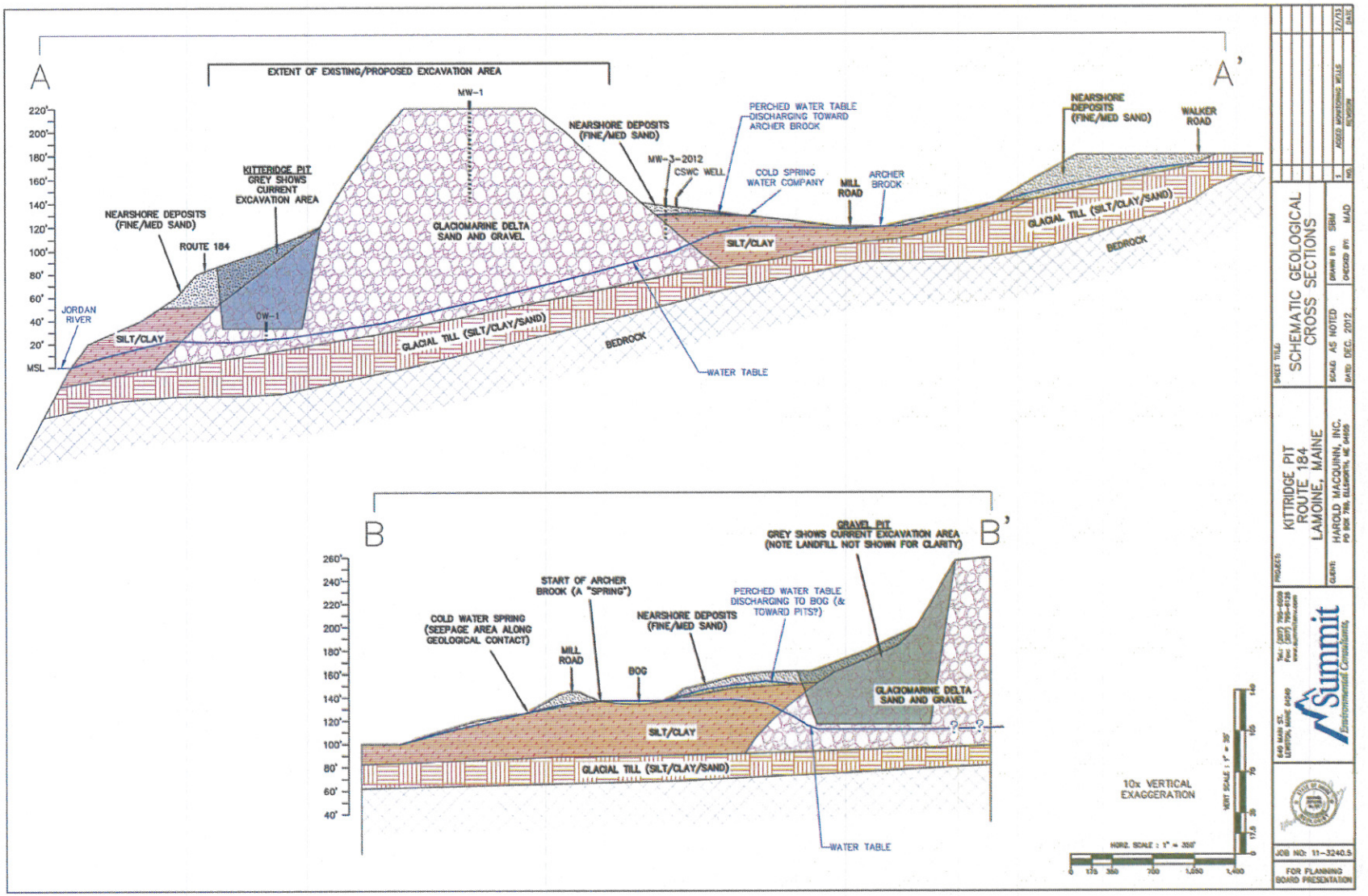
Figure 5



Proposed Additional Exploration Points
Town of Lamoine, MacQuinn Gravel Pit Expansion Review
Orthophoto is 2003 2-ft pixel density
Grid is UTM, NAD83, 19N, meters
RGG 4-15-13 131.06066

RANSOM Consulting, Inc.

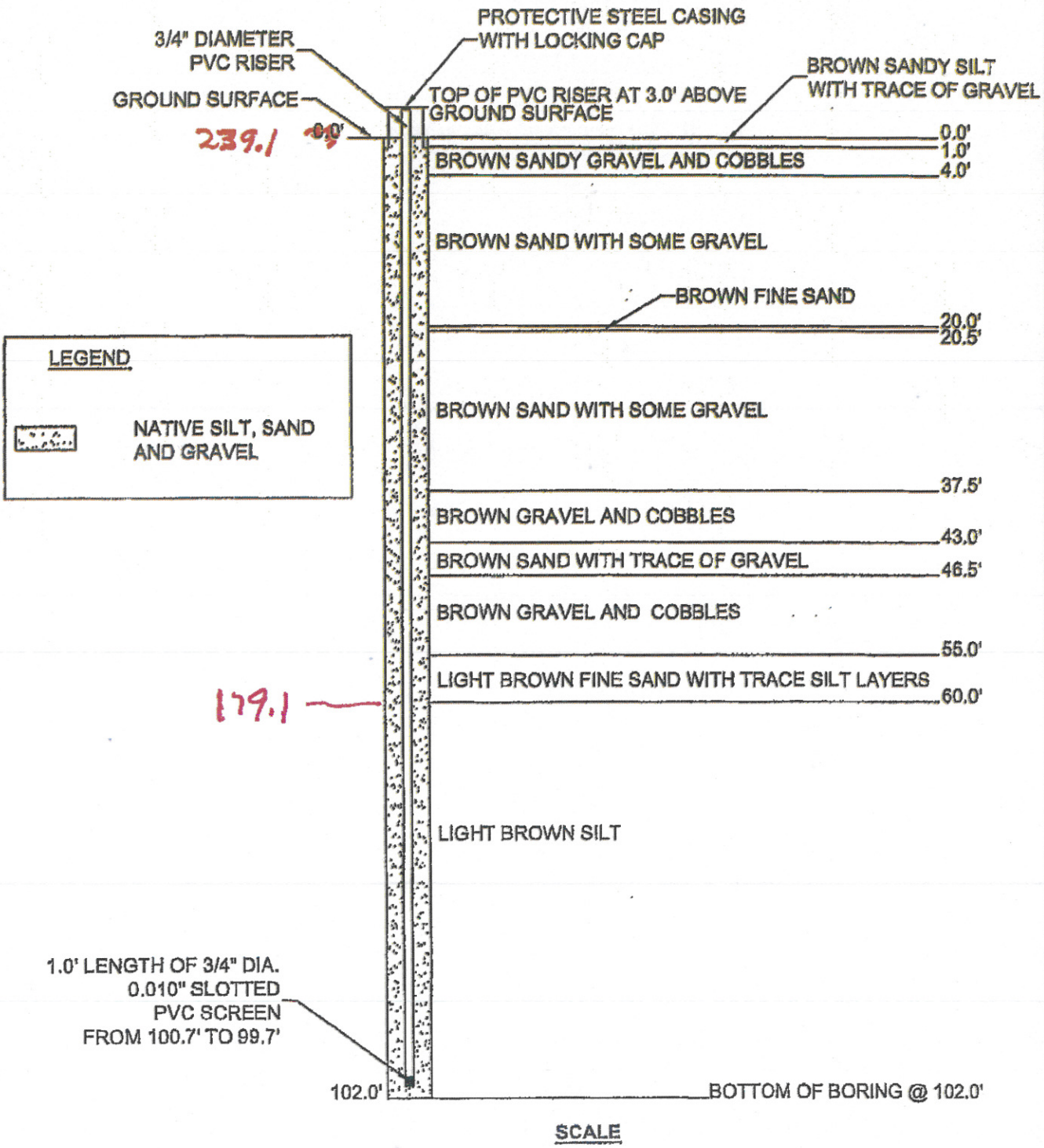
Figure 6



Attachment 1

S.W.COLE ENGINEERING, INC.

MW-1
WATER LEVEL MONITORING WELL INSTALLATION DETAIL



SCALE

VERTICAL: 1" = 15'
HORIZONTAL: NOT TO SCALE

Job No : 04-0421 G

Sheet 8

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn - Miro Lot
Location: Lamoine, Maine

Boring #: MW-3-2012
Project #: 11-3240.5
Sheet: 1 of 1
Chkd by: MAD

Drilling Co: Maine Test Borings
Personnel: Mike Porter
Summit Staff: Steve Marcotte, CG

Boring Location: see location map
Top of PVC Casing Elevation: 167.87
Date started: 8/27/2012

DRILLING METHOD		SAMPLER	
Vehicle:	Skidder	Type:	Not Functioning
Model:	CME	Hammer:	
Method:	4.25" HSA	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth (ft)	Reference	Groundwater Elevation (ft)
See Report			

164.9

144.9'

Depth (ft)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	Stratum
					0 to 2.5 ft bgs - Brown Sand and Gravel	
					2.5 to 10 ft bgs - Yellow Brown Medium Sand	Sand and Gravel Marine Near-shore
10					10 to 11 ft bgs - Gravel lense	
					11 to 20 ft bgs - Yellow Brown Medium Sand	
20					20 to 23 ft bgs - Moist Olive Silty Sand	
					23 to 26 ft bgs - Olive Clayey Sand	
30					26 to 36.5 ft bgs - Olive Silty Clay Moist (balling)	Marine Silt and Clay
40					36.5 to 65 ft bgs Olive to Brown Silty Very Fine Sand to Silt	Silty Very Fine Sand To Silt Marine Delta
					Dry	
50						
60						
70					Bottom of boring at 65 ft bgs	
80						
90						
100						

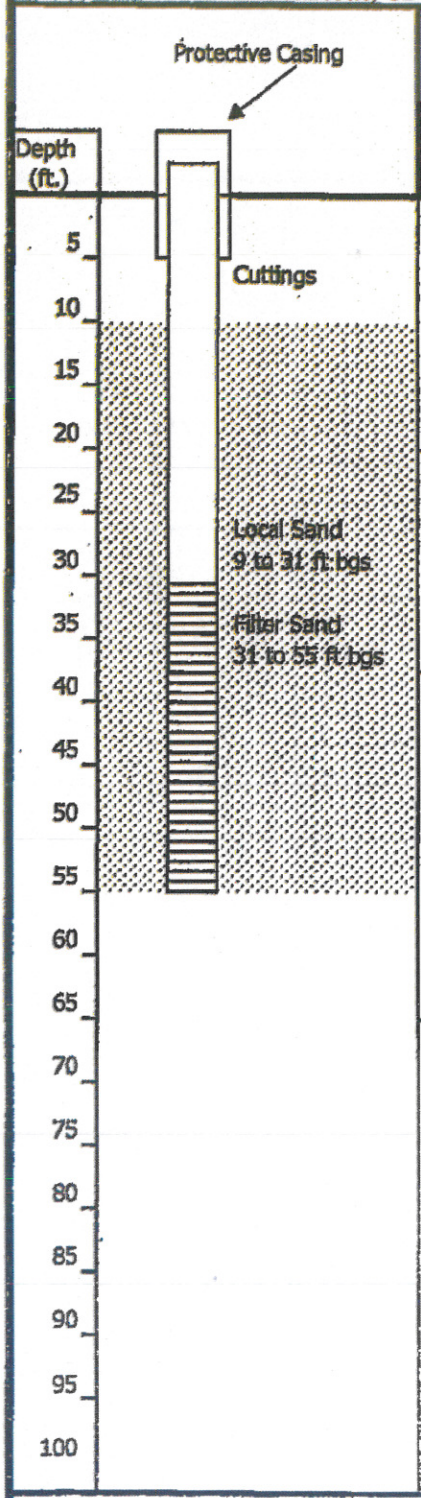
Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:
1. bgs = below ground surface
2. bottom 15 feet of augers were left in the hole due to driller error MW-3-2012 was installed in second boring to 55 ft located 3 ft from this boring
3. split spoon sampler was not functioning. Materials were classified based upon cuttings and inspection of cutting bit every 10 ft

SUMMIT
ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
lewiston, Maine 04240

WELL COMPLETION LOG

Project:	MacQuinn - Miro Lot	Well #:	MW-3-2012
Location:	Lamoine, Maine	Project #:	11-3240.5
		Sheet:	1 of 1
		Chkd by:	MAD
Drilling Co:	Maine Test Borings	Well Location:	See Location Map
Foreman:	Mike Porter		
Summit Staff:	Steve Marcotte, CG	Date started:	8/28/2012
		Date Completed:	8/28/2012



Stratum from soil boring log:
- Medium Sand & Gravel Marine Near-shore
- Marine Silt & Clay
- Silt to Very Fine Sand Marine Delta

REFERENCE ELEVATIONS

Surveyor:	Herrick and Salsbury
Reference (MSL or TBM):	NGVD 29
Top of Protective Casing:	
Top of inner casing:	167.87
Ground Surface:	164.9

GW ELEVATIONS

Date	Elevation
8/28/2012	<109.9
9/7/2012	<109.9

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	Standpipe
Diameter (in.):	1 inch
Length (in.):	5 foot
Concrete Seal (gal):	N/A

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	10	10
Diameter (in.):	1 inch	1 inch
Length (ft):	33.0	25.0
Interval below ground surface (ft):	+3 - 30	30 to 55
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	Sand	None
Size:	#1	
Quantity (lbs.):	500	
Interval below ground surface (ft):	31-55	

GROUT

Type (filter sand, bentonite, etc.):	
Quantity (gal. or lbs.):	
Interval below ground surface (ft.):	

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	
Depth of well from measuring point (ft):	
Total feet of water:	
Volume of water (gal):	
Volume of water evacuated:	
Method of development:	Not Developed

NOTES:

flow law
p. 126

Glacial Geomorphology

Clifford Embleton

Reader in Geography, University of London King's College

Cuchlaine A. M. King

Professor of Physical Geography, University of Nottingham

A HALSTED PRESS BOOK

John Wiley & Sons
New York

Attachment 3

First published 1975 by
Edward Arnold (Publishers) Ltd
London

This book is a fully revised edition of Parts I–III of
Glacial and Periglacial Geomorphology first published 1968 by
Edward Arnold (Publishers) Ltd
Reprinted 1969, 1971, 1974

Published in the USA
by Halsted Press, a Division
of John Wiley & Sons, Inc
New York

Library of Congress Cataloging in Publication Data

Embleton, Clifford
Glacial geomorphology

(Their Glacial and periglacial geomorphology; v. 1)
'A Halsted Press book'
Includes bibliographies and index
1. Glacial landforms. I. King, Cuchlaine, A. M. joint author. II. Title
GB581.E452 1975 vol. 1 551.3'1'08s
ISBN 0-470-23892-5 [551.3'1] 75-14188
ISBN 0-470-23893-3 pbk

Printed in Great Britain

Attachment 3

2.3 *Descriptions of eskers in different areas*

R. J. Price (1965) has described eskers left in front of the retreating Casement glacier in Alaska, some of which have been revealed since the glacier became land-ending about 1907. A complex set has been exposed from the retreating ice since 1935. The eskers are ridges 3–9 m high, formed of well-rounded gravel, cobbles and boulders. They occur on ground that slopes both away from and towards the glacier. Those formed on the slope down towards the glacier must either have been formed by subglacial streams under hydrostatic pressure or by englacial streams. In the latter event they must have been let down subsequently on to the reverse slope. A complex series of ridges is thought to have developed supraglacially in lakes, which have since drained, leaving shoreline features on the ridges. The largest ridges were probably on the site of meltwater streams and they appear to be true eskers which were underlain by ice at one time. Some near the glacier have ice cores, and photographs showed them extending on to the ice in places. They could either have formed in englacial tunnels or on the ice. Subsequent melting must have produced the uneven crest line. The lakes must have formed after the ice melted out beneath and around the eskers. Some of the eskers were 40 m high and 33 m wide at their base when they were still on the ice. These eskers have been destroyed by meltwater streams subsequently.

Hoppe (1961) has described some of the eskers of northern Sweden. These eskers occur both above and below the highest marine limit. They often extend for 5 to 10 km between breaks, which normally occur where the relief is highest. The largest eskers have rather flat, broad crests, supporting the view that the deposits were built up in successive layers in subglacial or englacial meltwater channels. Hoppe agrees with V. Tanner (1932) that the sharp-crested narrow variety of esker is the result of subsequent collapse of the sides when the supporting ice walls melt away. The eskers formed above the water-level consist mainly of stratified sand and gravel. Sometimes silt occurs within the esker or on its surface, and occasionally heaps of boulders are found.

One particular esker, Hammesharju, shows some unusual features. It is situated south-east of Gällivare and is over 4 km long, 50 to 80 m wide and up to 16 m high, although its crest is broken by gaps. The esker was formed probably in a subglacial or englacial tunnel; later, a supraglacial stream was let down across it and eroded the gaps that occur along it. Ridges of till flank the esker on either side. These ridges contain stones preferentially orientated transverse to the ridge elongation. It is thought that they were formed by the squeezing of water-soaked till into the area on either side of the tunnel. There are also examples of a similar type of feature that forms when the till is pressed beneath and into the central core of the esker rather than alongside it.

Another interesting example is the Vessö esker in southern Finland. It is in part a continuous ridge, but in places it is broken into separate mounds. It is situated about 50 km east of Helsinki, is 8 km long and varies in width from 300 m to 2 km, with a maximum height of 38 m (Fig. 16.7). It runs south-east to north-west radially to the large Salpausselka moraines to which it is linked. Its outer part consists of several islands, while it has been modified by the sea as it has risen isostatically since its emergence from the ice. The esker as a whole is asymmetrical and has a steeper eastern slope with a stony surface, continuing in places below sea level. In places, there are depressions,

which are steep and circular, along the ridge. Along part of its length, the esker forms a broad ridge with associated boulder-covered mounds. Elsewhere, the esker spreads out and merges into an even, sandy plain. The fluvioglacial material of which the esker is composed lies directly on the rock with no intervening till. The bedrock, an easily weathered granite, was eroded to form a depression along which the esker is situated.

The structure of the esker has been revealed in cuttings at a point where the eastern slope is 13° and the western only 3°. The esker is covered with boulders and its internal structure is shown in Fig. 16.7. The sloping layer of clay (4), with a dip of 8°, runs

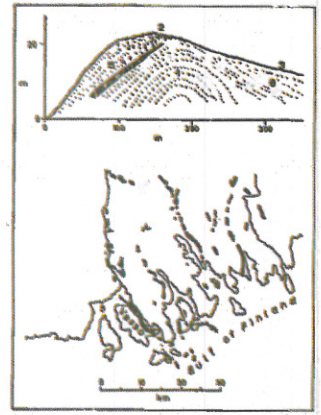


Fig. 16.7
The Vessö esker, Finland (O. Granö, *Fennia*, 1958, by permission of the Johnson Reprint Corporation)

almost parallel to the steeper eastern side. This layer probably formed the original esker surface, and the overlying sand and stones (5) consist of later marine additions. Beneath the clay and silt, sand (1) occurs in alternating layers of finer and coarser particles, showing cross-bedding. In the centre, the material is coarser. Some large angular boulders occur in the silt layer and on the upper surface (2), where the gravel and stone layer is 1–3 m thick.

The form of the esker and its constituent material give indications of its mode of formation. O. Granö (1958) suggests that the fluvioglacial material of the esker was deposited close to the ice margin in deep water. He considers that the character of the esker, particularly its core, agrees with the views of De Geer concerning esker formation in submarine environments. The original core was probably deposited as a small delta at the mouth of a subglacial stream emptying into the sea. A clay and silt layer represents a remnant of the covering of fine material deposited when the esker was still in deep water. It includes large ice-rafted angular blocks. The boulders covering the clay could have been derived from a covering of stony till from which the fine

Attachment 3

material has since been washed away. The sand (6) above the unconformity on the western side of the esker was deposited by the waves as the esker emerged above the sea. The steeper eastern slope is the result of movement of material to the lee side by the waves whose maximum fetch lay to the west. The feature has been considerably modified by the sea since its formation at the edge of the retreating Scandinavian ice sheet.

The Lammi esker, described by E. Wisniewski (1973) stretches north-west from the Salpausselka I moraines. It consists of a series of proglacial deltas linked by short ridges, and lies in a bedrock trough. The deltas formed successively in the Baltic Ice Lake. In places, the esker ridge is 200 m wide and 35 m high, and is composed of gravel and pebbles up to 30 cm in size. Its sides slope at 25° to 30°. Some boulders up to 2 m in size indicate an ice-contact position; they overlie bedded material whose stratification is deltaic. Deformation of the finer layers in places has resulted from melting of buried ice, and there are also kettle holes. The esker now has the form of hillocks of varying size, formed during deglaciation in a sub-aqueous environment. Each delta marks a pause in the retreat of the ice front, and the esker deposits accumulated in crevasses or channels along which fluvioglacial transport was taking place. It is a classic example of a De Geer-type esker. Most of it was submerged on deglaciation, resulting in some loss of fines and abrasion through wave action.

P. Fogelberg (1970) analyses the features of deglaciation associated with the Salpausselka II moraine in an area of southern Finland. In the moraine foreland, there are eskers whose southern ends rise to ridges or hills 135 to 140 m above sea level, northwards from which a lower tail continues at 100 to 110 m. The steep hillock at the southern end was deposited between ice walls where the ice-channelled stream or tunnel opened into a lake. The tail is part of the feeding esker formed in the ice tunnel. In the moraine hinterland, the fluvioglacial deposits include more continuous eskers. No De Geer-type eskers occur either in the foreland or the hinterland of this area.

Farther north in Finland, the deglacial history of the Tana valley provides further illustration of the complex environments with which esker systems are associated. The ice sheet melted rapidly from this area, its margin melting back at an average rate of 230 m/year until it became ice-free in 9500 BP (H. Mansikkaniemi, 1970). Subglacial sedimentation was extensive during this phase, and bottom eskers and subglacial valley trains formed. The largest eskers occur where the valley is narrow and deep; these include bottom eskers 10 to 40 m high that follow the valley floor and that were formed in ice tunnels. They have been trimmed by later marine incursion. During deglaciation, short-lived lakes formed in the narrow parts of the valley and these were filled with fine sediments, at a level above that of the river deposits. The sorted sediments attain thicknesses of 20 to 70 m on the valley floor. There are also 'slope eskers' descending the valley sides, which are smaller and less than 10 m high, the infillings of subglacial chutes (p. 346). Some of the large bottom eskers are continuous for 7 km. Their width varies from 100 to 300 m—25 to 50 per cent of the width of the valley bottom. Deep kettle holes are associated with them. The finest deposits in the eskers are well-sorted, and the stones rounded, having travelled 25 to 35 km. Coarse sediments, on the other hand, are poorly sorted and only slightly stratified. Some of the bedding in the bottom eskers is nearly horizontal. The eskers probably formed under dead ice 100 to 200 m thick, whose downwasting led to the plateaux and uplands being exposed while ice

remained in the valleys. Fine sediments accumulated as melting ice caused blockages in the valley at some places. Coarse sediments were deposited when the flow was rapid in subglacial or englacial tunnels. These were enlarged by melting until the marginal ice walls collapsed, together with the roof, and the fallen blocks of ice were then covered by further sediment. The slope eskers are less numerous because rapid flow of water down the subglacial chutes tended to prevent deposition.

The deglaciation of the Holy Cross Mountain area west of the Vistula in Poland has been discussed by C. Radlowska (1969). The Tarlow esker is associated with the Vistula ice lobe of Riss age. Its roots lie, in part, in a valley, although not at the lowest point. Its crest reaches 192 m where the plateau level is 210 m, and its course is sinuous, consisting of long hillocks and mounds, whose irregular relief is said to be partly the result of subsequent erosion. Coarse material occurs in the esker core, overlain by bands of gravel-pebble mixture and some sand. The structure is complex and in places disturbed, particularly where the material is coarsest in the north. Boulders up to 0·5 m across are tightly packed at the esker base. Material is more uniform towards the south. The lower eastern slope is thinly mantled with till up to 5 m from the crest, suggesting that the esker was formed in a tunnel. Large soft-rock boulders indicate short distances of transport, and there is little sign of sorting. Strong cross-bedding occurs and there are lenses of sand and silt. Three stages of deglaciation are inferred:

1 the esker developed in a subglacial tunnel and was then partially covered by till and ablation moraine as the ice decayed
2 a free space developed between the esker and the dead-ice wall, and water flowing along this channel added a kame terrace to the esker
3 after the dead ice decayed, a valley formed adjacent to the kame-esker, followed by settling and gelifluction on the slopes. Eolian activity finally added some sand dunes.

In central Poland, Z. Michalska (1969) differentiates true eskers from crevasse fillings. Esker materials are well washed but vary in particle size and bedding. Accumulation occurred in a marginal tunnel or, more rarely, in a decay crack near a tunnel outlet. There were probably short breaks in sedimentation, a series of layers representing separate depositional episodes with different sources. Till layers several metres thick are found near the bases of some eskers; at some later stage, channels up to 30 m deep were cut in the till. Following channel erosion, up to 30 m of fluvioglacial sediments were deposited in several episodes, to be overlain in turn by sandy deposits laid down in continuously flowing water. The tunnel then increased in size and deposits 15 m thick accumulated along the channel axis. Finally, the tunnel roof melted, letting down a mantle of till 1–2 m thick.

Mention should be made of some of the eskers of Ireland, as it was from this country that the name 'esker' originated. An interesting series of eskers and associated features has been described by F. M. Synge (1950) in the area around Trim, north-west of Dublin. The area lies in the drainage basin of the River Boyne, which flows north-eastward to the north of the main esker area. The area is drained by streams flowing north-westward to join the Boyne (Fig. 16.8). When the ice sheet associated with the eskers lay over the area, its margin ran roughly from north-east to south-west and was

Attachment 3

ATTACHMENT 2

BORING LOGS AND WELL COMPLETION LOGS

SOIL BORING LOGS

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-1**
Project #: 11-3240.5-01
Sheet: 1 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte / M. Deyling

Boring Location: See Location Map
Elevation: 166.2 feet NGVD29
Date started: 11/24/2013 Date Completed: 11/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	See Note #1
Model:	ATV	Hammer:	
Method:	D&W	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
2					Brown, coarse Sand and Gravel	MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA
4						
6					Brown/Gray, coarse Sand and Gravel	
8						
10						
12					Gray, coarse Sand and Gravel	
14						
16					Gray, coarse Sand and Gravel	
18						
20						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

1. Sample descriptions based on wash samples decribed at 5 foot intervals.

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-1**
Project #: 11-3240.5-01
Sheet: 2 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte / M. Deyling

Boring Location: See Location Map
Elevation: 166.2 feet NGVD29
Date started: 11/24/2013 Date Completed: 11/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	See Note #1
Model:	ATV	Hammer:	
Method:	D&W	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
22					Gray, coarse Sand and Gravel	MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA
24						
26					Gray, coarse Sand and Gravel	
28						
30						
32					Gray, coarse Sand and Gravel	
34						
36						
38					Gray, coarse Sand and Gravel	
40						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

1. Sample descriptions based on wash samples decribed at 5 foot intervals.

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ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project:	MacQuinn
Location:	Lamoine

Boring #:	**PB-1**
Project #:	11-3240.5-01
Sheet:	3 of 7
Chkd by:	S. Marcotte

Drilling Co:	East Coast Exploration
Personnel:	Chris & Bill
Summit Staff:	S. Marcotte / M. Deyling

Boring Location: See Location Map
Elevation: 166.2 feet NGVD29
Date started: 11/24/2013 Date Completed: 11/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	See Note #1
Model:	ATV	Hammer:	
Method:	D&W	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
42					Gray, coarse Sand and Gravel	MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA
44						
46					Gray, coarse Sand and Gravel	
48						
50					Hard drive at 50'	
52					Medium coarse, Sand and Gravel	
54						
56					Started washing 5' before driving casing	
58					Medium coarse, Sand and Gravel	
60						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

1. Sample descriptions based on wash samples decribed at 5 foot intervals.

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ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-1**
Project #: 11-3240.5-01
Sheet: 4 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte / M. Deyling

Boring Location: See Location Map
Elevation: 166.2 feet NGVD29
Date started: 11/24/2013 Date Completed: 11/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	See Note #1
Model:	ATV	Hammer:	
Method:	D&W	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
62					Gray, medium Sand, trace fine Sand, trace Gravel	MEDIUM TO FINE SAND GLACIOMARINE DELTA
64						
66					Gray, medium Sand, trace fine Sand, trace Gravel	
68						
70						
72					Gray, fine Sand, trace Silt	
74						
76						
					Stopped advancing casing	
78					Medium/Fine Sand, trace coarse Sand, trace Silt	
80						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

1. Sample descriptions based on wash samples decribed at 5 foot intervals.

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ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-1**
Project #: 11-3240.5-01
Sheet: 5 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte / M. Deyling

Boring Location: See Location Map
Elevation: 166.2 feet NGVD29
Date started: 11/24/2013 Date Completed: 11/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	See Note #1
Model:	ATV	Hammer:	
Method:	D&W	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
82					Medium/Fine Sand, trace coarse Sand, trace Silt	MEDIUM TO FINE SAND GLACIOMARINE DELTA
84						
86					Medium/Fine Sand, trace coarse Sand, trace Silt	
88						
90						
92					Gray medium Sand, some fine Sand, some coarse Sand	
94						
96						
98					Medium/Fine Sand, trace Silt trace coarse Sand and Gravel	
100						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

1. Sample descriptions based on wash samples decribed at 5 foot intervals.

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Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-1**
Project #: 11-3240.5-01
Sheet: 6 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte / M. Deyling

Boring Location: See Location Map
Elevation: 166.2 feet NGVD29
Date started: 11/24/2013 Date Completed: 11/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	See Note #1
Model:	ATV	Hammer:	
Method:	D&W	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
102					Gray, medium/fine Sand, trace Silt, trace coarse Sand and Gravel	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
104						
106					Gray Medium/Fine Sand, trace Silt, trace coarse Sand No Gravel	
108						
110						
112					Light tan, fine Sand and Silt, trace medium Sand, (low recovery due to silt content)	**FINE SAND WITH LITTLE TO SOME SILT GLACIOMARINE DELTA**
114						
116					Light tan, fine Sand and Silt (low recovery due to silt content)	
118						
120						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

1. Sample descriptions based on wash samples decribed at 5 foot intervals.

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ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-1**
Project #: 11-3240.5-01
Sheet: 7 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte / M. Deyling

Boring Location: See Location Map
Elevation: 166.2 feet NGVD29
Date started: 11/24/2013 Date Completed: 11/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	See Note #1
Model:	ATV	Hammer:	
Method:	D&W	Fall:	

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
122					Light tan, fine Sand and Silt (low recovery due to silt content)	**FINE SAND WITH LITTLE TO SOME SILT GLACIOMARINE DELTA**
124						
126					Dry hole in morning to 125' bgs Light tan, Fine Sand and Silt, little medium Sand (low recovery due to silt content)	
128						
130						
132					Bedrock at 131.75' bgs Olive gray metamorphic rock correlated to Ellsworth Formation	**BEDROCK**
134						
136						
138					Roller cone bedrock to 146.5' Set 20' screen riser to surface. (146.5 - 126.5 bgs screen interval) Install protective casing standpipe	
140						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

1. Sample descriptions based on wash samples decribed at 5 foot intervals.

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ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-2**
Project #: 11-3240.5-01
Sheet: 1 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 231.1 feet NGVD29
Date started: 11/15/2013 Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
4	SS1	24/8	4-6	21/23/21/29	Compact, Brown/Gray, coarse Sand and Gravel, some Silt, cobbles.	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
6					(Rock at 7'. Kicked casing out of vertical) (Moved 4' and reset)	
8	SS2	24/6	9-11	16/17/21/10	Gray, Medium/Coarse Sand and Gravel, trace Silt Cobbles	
10						
12						
14	SS3	24/12	14-16	9/9/9/8	Loose, Brown/Gray, coarse Sand and Gravel, trace Silt	
16						
18						
	SS4	24/6	19-21	8/8/7/6	Loose, gray Coarse Sand and Gravel, trace Silt, cobbles	
20						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

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ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-2**
Project #: 11-3240.5-01
Sheet: 2 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 231.1 feet NGVD29
Date started: 11/15/2013 Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
22						
24	SS5	24/8	24-26	8/8/9/10	Loose, gray Coarse Sand and Gravel trace Silt, stones, cobbles	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
26						
28						
30	SS6	24/3	29-31	20/16/12/8	Compact, gray Sand and Gravel Spoon pushing a rock Fragments in spoon	
32						
34	SS7	24/16	24-36	19/17/11/10	Compact, gray, coarse Sand and Gravel, stones and cobbles	
36						
38						
40	SS8	24/12	39-41	21/19/12/15	Compact, gray Sand and Gravel, little fine Sand, trace Silt, stones and rock fragments	

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-2**
Project #: 11-3240.5-01
Sheet: 3 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 231.1 feet NGVD29
Date started: 11/15/2013 Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
42						MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA
44	SS9	24/6	44-46	24/17/27/34	Compact, gray Coarse Sand and Gravel, trace Silt, stones common	
46						
48						
	SS10	24/10	49-51	15/12/12/20	Compact, gray, coarse Sand and Gravel, little silt, stones 1/2" to 1" common	
50						
52					At 50 feet bgs started continuous wash samples described at 5 foot intervals Gray, Coarse Sand and Gravel, trace Silt	
54						
56					Gray, Coarse Sand and Gravel, trace to little Silt. Angular fragments - ground up gravel, stones, and cobbles	
58						
60						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT	SOIL BORING LOG	Boring #:	PB-2
ENVIRONMENTAL CONSULTANTS, INC.	Project: MacQuinn	Project #:	11-3240.5-01
640 Main Street	Location: Lamoine	Sheet:	4 of 9
Lewiston, Maine 04240		Chkd by:	S. Marcotte

Drilling Co:	East Coast Exploration	Boring Location: See Location Map	
Personnel:	Chris & Bill	Elevation: 231.1 feet NGVD29	
Summit Staff:	M. Deyling	Date started: 11/15/2013	Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
					Same as 55-60 ft bgs	
					Gray, Coarse Sand and Gravel, trace to little Silt.	
					Angular fragments - ground up gravel, stones,	
62					and cobbles	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
64						
66						
					Gray, medium to coarse Sand, some fine Sand,	
					trace Gravel, trace Silt	
68						
70						
					Gray, fine to coarse Sand, little Gravel, trace Silt	
72						
						MEDIUM TO FINE SAND GLACIOMARINE DELTA
74						
76						
					Gray, fine to medium Sand, trace coarse Sand,	
78					little Silt	
80						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-2**
Project #: 11-3240.5-01
Sheet: 5 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 231.1 feet NGVD29
Date started: 11/15/2013 Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
82					Gray, fine to coarse Sand, little to some Gravel, trace to little Silt	MEDIUM TO FINE SAND GLACIOMARINE DELTA
84						
86					Same as 80' to 85'	
88						
90						
92					Gray, fine to coarse Sand, trace Gravel, trace to little Silt	
94						
96					Gray, fine to coarse Sand, little Gravel, little Silt	
98						
100						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-2**
Project #: 11-3240.5-01
Sheet: 6 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 231.1 feet NGVD29
Date started: 11/15/2013 Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
102					No sample 100' to 110', wash water similar to previous.	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
104						
106						
108						
110						
112					Gray, fine to medium Sand, some coarse Sand, trace Gravel, little Silt	
114						
116					Same as 110-115 ft bgs	
118					Gray, fine to medium Sand, some coarse Sand, trace Gravel, little Silt	
120						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-2**
Project #: 11-3240.5-01
Sheet: 7 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 231.1 feet NGVD29
Date started: 11/15/2013 Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
122					Gray, fine to medium Sand, some coarse Sand, trace Gravel, trace Silt	MEDIUM TO FINE SAND GLACIOMARINE DELTA
124						
126					Gray, fine Sand, some medium Sand, trace coarse Sand, trace Silt	
128						
130						
132					Same as 125' to 130'	
134						
136					Gray, fine to medium Sand, little coarse Sand, trace Silt	
138						
140						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT	SOIL BORING LOG	Boring #:	PB-2
ENVIRONMENTAL CONSULTANTS, INC.	Project: MacQuinn	Project #:	11-3240.5-01
640 Main Street	Location: Lamoine	Sheet:	8 of 9
Lewiston, Maine 04240		Chkd by:	S. Marcotte

Drilling Co:	East Coast Exploration	Boring Location:	See Location Map
Personnel:	Chris & Bill	Elevation:	231.1 feet NGVD29
Summit Staff:	M. Deyling	Date started: 11/15/2013	Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
142					Gray, fine to medium Sand, little coarse Sand, little Silt	MEDIUM TO FINE SAND GLACIOMARINE DELTA
144						
146					Same as 140' to 145'	
148						
150						
152					Same as 145' to 150'	
154						
156					Same as 150' to 155'	
158						
160						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-2**
Project #: 11-3240.5-01
Sheet: 9 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 231.1 feet NGVD29
Date started: 11/15/2013 Date Completed: 11/19/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
162					Gray, fine to medium Sand, some coarse Sand, trace Gravel, little Silt	MEDIUM TO FINE SAND GLACIOMARINE DELTA
164						
166					Brown, fine Sand and coarse Sand, little to some Silt	
168						
170					Brown/Gray, fine to medium Sand, some coarse Sand, little Silt	
172						
174						
176					Same as 170' to 175'	
178					Set well, 20' Screen 159' - 179' riser to surface Install protective casing standpipe	
180					Bottom of Boring at 179 feet bgs	

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 1 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
4	SS1	24/11	4-6	13/44/46/50	3" seam of gray silty clay over Yellow/Brown, dense coarse Sand and gravel,	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
10	SS2	24/14	9-11	30/32/36/36	Brown dense medium Sand, trace Gravel over Light Tan, fine Sand, trace Silt, loose	
14	SS3	24/11	14-16	12/14/15/15	Compact, gray/brown, coarse Sand and Gravel	
18	SS4	24/9	19-21	16/14/11/12	Compact, gray/brown, coarse Sand and Gravel	

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 2 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
22						
24	SS5	24/10	24-26	16/14/18/18	Compact, yellow/brown, fine Sand (uniform)	
26						
28						**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
	SS6	24/12	29-31	21/19/21/20	Compact, gray/brown, medium Sand and Gravel	
30						
32						
34	SS7	24/10	34-36	11/13/13/12	Compact/Loose stratified gray/brown, coarse Sand and medium Sand	
36						
38						
	SS8	24/11	39-41	13/15/17/19	Compact, gray/brown, medium Sand, trace Gravel	
40						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 3 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
42						
44	SS9	24/12	44-46	19/19/19/17	Compact, gray/brown medium Sand, and medium Sand and Gravel, trace Silt	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
46	SS10	24/12	46-48	14/17/21/22	Compact, gray/brown medium Sand, trace Gravel	
48	SS11	24/10	48-50	11/16/17/19	Compact gray/brown coarse Sand and Gravel Medium Sand, trace Gravel	
50	SS12	24/12	50-52	14/15/17/21	Compact Gray/Brown medium coarse Sand, some fine Sand, trace Silt	
52	SS14	24/12	52-54	16/17/18/24	Compact, brown/gray, fine to medium Sand little coarse Sand, trace Silt	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
54	SS15	24/12	54-56	20/16/18/24	Compact, gray/brown, fine to medium Sand, trace Silt	
56	SS16	24/10	56-58	14/16/19/20	Compact, gray/brown, medium to coarse Sand, trace Gravel, trace Silt	
58	SS17	24/16	58-60	11/15/18/21	Compact, brown/gray, fine to coarse Sand, trace Silt	
60						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

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640 Main Street
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SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 4 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
	SS18	24/15	60-62	8/15/22/30	Compact, gray/brown, medium to coarse Sand, trace Gravel, trace Silt	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
62	SS19	24/12	62-64	22/17/19/33	Compact, gray/brown, medium to coarse Sand, trace Gravel, trace Silt, some fine Sand (dry)	
64	SS20	24/16	64-66	18/27/19/28	Compact, gray/brown, fine to medium Sand, trace Silt	
66	SS21	24/14	66-68	20/20/18/30	Compact, gray/brown, fine to coarse Sand, trace Silt	
68	SS22	24/12	68-70	18/19/20/20	Compact, gray/brown, fine to medium Sand, some coarse Sand, trace Silt	
70	SS23	24/18	70-72	22/23/25/28	Compact, gray/brown, fine to medium Sand, trace Silt	
72	SS24	24/10	72-74	18/20/22/25	Compact, gray/brown, fine to medium Sand, little coarse Sand, trace Silt	
74	SS25	24/18	74-76	25/30/22/30	Compact, fine to coarse Sand, little Gravel, trace Silt	
76	SS26	24/12	76-78	18/26/27/27	Compact, gray/brown, medium to coarse Sand, thin 1/2" seams of fine Sand, trace Silt	
78	SS27	24/10	78-80	27/24/30/35	Same as 76' to 78'	

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 5 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
80	SS28	24/14	80-82	20/13/22/24	Compact, gray/brown, fine to medium Sand, little coarse Sand, trace Silt	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
82	SS29	24/12	82-84	21/21/26/35	Compact, gray/brown, layered medium to coarse Sand and fine Sand. Trace to little Silt. (May have pushed a cobble that resulted in poor recovery)	
84						
86					drive and wash to 84 to 94 / no samples Driller noted some cobbles in this zone	
88						
90						
92						
94	SS30	24/6	94-96	24/27/34/38	Compact, gray, fine Sand, trace to little Silt, trace Gravel	
96					Collecting wash samples at 5 foot intervals	
98					Gray/Brown Sand and Gravel	
100						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 6 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
102					Gray/Brown, fine Sand, trace Silt, little medium Sand (Sample collected by bucket in wash water from 99' to 104')	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
104						
106					Gray/Brown, fine Sand, trace to little Silt	**FINE SAND WITH TRACE TO LITTLE SILT GLACIOMARINE DELTA**
108						
110					Gray/Brown, fine Sand, Little Silt	
112						
114						
116					Gray/Brown, fine Sand, little Silt	
118						
120						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 7 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
122					Gray, fine Sand, little Silt	FINE SAND WITH TRACE TO LITTLE SILT GLACIOMARINE DELTA
124						
126					Gray, fine Sand, little Silt, trace medium Sand	
128						
130					Gray/Brown, fine Sand, trace Silt	
132						
134						
136					Gray/Brown, fine Sand, some medium Sand, trace Silt	
138						
140						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT	SOIL BORING LOG	Boring #:	PB-3
ENVIRONMENTAL CONSULTANTS, INC.	Project: MacQuinn	Project #:	11-3240.5-01
640 Main Street	Location: Lamoine	Sheet:	8 of 9
Lewiston, Maine 04240		Chkd by:	S. Marcotte

Drilling Co:	East Coast Exploration	Boring Location: See Location Map	
Personnel:	Chris & Bill	Elevation: 232.7 ft NGVD29	
Summit Staff:	S. Marcotte	Date started: 11/12/2013	Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH			
Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
140						
142						
					Gray, fine Sand, some medium Sand, trace Silt	
144						
					6" cobble at 145-145.5' bgs	
146						**FINE SAND WITH TRACE TO LITTLE SILT GLACIOMARINE DELTA**
					Gray, fine Sand, some medium Sand, some coarse Sand, trace Silt	
148						
150						
					Gray, fine Sand, trace Silt	
152						
154						
					Gray, fine Sand, trace medium Sand, trace Silt	
156						
158						
160						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-3**
Project #: 11-3240.5-01
Sheet: 9 of 9
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: S. Marcotte

Boring Location: See Location Map
Elevation: 232.7 ft NGVD29
Date started: 11/12/2013 Date Completed: 11/15/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
160						
162					Gray, fine Sand, little medium Sand, trace Silt	
164						
166					Gray, fine Sand, little Silt	**FINE SAND WITH TRACE TO LITTLE SILT GLACIOMARINE DELTA**
168						
170					Bottom of boring at 169'	
172					Set well 20' screen 149'-169' Riser to surface Install protective casing standpipe	
174						
176						
178						
180						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-4**
Project #: 11-3240.5-01
Sheet: 1 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 183.9 ft NGVD
Date started: 10/23/2013 Date Completed: 10/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
	SS1	24/18	0-2	8/15/12/6	2" organic layer. Loose, brown, medium Sand, little Gravel (dry)	MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA
2	SS2	24/18	2-4	12/14/14/12	Tan/Gray, medium Sand and Gravel	
4	SS3	24/8	4-6	10/13/16/15	Gray, medium to coarse Sand and Gravel	
6	SS4	24/2	6-8	9/14/20/18	Rock in tip, Gravel fragments in spoon	
8	SS5	24/6	8-10	19/8/14/7	Brown Sand and Gravel, some Silt	
10	SS6	24/6	10-12	23/25/27/22	Brown/Gray Sand and Gravel. Rock in tip. Little Silt	
12	SS7	24/5	12-14	19/10/8/8	Gray Gravel, some Sand	
14	SS8	24/5	14-16	14/14/20/14	Gray Sand and Gravel, little Silt	
16	SS9	24/5	16-18	13/13/15/50	Gray/Brown Sand and Gravel, little Silt	
18	SS-10	24/6	18-20	20/17/10/18	Brown/Gray Gravel and fine Sand, some Silt	
20						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-4**
Project #: 11-3240.5-01
Sheet: 2 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 183.9 ft NGVD
Date started: 10/23/2013 Date Completed: 10/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
20	SS11	24/8	20-22	20/17/20/18	Brown Sand and Gravel, some Silt, stones to 2"	
22	SS12	24/12	22-24	14/14/18/19	Brown to Gray Sand and Gravel, little Silt	
24	SS13	24/6	22-26	15/16/13/17	Gray Gravel (1/4" to 1-1/2"), medium coarse Sand, trace Silt	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
26	SS14	24/4	26-28	16/16/15/22	Brown, medium Sand, some Silt, trace Gravel	
28	SS15	24/0	28-30	50-0"	Rock/Boulder, no recovery	
30	SS16	24/12	30-32	12/10/12/13	Gray, medium to coarse Sand, trace Gravel, little Silt	
32	SS17	24/12	32-34	11/11/19/10	Top 6" gray, medium coarse Sand, trace Gravel, Bottom 6" olive Silt and Clay, trace Sand, some Gravel	
34	SS18	24/24	34-36	4/8/6/12	Olive Silty Clay	**GLACIOMARINE SEDIMENTS**
36	SS19	24/20	36-38	36/38/42/44	Olive, fine Sand, little Silt	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
38	SS20	24/20	38-40	30/37/37/44	Olive, fine Sand and Silt, trace Clay Medium to coarse gray Sand seams (2")	
40						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-4**
Project #: 11-3240.5-01
Sheet: 3 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 183.9 ft NGVD
Date started: 11/12/2013 Date Completed: 11/20/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
40	SS21	24/16	40-42	30/24/24/34	Gray, fine to coarse Sand	
42	SS22	24/10	42-44	20/26/26/27	Gray, fine to medium Sand, trace Silt	
44	SS24	24/16	44-46	24/22/24/25	Brown/Gray (salt/pepper), fine to medium Sand, trace Silt	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
46	SS25	24/12	46/48	15/20/23/24	Gray, fine to medium Sand, trace Silt, trace Gravel	
48	SS26	24/14	48-50	14/17/19/20	Gray, fine to medium Sand, trace Silt	
50						
52						
54	SS27	24/12	54-56	18/19/20/31	Gray, fine to medium Sand, trace Silt, trace Gravel	
56						
58						
60						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-4**
Project #: 11-3240.5-01
Sheet: 4 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 183.9 ft NGVD
Date started: 10/23/2013 Date Completed: 10/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
62						**FINE SAND WITH LITTLE TO SOME SILT GLACIOMARINE DELTA**
64	SS28	24/12	64-66	15/21/31/40	Gray, fine Sand, little Silt, trace coarse Sand	
66						
68						
70						
72						
74	SS29	24/14	74-76	17/14/40/45	Gray, fine Sand, little Silt, trace coarse Sand	
76						
78						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-4**
Project #: 11-3240.5-01
Sheet: 5 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 183.9 ft NGVD
Date started: 10/23/2013 Date Completed: 10/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
84	SS30	24/10	84-86	30/35/39/40	Brown, fine Sand, some Silt, trace Clay	**FINE SAND WITH LITTLE TO SOME SILT GLACIOMARINE DELTA**
94	SS31	24/0	94-96	21/28/38/38	No recovery - wash looks like very fine gray Sand	

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **PB-4**
Project #: 11-3240.5-01
Sheet: 6 of 7
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 183.9 ft NGVD
Date started: 10/23/2013 Date Completed: 10/25/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140lb
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
102						**FINE SAND WITH LITTLE TO SOME SILT GLACIOMARINE DELTA**
104						
	SS32	24/0	105-107	20/21/30/40	No recovery with new spoon Wash is very fine Brown/Gray Sand and Silt	
106						
108					Bottom of Boring at 105' bgs, last spoon at 105-107 feet bgs	
110					Set well (PB-4D) as Deeper Couplet Well Screen 85'-105' bgs, riser to surface formation to collapse around screen and riser Install protective casing standpipe	
112						
114					Set Well (PB-4S) as Shallow Couplet above marine silt and clay sediments Drive and wash casing to 33' bgs for PB-4S Well screen 23' - 33' bgs, riser to surface Install protective casing standpipe	
116						
118						
120						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **MW-4**
Project #: 11-3240.5-01
Sheet: 1 of 4
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 143.0 ft NGVD29
Date started: 11/18/2013 Date Completed: 11/18/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140 LB
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
2	SS1	24/18	4-6	8/13/11/14	6" - Loose gray, fine Sand 6" - Loose gray, coarse Sand, trace Gravel 6" - Loose Gray fine Sand, little Silt	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
6	SS2	24/	9-11	22/20/19/18	Compact, gray, fine to coarse Sand, some Gravel, trace Silt	
14	SS3	28/12	14-16	17/22/24/50	Compact, gray, fine Sand, trace medium Sand, some Silt	
20	SS4		19-21		Compact, gray/brown, fine to medium Sand, some Gravel, little coarse Sand, trace Silt Started wash samples at 20 feet bgs	

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **MW-4**
Project #: 11-3240.5-01
Sheet: 2 of 4
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 143.0 ft NGVD29
Date started: 11/18/2013 Date Completed: 11/18/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140 LB
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
20					Started wash samples with description at 5 foot intervals	**MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA**
22					Fine to coarse Sand and Gravel	
24						
26					Same as 21' to 26'	
28						
30						
32					Gray Sand and Gravel	
34						
36					Gray, fine to coarse Sand, some Gravel, trace Silt	
38						
40						

Granular Soils		Cohesive Soils	
Blows/ft.	Density	Blows/ft.	Consistency
0-4	V. Loose	<2	V. soft
4-10	Loose	2-4	Soft
10-30	Compact	4-8	Firm
30-50	Dense	8-15	Stiff
>50	V. Dense	15-30	V. Stiff
		>30	Hard

% Composition	
<5%	trace
5-15	little
15-25	some
>25	and

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **MW-4**
Project #: 11-3240.5-01
Sheet: 3 of 4
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 143.0 ft NGVD29
Date started: 11/18/2013 Date Completed: 11/18/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140 LB
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
40						
42						
					Gray, Sand and Gravel	
44						
						MEDIUM TO COARSE SAND AND GRAVEL GLACIOMARINE DELTA
46						
					Gray, fine to coarse Sand, little Gravel, little Silt	
48						
50						
					Gray, fine to medium Sand, little coarse Sand, trace Silt	
52						**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
54						
56						
					Gray, fine Sand, trace to little Silt	
58						
60						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **MW-4**
Project #: 11-3240.5-01
Sheet: 4 of 4
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 143.0 ft NGVD29
Date started: 11/18/2013 Date Completed: 11/18/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140 LB
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
62					Gray, fine Sand, little Gravel, little Silt	**MEDIUM TO FINE SAND GLACIOMARINE DELTA**
64					Bottom of boring at 64 bgs Water level through rod at 54' bgs	
66					Set well 10' screen (54- 64' bgs), riser to surface Install protective casing standpipe	
68						
70						
72						
74						
76						
78						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **Blueberry Field Access Road**
Project #: 11-3240.5-01
Sheet: 1 of 2
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris Palmer
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 144.2 ft NGVD29
Date started: 10/23/2013 Date Completed: 10/23/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140 LB
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
					Cuttings - fine Sand, little Silt top 5'	
2						**MARINE REGRESSIVE SAND**
4						
	SS1	24/24	5-7	16/20/21/22	Very stiff, olive Clay, some Silt (moist), some brown mottling, few thin 1/8" Sand seams	
6					(minor black organics)	**MARINE SEDIMENTS**
8						
10	SS2	24/24	10-12	6/7/8/7	Same as 5' to 7' with a few pebbles	
12						
14						
	SS3	24/16	15-17	4/24/42/12	6" - Brown Silty Clay	
16					10" - fine Sand, trace silt, rock present in Sand,	
18						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **Blueberry Field Access Road**
Project #: 11-3240.5-01
Sheet: 2 of 2
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris & Bill
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 144.2 ft NGVD29
Date started: 10/23/2013 Date Completed: 10/23/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140 LB
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
20	SS4	24/20	20-22		12" - Brown, fine Sand grades to salt/pepper gray medium Sand with 2" Clay seam, rock fragments	**MARINE SEDIMENTS**
22					Bottom of last spoon at 22 feet bgs	
24					Boring for material information only - well not set	
26						
28						
30						
32						
34						
36						
38						
40						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS, INC.
640 Main Street
Lewiston, Maine 04240

SOIL BORING LOG

Project: MacQuinn
Location: Lamoine

Boring #: **Mill Road**
Project #: 11-3240.5-01
Sheet: 1 of 1
Chkd by: S. Marcotte

Drilling Co: East Coast Exploration
Personnel: Chris Palmer
Summit Staff: M. Deyling

Boring Location: See Location Map
Elevation: 126.0 FT NGVD29
Date started: 10/23/2013 Date Completed: 10/23/2013

DRILLING METHOD		SAMPLER	
Vehicle:	CME	Type:	SS
Model:	ATV	Hammer:	140 LB
Method:	D&W	Fall:	30"

ESTIMATED GROUND WATER DEPTH

Date	Depth	Reference	Groundwater Elevation
		Ex. Grade	
		Top of PVC	

Depth (ft.)	No.	Pen/Rec (in)	Depth (ft)	Blows/6 in.	SAMPLE DESCRIPTION	GEOLOGICAL STRATUM
					0 to 4 ft bgs: Brown Silty Sand cuttings	**MARINE REGRESSIVE SAND**
4					4 to 5 ft bgs: Gray Silt cuttings	
	SS1	24/24	5-7	4/3/3/4	Soft, gray Clay (wet)	**GLACIOMARINE SEDIMENTS**
8	SS2	24/24	7-9	5/6/5/7	Soft, gray Clay (wet)	
12					Boring for material information only - well not set	
16						
18						

Granular Soils		Cohesive Soils		% Composition	
Blows/ft.	Density	Blows/ft.	Consistency		
0-4	V. Loose	<2	V. soft		
4-10	Loose	2-4	Soft	<5%	trace
10-30	Compact	4-8	Firm	5-15	little
30-50	Dense	8-15	Stiff	15-25	some
>50	V. Dense	15-30	V. Stiff	>25	and
		>30	Hard		

NOTES:

MONITORING WELL COMPLETION LOGS

SUMMIT

ENVIRONMENTAL CONSULTANTS
640 Main Street
lewiston, Maine 04240

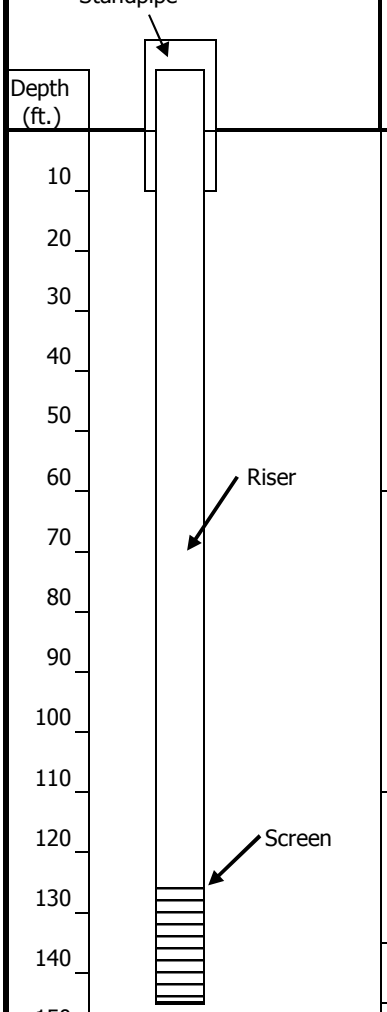
WELL COMPLETION LOG

Project:	Harold MacQuinn, Inc.	Well #:	PB-1-2013
Location:	Lamoine, Maine	Project #:	11-3240.5
		Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co: East Coast Explorations
Foreman: Chris Palmer
Summit Staff: M. Deyling

Well Location: See Location Map

Date started: 11/25/2013 Date Completed: 11/25/13



Stratum from soil boring log:
- Medium to coarse SAND and Gravel
- Medium to fine SAND, trace Gravel, Silt, and coarse Sand
- Fine SAND with little to some Silt
- BEDROCK
- Bottom of boring at 146.5'bgs

REFERENCE ELEVATIONS
Surveyor: Herrick & Salsbury, Inc.

Reference (MSL or TBM):	NVGD29
Top of Protective Casing:	
Top of inner casing:	168.73
Ground Surface:	166.23

GW ELEVATIONS

Date	Elevation

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	Standpipe
Diameter (in.):	4"
Length (in.):	5'
Concrete Seal (gal):	not app.

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2.0	2.0
Length (ft):	126.5	20.0
Interval below ground surface (ft):	0-126.5	126.5-146.5
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	sand	bentonite
Size:	native cave	
Quantity (lbs.):		
Interval below ground surface (ft):		

GROUT

Type (filter sand, bentonite, etc.):	not appl.
Quantity (gal. or lbs.):	
Interval below ground surface (ft.):	

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	
Depth of well from measuring point (ft):	
Total feet of water:	
Volume of water (gal):	
Volume of water evacuated:	
Method of development:	wells not developed

Bedrock at 131.75' bgs

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS
640 Main Street
lewiston, Maine 04240

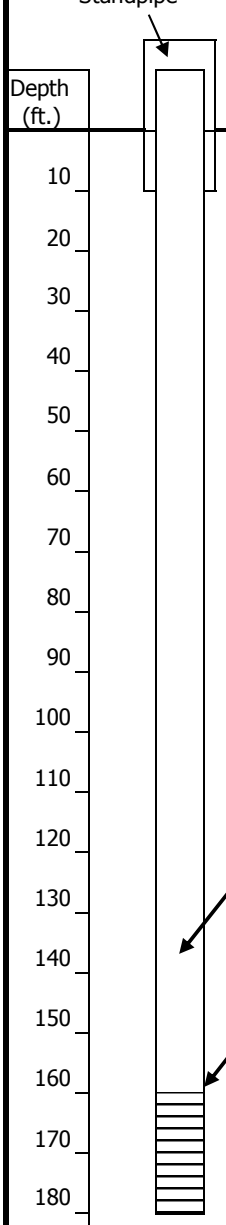
WELL COMPLETION LOG

Project:	Harold MacQuinn, Inc.	Well #:	PB-2-2013
Location:	Lamoine, Maine	Project #:	11-3240.5
		Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co: East Coast Explorations
Foreman: Chris Palmer
Summit Staff: M. Deyling

Well Location: See Location Map

Date started: 11/19/2013 Date Completed: 11/19/13



Stratum from soil boring log:
- Medium to coarse SAND and Gravel
- Medium to fine SAND, trace to little Silt
- Bottom of boring at 179.0'bgs

REFERENCE ELEVATIONS
Surveyor: Herrick & Salsbury, Inc.
Reference (MSL or TBM): NVGD29
Top of Protective Casing:
Top of inner casing: 233.53
Ground Surface: 231.08

GW ELEVATIONS

Date	Elevation

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	Standpipe
Diameter (in.):	4"
Length (in.):	5'
Concrete Seal (gal):	not app.

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2.0	2.0
Length (ft):	159.0	20.0
Interval below ground surface (ft):	0-159	159-179
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	sand	bentonite
Size:	native cave	
Quantity (lbs.):		
Interval below ground surface (ft):		

GROUT

Type (filter sand, bentonite, etc.):	not appl.
Quantity (gal. or lbs.):	
Interval below ground surface (ft.):	

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	
Depth of well from measuring point (ft):	
Total feet of water:	
Volume of water (gal):	
Volume of water evacuated:	
Method of development:	wells not developed

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS
640 Main Street
lewiston, Maine 04240

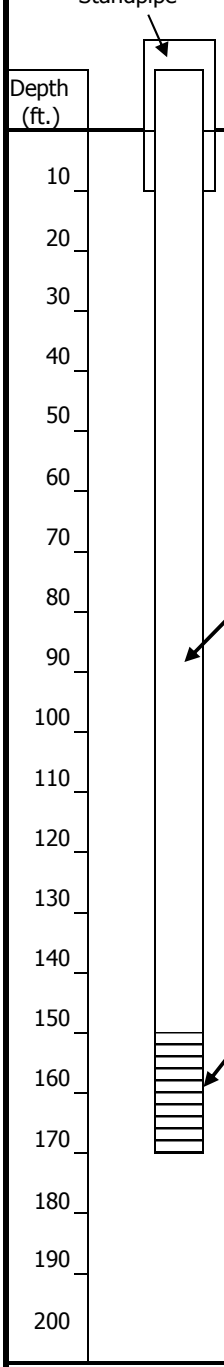
WELL COMPLETION LOG

Project:	Harold MacQuinn, Inc.	Well #:	PB-3-2013
Location:	Lamoine, Maine	Project #:	11-3240.5
		Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co: East Coast Explorations
Foreman: Chris Palmer
Summit Staff: M. Deyling

Well Location: See Location Map

Date started: 11/15/13 Date Completed: 11/15/13



Stratum from soil boring log:
- Medium to coarse SAND and Gravel
- Fine to Medium SAND, trace Silt and Gravel
- Fine Sand Trace to Little Silt
- Bottom of boring at 169.0'bgs

REFERENCE ELEVATIONS

Surveyor:	Herrick & Salsbury, Inc.
Reference (MSL or TBM):	NVGD29
Top of Protective Casing:	
Top of inner casing:	235.07
Ground Surface:	232.72

GW ELEVATIONS

Date	Elevation

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	Standpipe
Diameter (in.):	4"
Length (in.):	5'
Concrete Seal (gal):	not app.

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2.0	2.0
Length (ft):	149.0	20.0
Interval below ground surface (ft):	0-149	149-169
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	sand	bentonite
Size:	native cave	
Quantity (lbs.):		
Interval below ground surface (ft):		

GROUT

Type (filter sand, bentonite, etc.):	not appl.
Quantity (gal. or lbs.):	
Interval below ground surface (ft.):	

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	
Depth of well from measuring point (ft):	
Total feet of water:	
Volume of water (gal):	
Volume of water evacuated:	
Method of development:	wells not developed

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS
640 Main Street
lewiston, Maine 04240

WELL COMPLETION LOG

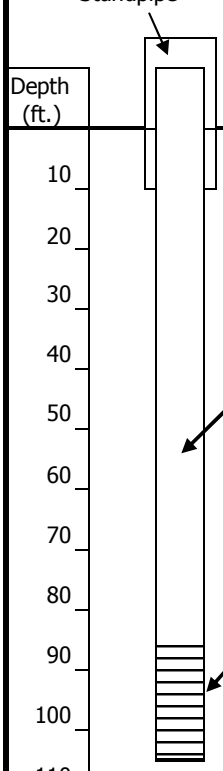
Project: Harold MacQuinn, Inc.
Location: Lamoine, Maine

Well #: PB-4D-2013
Project #: 11-3240.5
Sheet: 1 of 1
Chkd by: SBM

Drilling Co: East Coast Explorations
Foreman: Chris Palmer
Summit Staff: M. Deyling

Well Location: See Location Map

Date started: 10/25/13 Date Completed: 10/25/13



Depth (ft.)

Stratum from soil boring log

10 — Medium to coarse SAND and Gravel
20
30 — Silt/Clay
40 — Fine to Med. SAND, trace gravel, Silt and coarse SAND
50
60
70 — Fine SAND Little to Some Silt
80
90
100
110 — Bottom of boring at 105.0'bgs
120
130
140
150
160
170
180
190
200

REFERENCE ELEVATIONS
Surveyor: Herrick & Salsbury, Inc.
Reference (MSL or TBM): NVGD29
Top of Protective Casing:
Top of inner casing: 186.78
Ground Surface: 183.99

GW ELEVATIONS

Date	Elevation

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	Standpipe
Diameter (in.):	4"
Length (in.):	5'
Concrete Seal (gal):	not app.

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2.0	2.0
Length (ft):	85.0	20.0
Interval below ground surface (ft):	0-85	85-105
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	sand	bentonite
Size:	native cave	
Quantity (lbs.):		
Interval below ground surface (ft):		

GROUT

Type (filter sand, bentonite, etc.):	not appl.
Quantity (gal. or lbs.):	
Interval below ground surface (ft.):	

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	
Depth of well from measuring point (ft):	
Total feet of water:	
Volume of water (gal):	
Volume of water evacuated:	
Method of development:	wells not developed

1. Glaciomarine silt and clay encountered at 33-35'bgs.

NOTES:

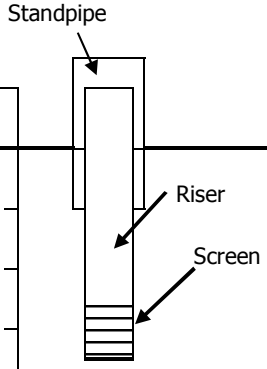
SUMMIT

ENVIRONMENTAL CONSULTANTS
640 Main Street
lewiston, Maine 04240

WELL COMPLETION LOG

Project:	Harold MacQuinn, Inc.	Well #:	PB-4S-2013
Location:	Lamoine, Maine	Project #:	11-3240.5
		Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co:	East Coast Explorations	Well Location:	See Location Map
Foreman:	Chris Palmer		
Summit Staff:	M. Deyling	Date started:	10/25/13 Date Completed: 10/25/13



Depth (ft.)	Stratum from soil boring log
10	Medium to coarse SAND and Gravel
20	
30	
	Silt/Clay
40	Bottom of boring at 33.0'bgs
50	
60	
70	
80	
90	
100	
110	
120	
130	
140	
150	
160	
170	
180	
190	
200	

REFERENCE ELEVATIONS
Surveyor: Herrick & Salsbury, Inc.
Reference (MSL or TBM): NVGD29
Top of Protective Casing:
Top of inner casing: 186.91
Ground Surface: 183.9

GW ELEVATIONS

Date	Elevation

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	Standpipe
Diameter (in.):	4"
Length (in.):	5'
Concrete Seal (gal):	not app.

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2.0	2.0
Length (ft):	23.0	10.0
Interval below ground surface (ft):	0-23	23-33
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	sand	bentonite
Size:	native cave	
Quantity (lbs.):		
Interval below ground surface (ft):		

GROUT

Type (filter sand, bentonite, etc.):	not appl.
Quantity (gal. or lbs.):	
Interval below ground surface (ft.):	

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	
Depth of well from measuring point (ft):	
Total feet of water:	
Volume of water (gal):	
Volume of water evacuated:	
Method of development:	wells not developed

1. Glaciomarine silt and clay encountered at 33-35'bgs.

NOTES:

SUMMIT

ENVIRONMENTAL CONSULTANTS
640 Main Street
lewiston, Maine 04240

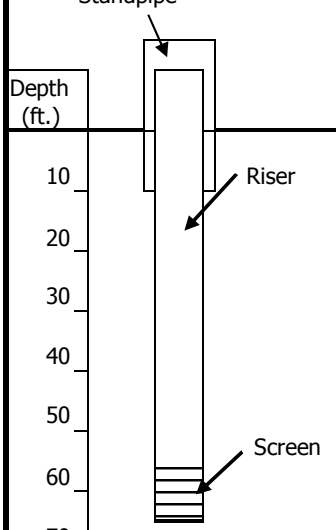
WELL COMPLETION LOG

Project:	Harold MacQuinn, Inc.	Well #:	MW-4-2013
Location:	Lamoine, Maine	Project #:	11-3240.5
		Sheet:	1 of 1
		Chkd by:	SBM

Drilling Co: East Coast Explorations
Foreman: Chris Palmer
Summit Staff: M. Deyling

Well Location: See Location Map

Date started: 11/18/13 Date Completed: 11/18/13



Stratum from soil boring log:
- Medium to Coarse SAND and Gravel
- Med. to Fine SAND
- Bottom of boring at 64.0'bgs

REFERENCE ELEVATIONS
Surveyor: Herrick & Salsbury, Inc.
Reference (MSL or TBM): NVGD29
Top of Protective Casing:
Top of inner casing: 145.39
Ground Surface: 143.03

GW ELEVATIONS

Date	Elevation

WELL CONSTRUCTION DETAILS

PROTECTIVE CASING

Type (Standpipe or roadbox):	Standpipe
Diameter (in.):	4"
Length (in.):	5'
Concrete Seal (gal):	not app.

WELL CASING AND SCREEN

	Riser	Screen
Material:	PVC	PVC
Schedule:	40	40
Diameter (in.):	2.0	2.0
Length (ft):	54.0	10.0
Interval below ground surface (ft):	0-54	54-64
Slot size (in.):		0.01

FILTER AND SEAL MATERIALS

	Filter	Seal
Type:	sand	bentonite
Size:	native cave	
Quantity (lbs.):		
Interval below ground surface (ft):		

GROUT

Type (filter sand, bentonite, etc.):	not appl.
Quantity (gal. or lbs.):	
Interval below ground surface (ft.):	

WELL DEVELOPMENT DETAILS

Water level from measuring point (ft):	
Depth of well from measuring point (ft):	
Total feet of water:	
Volume of water (gal):	
Volume of water evacuated:	
Method of development:	wells not developed

NOTES:

ATTACHMENT 3

PHOTOGRAPH LOG

PHOTOGRAPHIC LOG

Client Name: Harold MacQuinn, Inc.

Project No. 11-3240.5

Photo No. 1

Date: October 23, 2013

Site Location: Lamoine, Maine

Description:

Blue/gray clay found in Mill Road Boring

Photo No. 2

Date: October 23, 2013

Site Location: Lamoine, Maine

Description:

Olive colored clay found in Blueberry Field Access Road boring and PB-4.

PHOTOGRAPHIC LOG

Client Name: Harold MacQuinn, Inc.

Project No. 11-3240.5

Photo No. 3

Date: October 23, 2013

Site Location: Lamoine, Maine

Description:

Transition to medium/coarse sand typical of Sand coloration at Site. Described as gray or "salt and pepper" in logs

Photo No. 4

Date: October 23, 2013

Site Location: Lamoine, Maine

Description:

Completed wells at location PB-4.

PHOTOGRAPHIC LOG

Client Name: Harold MacQuinn, Inc.

Project No. 11-3240.5

Photo No. 5

Date: October 23, 2013

Site Location: Lamoine, Maine

Description:

Water balance location A. Culvert is 42" diameter

Photo No. 6

Date: October 23, 2013

Site Location: Lamoine, Maine

Description:

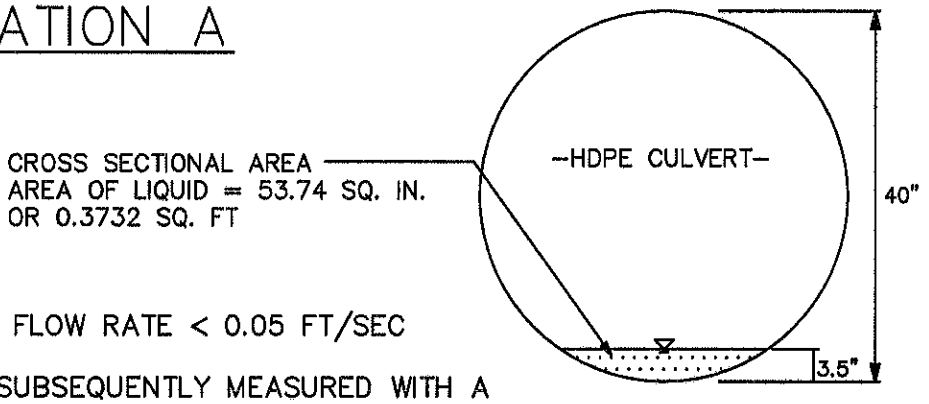
Water balance weir constructed at location C on tributary stream.

ATTACHMENT 4

STREAM FLOW WORKSHEET

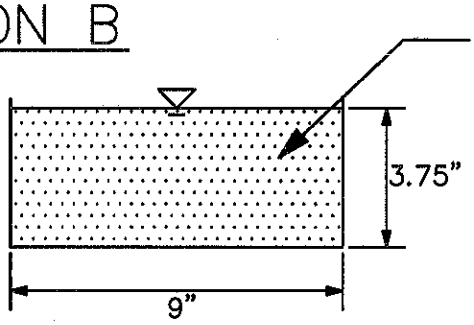
SURFACE WATER FLOW WORKSHEET

LOCATION A



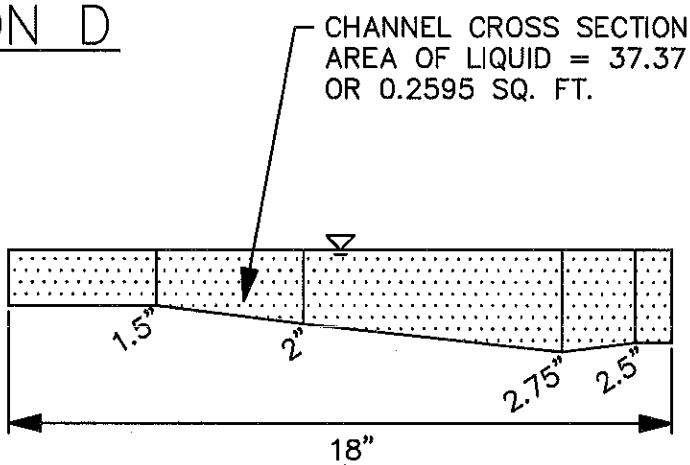
- METER FLOW RATE < 0.05 FT/SEC
- FLOW SUBSEQUENTLY MEASURED WITH A 5-GALLON BUCKET AND STOPWATCH AT 1.5 GALLONS PER MINUTE.

LOCATION B



- METER FLOW RATE = 0.45 TO 0.50 FT/SEC
- FLOW RANGE = 0.105 TO 0.117 CF/SEC (47 TO 52 GALLONS PER MINUTE)

LOCATION D



- METER FLOW RATE = 0.22 TO 0.26 FT/SEC
- FLOW RANGE = 0.057 TO 0.067 CF/SEC (25 TO 30 GALLONS PER MINUTE)

NOTES:

1. FLOW MEASUREMENTS TAKEN WITH A FLO-MATE 2000 DIGITAL FLOW METER
2. LOCATIONS SHOWN ON SITE PLAN (FIGURE 1) IN REPORT