LIMITED SITE DATA DOCUMENT

SARANAC LAKE GAS COMPANY, INC.

VILLAGE OF SARANAC LAKE, ESSEX COUNTY, NEW YORK

SITE NO. 516008

These documents that follow are **NOT** part of the Contract Documents for the remedial work at the Saranac Lake Gas Company, Inc. Site, OU01. The Department neither represents that the Site conditions will be the same as in the attached document nor considers the attached documents as being comprehensive and an actual description of the site conditions. The Contractor shall be responsible for performing the remediation work based on the existing conditions at the Site.

TABLE OF CONTENTS

Investigation Summary

Figures (from Pre-Design Investigation Report)

- Site Location Map
- Site Features
- Interpreted Overburden Groundwater Flow
- Estimated Extent of MGP Impacted Material
- Location of Sewer Force Main

Tables (from Pre-Design Investigation Report)

- Monitoring Well and Piezometer Construction Details
- Groundwater Elevation Measurements
- Pre-Design Investigation Report General Table Notes
- OU-01 Pre-Design Investigation Summary of Findings
- Railroad Borings Summary of Findings
- Concentrations of BTEXs and PAHx in Soils
- Railroad Boring Soil Sample Detections
- Total Cyanide in Soils
- ISS Soil Samples and Soil Waste Disposal Pre-Characterization Results
- Summary of BTEX and PAHs Detected in Groundwater
- Groundwater Pretreatment (from Test Pit) and Hydrant Sampling Results
- GPS Positions of Sewer Force Main

Logs

- Location of Monitoring Well and Piezometers to be Abandoned
- Associated Monitoring Well and Piezometers Logs

Appendices

- Appendix A – Select Photographs
- Appendix B – Site Survey
- Appendix C – Records of Decision
- Appendix D – Groundwater Modeling
- Appendix E – ISS Preliminary Bench Scale Mix Study Report

INVESTIGATION SUMMARY

The following is a summary of reports describing historical investigations conducted at the Saranac Lake Gas Company, Inc. Site between 2007 and 2017. These are provided in chronological order.

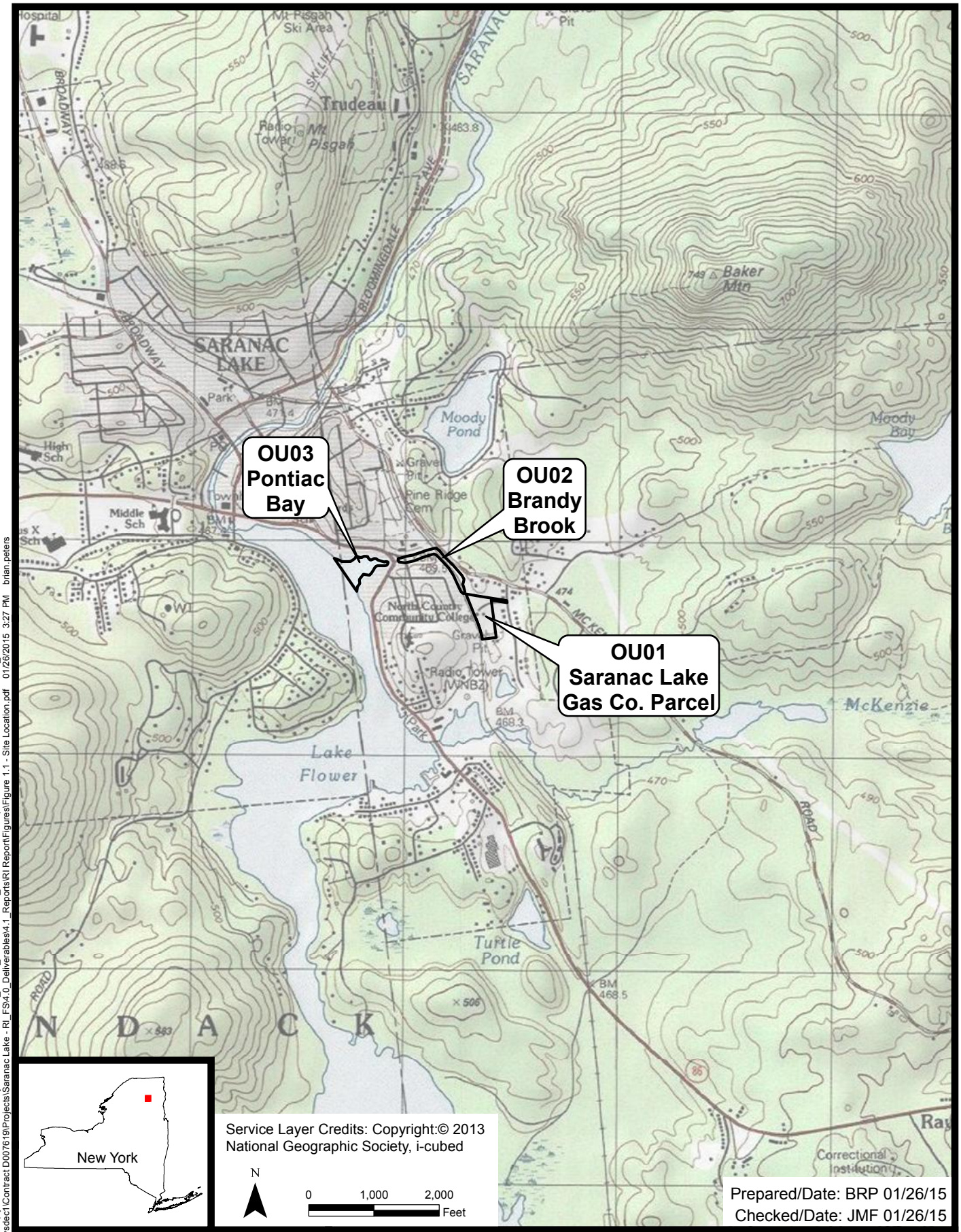
- MACTEC Engineering & Consulting, P.C. (MACTEC), 2007. Final Site Characterization Report, Former Saranac Lake Gas Company Site. Prepared for New York State Department of Environmental Conservation, Ray Brook, New York. October 2007.
- MACTEC, 2013. Fish and Wildlife Impact Analysis Report Saranac Lake Gas Company Site, Site No. 516008. September 2013.
- MACTEC, 2015. Remedial Investigation Report – Saranac Lake Gas Company Site #516008. Prepared for New York State Department of Environmental Conservation, Albany, New York. January 2015.
- MACTEC, 2015. Final Focused Feasibility Study Report, Operable Unit No. 03 Saranac Lake Gas Company Site, Site No. 516008. January 2015.
- MACTEC, 2015. Final Focused Feasibility Study Report, Operable Unit No. 02 Saranac Lake Gas Company Site, Site No. 516008. August 2015.
- MACTEC, 2015. Final Focused Feasibility Study Report, Operable Unit No. 01 Saranac Lake Gas Company Site, Site No. 516008. December 2015.
- MACTEC, 2020. Pre-Design Investigation Field Activities Report, Operable Units OU01, Saranac Lake Gas Company Site, Site No. 516008. April 2020.

This information is being offered for consideration when planning the OU01 remedial work. Electronic copies of these reports can be provided upon request.

FIGURES

SITE MAPS/SITE FEATURES

The enclosed figures are taken from the Pre-Design Investigation Report. In general, the figures depict on- and off-Site area conditions observed during the 2019 investigations and to some extent summarize additional data collected between 2007 and 2019. The intent of each figure is to illustrate site conditions as they were known to have existed at the time the figure was generated. This information is being offered for consideration when planning the remedial work.



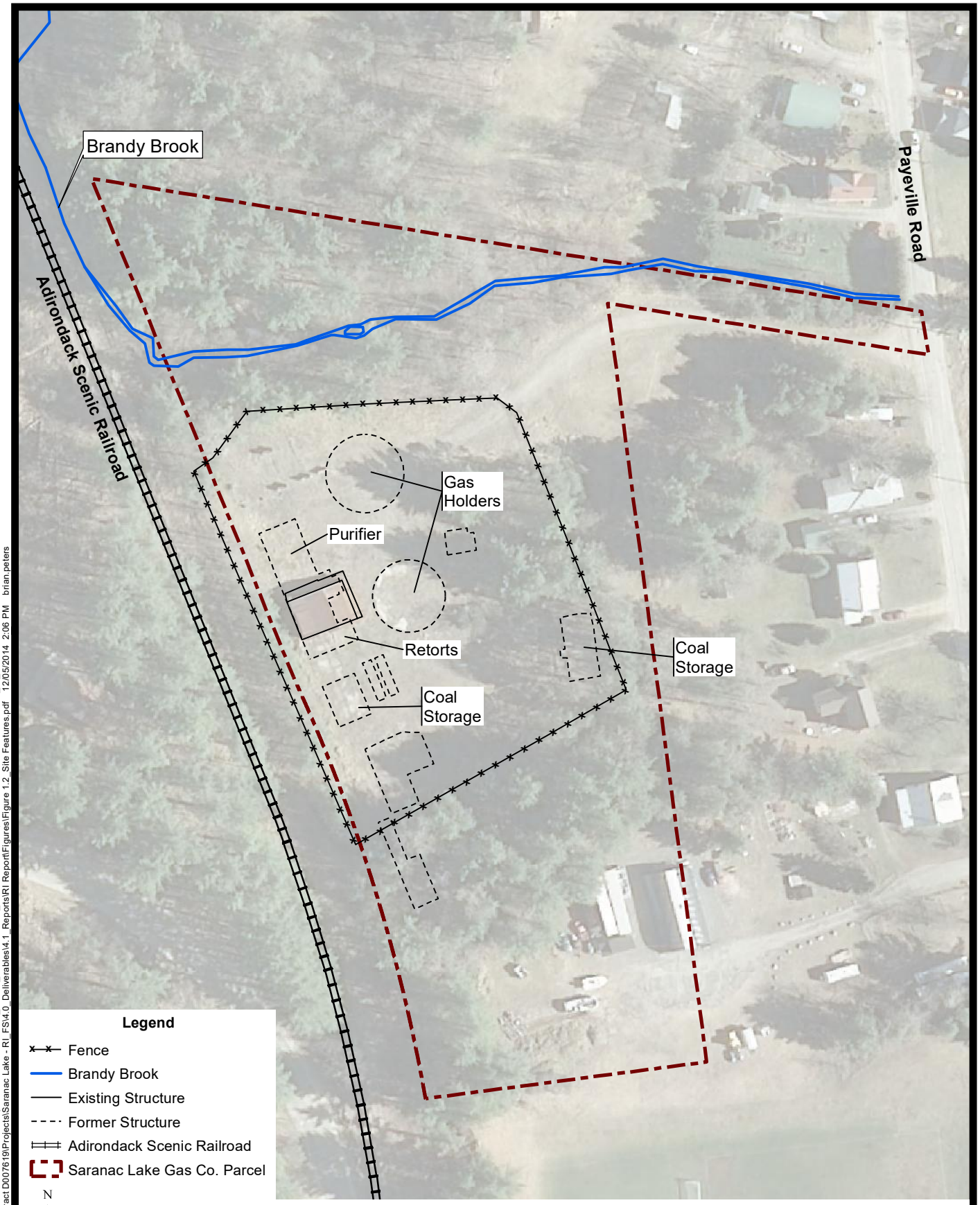
NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Site Location Map

Project 3612132271 Figure 1.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Phase II RI\SiteLocation_OU123.mxd
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.1_Reports\RI Report\Figures\Figure 1.1 - Site Location.pdf 01/26/2015 3:27 PM brian.peters



Essex County color digital orthoimagery (2013) obtained from New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 12/05/14
Checked/Date: BAS 12/05/14

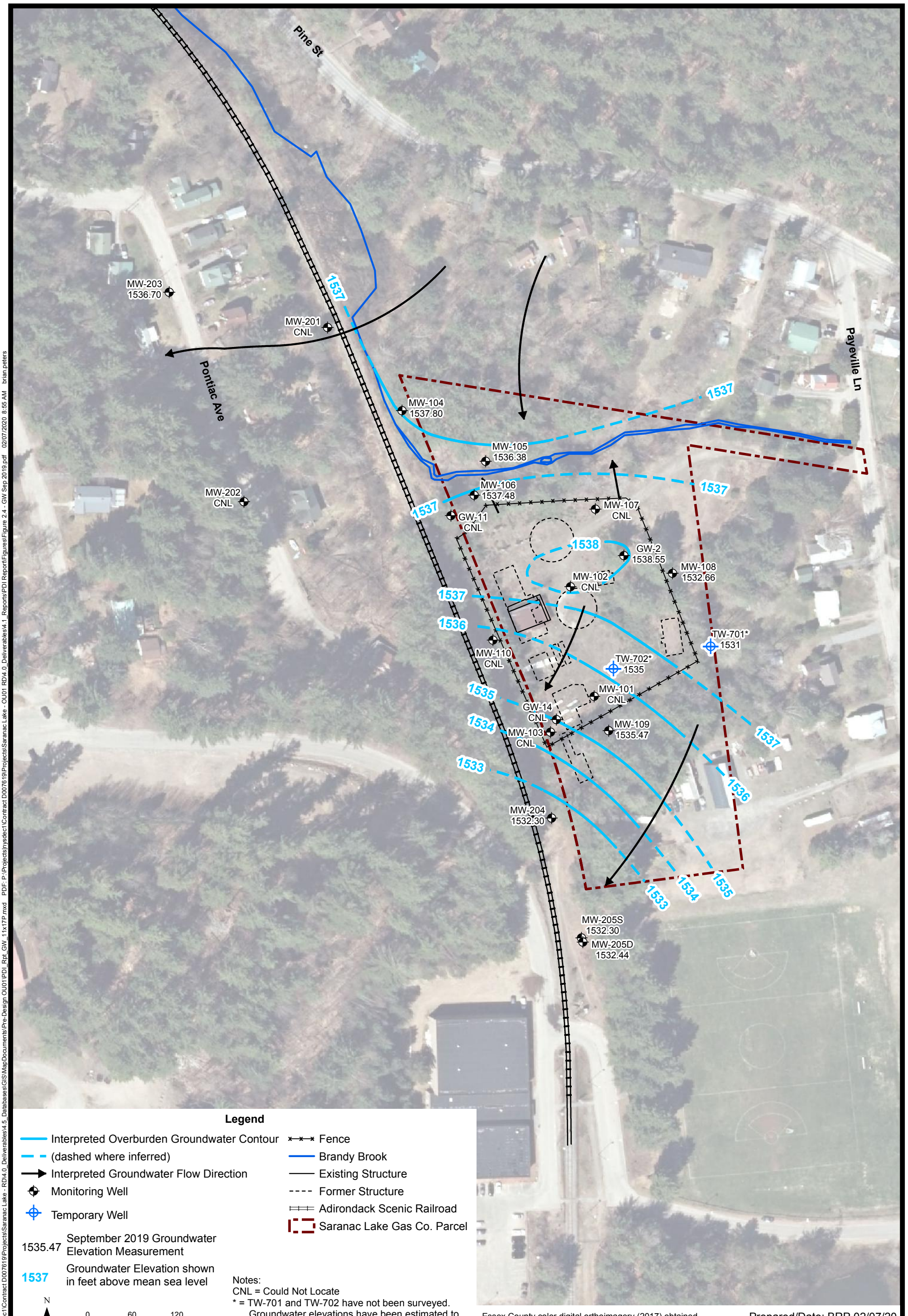
NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Site Features

Project 3611191237 Figure 1.2

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Phase II RI\Phase II_RI_8.5x11P.mxd
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RI_FS\4.0_Deliverables\4.1_Reports\RI Report\Figures\Figure 1.2_Site Features.pdf 12/05/2014 2:06 PM brian.peters



Legend

- Interpreted Overburden Groundwater Contour
- (dashed where inferred)
- Interpreted Groundwater Flow Direction
- Monitoring Well
- Temporary Well
- 1535.47 September 2019 Groundwater Elevation Measurement
- 1537 Groundwater Elevation shown in feet above mean sea level
- Fence
- Brandy Brook
- Existing Structure
- Former Structure
- Adirondack Scenic Railroad
- Saranac Lake Gas Co. Parcel

N

0 60 120 Feet

Notes:
CNL = Could Not Locate
* = TW-701 and TW-702 have not been surveyed. Groundwater elevations have been estimated to the nearest foot using site topographic map.

Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

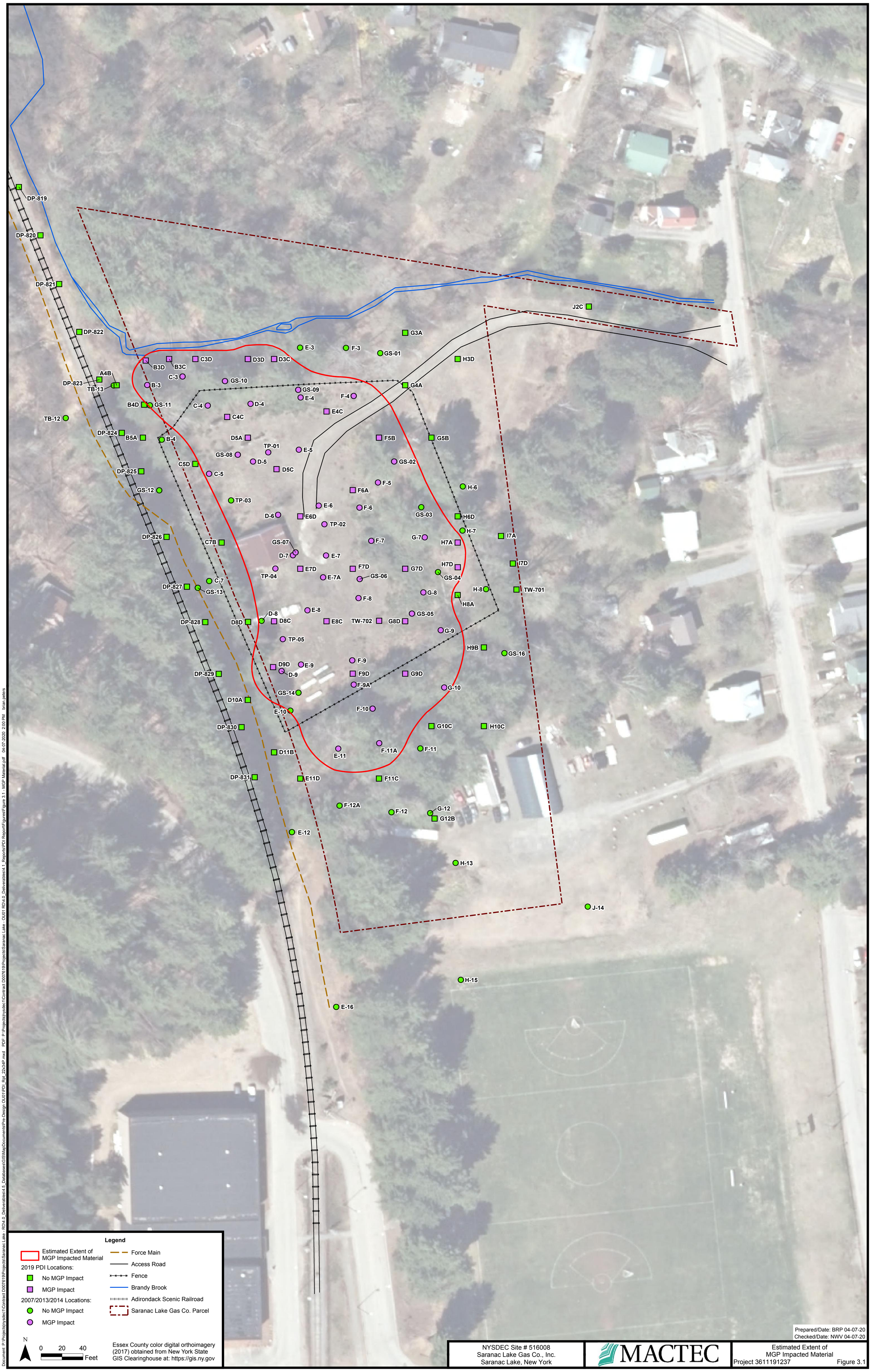
Prepared/Date: BRP 02/07/20
Checked/Date: NWV 02/07/20

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Interpreted Overburden Groundwater Flow
Project 3611191237
Figure 2.7

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PDI_Rpt_GW_11x17P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.1_Reports\PDI Report\Figures\Figure 2.4 - GW Sep 2019.pdf 02/07/2020 8:55 AM brian.peters



Legend

- Estimated Extent of MGP Impacted Material
- 2019 PDI Locations:
  - No MGP Impact
  - MGP Impact
- 2007/2013/2014 Locations:
  - No MGP Impact
  - MGP Impact
- Force Main
- Access Road
- Fence
- Brandy Brook
- Adirondack Scenic Railroad
- Saranac Lake Gas Co. Parcel

N

0 20 40 Feet

Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

Prepared/Date: BRP 04-07-20
Checked/Date: NWV 04-07-20

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

Estimated Extent of
MGP Impacted Material
Project 3611191237 Figure 3.1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PDI_Rpt_22x34P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.1_Reports\PDI Report\Figures\Figure 3.1 - MGP Material.pdf 04-07-2020 2:00 PM brian.peters

CGE LEGEND

suspected force main location

38 GPS recorded position and Position ID

Clean Globe Environmental LLC (CGE)	Long Island 34 Cain Dr. Brentwood, NY 11717	Rockland County PO BOX 1895 New City, NY 10956
	Phone: 888-454-5923, Ext 700	

Client: Aztech Environmental Technologies, Inc.

Date of Investigation: October 29, 2019

Results mapped by: Kelly A. Weyer

Figure 1. GPS mapped location of a suspected force main south of River Street / Brandy Brook Saranac Lake, New York

Coordinate system: New York East State Plane. Datum: NAD 83. Units: US Survey Feet. Image Source: https://gis.ny.gov.
GPS software indicates horizontal accuracy of ~0.5' or less in open areas and up to ~2' feet accuracy closer to the tree lines.

*refer to Table 1 (GPS positions of suspected force main location) for position data

TABLES

The enclosed tables are taken from the Pre-Design Investigation Report, and do not include all historical site data. Additional site data is available in site investigation reports listed above. In general, the tables depict on- and off-Site area conditions observed during the 2019 investigations. The intent of the tables is to depict contaminant concentrations for soil and groundwater.

Contaminant concentrations presented on the tables are those reported at the time the table was generated. This information is being offered for consideration when planning the remedial work.

Table 2.3: Monitoring Well and Piezometer Construction Details

Location ID	Northing	Easting	Casing Elevation (ft amsl)	Riser Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	TOC (ft ags)	TOC - TOR (ft)	Bottom of Well (ft BTOR)	Screening Interval (ft bgs)	OU Location	Well Inventory Status
MW-101	1999449.36	592312.95	1543.18	1542.93	1543.2	0	0.25	13.0	3 - 13	OU-1	CNL - Presumed Destroyed During OU-2 Site Activities
MW-102	1999596.97	592281.02	1543.51	1543.22	1543.5	0	0.29	14.9	4.9 - 14.9	OU-1	CNL - Presumed Destroyed During OU-2 Site Activities
MW-103	1999401.39	592254.05	1542.45	1542.07	1542.4	0	0.38	19.7	9.7 - 19.7	OU-1	CNL - Presumed Destroyed During OU-2 Site Activities
MW-104	1999833.87	592054.19	1545.27	1544.85	1542.3	3.0	0.42	19.4	6.4 - 16.4	OU-1	Located - good condition
MW-105	1999766.01	592166.86	1545.98	1545.83	1543.0	3.0	0.15	18.3	5.3 - 15.3	OU-1	Located - good condition
MW-106	1999720.04	592151.21	1543.23	1543.17	1540.4	2.8	0.06	16.9	4.1 - 14.1	OU-1	Located - Casing had heaved during OU2 Remediation, decommissioned
MW-107	1999701.42	592314.39	1542.21	1541.91	1542.2	0	0.30	14.6	4.6 - 14.6	OU-1	CNL - Presumed Destroyed During OU-2 Site Activities
MW-108	1999615.19	592418.34	1546.75	1546.69	1543.6	3.1	0.06	22.1	9.0 - 19.0	OU-1	Located - good condition
MW-109	1999403.28	592332.38	1546.10	1545.85	1543.0	3.1	0.25	18.8	5.7 - 15.7	OU-1	Located - good condition, recommend decommissioing for ISS activities
MW-110	1999524.97	592176.70	1543.33	1543.08	1543.3	0	0.25	19.6	9.6 - 19.6	OU-1	CNL
MW-201	1999945.73	591954.15	1543.81	1543.58	1540.6	3.2	0.23	18.6	5.4 - 15.4	OU-1	CNL - Presumed Destroyed During OU-2 Remediation
MW-202	1999711.88	591841.61	1554.19	1553.97	1554.2	0	0.22	22.4	12.4 - 22.4	OU-1	CNL
MW-203	1999993.61	591740.99	1548.05	1547.83	1548.1	0	0.22	17.3	7.3 - 17.3	OU-1	Located - good condition
MW-204	1999285.76	592255.49	1546.53	1546.29	1543.5	3.0	0.24	28.3	10.3 - 25.3	OU-1	Located - good condition
MW-205S	1999119.02	592297.69	1545.44	1545.24	1542.5	2.9	0.20	19.6	9.6 - 19.6	OU-1	Located - good condition
MW-205D	1999124.30	592295.88	1545.52	1545.37	1542.4	3.1	0.15	33.5	20.4 - 30.4	OU-1	Located - good condition
GW-02	1999638.97	592352.87	1543.65	1543.53	1543.7	0	0.12	10.5	1.5 - 10.5	OU-1	Located - good condition, recommend decommissioing for ISS activities
TW-701	1999516.86	592469.52	NA	1544	1544	NA	NA	20.0	10 - 20	OU-1	Installed for OU-1 PDI, decomissioned
TW-702	1999487.00	592338.61	NA	1545	1543	NA	NA	18.0	8 - 18	OU-1	Installed for OU-1 PDI, recommend decommissioing for ISS activities
PZ-301	1999930	591915	NA	NA	1540	NA	NA	12.0	2.0 - 12.0	OU-2	Located - good condition, decommissioned
PZ-302	1999848	592090	NA	1553.9	1550	3.9	NA	19.9	3.0 - 16.0	OU-2	Located - good condition, decommissioned
PZ-303	2000117	592005	NA	1540.9	1539	1.9	NA	9.9	3.0 - 8.0	OU-2	Located - good condition, decommissioned
PZ-304	2000133	592036	NA	1546.9	1544	2.9	NA	14.9	1.0 - 11.0	OU-2	Located - good condition, decommissioned
PZ-311	2000325	591770	NA	NA	1542	NA	NA	12.0	2.0 - 12.0	OU-2	CNL - Presumed Destroyed During OU-2 Remediation
PZ-317	2000475	591409	NA	NA	1536	NA	NA	8.0	3.0 - 8.0	OU-2	CNL - Presumed Destroyed During OU-2 Remediation
PZ-318	2000500	591399	NA	NA	1535	NA	NA	8.0	3.0 - 8.0	OU-2	CNL - Presumed Destroyed During OU-2 Remediation

Table 2.3: Monitoring Well and Piezometer Construction Details

Location ID	Northing	Easting	Casing Elevation (ft amsl)	Riser Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	TOC (ft ags)	TOC - TOR (ft)	Bottom of Well (ft BTOR)	Screening Interval (ft bgs)	OU Location	Well Inventory Status
PZ-337	2000303	591733	NA	NA	1549	NA	NA	17.0	7.0 - 17.0	OU-2	Located - good condition, decommissioned
PZ-328	2000416	590853	NA	NA	1531	NA	NA	8.0	3.0 - 8.0	OU-3	Located - good condition, decommissioned
PZ-331	2000308	590667	NA	NA	1533	NA	NA	25.0	15.0 - 25.0	OU-3	CNL - Presumed Destroyed During OU-3 Remediation
PZ-332	2000173	590565	NA	NA	1529	NA	NA	9.0	4.0 - 9.0	OU-3	CNL - Presumed Destroyed During OU-3 Remediation
PZ-333	2000391	590880	NA	NA	1532	NA	NA	NA	NA	OU-3	Located - good condition, decommissioned
PZ-335	2000463	590668	NA	NA	1532	NA	NA	26.0	16.0 - 26.0	OU-3	Located - good condition, decommissioned
PZ-336	2000495	590419	NA	NA	1533	NA	NA	20.0	10.0 - 20.0	OU-3	CNL - Presumed Destroyed During OU-3 Remediation

Notes:

MW - monitoring well
TOC - top of casing
ft - feet
NA - not available
PZ - Piezometer
TOR - top of riser
ags - above ground surface
CNL - Could not locate
TW - temporary well
BTOR - below top of riser
bgs - below ground surface
NA - not available
amsl - above mean sea level

Wells Surveyed by Prudent Engineering
Northing/Easting = North American Datum 83/96 - NYSPCS EAST (US survey ft); Elevations = North American Vertical Datum 88 (US survey ft)

Piezometers and Temporary Wells located via Global Positioning System handheld unit, elevations estimated to the nearest foot using Site topographic maps
Northing/Easting = North American Datum 83/96 - NYSPCS EAST (US survey ft); Elevations = North American Vertical Datum 88 (US survey ft)

Table 2.4: Groundwater Elevation Measurements

Monitoring Well Location ID	Riser Elevation (ft amsl)	Bottom of Well (ft btor)	Depth to Water 8/19/2013 (ft btor)	Groundwater Elevation 8/19/2013 (ft btor)	Depth to Water 9/29/2014 (ft btor)	Groundwater Elevation 9/29/2014 (ft amsl)	Depth to Water 9/20/2019 (ft btor)	Groundwater Elevation 9/20/2019 (ft amsl)
MW-101	1542.93	13.0	9.93	1533.00	8.56	1534.37	CNL	NA
MW-102	1543.22	14.9	4.84	1538.38	5.17	1538.05	CNL	NA
MW-103	1542.07	19.7	9.23	1532.84	10.02	1532.05	CNL	NA
MW-104	1544.85	19.4	8.10	1536.75	7.68	1537.17	7.05	1537.80
MW-105	1545.83	18.3	9.17	1536.66	8.65	1537.18	9.45	1536.38
MW-106	1543.23	16.9	5.51	1537.66	5.96	1537.21	5.75	1537.48
MW-107	1541.91	14.6	3.86	1538.05	4.16	1537.75	CNL	NA
MW-108	1546.69	22.1	13.7	1532.99	13.51	1533.18	14.03	1532.66
MW-109	1545.85	18.8	9.44	1536.41	10.25	1535.60	10.38	1535.47
MW-110	1543.08	19.6	10.00	1533.08	9.93	1533.15	CNL	NA
MW-201	1543.58	18.6	NM	NM	6.28	1537.30	CNL	NA
MW-202	1553.97	22.4	NM	NM	14.92	1539.05	CNL	NA
MW-203	1547.83	17.3	NM	NM	11.12	1536.71	11.13	1536.70
MW-204	1546.29	28.3	NM	NM	13.42	1532.87	13.99	1532.30
MW-205S	1545.24	19.6	NM	NM	12.34	1532.90	12.94	1532.30
MW-205D	1545.37	33.5	NM	NM	12.35	1533.02	12.93	1532.44
GW-02	1543.65	9.8	4.53	1539.12	6.42	1537.23	5.1	1538.55
GW-11	1541.95	10.5	3.88	1538.07	4.71	1537.24	CNL	NA
GW-14	1542.97	10.4	8.51	1534.46	9.37	1533.60	CNL	NA
TW-701	1544	19.5	NA	NA	NA	NA	12.9	1531
TW-702	1546	20.5	NA	NA	NA	NA	10.9	1535
BB-1	1548.42	NA	NA	NA	NA	NA	NM	NA
BB-2	1535.86	NA	NM	NM	6.06	1529.80	NM	NA
LF-1	1529.52	NA	NM	NM	1.97	1527.55	NM	NA

Notes:
ft = feet
tor = top of riser
btor = below top of riser
amsl = above mean sea level
Wells Surveyed by Prudent Engineering
Elevations = North American Vertical Datum 88 (US survey ft)

CNL = Could Not Locate
NA = Not Available
NM = Not Measured

Created by: NWV 02/06/2020
Checked by: JKR 02/18/2020

Table 3.1 - Pre-Design Investigation Report General Table Notes

General Notes:
ND - non detect
ft bgs - feet below ground surface
FS - field sample
FD - field duplicate
blank cell - screening data or analytical sample not collected at location interval
mg/kg - milligram per kilogram (ppm)
ng/L - nanograms per liter (ppt)
µg/L - micrograms per liter (ppb)
mg/L - milligrams per liter (ppm)
Bold = Detected in sample below criteria value
NA - not applicable

MGP Description Type -
Blebs - observed discrete sphericals of tar/free product
Coated - soil grains coated with tar/free product
Purifier - blue/green granular material
DNAPL - dense non-aqueous phase liquid
NOI - no observable impacts
BTEX - benzene, toluene, ethylbenzene, xylene
PCB - polychlorinated biphenyl
PAH - polycyclic aromatic hydrocarbons
PFAS - per- and polyfluoroalkyl substances
TCLP - Toxicity Characteristic Leaching Procedure
2007 samples were collected during the Site Characterization (SC)
2013 samples were collected during the Remedial Investigation (RI)

Qualifiers:
U - analyzed but not detected
J - estimated value
J+ - estimated value, biased high
J- - estimate value, biased low
UJ - estimated concentration below the method reporting limit

Soil Notes:
SCO - NYSDEC Part 375 Remedial Program Soil Cleanup Objective
RRES - Restricted Residential SCO
COMM - Commercial SCO
NS - No SCO
Yellow highlighted cells indicate an exceedance of the Restricted Residential SCO
Orange highlighted cells indicate an exceedance of the Commercial SCO

Groundwater Notes:
GA/GVs - TOGS 1.1.1: Division of Water Technical and Operational Guidance Series (1.1.1)
Yellow highlight indicates an exceedance of Class GA criteria
Orange highlight indicates an exceedance of Class GA guidance value
MCL - New York State maximum contaminant level

Table 3.2: OU-01 Pre-Design Investigation Summary of Findings

Sample Location ID	Northing	Easting	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results			
									Sample Depth (ft bgs)	Total PAH (mg/kg)	Naphthalene (mg/kg)	Total BTEX (mg/kg)
A4B	1999711.60	592088.50	0	4	NOI	4	0.2					
			4	4.2	purifier							
			4.2	8.2	NOI							
B3C	1999736.60	592138.50	0	1	NOI	1						
			1	2	Coated, Blebs, DNAPL		43.2	LNAPL				
			3.7	6.3	purifier							
			6.3	10	staining/odor		199					
			10	20	NOI		9.2					
B3D	1999735.28	592116.16	0	6	purifier	3	197					
			6	7	NOI							
B4D	1999693.12	592114.72	0	4	NOI	4	0.2					
			4	4.2	purifier							
			4.2	8.2	NOI							
			8.2	10	staining/odor							
			10	30	NOI		2.4					
B5A	1999661.60	592113.50	0	2	NOI	3.5			1	4.44	ND	ND
			2	5.8	NOI							
C3D	1999736.60	592163.50	0	3	NOI	2.5						
			3	3.5	Coated, Blebs, DNAPL		84.8		3	723.4	40	ND
			4	5	purifier		0.6					
			5	20	NOI							
C4C	1999681.58	592193.82	0	5	staining/odor	5						
			5	12	Coated, Blebs, DNAPL		174					
			12	25	Coated, Blebs, DNAPL		174					
			25	30	NOI							
C5D	1999636.60	592163.50	0	3	NOI	10.7	0.4					
			3	6	staining/odor							
			6	20	NOI							
C7B	1999561.61	592188.50	0	20	NOI	8.6						
D3C	1999736.60	592238.50	0	4.5	NOI	3.5	0					
			4.5	5	staining/odor							
			5	20	NOI		0.1					
D3D	1999736.60	592213.50	0	4	NOI	3.5	0					
			4	4.5	Coated, Blebs, DNAPL				4	22.49	ND	ND
			4.5	7	NOI		0					
			7	7	staining/odor		0.2					
			7	20	NOI		0					

Table 3.2: OU-01 Pre-Design Investigation Summary of Findings

Sample Location ID	Northing	Easting	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results			
									Sample Depth (ft bgs)	Total PAH (mg/kg)	Naphthalene (mg/kg)	Total BTEX (mg/kg)
D5A	1999661.60	592213.50	0	7.3	NOI							
			7.3	11.4	Coated, Blebs, DNAPL		26.6	LNAPL				
			11.4	16.5	staining/odor		14.8					
			16.5	22.1	Coated, Blebs, DNAPL			LNAPL				
			22.1	25	NOI							
D5C	1999631.64	592240.83	0	6	NOI		1.4					
			6	27	Coated, Blebs, DNAPL		54	LNAPL				
			27	30	NOI							
D8C	1999486.61	592238.50	0	1.9	staining/odor							
			1.9	5	NOI		0.2					
			5	18	staining/odor		97					
			18	30	NOI		11.9					
D8D	1999486.04	592213.76	0	1.3	staining/odor	11						
			1.3	30	NOI		35.2					
D9C	1999443.02	592237.54	0	12	staining/odor				1	888.7	1.1	0.51
			12	17.5	Coated, Blebs, DNAPL		322	Both				
			17.5	30	NOI		35					
D10A	1999411.60	592213.50	0	1	NOI							
D11B	1999361.60	592238.50	0	25	NOI		0.4	NA				
			25	26	staining/odor		50.4					
			26	30	NOI							
E4C	1999686.60	592288.50	0	1	NOI	7.9						
			1	4	staining/odor		1.4					
			4	20	NOI		0.6					
E6D	1999586.61	592263.50	0	1	staining/odor							
			1	4	NOI		4.7					
			4	27	Coated, Blebs, DNAPL		316	LNAPL				
			27	30	NOI							
E7D	1999536.61	592263.50	0	4.5	staining/odor		181					
			4.5	22	Coated, Blebs, DNAPL		4008	Both				
			22	30	NOI							
E8C	1999486.61	592288.50	0	7	staining/odor		0.8					
			7	23	Coated, Blebs, DNAPL		398					
			23	30	NOI							
E11D	1999336.60	592263.50	0	30	NOI	13	1.4		1	3.351	0.04	ND
									15	0.147	ND	0.11

Table 3.2: OU-01 Pre-Design Investigation Summary of Findings

Sample Location ID	Northing	Easting	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results			
									Sample Depth (ft bgs)	Total PAH (mg/kg)	Naphthalene (mg/kg)	Total BTEX (mg/kg)
F5B	1999661.60	592338.50	0	2	NOI	6.5						
			2	4	staining/odor		30.2					
			4	4.5	Coated, Blebs, DNAPL		60.3					
			4.5	7.3	NOI							
			7.3	16.2	Coated, Blebs, DNAPL		4.6	LNAPL				
			16.2	20	staining/odor		0.9					
F6A	1999611.60	592313.50	0	1.5	staining/odor							
			1.5	5.25	NOI							
			5.25	8.5	staining/odor		20					
			8.5	28.5	Coated, Blebs, DNAPL		226.7	LNAPL				
			28.5	30	NOI							
F7D	1999536.61	592313.50	0	4.4	NOI							
			4.4	22	Coated, Blebs, DNAPL		410	LNAPL				
			22	30	NOI							
F9D	1999436.60	592313.50	0	3	staining/odor							
			3	15	Coated, Blebs, DNAPL		361					
			15	19	Coated, Blebs, DNAPL							
			19	30	NOI							
F11C	1999336.60	592338.50	0	30	NOI	12	2.4					
G3A	1999761.61	592363.50	0	20	NOI	11	0.1					
G4A	1999711.60	592363.50	0	20	NOI	9			11	ND	ND	ND
G5B	1999661.60	592388.50	0	20	NOI	11	9		1	0.02	ND	ND
									11	0.122	ND	ND
G7D	1999536.61	592363.50	0	4	staining/odor	4	80.4					
			4	24	Coated, Blebs, DNAPL		184	LNAPL				
			24	30	NOI							
G8D	1999486.61	592363.50	0	2	staining/odor							
			2	6	staining/odor		647					
			6	20	Coated, Blebs, DNAPL		587	LNAPL				
			20	30	NOI							
G9D	1999436.60	592363.50	0	5	NOI							
			5	6	staining/odor							
			6	7	Coated, Blebs, DNAPL		149					
			7	24.5	staining/odor							
			24.5	26	Coated, Blebs, DNAPL		119	DNAPL				
			26	30	NOI							
G10C	1999386.60	592388.50	0	30	NOI	8	37.9					
G12B	1999298.48	592391.51	0	30	NOI	16	0.2		1	10.75	0.77	ND
									17	0.139	ND	ND
H6D	1999586.61	592413.50	0	20	NOI		33.4		10	ND	ND	ND

Table 3.2: OU-01 Pre-Design Investigation Summary of Findings

Sample Location ID	Northing	Easting	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Estimated Groundwater Level (ft bgs)	Field Scan PID (ppm)	Shake Test Observations	Analytical Results			
									Sample Depth (ft bgs)	Total PAH (mg/kg)	Naphthalene (mg/kg)	Total BTEX (mg/kg)
H7A	1999561.60	592413.50	0	6	NOI							
			6	22.5	Coated, Blebs, DNAPL		19.7	LNAPL				
			22.5	30	NOI		10.7					
H7D	1999538.19	592413.59	0	1	staining/odor							
			1	18	Coated, Blebs, DNAPL		154					
			18	30	NOI		20.2					
H8A	1999511.61	592413.50	0	30	NOI	7.3	10.4					
H9B	1999461.60	592438.50	0	30	NOI	13						
H10C	1999386.60	592438.50	0	40	NOI	22	2.4		1	4.477	0.083	ND
									23	0.026	ND	ND
I7A	1999567.90	592454.80	0	30	NOI	15	9.8					
TW-701	1999516.86	592469.52	0	20	NOI	13	0.2					
TW-702	1999487.00	592338.61	0	5	NOI				1	ND	ND	0.27
			5	12	staining/odor		129					
			12	13	Coated, Blebs, DNAPL			Both				
			13	20	NOI		30					

Notes:
See Table 3.1 for general table notes

Table 3.3: Railroad Borings Summary of Findings

Sample Location ID	Northing	Easting	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Analytical Results			
						Sample Depth (ft bgs)	Total PAH (mg/kg)	Naphthalene (mg/kg)	Total BTEX (mg/kg)
DP-801	2000547.78	591537.28	0	13	NOI				
			13	13.5	Coated				
			13.5	15	sheen/odor				
			15	25	NOI	15	1.585	ND	ND
DP-802	2000529.90	591558.63	0	25	NOI				
DP-803	2000513.97	591575.14	0	25	NOI	8	ND	ND	ND
DP-804	2000481.28	591623.06	0	23	NOI	12	ND	ND	ND
DP-805	2000451.61	591652.98	0	20	NOI				
DP-806	2000414.37	591688.66	0	20	NOI	8	ND	ND	ND
DP-807	2000376.70	591722.97	0	25	NOI				
DP-808	2000337.25	591755.09	0	25	NOI	8	ND	ND	ND
DP-809	2000299.79	591785.85	0	25	NOI				
DP-810	2000260.12	591815.63	0	18	NOI	8	ND	ND	ND
DP-811	2000216.85	591843.00	0	20	NOI				
DP-812	2000173.60	591869.08	0	20	NOI	9	ND	ND	ND
DP-813	2000126.73	591895.96	0	20	NOI				
DP-814	2000084.28	591916.54	0	20	NOI	8	ND	ND	ND
DP-815	2000039.09	591937.38	0	20	NOI				
DP-816	1999993.15	591958.21	0	20	NOI				
DP-817	1999958.02	591972.59	0	25	NOI	8	6.61	6.2	ND
DP-818	1999946.53	591977.16	0	10	NOI				
			10	12	sheen/odor	12	2.515	ND	ND
			12	25	NOI				
DP-819	1999900.73	591995.31	0	25	NOI				
DP-820	1999854.62	592015.83	0	20	NOI				
DP-821	1999808.15	592033.67	0	20	NOI	9	ND	ND	ND
DP-822	1999762.61	592052.81	0	20	NOI				
DP-823	1999717.01	592071.97	0	20	NOI	8	0.43	ND	ND
DP-824	1999666.27	592093.36	0	25	NOI				
DP-825	1999629.58	592111.95	0	25	NOI	12	ND	ND	ND
DP-826	1999567.13	592136.01	0	25	NOI				

Created by: NWV 2/5/2020
Checked BY: JKR 2/18/2020

Table 3.3: Railroad Borings Summary of Findings

Sample Location ID	Northing	Easting	Top Depth (ft bgs)	Bottom Depth (ft bgs)	Visual MGP Description Type	Analytical Results			
						Sample Depth (ft bgs)	Total PAH (mg/kg)	Naphthalene (mg/kg)	Total BTEX (mg/kg)
DP-827	1999519.57	592155.41	0	25	NOI	12	ND	ND	ND
DP-828	1999485.85	592172.87	0	25	NOI				
DP-829	1999436.39	592185.77	0	20	NOI	12	ND	ND	ND
DP-830	1999385.61	592207.48	0	20	NOI				
DP-831	1999337.88	592220.01	0	20	NOI	7	ND	ND	ND
DP-832	1999949.55	591962.59	0	25	NOI	18	ND	ND	ND
DP-833	1999940.67	591966.64	0	10	NOI				
			10	10.5	Coated				
			10.5	25	NOI	12	ND	ND	0.023
DP-834	1999928.13	591971.82	0	25	NOI	12			

Notes:
See Table 3.1 for general table notes

Table 3.4: Concentrations of BTEXs and PAHs in Soils

			Location	DP-B5A		DP-D10A		DP-E11D		DP-E11D		DP-G12B		DP-G12B		DP-G4A	
			Sample Date	9/26/2019		9/26/2019		9/25/2019		9/25/2019		9/26/2019		9/26/2019		9/24/2019	
			Sample ID	DP-B5A010		DP-D10A010		DP-E11D010		DP-E11D150		DP-G12B010		DP-G12B170		DP-G4A110	
			Sample Depth (ft bgs)	1		1		1		15		1		17		11	
			Qc Code	FS		FS		FS		FS		FS		FS		FS	
Parameter	**RRES**	**COM**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
BTEX																	
Benzene	4.8	44	mg/kg	0.14	U	**0.17**		0.12	U	0.046	U	0.078	U	0.059	U	0.049	U
Ethylbenzene	41	390	mg/kg	0.14	U	0.14	U	0.12	U	**0.015**	J	0.078	U	0.059	U	0.049	U
Toluene	100	500	mg/kg	0.14	U	**0.23**		0.12	U	**0.032**	J	0.078	U	0.059	U	0.049	U
Total BTEX	10	10	mg/kg	0.27	U	**0.51**		0.23	U	**0.11**		0.16	U	0.12	U	0.098	U
Xylene, o	100	500	mg/kg	0.14	U	**0.024**	J	0.12	U	**0.024**	J	0.078	U	0.059	U	0.049	U
Xylenes (m&p)	100	500	mg/kg	0.27	U	**0.086**	J	0.23	U	**0.038**	J	0.16	U	0.12	U	0.098	U
Xylenes, Total	100	500	mg/kg	0.27	U	**0.11**	J	0.23	U	**0.062**	J	0.16	U	0.12	U	0.098	U
PAHs																	
Acenaphthene	100	500	mg/kg	0.21	U	**1**	J	0.18	U	0.2	U	1.8	U	0.19	U	0.17	U
Acenaphthylene	100	500	mg/kg	**0.18**	J	**33**		**0.091**	J	0.2	U	**0.71**	J	0.19	U	0.17	U
Anthracene	100	500	mg/kg	**0.11**	J	**14**		0.18	U	0.2	U	1.8	U	0.19	U	0.17	U
Benzo(a)anthracene	1	5.6	mg/kg	**0.49**		**66**		**0.21**		0.2	U	**0.78**	J	0.19	U	0.17	U
Benzo(a)pyrene	1	1	mg/kg	**0.39**		**59**		**0.14**	J	0.2	U	**0.75**	J	0.19	U	0.17	U
Benzo(b)fluoranthene	1	5.6	mg/kg	**0.53**		**66**		**0.29**		0.2	U	**0.87**	J	0.19	U	0.17	U
Benzo(ghi)perylene	100	500	mg/kg	**0.21**		**44**		**0.2**		0.2	U	**0.55**	J	0.19	U	0.17	U
Benzo(k)fluoranthene	3.9	56	mg/kg	**0.32**		**33**		**0.13**	J	0.2	U	**0.37**	J	0.19	U	0.17	U
Chrysene	3.9	56	mg/kg	**0.56**		**78**		**0.32**		0.2	U	**0.68**	J	0.19	U	0.17	U
Dibenz(a,h)anthracene	0.33	0.56	mg/kg	0.21	U	**11**		0.18	U	0.2	U	1.8	U	0.19	U	0.17	U
Fluoranthene	100	500	mg/kg	**0.64**		**130**		**0.48**		**0.034**	J	**1.4**	J	**0.035**	J	0.17	U
Fluorene	100	500	mg/kg	0.21	U	**7.6**		0.18	U	0.2	U	**0.32**	J	0.19	U	0.17	U
Indeno(1,2,3-cd)pyrene	0.5	5.6	mg/kg	**0.22**		**35**		**0.15**	J	0.2	U	**0.55**	J	0.19	U	0.17	U
Naphthalene	100	500	mg/kg	0.21	U	**1.1**	J	**0.04**	J	0.2	U	**0.77**	J	0.19	U	0.17	U
Phenanthrene	100	500	mg/kg	**0.16**	J	**110**		**0.49**		**0.055**	J	**1.5**	J	**0.063**	J	0.17	U
Pyrene	100	500	mg/kg	**0.63**		**200**		**0.81**		**0.058**	J	**1.5**	J	**0.041**	J	0.17	U
Total PAHs	500	500	mg/kg	**4.44**		**888.7**		**3.351**		**0.147**		**10.75**		**0.139**		0.17	U

Notes:
See Table 3.1 for general table notes

Table 3.4: Concentrations of BTEXs and PAHs in Soils

			Location	DP-G5B		DP-G5B		DP-H10C		DP-H10C		DP-H6D		DP-I8A		HA-H3D	
			Sample Date	9/23/2019		9/24/2019		9/26/2019		9/26/2019		9/24/2019		9/23/2019		9/17/2019	
			Sample ID	DP-G5B010		DP-G5B110		DP-H10C010		DP-H10C230		DP-H6A100		DP-I8A010		HA-H3D01	
			Sample Depth (ft bgs)	1		11		1		23		10		1		1	
			Qc Code	FS		FS		FS		FS		FS		FS		FS	
Parameter	**RRES**	**COM**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
BTEX																	
Benzene	4.8	44	mg/kg	0.044	U	0.046	U	0.098	U	0.06	U	0.061	U	**0.14**		0.091	UJ
Ethylbenzene	41	390	mg/kg	0.044	U	0.046	U	0.098	U	0.06	U	0.061	U	0.047	U	0.091	UJ
Toluene	100	500	mg/kg	0.044	U	0.046	U	0.098	U	0.06	U	0.061	U	**0.13**		0.091	UJ
Total BTEX	10	10	mg/kg	0.088	U	0.092	U	0.2	U	0.12	U	0.12	U	**0.27**		0.18	UJ
Xylene, o	100	500	mg/kg	0.044	U	0.046	U	0.098	U	0.06	U	0.061	U	0.047	U	0.091	UJ
Xylenes (m&p)	100	500	mg/kg	0.088	U	0.092	U	0.2	U	0.12	U	0.12	U	0.095	U	0.18	UJ
Xylenes, Total	100	500	mg/kg	0.088	U	0.092	U	0.2	U	0.12	U	0.12	U	0.095	U	0.18	UJ
PAHs																	
Acenaphthene	100	500	mg/kg	0.17	U	0.17	U	**0.027**	J	0.18	U	0.17	U	0.17	U	0.19	U
Acenaphthylene	100	500	mg/kg	0.17	U	0.17	U	**0.073**	J	0.18	U	0.17	U	0.17	U	**0.049**	J
Anthracene	100	500	mg/kg	0.17	U	0.17	U	**0.08**	J	0.18	U	0.17	U	0.17	U	0.19	U
Benzo(a)anthracene	1	5.6	mg/kg	0.17	U	**0.017**	J	**0.46**		0.18	U	0.17	U	0.17	U	**0.037**	J
Benzo(a)pyrene	1	1	mg/kg	0.17	U	0.17	U	**0.51**		0.18	U	0.17	U	0.17	U	**0.048**	J
Benzo(b)fluoranthene	1	5.6	mg/kg	0.17	U	0.17	U	**0.56**		0.18	U	0.17	U	0.17	U	**0.066**	J
Benzo(ghi)perylene	100	500	mg/kg	**0.02**	J	0.17	U	**0.3**		0.18	U	0.17	U	0.17	U	**0.053**	J
Benzo(k)fluoranthene	3.9	56	mg/kg	0.17	U	0.17	U	**0.3**		0.18	U	0.17	U	0.17	U	0.19	U
Chrysene	3.9	56	mg/kg	0.17	U	0.17	U	**0.42**		0.18	U	0.17	U	0.17	U	**0.048**	J
Dibenz(a,h)anthracene	0.33	0.56	mg/kg	0.17	U	0.17	U	0.18	U	0.18	U	0.17	U	0.17	U	0.19	U
Fluoranthene	100	500	mg/kg	0.17	U	**0.024**	J	**0.54**		0.18	U	0.17	U	0.17	U	**0.066**	J
Fluorene	100	500	mg/kg	0.17	U	0.17	U	**0.034**	J	0.18	U	0.17	U	0.17	U	**0.024**	J
Indeno(1,2,3-cd)pyrene	0.5	5.6	mg/kg	0.17	U	0.17	U	**0.29**		0.18	U	0.17	U	0.17	U	**0.042**	J
Naphthalene	100	500	mg/kg	0.17	U	0.17	U	**0.083**	J	0.18	U	0.17	U	0.17	U	0.19	U
Phenanthrene	100	500	mg/kg	0.17	U	**0.049**	J	**0.19**		0.18	U	0.17	U	0.17	U	**0.088**	J
Pyrene	100	500	mg/kg	0.17	U	**0.032**	J	**0.61**		**0.026**	J	0.17	U	0.17	U	**0.092**	J
Total PAHs	500	500	mg/kg	**0.02**		**0.122**		**4.477**		**0.026**		0.17	U	0.17	U	**0.613**	

Notes:
See Table 3.1 for general table notes

Table 3.4: Concentrations of BTEXs and PAHs in Soils

			Location	HA-J2C		TP-C3D		TP-D3D		TP-D3D	
			Sample Date	9/17/2019		9/16/2019		9/16/2019		9/16/2019	
			Sample ID	HA-J2C01		TP-C3D03		TP-D3D04		TP-D3D04D	
			Sample Depth (ft bgs)	1		3		4		4	
			Qc Code	FS		FS		FS		FD	
Parameter	**RRES**	**COM**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
BTEX											
Benzene	4.8	44	mg/kg	0.044	UJ	0.48	UJ	0.1	UJ	0.2	UJ
Ethylbenzene	41	390	mg/kg	0.044	UJ	0.48	UJ	0.1	UJ	0.2	UJ
Toluene	100	500	mg/kg	0.044	UJ	0.48	UJ	0.1	UJ	0.2	UJ
Total BTEX	10	10	mg/kg	0.087	UJ	0.95	UJ	0.2	UJ	0.4	UJ
Xylene, o	100	500	mg/kg	0.044	UJ	0.48	UJ	0.1	UJ	0.2	UJ
Xylenes (m&p)	100	500	mg/kg	0.087	UJ	0.95	UJ	0.2	UJ	0.4	UJ
Xylenes, Total	100	500	mg/kg	0.087	UJ	0.95	UJ	0.2	UJ	0.4	UJ
PAHs											
Acenaphthene	100	500	mg/kg	0.17	U	**24**		**0.06**	J	**0.09**	J
Acenaphthylene	100	500	mg/kg	0.17	U	**79**		**0.27**		**0.6**	
Anthracene	100	500	mg/kg	0.17	U	**56**		**0.83**		**2**	
Benzo(a)anthracene	1	5.6	mg/kg	0.17	U	**27**		**0.71**		**1.6**	
Benzo(a)pyrene	1	1	mg/kg	0.17	U	**23**		**0.71**		**1.4**	
Benzo(b)fluoranthene	1	5.6	mg/kg	0.17	U	**23**		**0.6**		**1.1**	
Benzo(ghi)perylene	100	500	mg/kg	**0.022**	J	**12**		**0.39**		**0.79**	
Benzo(k)fluoranthene	3.9	56	mg/kg	0.17	U	4.2	U	**0.15**	J	**0.4**	
Chrysene	3.9	56	mg/kg	0.17	U	**26**		**0.64**		**1.3**	
Dibenz(a,h)anthracene	0.33	0.56	mg/kg	0.17	U	**2.2**	J	0.2	U	0.21	U
Fluoranthene	100	500	mg/kg	0.17	U	**63**		**1.4**		**3**	
Fluorene	100	500	mg/kg	0.17	U	**59**		**0.31**		**0.68**	
Indeno(1,2,3-cd)pyrene	0.5	5.6	mg/kg	0.17	U	**8.2**		**0.26**		**0.53**	
Naphthalene	100	500	mg/kg	0.17	U	**40**		0.2	U	0.21	U
Phenanthrene	100	500	mg/kg	0.17	U	**190**		**2**		**4.2**	
Pyrene	100	500	mg/kg	**0.026**	J	**91**		**2.4**		**4.8**	
Total PAHs	500	500	mg/kg	**0.048**		**723.4**		**10.73**		**22.49**	

Notes:
See Table 3.1 for general table notes

Table 3.5: OU02 Railroad Boring Soil Sample Detections

			Location	DP-801		DP-803		DP-804		DP-806		DP-808		DP-810		DP-812		DP-814		DP-817	
			Sample Depth (ft bgs)	15		8		12		8		8		8		9		8		9	
			Sample Date	11/4/2019		11/4/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/5/2019		11/6/2019		11/6/2019	
			Sample ID	DP-80115		DP-80308		DP-80412		DP-80608		DP-80808		DP-81008		DP-81209		DP-81408		DP-81709	
	SCO		**Qc Code**	FS		FS		FS		FS		FS		FS		FS		FS		FS	
Parameter	**RESTR**	**COMM**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
BTEX																					
Ethylbenzene	41	390	mg/kg	0.037	U	0.035	U	0.19	U	0.038	U	0.46	U	0.038	U	0.041	U	0.33	U	0.16	U
Total BTEX	10	10	mg/kg	0.074	U	0.07	U	0.38	U	0.075	U	0.91	U	0.076	U	0.082	U	0.66	U	0.32	U
PAHs																					
Acenaphthene	100	500	mg/kg	**0.11**	J	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	**0.41**	J
Anthracene	100	500	mg/kg	**0.14**	J	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Benzo(a)anthracene	1	5.6	mg/kg	**0.06**	J	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Benzo(a)pyrene	1	1	mg/kg	**0.037**	J	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Benzo(b)fluoranthene	1	5.6	mg/kg	**0.045**	JN	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Benzo(ghi)perylene	100	500	mg/kg	**0.026**	J	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Benzo(k)fluoranthene	3.9	56	mg/kg	0.17	U	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Chrysene	3.9	56	mg/kg	**0.052**	J	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Fluoranthene	100	500	mg/kg	**0.21**		0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Fluorene	100	500	mg/kg	**0.075**	J	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Indeno(1,2,3-cd)pyrene	0.5	5.6	mg/kg	0.17	U	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Naphthalene	100	500	mg/kg	0.17	U	0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	**6.2**	
Phenanthrene	100	500	mg/kg	**0.5**		0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Pyrene	100	500	mg/kg	**0.33**		0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	0.83	U
Total PAH	500	500	mg/kg	**1.585**		0.17	U	0.84	U	0.17	U	0.17	U	0.17	U	0.17	U	0.17	U	**6.61**	

Notes:
See Table 3.1 for general table notes

Table 3.5: OU02 Railroad Boring Soil Sample Detections

			Location	DP-818		DP-821		DP-823		DP-825		DP-827		DP-829		DP-831		DP-832		DP-833		DP-834	
			Sample Depth (ft bgs)	12		9		8		12		12		12		7		18		12		12	
			Sample Date	11/6/2019		11/6/2019		11/6/2019		11/8/2019		11/7/2019		11/7/2019		11/7/2019		11/8/2019		11/8/2019		11/8/2019	
			Sample ID	DP-81812		DP- 82109		DP- 82308		DP- 82512		DP- 82712		DP- 82912		DP- 83107		DP- 83218		DP- 83312		DP- 83412	
	SCO		**Qc Code**	FS		FS		FS		FS		FS		FS		FS		FS		FS		FS	
Parameter	**RESTR**	**COMM**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
BTEX																							
Ethylbenzene	41	390	mg/kg	0.036	U	0.055	U	0.059	U	0.051	U	0.059	U	0.043	U	0.061	U	0.055	U	**0.023**	J	0.055	U
Total BTEX	10	10	mg/kg	0.072	U	0.11	U	0.12	U	0.1	U	0.12	U	0.087	U	0.12	U	0.11	U	**0.023**	J	0.11	U
PAHs																							
Acenaphthene	100	500	mg/kg	**0.25**		0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Anthracene	100	500	mg/kg	**0.2**		0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Benzo(a)anthracene	1	5.6	mg/kg	**0.11**	J	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Benzo(a)pyrene	1	1	mg/kg	**0.084**	J	0.2	U	**0.043**	J	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Benzo(b)fluoranthene	1	5.6	mg/kg	**0.063**	J	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Benzo(ghi)perylene	100	500	mg/kg	**0.048**	J	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Benzo(k)fluoranthene	3.9	56	mg/kg	**0.026**	J	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Chrysene	3.9	56	mg/kg	**0.083**	J	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene	100	500	mg/kg	**0.21**		0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluorene	100	500	mg/kg	**0.16**	J	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Indeno(1,2,3-cd)pyrene	0.5	5.6	mg/kg	**0.031**	J	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Naphthalene	100	500	mg/kg	0.17	U	0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Phenanthrene	100	500	mg/kg	**0.82**		0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Pyrene	100	500	mg/kg	**0.43**		0.2	U	0.2	U	0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U
Total PAH	500	500	mg/kg	**2.515**		0.2	U	**0.043**		0.19	U	0.2	U	0.18	U	0.2	U	0.2	U	0.2	U	0.2	U

Notes:
See Table 3.1 for general table notes

Table 3.6: Total Cyanide in Soils

Location ID	Sample Depth (ft bgs)	Sample ID	QC Code	Parameter / Units / RRES / COM / Sample Date	Cyanide, Total mg/kg 27 27 Result	Qualifier
2019 OU-1 PDI Samples						
DP-E7D	12	DP-E7D120	FS	9/23/2019	1.2	U
DP-F9D	16	DP-F9D160	FS	9/23/2019	1.2	U
DP-G7D	20	DP-G7D200	FS	9/23/2019	1.2	U
DP-G8D	6	DP-G8D060	FS	9/23/2019	**3.6**	
DP-G8D	10	DP-G8D100	FS	9/23/2019	**0.75**	J
TP-B3D	3	TP-B3D030	FS	9/23/2019	1.4	U
TW-702	7	TW-702070	FS	9/25/2019	**1.1**	J
TW-702	12	TW-702120	FS	9/25/2019	1.2	U
2013 RI and 2007 SC Samples						
C-3	6.5 - 7.2	516008-C307	FS	8/10/2013	1	UJ
C-4	6.8 - 8	516008-C408	FS	8/8/2013	1.2	UJ
C-4	6.8 - 8	516008-C408D	FD	8/8/2013	1.2	UJ
D-5	15 - 16	516008-D516	FS	8/8/2013	**0.99**	J
D-6	11 - 12	516008-D612	FS	8/8/2013	1.2	UJ
D-7	12.5 - 13	516008-D712	FS	8/7/2013	1.2	UJ
D-9	7.8 - 8	516008-D908	FS	8/6/2013	1.2	UJ
D-9	10.7 - 11	516008-D911	FS	8/6/2013	1.2	UJ
E-4	1.4 - 1.7	516008-E402	FS	8/12/2013	**62.8**	J
E-5	15 - 16	516008-E516	FS	8/8/2013	1.2	UJ
E-6	1.5 - 2	516008-E602	FS	8/8/2013	**7.5**	J
E-6	10.4 - 12	516008-E612	FS	8/8/2013	1.2	UJ
E-9	2.6 - 3	516008-E903	FS	8/6/2013	1.3	UJ
F-2	5.9 - 6.4	516880-F206	FS	8/9/2013	0.99	UJ
F-3	6.5 - 7	516880-F307	FS	8/12/2013	1	UJ
F-6	1.5 - 2	516880-F602	FS	8/10/2013	**2.6**	J
F-6	4.6 - 5.4	516880-F605	FS	8/10/2013	1	UJ
F-6	9.6 - 9.9	516880-F610	FS	8/10/2013	0.99	UJ
F-7	15.5 - 16	516880-F716	FS	8/7/2013	1.2	UJ
F-8	3.5 - 4	516880-F804	FS	8/6/2013	1.4	UJ
F-9	3 - 3.8	516880-F903	FS	8/6/2013	1.4	UJ
G-8	5.2 - 6	516008-G806	FS	8/7/2013	**1.3**	J
G-8	13.6 - 14.2	516008-G814	FS	8/7/2013	1.2	UJ
G-10	6.5 - 7	516008-G1007	FS	8/12/2013	1	UJ
G-10	14.7 - 15.2	516008-G1015	FS	8/12/2013	1	UJ
GS-05	3	SLGS00503SCXX	FS	5/1/2007	**1.7**	
GS-06	7	SLGS00607SCXX	FS	5/1/2007	1.2	U
TP-04	6	SLTP00406SCXD	FD	4/30/2007	**423**	
TP-04	6	SLTP00406SCXX	FS	4/30/2007	0.99	U
TP-05	2	SLTP00502SCXX	FS	4/30/2007	**12.9**	

Notes:
See Table 3.1 for general table notes

Table 3.7: ISS Soil Samples and Soil Waste Disposal Pre-Characterization Results

			Location	OU01 CENTRAL DEEP		OU01 CENTRAL SHALLOW		OU01 NORTH	
			Sample Date	9/20/2019		9/20/2019		9/17/2019	
			Sample ID	516008-OU01 CENTRAL DEEP		516008-OU01 CENTRAL SHALLOW		516008-OU01 NORTH	
			Sample Depth (ft bgs)	10 - 30		0 - 10		0 - 6	
			Qc Code	FS		FS		FS	
Parameter	**RRES**	**COM**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier
BTEX									
Benzene	4.8	44	mg/kg	**71**		**4.3**		0.45	UJ
Ethylbenzene	41	390	mg/kg	**31**		**23**		0.45	UJ
Toluene	100	500	mg/kg	**130**		**33**		0.45	UJ
Total BTEX	10	10	mg/kg	**390**		**110**		0.9	UJ
Xylene, o	100	500	mg/kg	**51**		**17**		0.45	UJ
Xylenes (m&p)	100	500	mg/kg	**110**		**37**		0.9	UJ
Xylenes, Total	100	500	mg/kg	**160**		**54**		0.9	UJ
Polycyclic Aromatic Hydrocarbons (PAHs)									
Acenaphthene	100	500	mg/kg	**12**		**28**		**7.9**	
Acenaphthylene	100	500	mg/kg	**100**		**250**		**8.5**	
Anthracene	100	500	mg/kg	**36**		**73**		**10**	
Benzo(a)anthracene	1	5.6	mg/kg	**23**		**52**		**5.2**	
Benzo(a)pyrene	1	1	mg/kg	**22**		**52**		**4.6**	
Benzo(b)fluoranthene	1	5.6	mg/kg	**16**		**40**		**3.3**	
Benzo(ghi)perylene	100	500	mg/kg	**13**		**33**		**2.4**	
Benzo(k)fluoranthene	3.9	56	mg/kg	**7.8**		**19**		**1.6**	
Chrysene	3.9	56	mg/kg	**21**		**45**		**4.8**	
Dibenz(a,h)anthracene	0.33	0.56	mg/kg	**2.4**		**5.6**		1.1	U
Fluoranthene	100	500	mg/kg	**53**		**120**		**12**	
Fluorene	100	500	mg/kg	**48**		**100**		**10**	
Indeno(1,2,3-cd)pyrene	0.5	5.6	mg/kg	**7.8**		**21**		**1.5**	
Naphthalene	100	500	mg/kg	**180**		**320**		**0.3**	J
Phenanthrene	100	500	mg/kg	**160**		**360**		**28**	
Pyrene	100	500	mg/kg	**93**		**230**		**17**	
Total PAHs	500	500	mg/kg	**795**		**1748.6**		**117.1**	
TCLP Volatile Organic Compounds (VOCs)									
1,1-Dichloroethene	NS	NS	mg/L			0.01	U	0.01	U
1,2-Dichloroethane	NS	NS	mg/L			0.01	U	0.01	UJ
2-Butanone	NS	NS	mg/L			0.05	U	0.05	U
Benzene	NS	NS	mg/L			**0.097**		0.01	U
Carbon tetrachloride	NS	NS	mg/L			0.01	U	0.01	U
Chlorobenzene	NS	NS	mg/L			0.01	U	0.01	U
Chloroform	NS	NS	mg/L			0.01	U	0.01	U
Tetrachloroethene	NS	NS	mg/L			0.01	U	0.01	U
Trichloroethene	NS	NS	mg/L			0.01	U	0.01	U
Vinyl chloride	NS	NS	mg/L			0.01	U	0.01	U
TCLP Semi-Volatile Organic Compounds (SVOCs)									
1,4-Dichlorobenzene	NS	NS	mg/L			0.4	U	0.04	U
2,4,5-Trichlorophenol	NS	NS	mg/L			0.2	U	0.02	U
2,4,6-Trichlorophenol	NS	NS	mg/L			0.2	U	0.02	U
2,4-Dinitrotoluene	NS	NS	mg/L			0.2	U	0.02	U
2-Methylphenol	NS	NS	mg/L			0.2	U	0.02	U
3-Methylphenol	NS	NS	mg/L			0.4	U	0.04	U
4-Methylphenol	NS	NS	mg/L			0.4	U	0.04	U
Hexachlorobenzene	NS	NS	mg/L			0.2	U	0.02	U
Hexachlorobutadiene	NS	NS	mg/L			0.2	U	0.02	U
Hexachloroethane	NS	NS	mg/L			0.2	U	0.02	U
Nitrobenzene	NS	NS	mg/L			0.2	U	0.02	U
Pentachlorophenol	NS	NS	mg/L			0.4	U	0.04	U
Pyridine	NS	NS	mg/L			1	UJ	0.1	UJ

Table 3.7: ISS Soil Samples and Soil Waste Disposal Pre-Characterization Results

			Location	OU01 CENTRAL DEEP		OU01 CENTRAL SHALLOW		OU01 NORTH	
			Sample Date	9/20/2019		9/20/2019		9/17/2019	
			Sample ID	516008-OU01 CENTRAL DEEP		516008-OU01 CENTRAL SHALLOW		516008-OU01 NORTH	
			Sample Depth (ft bgs)	10 - 30		0 - 10		0 - 6	
			Qc Code	FS		FS		FS	
Parameter	**RRES**	**COM**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier
Polychlorinated Biphenyls (PCBs)									
Aroclor-1016	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1221	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1232	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1242	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1248	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1254	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1260	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1262	1	1	mg/kg			0.25	U	0.26	U
Aroclor-1268	1	1	mg/kg			0.25	U	0.26	U
PCB (total)	1	1	mg/kg			0.25	U	0.26	U
TCLP Pesticides									
Chlordane	NS	NS	mg/L			0.002	U	0.002	U
Endrin	NS	NS	mg/L			0.0002	U	0.0002	U
Gamma-BHC/Lindane	NS	NS	mg/L			0.0002	U	0.0002	U
Heptachlor	NS	NS	mg/L			**0.00004**	J	0.0002	U
Heptachlor epoxide	NS	NS	mg/L			0.0002	U	0.0002	U
Methoxychlor	NS	NS	mg/L			0.0002	U	0.0002	U
Toxaphene	NS	NS	mg/L			0.002	U	0.002	U
TCLP Herbicides									
2,4,5-TP/Silvex	NS	NS	mg/L			0.002	U	0.002	U
2,4-D	NS	NS	mg/L			0.002	U	0.002	U
TCLP Metals									
Arsenic	NS	NS	mg/L			0.015	U	0.015	U
Barium	NS	NS	mg/L			**0.17**	J	**0.18**	J
Cadmium	NS	NS	mg/L			0.002	U	0.002	U
Chromium	NS	NS	mg/L			0.02	U	0.02	U
Lead	NS	NS	mg/L			**0.0065**	J	**0.0062**	J
Mercury	NS	NS	mg/L			0.0002	U	0.0002	U
Selenium	NS	NS	mg/L			0.025	U	0.025	U
Silver	NS	NS	mg/L			0.006	U	0.006	U
Inorganic or Field Parameters									
pH	NS	NS	pH Units	**4.7**	J	**4.9**	J	**6**	J
Sulfide	NS	NS	mg/kg	23.6	U	22.8	U	25.2	U
Temperature	NS	NS	°C	**19.9**	J	**20**	J	**20.2**	J
Total Organic Carbon	NS	NS	mg/kg	**4880**		**10700**		**7930**	
RCRA									
Cyanide, Reactive	NS	NS	mg/kg			10	U	10	U
Flash Point	NS	NS	°F			**176**		**176**	
Sulfide, Reactive	NS	NS	mg/kg			10	U	10	U
Moisture/Solids									
Percent Moisture	NS	NS	Percent	**15.3**		**12.4**		**20.8**	
Percent Solids	NS	NS	Percent	**84.7**		**87.6**		**79.2**	

Notes:
°C - degrees Celcius
°F - degrees Fahrenheit

Table 3.8: Summary of BTEX and PAHs Detected in Groundwater

			Location	MW-108		MW-204		MW-205D		MW-205D	
			Sample Date	9/26/2019		9/26/2019		9/26/2019		9/26/2019	
			Sample ID	516008-MW108019		516008-MW204023		516008-MW205D025		516008-MW205D025D	
			Qc Code	FS		FS		FS		FD	
Parameter	**GA**	**GV**	**Units**	Result	Qualifier	Result	Qualifier	Result	Qualifier	Result	Qualifier
BTEX											
Benzene	1	NS	µg/L	1	U	**23**		**410**		**500**	
Ethylbenzene	5	NS	µg/L	1	U	**83**		**91**		**110**	
Toluene	5	NS	µg/L	1	U	**190**		**97**		**120**	
Total BTEX	NS	NS	µg/L	2	U	**590**		**880**		**1100**	
Xylene, o	5	NS	µg/L	1	U	**130**		**160**		**190**	
Xylenes (m&p)	5	NS	µg/L	2	U	**160**		**120**		**130**	
Xylenes, Total	5	NS	µg/L	2	U	**290**		**280**		**320**	
PAHs											
Acenaphthene	NS	20	µg/L	5	U	**6.7**	J	**41**		**38**	J
Acenaphthylene	NS	NS	µg/L	5	U	**49**		**130**		**130**	
Anthracene	NS	50	µg/L	5	U	**2.3**	J	**2.8**	J	130	U
Fluorene	NS	50	µg/L	5	U	**12**	J	**20**	J	**21**	J
Naphthalene	NS	10	µg/L	**1.1**	J	**490**		**2100**		**2000**	
Phenanthrene	NS	50	µg/L	5	U	**11**	J	**20**	J	**20**	J
Total PAHs	NS	NS	µg/L	**1.1**		**571**		**2313.8**		**2209**	

Notes:
See Table 3.1 for general table notes

Table 3.11: Groundwater Pretreatment and Hydrant Sampling Results

	Location	TP-H8A		Hydrant	
	Sample Date	9/18/2019		9/25/2019	
	Sample ID	516008-OU01 WATER		516008-HYDRANT	
	Qc Code	FS		FS	
Parameter	**Units**	Result	Qualifier	Result	Qualifier
Volatile Organic Compounds (VOCs)					
1,1,1-Trichloroethane	µg/L	1	U		
1,1,2,2-Tetrachloroethane	µg/L	1	U		
1,1,2-Trichloro-1,2,2-Trifluoroethane	µg/L	1	U		
1,1,2-Trichloroethane	µg/L	1	U		
1,1-Dichloroethane	µg/L	1	U		
1,1-Dichloroethene	µg/L	1	U		
1,2,3-Trichlorobenzene	µg/L	1	U		
1,2,4-Trichlorobenzene	µg/L	1	U		
1,2-Dibromo-3-chloropropane	µg/L	**0.63**	J		
1,2-Dibromoethane	µg/L	1	U		
1,2-Dichlorobenzene	µg/L	1	U		
1,2-Dichloroethane	µg/L	1	U		
1,2-Dichloropropane	µg/L	1	U		
1,3-Dichlorobenzene	µg/L	1	U		
1,4-Dichlorobenzene	µg/L	1	U		
1,4-Dioxane	µg/L	40	U		
2-Butanone	µg/L	10	U		
2-Hexanone	µg/L	5	U		
4-Methyl-2-pentanone	µg/L	5	U		
Acetic acid, methyl ester	µg/L	2.5	U		
Acetone	µg/L	**8.7**	J		
Benzene	µg/L	**6.5**			
Bromochloromethane	µg/L	1	U		
Bromodichloromethane	µg/L	1	U		
Bromoform	µg/L	1	U		
Bromomethane	µg/L	1	U		
Carbon disulfide	µg/L	1	U		
Carbon tetrachloride	µg/L	1	U		
Chlorobenzene	µg/L	1	U		
Chloroethane	µg/L	1	U		
Chloroform	µg/L	1	U		
Chloromethane	µg/L	1	U		
cis-1,2-Dichloroethene	µg/L	1	U		
cis-1,3-Dichloropropene	µg/L	1	U		
Cyclohexane	µg/L	1	U		
Dibromochloromethane	µg/L	1	U		
Dichlorodifluoromethane	µg/L	1	UJ		
Ethylbenzene	µg/L	**3.5**			
Isopropylbenzene	µg/L	1	U		
Methyl cyclohexane	µg/L	1	U		
Methyl Tertbutyl Ether	µg/L	1	U		
Methylene chloride	µg/L	1	U		
Styrene	µg/L	**8.3**			
Tetrachloroethene	µg/L	1	U		
Toluene	µg/L	**2.2**			
trans-1,2-Dichloroethene	µg/L	1	U		
trans-1,3-Dichloropropene	µg/L	1	U		
Trichloroethene	µg/L	1	U		
Trichlorofluoromethane	µg/L	1	U		
Vinyl chloride	µg/L	1	U		
Xylenes, Total	µg/L	**24**			

Table 3.11: Groundwater Pretreatment and Hydrant Sampling Results

	Location	TP-H8A		Hydrant	
	Sample Date	9/18/2019		9/25/2019	
	Sample ID	516008-OU01 WATER		516008-HYDRANT	
	Qc Code	FS		FS	
Parameter	**Units**	Result	Qualifier	Result	Qualifier
Semi-Volatile Organic Compounds (SVOCs)					
2,2'-Dichlorodiisopropylether	µg/L	50	U		
2,4,5-Trichlorophenol	µg/L	50	U		
2,4,6-Trichlorophenol	µg/L	50	U		
2,4-Dichlorophenol	µg/L	50	U		
2,4-Dimethylphenol	µg/L	50	U		
2,4-Dinitrophenol	µg/L	100	U		
2,4-Dinitrotoluene	µg/L	50	U		
2,6-Dinitrotoluene	µg/L	50	U		
2-Chloronaphthalene	µg/L	50	U		
2-Chlorophenol	µg/L	50	U		
2-Methylnaphthalene	µg/L	**210**			
2-Methylphenol	µg/L	50	U		
2-Nitroaniline	µg/L	100	U		
2-Nitrophenol	µg/L	50	U		
3,3'-Dichlorobenzidine	µg/L	50	U		
3-Nitroaniline	µg/L	100	U		
4,6-Dinitro-2-methylphenol	µg/L	100	U		
4-Bromophenyl phenyl ether	µg/L	50	U		
4-Chloro-3-methylphenol	µg/L	50	U		
4-Chloroaniline	µg/L	50	U		
4-Chlorophenyl phenyl ether	µg/L	50	U		
4-Methylphenol	µg/L	100	U		
4-Nitroaniline	µg/L	100	U		
4-Nitrophenol	µg/L	100	U		
Acenaphthene	µg/L	**15**	J		
Acenaphthylene	µg/L	**160**			
Acetophenone	µg/L	50	U		
Anthracene	µg/L	**18**	J		
Atrazine	µg/L	50	U		
Benzaldehyde	µg/L	50	UJ		
Benzo(a)anthracene	µg/L	**5.3**	J		
Benzo(a)pyrene	µg/L	50	U		
Benzo(b)fluoranthene	µg/L	50	U		
Benzo(ghi)perylene	µg/L	50	U		
Benzo(k)fluoranthene	µg/L	50	U		
Biphenyl	µg/L	**41**	J		
Bis(2-Chloroethoxy)methane	µg/L	50	U		
Bis(2-Chloroethyl)ether	µg/L	50	U		
Bis(2-Ethylhexyl)phthalate	µg/L	50	U		
Butylbenzylphthalate	µg/L	50	U		
Caprolactam	µg/L	50	UJ		
Carbazole	µg/L	50	U		
Chrysene	µg/L	**5.4**	J		
Di-n-butylphthalate	µg/L	50	U		
Di-n-octylphthalate	µg/L	50	U		
Dibenz(a,h)anthracene	µg/L	50	U		
Dibenzofuran	µg/L	**5.4**	J		
Diethylphthalate	µg/L	50	U		
Dimethylphthalate	µg/L	50	U		
Fluoranthene	µg/L	**21**	J		
Fluorene	µg/L	**60**			
Hexachlorobenzene	µg/L	50	U		
Hexachlorobutadiene	µg/L	50	U		
Hexachlorocyclopentadiene	µg/L	50	U		
Hexachloroethane	µg/L	50	U		
Indeno(1,2,3-cd)pyrene	µg/L	50	U		
Isophorone	µg/L	50	U		
N-Nitrosodi-n-propylamine	µg/L	50	U		
N-Nitrosodiphenylamine	µg/L	50	U		

Table 3.11: Groundwater Pretreatment and Hydrant Sampling Results

	Location	TP-H8A		Hydrant	
	Sample Date	9/18/2019		9/25/2019	
	Sample ID	516008-OU01 WATER		516008-HYDRANT	
	Qc Code	FS		FS	
Parameter	**Units**	Result	Qualifier	Result	Qualifier
Naphthalene	µg/L	**350**			
Nitrobenzene	µg/L	50	U		
Pentachlorophenol	µg/L	100	UJ		
Phenanthrene	µg/L	**110**			
Phenol	µg/L	50	U		
Pyrene	µg/L	**29**	J		
Polychlorinated Biphenyls (PCBs)					
Aroclor-1016	µg/L	0.06	U		
Aroclor-1221	µg/L	0.06	U		
Aroclor-1232	µg/L	0.06	U		
Aroclor-1242	µg/L	0.06	U		
Aroclor-1248	µg/L	0.06	U		
Aroclor-1254	µg/L	0.06	U		
Aroclor-1260	µg/L	0.06	U		
Aroclor-1262	µg/L	0.06	U		
Aroclor-1268	µg/L	0.06	U		
PCB (total)	µg/L	0.06	U		
Pesticides					
4,4'-DDD	µg/L	**0.26**	J+		
4,4'-DDE	µg/L	0.05	U		
4,4'-DDT	µg/L	0.05	U		
Aldrin	µg/L	**0.026**	J+		
Alpha-BHC	µg/L	**0.99**	J+		
Alpha-Chlordane	µg/L	0.05	U		
Beta-BHC	µg/L	**0.081**	J+		
Delta-BHC	µg/L	0.05	U		
Dieldrin	µg/L	0.05	U		
Endosulfan I	µg/L	0.05	U		
Endosulfan II	µg/L	0.05	U		
Endosulfan sulfate	µg/L	0.05	U		
Endrin	µg/L	0.05	U		
Endrin aldehyde	µg/L	0.05	U		
Endrin ketone	µg/L	0.05	U		
Gamma-BHC/Lindane	µg/L	0.05	U		
Heptachlor	µg/L	**0.044**	J+		
Heptachlor epoxide	µg/L	**0.14**	J+		
Methoxychlor	µg/L	0.05	U		
Toxaphene	µg/L	0.5	U		
Trans-Chlordane (Gamma)	µg/L	0.05	U		
Oil/Grease					
OIL AND GREASE	mg/L	5.2	U		
Total Metals					
Aluminum	mg/L	**14**			
Antimony	mg/L	0.02	U		
Arsenic	mg/L	0.015	U		
Barium	mg/L	**0.14**			
Beryllium	mg/L	**0.00087**	J		
Cadmium	mg/L	**0.0005**	J		
Calcium	mg/L	**97.8**			
Chromium	mg/L	**0.014**			
Cobalt	mg/L	**0.0097**			
Copper	mg/L	**0.0072**	J		
Iron	mg/L	**24.6**			
Lead	mg/L	**0.013**			
Magnesium	mg/L	**5.5**			
Manganese	mg/L	**0.44**			
Mercury	mg/L	0.0002	U		
Nickel	mg/L	**0.015**			
Potassium	mg/L	**2.9**			
Selenium	mg/L	0.025	U		

Table 3.11: Groundwater Pretreatment and Hydrant Sampling Results

	Location	TP-H8A		Hydrant	
	Sample Date	9/18/2019		9/25/2019	
	Sample ID	516008-OU01 WATER		516008-HYDRANT	
	Qc Code	FS		FS	
Parameter	**Units**	Result	Qualifier	Result	Qualifier
Silver	mg/L	0.006	U		
Sodium	mg/L	**57.6**			
Thallium	mg/L	0.02	U		
Vanadium	mg/L	**0.033**			
Zinc	mg/L	**0.16**			
Dissolved Metals					
Aluminum	mg/L	**15**			
Antimony	mg/L	0.02	U		
Arsenic	mg/L	0.015	U		
Barium	mg/L	**0.15**			
Beryllium	mg/L	**0.00096**	J		
Cadmium	mg/L	0.002	U		
Calcium	mg/L	**107**			
Chromium	mg/L	**0.014**			
Cobalt	mg/L	**0.01**			
Copper	mg/L	**0.0077**	J		
Iron	mg/L	**26.1**			
Lead	mg/L	**0.0074**	J		
Magnesium	mg/L	**5.8**			
Manganese	mg/L	**0.47**			
Mercury	mg/L	0.0002	U		
Nickel	mg/L	**0.016**			
Potassium	mg/L	**2.9**			
Selenium	mg/L	0.025	U		
Silver	mg/L	0.006	U		
Sodium	mg/L	**62.8**			
Thallium	mg/L	0.02	U		
Vanadium	mg/L	**0.035**			
Zinc	mg/L	**0.18**			
Inorganic Compounds					
Chlorine	mg/L	**0.08**	J	**0.32**	J
Total Dissolved Solids	mg/L	**1260**		**207**	J
Biochemical Oxygen Demand	mg/L	12	UJ		
pH	pH Units	**5.94**	J	**7.37**	J
Temperature	°C	**17.2**	J	**20**	J
Total Suspended Solids	mg/L	**74.5**		4	UJ
Total Organic Carbon	mg/L	**23.2**		1	U

Notes:
See Table 3.1 for general table notes
°C - degrees Celcius

Table 1. GPS positions of suspected force main location

Project Location: Saranac Lake, New York
Date of investigation: October 29, 2019
refer to Figure 1 (GPS mapped location of a suspected force main) for plotted coordinates.

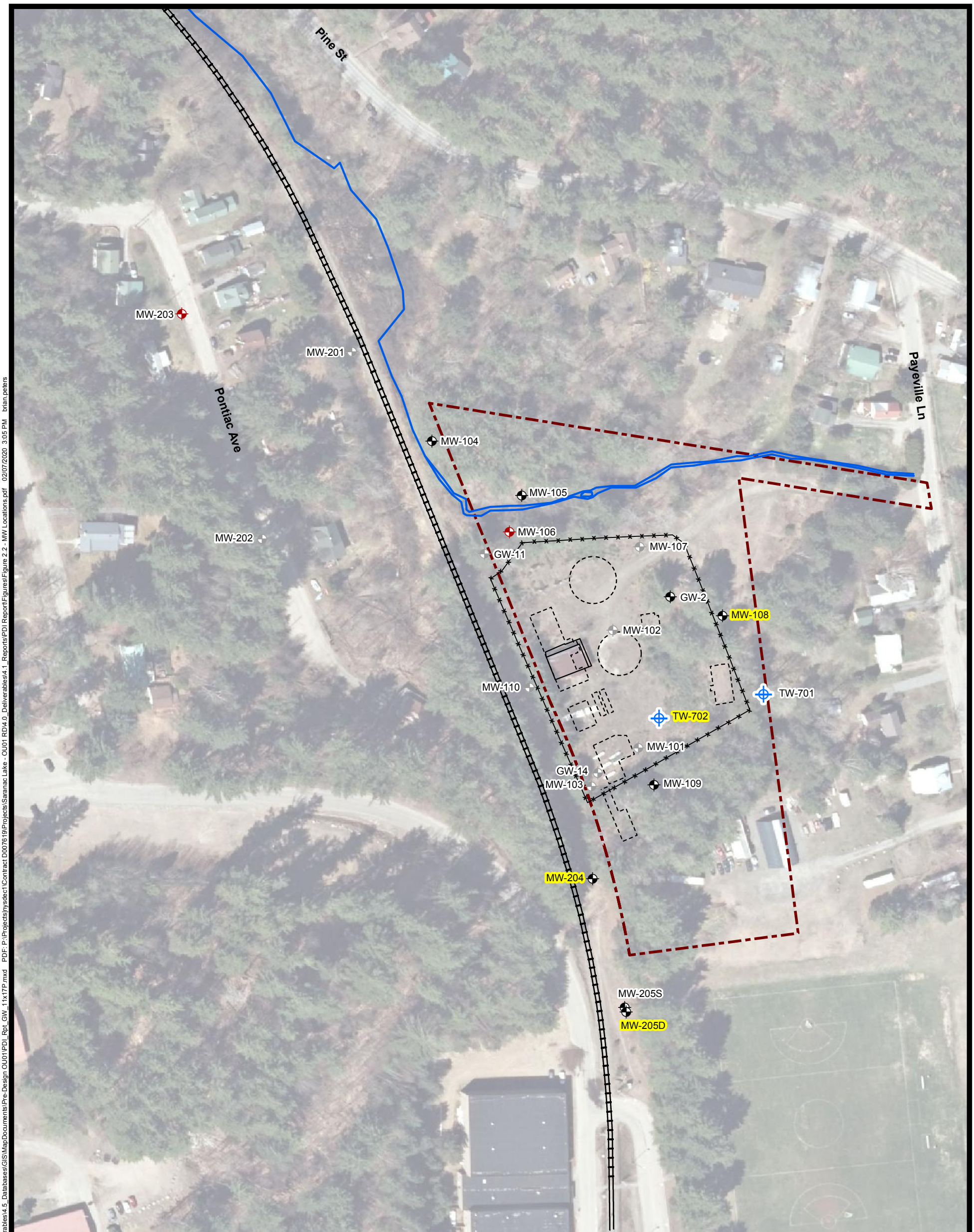
Coordinate System: New York East State Plane, Datum: NAD83, Units: US Survey Feet

Position ID	Easting	Northing
1	591485.247	2000578.550
2	591503.435	2000557.351
3	591518.605	2000543.264
4	591535.130	2000529.897
5	591541.681	2000524.211
6	591553.829	2000511.140
7	591590.630	2000474.605
8	591630.771	2000439.480
9	591638.657	2000431.099
10	591654.492	2000418.114
11	591665.660	2000409.540
12	591688.777	2000401.424
13	591709.012	2000370.748
14	591735.258	2000342.266
15	591747.994	2000326.294
16	591758.191	2000307.047
17	591769.659	2000290.297
18	591787.249	2000253.420
19	591796.851	2000239.292
20	591816.366	2000205.994
21	591836.783	2000173.309
22	591848.106	2000157.630
23	591852.568	2000143.507
24	591864.197	2000124.483
25	591875.085	2000106.651
26	591884.834	2000087.445
27	591895.305	2000073.559
28	591907.411	2000053.772
29	591917.183	2000037.220
30	591933.016	2000000.725

Position ID	Easting	Northing
31	591945.305	1999967.882
32	591954.082	1999954.019
33	591964.290	1999928.163
34	591973.528	1999905.481
35	591993.577	1999859.088
36	592007.240	1999823.845
37	592016.385	1999799.461
38	592028.782	1999764.382
39	592038.952	1999734.831
40	592053.752	1999695.600
41	592065.416	1999666.077
42	592078.132	1999643.099
43	592091.120	1999618.928
44	592100.469	1999606.034
45	592113.007	1999597.260
46	592139.721	1999577.621
47	592152.796	1999543.461
48	592163.885	1999521.541
49	592179.760	1999490.372
50	592202.738	1999446.540
51	592216.991	1999407.032
52	592226.747	1999375.139
53	592230.411	1999359.834
54	592240.266	1999321.749
55	592255.798	1999268.332
56	592261.550	1999251.477
57	592273.177	1999217.688
58	592283.707	1999156.333
59	592291.444	1999117.166

Clean Globe Environmental, Inc - CGE
Email: kweyer@cg-env.com, Phone: 888-454-5923 Ext.700

MONITORING WELL AND PIEZOMETER INSTALLATION LOGS (TO BE ABANDONED)



Legend

- Monitoring Well
- Monitoring Well Could Not be Located
- Decommissioned Monitoring Well
- Temporary Well
- MW-108 2019 PDI Sample Location
- Protect
- Abandon
- Fence
- Brandy Brook
- Existing Structure
- Former Structure
- Adirondack Scenic Railroad
- Saranac Lake Gas Co. Parcel
- Assume Abandoned

N

0 60 120 Feet

Essex County color digital orthoimagery (2017) obtained from New York State GIS Clearinghouse at: https://gis.ny.gov

Prepared/Date: BRP 02/07/20
Checked/Date: NWV 02/07/20

NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

OU01 Monitoring Well Locations

Project 3611191237

Figure 2

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PDI_Rpt_GW_11x17P.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD4.0_Deliverables\4.1_Reports\PDI Report\Figures\Figure 2.2 - MW Locations.pdf 02/07/2020 3:05 PM brian.peters

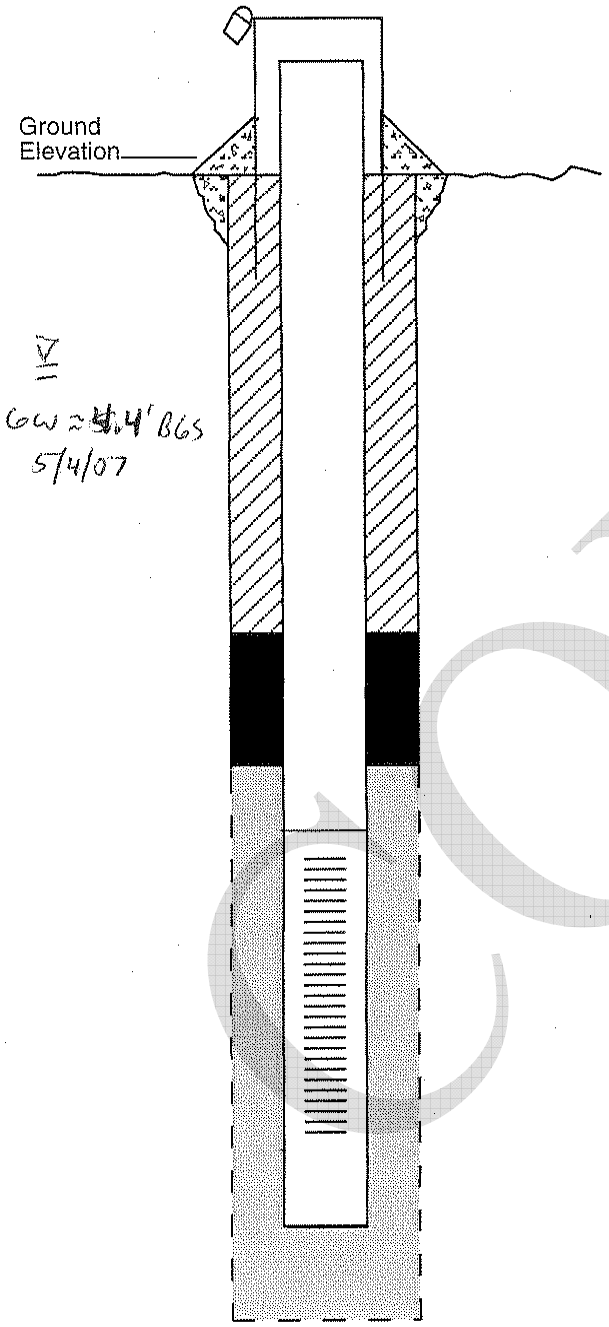
MONITORING WELL CONSTRUCTION DIAGRAM

Project Saranac Lake Gas Co. AOC _____ Driller Mike Sarro

Project No. 3612062058-03.1 Boring No. GS-2 Drilling Method Direct Push

Date Installed 5/1/07 Development Method pump

Field Technician: M. Washburn



Stick-up of Casing Above Ground Surface: 0

Type of Surface Seal/Other Protection: Flush mount in bentonite and cement

Type of Surface Casing: steel flush mount.

ID of Surface Casing: 3"

Diameter of Borehole: 2"

Riser Pipe ID: 1"

Type of Riser Pipe: Sch 40 PVC

Type of Backfill: cement

Depth of Top of Seal: 0.5'

Type of Seal: bentonite

Depth of Top of Sand: 1' BGS

Depth of Top of Screen: 1.2' BGS

Type of Screen: Sch 40 PVC

Slot Size x Length: 0.01" x 9'

ID of Screen: 1"

Type of Sandpack: filter sand and native caverin

Depth of Bottom of Screen: 10' BGS

Depth of Sediment Sump with Plug: 10' BGS

Depth of Bottom of Borehole: 10' BGS

COPY

MACTEC

2002040a L3

MICROWELL CONSTRUCTION DIAGRAM
STICKUP

LOCATION ID: MW PZ-108

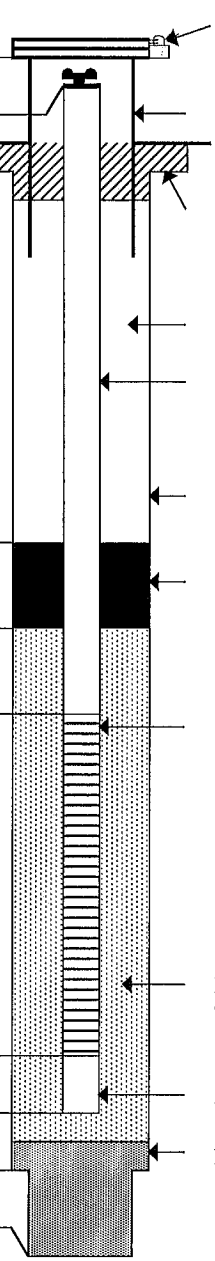
Project Name:	Saranac Lake RI/FS	Date Started:	08-11-13
Project Location:	Saranac Lake, New York	Date Completed:	08-12-13
Project Number:	3612132271	Logged By:	B. Shaw
Task Number	02 04	Checked By:	[illegible]
Subcontractor:	Geologic NY	Checked Date:	1/27/14
Drilling Method:	Direct Push		
Development Method:	Parastaltic Pump	Development Date:	Aug 14, 2013
Bucking Posts/Ballards:	NA		

Notes: DTW: 10.7' bgs (08-11-2013), 13.68 (08-14-13) Installed boring @ H-6

Measuring Point Information

Measuring Point (MP) Type:	Top Of Riser
MP Elevation (ft):	1546.69'

Item	Depth BMP (ft)	Elevation (ft) amsl
Stickup	3.1' ags	1546.75'
Riser Pipe (Top)	3.0' ags	1546.69'
Ground Surface Elevation	0' bgs	1543.7'
Top of Well Seal	0.5' bgs	1543.2'
Top of Sand Pack	~7' bgs	1536.7'
Top of Screen	~9' bgs	1534.7'
Base of Screen	~19' bgs	1524.7'
End Cap	~19' bgs	1524.7'
Drilled Depth	~19' bgs	1524.7'
Bottom of Exploration	~19' bgs	1524.7'
Bedrock Surface	unknown	unk



Description	
Lock Identification	
Stickup Casing Type:	Black steel
Stickup Casing Diameter:	3-inch
Surface Seal Type:	Concrete
Backfill/Grout Type:	NA
Riser Pipe Type:	Sch 40 PVC
Riser Pipe ID:	1-inch
Borehole Diameter:	2 7/8-inch
Type of Seal:	3/8-inch Holeplug Bentonite
Screen Type:	Slotted PVC
Screen ID:	1-inch
Screen Slot Size:	0.01-inch
Screen Length:	~10'
Filter/Sand Pack Type:	#1 Industrial Quartz
Sump:	
Fallback/Backfill:	NA

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

MICROWELL CONSTRUCTION DIAGRAM
STICKUP

LOCATION ID: MW-109

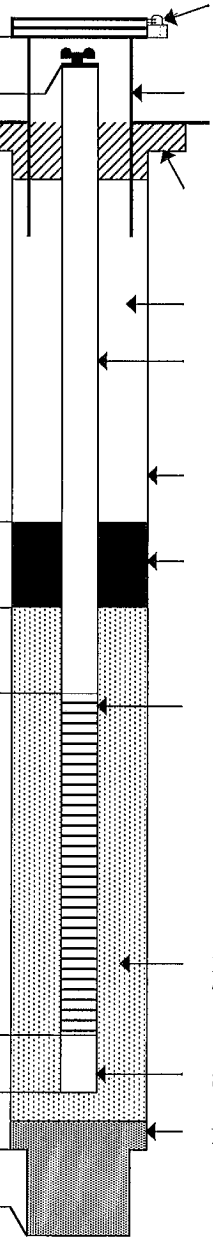
Project Name:	Saranac Lake RI/FS	Date Started:	08-12-13
Project Location:	Saranac Lake, New York	Date Completed:	08-12-13
Project Number:	3612132271	Logged By:	B. Shaw
Task Number	02	Checked By:	[illegible]
Subcontractor:	Geologic NY	Checked Date:	1/27/14
Drilling Method:	Direct Push		
Development Method:	Parastaltic Pump		
Development Date:	August 14, 2013		
Bucking Posts/Ballards:	NA		

Notes: Installed in boring @ F-10
Depth to water: 9.42' (BTOR)

Measuring Point Information

Measuring Point (MP) Type:	Top Of Riser
MP Elevation (ft):	1545.85'

Item	Depth BMP (ft)	Elevation (ft) amsl
Stickup	+3.1' ags	1546.10'
Riser Pipe (Top)	+2.9' ags	1545.85'
Ground Surface Elevation	0' bgs	1543.0'
Top of Well Seal	0.5' bgs	1542.5'
Top of Sand Pack	~4' bgs	1539.0'
Top of Screen	~5.5' bgs	1537.5'
Base of Screen	15.5' bgs	1527.5'
End Cap	15.5' bgs	1527.5'
Drilled Depth	~20' bgs	1523'
Bottom of Exploration	~20' bgs	1523'
Bedrock Surface	Unknown	Unk



Description	
Lock Identification	NA
Stickup Casing Type:	Black Steel
Stickup Casing Diameter:	3-inch
Surface Seal Type:	Concrete
Backfill/Grout Type:	NA
Riser Pipe Type:	Sch 40 PVC
Riser Pipe ID:	1-inch
Borehole Diameter:	2 7/8-inch
Type of Seal:	3/8-inch Holeplug Bentonite
Screen Type:	Slotted PVC
Screen ID:	1-inch
Screen Slot Size:	0.01-inch
Screen Length:	~10'
Filter/Sand Pack Type:	#1 Industrial Quartz
Sump:	
Fallback/Backfill:	native

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

WELL/PIEZOMETER CONSTRUCTION DIAGRAM STICKUP

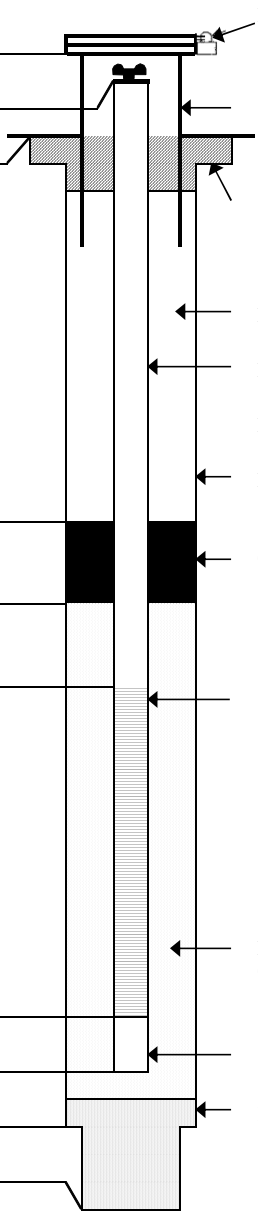
LOCATION ID: TW-702

Project Name:	Saranac Lake OU1 PDI	Date Started:	9/24/2019
Project Location:	Saranac Lake	Date Completed:	9/24/2019
Project Number:	3611191237	Logged By:	Brian Havens
Task Number	3	Checked By:	J Rawcliffe
Subcontractor:	Aztec Drilling	Checked Date:	2/19/2020
Drilling Method:	Direct Push		
Development Method:	Perstaltic pump		
Development Date:	9/25/2019		
Bucking Posts/Ballards:	No		
Notes:	1 inch temporary well No protective casing.		
	Stickup on PVC well riser approximately 2.1 feet above ground surface.		

Measuring Point Information

Measuring Point (MP) Type	Top Of Riser
MP Elevation (ft):	

Item	Depth BMP (ft)	Elevation (ft)
Stickup	2.1	
Riser Pipe (Top)	1545 msl	
Ground Surface Elevatio	1543 msl	
Top of Well Seal	0.1	
Top of Sand Pack	1	
Top of Screen	8	
Base of Screen	18	
End Cap	18	
Drilled Depth	20	
Bottom of Exploration	20	
Bedrock Surface	NA	



Description	
Lock Identification	No Lock
Stickup Casing Type:	NA
Stickup Casing Diameter:	NA
Surface Seal Type:	NA
Backfill/Grout Type:	Sand
Riser Pipe Type:	Sch 40 PVC
Riser Pipe ID:	I inch
Borehole Diameter:	2 inches
Type of Seal:	Bentonite chips
Screen Type:	Sch 40 PVC
Screen ID:	I inch
Screen Slot Size:	0.01"
Screen Length:	10'
Filter/Sand Pack Type:	Sand
Sump:	NA
Fallback/Backfill:	NA

NOT TO SCALE

MACTEC
511 Congress Street, Portland Maine 04101

FIGURE 4.7
WELL/PIEZOMETER CONSTRUCTION DIAGRAM - STICKUP
NYSDEC QUALITY ASSURANCE PROJECT PLAN

APPENDIX A

PHOTOGRAPHS

Appendix A contains select photographs of the Site taken during the execution of the Pre-Design Investigations in 2019. This information is offered for consideration when planning the remedial work.

Appendix C – Site Activities Photographic Log

Client: NYSDEC ***Project Number:*** 3611191237

Site Name: Saranac Lake Gas Company ***Site Location:*** Saranac Lake, New York

Photographer:

Nate Vogan

Date:
September 17, 2019

Photograph: 9

Direction:
Northwest

Description:

Mini Excavator set up on location TP-E6D.

Photographer:

Nate Vogan

Date:
September 17, 2019

Photograph: 10

Direction:
NA

Description:

Waste material in test pit TP-E6D.

Appendix C – Site Activities Photographic Log

Client: NYSDEC ***Project Number:*** 3611191237

Site Name: Saranac Lake Gas Company ***Site Location:*** Saranac Lake, New York

Photographer:

Nate Vogan

Date:
September 30, 2019

Photograph: 11

Direction:
Northwest

Description:

Excavated material with woody debris from near formerly identified purifier box waste area.

Photographer:

Brian Havens

Date:
September 19, 2019

Photograph: 12

Direction:
NA

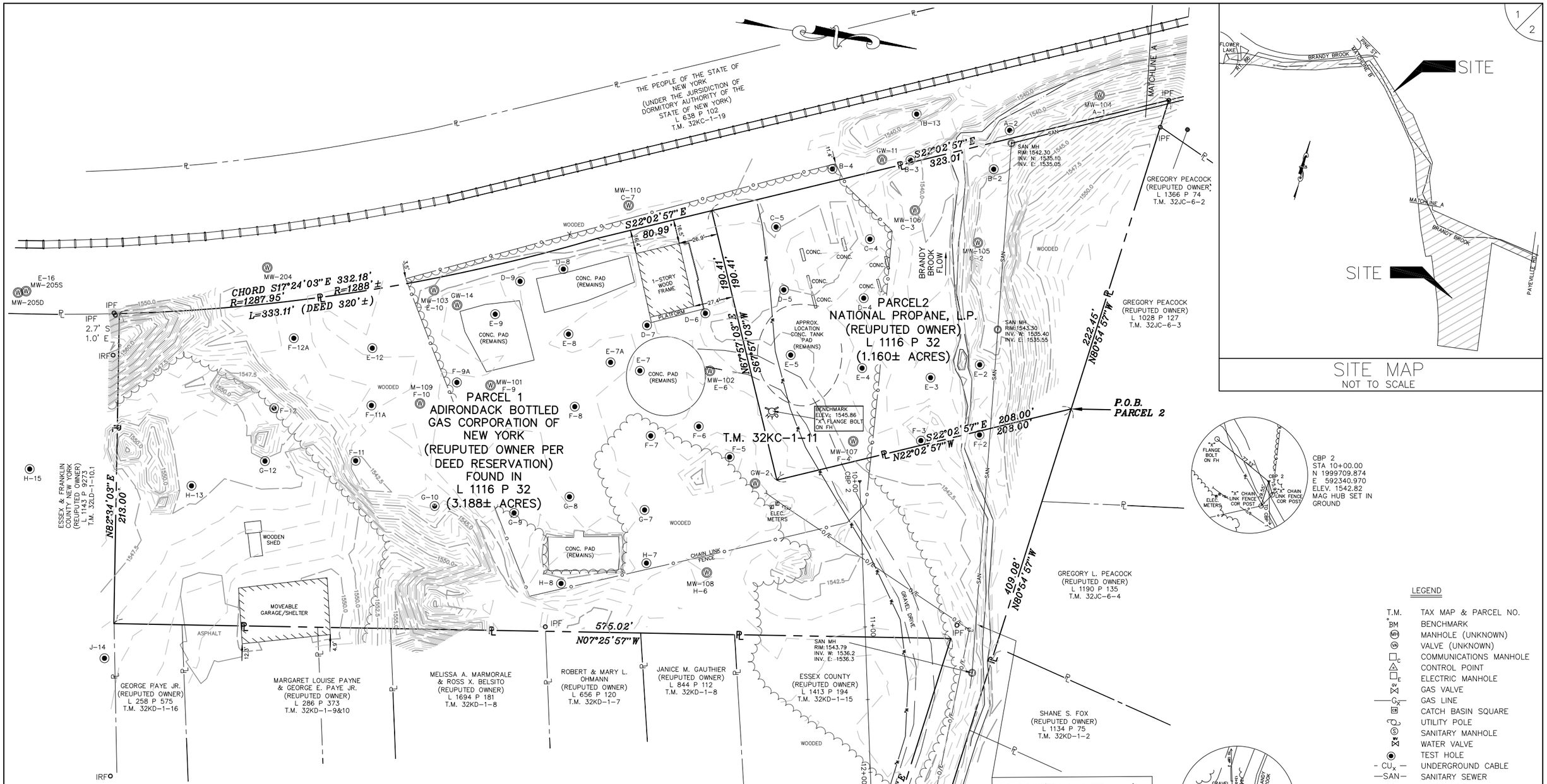
Description:

Excavating to investigate concrete tank stands.

APPENDIX B

SITE SURVEY

Appendix B contains the most recent surveys of the Site. This information is offered for consideration when planning the remedial work.



THE UNDERSIGNED SURVEYOR HEREBY CERTIFIES TO THE PEOPLE OF THE STATE OF NEW YORK ACTING THROUGH THE COMMISIONER OF THE DEPARTMENT OF ENVIROMENTAL CONSERVATION THAT THIS IS AN ACCURATE MAP OF AN ACTUAL SURVEY COMPLETED 6/12/2013. SUBJECT TO ANY STATE OF FACTS AN ACCURATE ABSTRACT DATED AFTER 9/12/2013 MAY SHOW.

STATE OF NEW YORK · MICHAEL ANTHONY VERONE · 56273 · LICENSED LAND SURVEYOR

1/7/14

NOTES:

1. HORIZONTAL COORDINATES REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM (NYSNET), EAST ZONE (3101) BASED ON NAD 83 (2011).

2. VERTICAL DATUM BASED ON NAVD 88 (NYSNET). CONTOURS ARE AT 1/2 FOOT INTERVALS.

3. UNDERGROUND FACILITIES, STRUCTURES AND UTILITIES HAVE BEEN PLOTTED FROM A COMBINATION OF FIELD OBSERVATIONS, AVAILABLE MAPS, RECORDS AND INFORMATION PROVIDED BY THEIR OWNERS, THE LOCATION AND DESCRIPTION SHOULD BE CONSIDERED APPROXIMATE, THERE ALSO MAY BE OTHER FACILITIES, STRUCTURES OR UTILITIES IN THE AREA, THE EXISTENCE OF WHICH IS PRESENTLY UNKNOWN.

LEGEND

T.M.	TAX MAP & PARCEL NO.
BM	BENCHMARK
MH	MANHOLE (UNKNOWN)
VA	VALVE (UNKNOWN)
C	COMMUNICATIONS MANHOLE
	CONTROL POINT
E	ELECTRIC MANHOLE
	GAS VALVE
G	GAS LINE
CB	CATCH BASIN SQUARE
	UTILITY POLE
S	SANITARY MANHOLE
	WATER VALVE
	TEST HOLE
CU	UNDERGROUND CABLE
SAN	SANITARY SEWER
W	WATER LINE
W	MONITORING WELL
	STREET RIGHT-OF-WAY
PL	PROPERTY LINE
O/E	ELECTRIC LINE
	CHAINLINK FENCE
	FIRE HYDRANT
	RAILROAD TRACKS
ST	STORM SEWER
EP	PAVEMENT EDGE
IPF/IRF	IRON PIPE/ROD FOUND
D	STORM MANHOLE

REF.

Saranac Gas Plant
Saranac Lake, NY

"Unauthorized alteration or addition to a survey map bearing a licensed land surveyor's seal is a violation of section 7209, sub-division 2, of the New York State Education Law." "Copies from the original of this survey map not marked with an original of the of the land surveyor's inked seal or his embossed seal shall not be considered a valid true copy."

Part of LOT 13 TOWN North Elba
County of Essex State of New York
Scale of 1 inch = 30' Date 1/7/14 - 12/08/14 (Revised)

PHONE: (315) 432-9823
FAX: (315) 432-9826
6390 FLY ROAD
EAST SYRACUSE, N.Y. 13057
www.PrudentEng.com

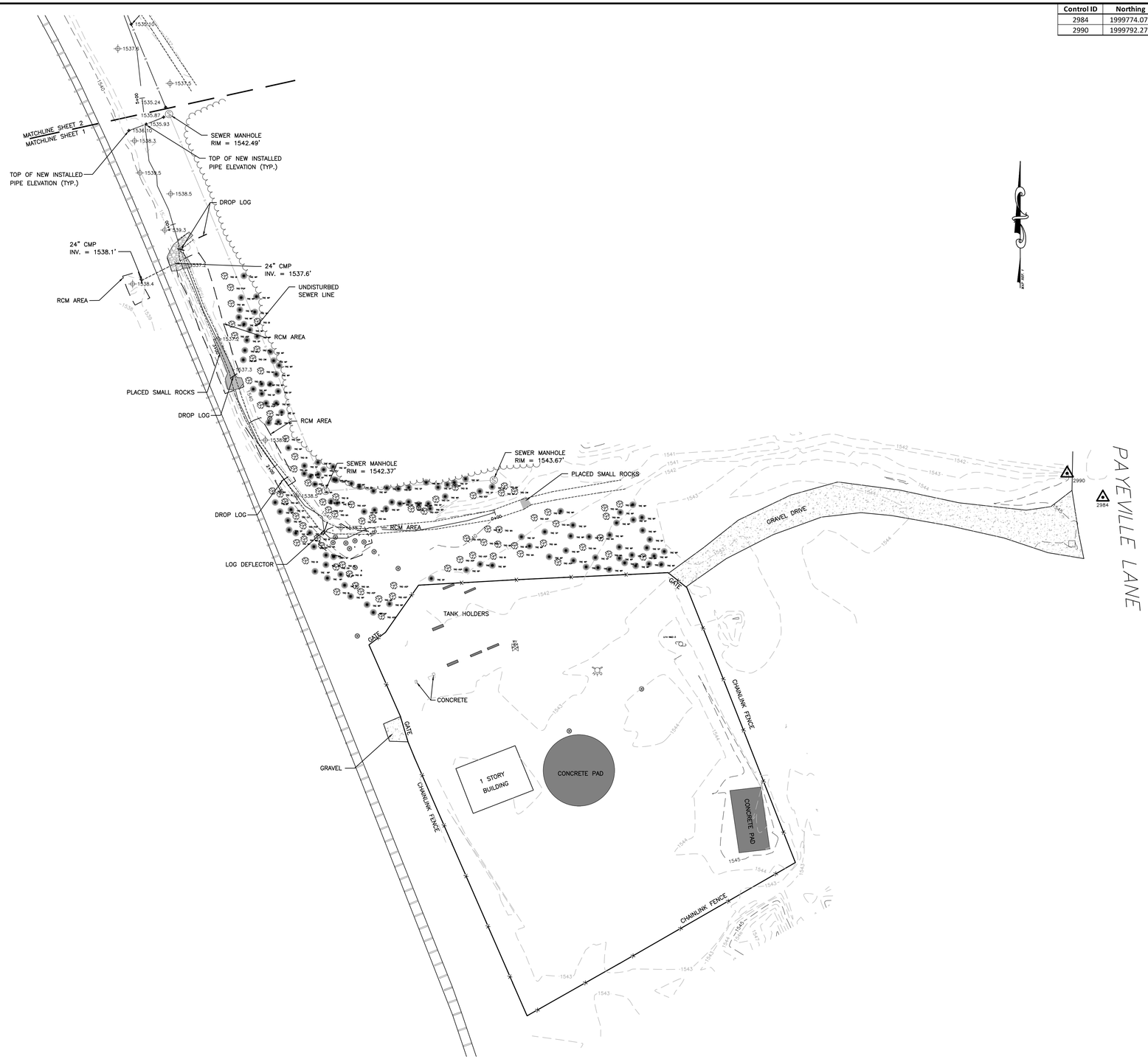
Project No. 109.005-4

PRUDENT ENGINEERING

CADD File Name: M:\Drawings\109\005\Phase 04 – SARANAC GAS PLANT.DWG

IN CHARGE OF M.A.V. DESIGNED BY ____ CHECKED BY ____ ESTIMATED BY ____ CHECKED BY ____ DRAFTED BY B.G.P. CHECKED BY M.A.V.

Control ID	Northing	Easting	Elevation	Description
2984	1999774.077	592685.332	1545.690	CBP
2990	1999792.272	592658.264	1548.420	BM X CUT HEADWALL



SITE LOCATION MAP

N.T.S.

LEGEND:

- UTILITY POLE
- TREE LINE
- WATER VALVE
- FIRE HYDRANT
- MONITORING WELL
- BOLLARD
- SIGN (1 POST)
- SIGN (2 POST)
- CHAINLINK FENCE
- LIGHT POST
- 1531 — MINOR CONTOUR
- 1530 — MAJOR CONTOUR
- 1538.7 GROUND SPOT ELEVATIONS
- 1538.4 TOP OF PIPE ELEVATION
- W — WATER LINE
- G — GAS LINE
- E — UNDERGROUND ELECTRIC LINE
- S — SEWER LINE
- SEWER MANHOLE
- DRAINAGE MANHOLE
- OH — OVERHEAD UTILITY LINE
- GAS VALVE
- ASPHALT
- GRAVEL AREA
- CONCRETE
- REACTIVE CORE MATTING AREA
- BASELINE CONTROL POINT
- DROP LOG STRUCTURES
- EDGE OF STREAM
- PLACED MAPLE
- PLACED ASPEN
- PLACED CHERRY
- PLACED DOGWOOD
- PLACED POPLAR
- PLACED BIRCH
- PLACED SPRUCE
- PLACED WHITE PINE

0 40 80 Feet

NOTES:

1. SURVEY SHOWN WAS PREPARED FROM A JUNE 2019 FIELD SURVEY.
2. SURVEY SUBJECT TO ANY SUBSURFACE CONDITIONS THAT MAY EXIST, IF ANY.
3. NO UNDERGROUND UTILITY INVESTIGATION WAS PERFORMED.
4. THE DATUM USED FOR THIS SURVEY IS BASED ON MAP REFERENCE 1.
5. SURVEY WAS PERFORMED UNDER ICE AND SNOW CONDITIONS, OTHER SITE FEATURES MAY EXIST.

MAP REFERENCES

MAP ENTITLED "REMEDIAL ACTION NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION SARANAC LAKE GAS CO., INC., SITE NO. 516008 OU02: BRANDY BROOK AND OU03 PONTIAC BAY ON LAKE FLOWER", DATED NOVEMBER 29, 2017 AND PREPARED BY MACTEC ENGINEERING AND CONSULTING, P.C..

Well #	Northing	Easting	top of casing elev.	bottom of casing elev.
1	1999744	592103.9	1540.877	1535.585
2	1999740	592102.1	1540.261	1534.969
3	1999739	592111.8	1540.339	1535.047
4	1999735	592114.6	1541.011	1535.719
5	1999741	592118.7	1540.365	1535.073
6	1999740	592125.5	1540.461	1535.169
7	1999733	592133.2	1540.969	1534.219
8	1999721	592118.8	1542.337	1534.004

REVISIONS			
NO.	DATE	DESCRIPTION	BY

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY MAP IS A VIOLATION OF SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW. COPIES OF THIS SURVEY MAP NOT BEARING THE LAND SURVEYOR'S EMBOSSED SEAL AND SIGNATURE IN RED SHALL NOT BE CONSIDERED TO BE VALID COPIES. CERTIFICATES INDICATED OR IMPLIED HEREON SHALL RUN ONLY TO THE PARTY FOR WHOM THE SURVEY IS PREPARED, AND ON THEIR BEHALF TO THE ADDITIONAL PARTIES LISTED HEREON. CERTIFICATES ARE NOT TRANSFERABLE TO ADDITIONAL PARTIES, OR SUBSEQUENT OWNERS, NOT LISTED HEREON.

NATHAN M. BURROWS L.S.
NEW YORK LIC. No. 50,724

NMB LAND SURVEYING PLLC
20 TROY AVE, WYNANTSKILL NY, 12198
518-376-4630

POST CONSTRUCTION TOPOGRAPHIC SURVEY

REMEDIAL ACTION NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SARANAC LAKE GAS CO., INC., SITE 516008
OU02: BRANDY BROOK AND OU03 PONTIAC BAY ON LAKE FLOWER

VILLAGE OF SARANAC LAKE

COUNTY OF ESSEX — STATE OF NEW YORK

SURVEYED BY: AJK,CRT	CHECKED BY: NMB	DATE: 11-6-2019
DRAWN BY: AJK	JOB No. 6530	DWG No. POST CONSTRUCTION

SCALE: 1"=40' — SHEET 1 OF 3

APPENDIX C

RECORDS OF DECISION

Appendix C contains the Records of Decision (RODs) issued for OU01 (March 2017) under the NYSDEC Superfund Program. This information is offered for consideration when planning the remedial work.

RECORD OF DECISION

Saranac Lake Gas Co. Inc.
Operable Unit Number 01: Former Gas Plant Property
State Superfund Project
Saranac Lake, Essex County
Site No. 516008
March 2017

Prepared by
Division of Environmental Remediation
New York State Department of Environmental Conservation

DECLARATION STATEMENT - RECORD OF DECISION

Saranac Lake Gas Co. Inc.
Operable Unit Number: 01
State Superfund Project
Saranac Lake, Essex County
Site No. 516008
March 2017

Statement of Purpose and Basis

This document presents the remedy for Operable Unit Number: 01: Former Gas Plant Property of the Saranac Lake Gas Co. Inc. site, a Class 2 inactive hazardous waste disposal site. The remedial program was chosen in accordance with the New York State Environmental Conservation Law and Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York (6 NYCRR) Part 375, and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for Operable Unit Number: 01 of the Saranac Lake Gas Co. Inc. site and the public's input to the proposed remedy presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Description of Selected Remedy

The elements of the selected remedy are as follows:

1. Remedial Design: A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and

• Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. In-Situ Solidification: In-situ solidification (ISS) of soils will be implemented in a 1.37 acre area (59,500 square feet) where source material exists or total polycyclic aromatic hydrocarbon (PAHs) concentrations exceed 500 ppm. Approximately 24,500 cubic yards of soil will be solidified. The treatment zone will generally extend from approximately five feet below present grade to twenty feet below present grade. The actual contamination depth varies throughout the site so the depth of ISS will vary accordingly. Should the predesign investigation identify any contamination offsite, this material will be consolidated into the onsite area at depth and solidified. ISS is a process that binds the soil particles in place creating a low permeability mass. The contaminated soil will be mixed in place together with solidifying agents (typically Portland cement) or other binding agents using an excavator or augers. The soil and binding agents are mixed to produce a solidified mass resulting in a low permeability monolith. The resulting solid matrix reduces or eliminates mobility of contamination and reduces or eliminates the matrix as a source of groundwater contamination. An estimated six foot pre-excavation will be required to allow for the swelling of the solidified soil during mixing. Of this excavated material, any MGP waste, coal tar, purifier waste, or contaminated soil meeting one or more of the following criteria: visible tar or oil; the presence of sheen or odors with total PAHs over 500 ppm; or total BTEX concentrations of 10 ppm or above, encountered will be disposed of at an off-site treatment or disposal facility. Excavated materials which are below the criteria will be stockpiled and evaluated for use as backfill.

3. Site Cover: A site cover will be required to allow for commercial use of the site, and to protect the ISS component of the remedy. The cover will consist either of the structures such as buildings, pavement, or sidewalks comprising site development, or a site cover in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives (SCOs). In the ISS area, the function of this cover will be to provide sufficient thermal protection of the solidified mass from seasonal freeze/thaw cycles, and to protect the ISS mass from deep root penetration while still allowing re-establishment of an appropriate vegetative cover. To provide this protection, four feet of soil will be established between the solidified matrix and the finished ground surface. Excavated soil below the disposal criteria identified in Element 2 above may be used as backfill with the upper one foot, as well as any fill material brought to the site, meeting the requirements for commercial site use as set forth in 6 NYCRR Part 375-6.7(d).

In areas outside ISS treatment area, a one foot cover will be installed where contamination concentrations are between the commercial SCOs and 500 ppm total PAHs; the imported soil will be placed over a demarcation layer. The upper six inches of the soil in all cover areas will be of sufficient quality to maintain a vegetation layer.

4. Institutional Control: Imposition of an institutional control in the form of environmental easement for the controlled property that:

- Requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- Allows the use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- Requires compliance with the Department approved Site Management Plan.

5. Site Management Plan: A Site Management Plan is required, which includes the following:

a. An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and any off-site impacts, and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in Paragraph 4 above.

Engineering Controls: The solidified soil discussed in Paragraph 2 above, and the site cover system as discussed in Paragraph 3 above. This plan includes, but may not be limited to:

- An Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- Descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;
- A provision for evaluation of the potential for soil vapor intrusion for any existing buildings to be reoccupied or any buildings developed on the site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
- Provisions for the management and inspection of the identified engineering controls;
- Maintaining site access controls and Department notification; and
- The steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- Monitoring of groundwater to assess the performance and effectiveness of the remedy;
- A contingency for in-situ groundwater treatment, such as enhanced bioremediation, to address downgradient groundwater contamination;
- A schedule of monitoring and frequency of submittals to the Department; and
- Monitoring for vapor intrusion for any buildings, as may be required by the Institutional and Engineering Control Plan discussed above.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

March 30, 2017

Date

Robert W. Schick, P.E., Director
Division of Environmental Remediation

RECORD OF DECISION

Saranac Lake Gas Co. Inc.
Saranac Lake, Essex County
Site No. 516008
March 2017

SECTION 1: SUMMARY AND PURPOSE

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected a remedy for the above referenced site. The disposal of hazardous wastes at the site has resulted in threats to public health and the environment that would be addressed by the remedy. The disposal or release of hazardous wastes at this site, as more fully described in this document, has contaminated various environmental media. The remedy is intended to attain the remedial action objectives identified for this site for the protection of public health and the environment. This Record of Decision (ROD) identifies the selected remedy, summarizes the other alternatives considered, and discusses the reasons for selecting the remedy.

The New York State Inactive Hazardous Waste Disposal Site Remedial Program (also known as the State Superfund Program) is an enforcement program, the mission of which is to identify and characterize suspected inactive hazardous waste disposal sites and to investigate and remediate those sites found to pose a significant threat to public health and environment.

The Department has issued this document in accordance with the requirements of New York State Environmental Conservation Law and 6 NYCRR Part 375. This document is a summary of the information that can be found in the site-related reports and documents.

SECTION 2: CITIZEN PARTICIPATION

The Department seeks input from the community on all remedies. A public comment period was held, during which the public was encouraged to submit comment on the proposed remedy. All comments on the remedy received during the comment period were considered by the Department in selecting a remedy for the site. Site-related reports and documents were made available for review by the public at the following document repositories:

NYSDEC Region 5
Attn: Michael P. McLean
1115 Route 86 - PO Box 296
Ray Brook, NY 12977
Phone: 518-897-1243

Saranac Lake Free Library
100 Main Street
Saranac Lake, NY 12983
Phone: 518-891-4190

A public meeting was also conducted. At the meeting, the findings of the remedial investigation (RI) and the feasibility study (FS) were presented along with a summary of the proposed remedy. After the presentation, a question-and-answer period was held, during which verbal or written comments were accepted on the proposed remedy.

Comments on the remedy received during the comment period are summarized and addressed in the responsiveness summary section of the ROD.

Receive Site Citizen Participation Information By Email

Please note that the Department's Division of Environmental Remediation (DER) is "going paperless" relative to citizen participation information. The ultimate goal is to distribute citizen participation information about contaminated sites electronically by way of county email listservs. Information will be distributed for all sites that are being investigated and cleaned up in a particular county under the State Superfund Program, Environmental Restoration Program, Brownfield Cleanup Program, Voluntary Cleanup Program, and Resource Conservation and Recovery Act Program. We encourage the public to sign up for one or more county listservs at http://www.dec.ny.gov/chemical/61092.html

SECTION 3: SITE DESCRIPTION AND HISTORY

Location: The Saranac Lake Gas Company site, a former manufactured gas plant (MGP) facility, is located in a residential setting on Payeville Road in the Village of Saranac Lake, Essex County. The site is approximately 4.5 acres in size and lies east of and adjacent to the Remsen Lake Placid Travel Corridor (railway). Residential properties border the site to the north and east, and a college recreational facility and playing field borders to the south.

Site Features: Currently the main site feature is a fenced storage yard and small open sided building; this fenced area does not reflect the site property line except for a small portion on the west along the railway. The manufactured gas plant was predominantly located within the fenced area. Other site features include Brandy Brook, a wooded area, and an access road on the northern portions of the property and woods and equipment storage on the southern portions.

Current zoning/use: The site is zoned commercial and is currently unoccupied.

Past Use of the Site: From the late 1800s to approximately the 1940s, the site was used for manufacturing lighting gas via coal gasification for the Village of Saranac Lake. The operations consisted of two gas holders, a purifier, retort operations, along with coal storage areas and offices. No original structures exist on site today with the exception of a raised concrete storage pad and concrete foundation for one of the gas holders. The past activities at the site have resulted in contamination, both on and off-site.

Operable Units (OU): An operable unit represents a portion of a remedial program for a site that for technical or administrative reasons can be addressed separately to investigate, eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. There are three OUs associated with this site: the former gasification plant property (OU01); Brandy Brook, running from the site to Pontiac Bay of Lake Flower (OU02); and Pontiac Bay/Lake Flower (OU03). OU02 and OU03 are considered off-site areas.

Site Geology and Hydrogeology: Surficial geology at the Site is predominantly medium to fine sands with some silt. Borings were conducted to as much as 56 feet below ground surface and bedrock was not encountered. Groundwater is very shallow at the site (less than 5 feet) and generally flows to the south; a small brook (Brandy Brook) runs through the northern portions the site. Brandy Brook discharges into Lake Flower approximately 2,000 feet downstream of the site. Sediments in Brandy Brook and Lake Flower are a silty-fine sand, fine sandy silt with traces of clay and gravel.

Operable Unit (OU) Number 01 is the subject of this document.

A Record of Decision was issued previously for OU 02 and 03.

A site location map is attached as Figure 1.

SECTION 4: LAND USE AND PHYSICAL SETTING

The Department may consider the current, intended, and reasonably anticipated future land use of the site and its surroundings when evaluating a remedy for soil remediation. For this site, alternatives (or an alternative) that restrict(s) the use of the site to commercial use (which allows for industrial use) as described in Part 375-1.8(g) were/was evaluated in addition to an alternative which would allow for unrestricted use of the site.

A comparison of the results of the RI to the appropriate standards, criteria and guidance values (SCGs) for the identified land use and the unrestricted use SCGs for the site contaminants is included in the Tables for the media being evaluated in Exhibit A.

SECTION 5: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include:

Saranac Lake Gas Company

SECTION 6: SITE CONTAMINATION

6.1: Summary of the Remedial Investigation

A Remedial Investigation (RI) has been conducted. The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The field activities and findings of the investigation are described in the RI Report.

The following general activities are conducted during an RI:

- Research of historical information,
- Geophysical survey to determine the lateral extent of wastes,
- Test pits, soil borings, and monitoring well installations,
- Sampling of waste, surface and subsurface soils, groundwater, and soil vapor,
- Sampling of surface water and sediment,
- Ecological and Human Health Exposure Assessments.

The analytical data collected on this site includes data for:

- Groundwater
- Soil

6.1.1: Standards, Criteria, and Guidance (SCGs)

The remedy must conform to promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance, as appropriate. Standards, Criteria and Guidance are hereafter called SCGs.

To determine whether the contaminants identified in various media are present at levels of concern, the data from the RI were compared to media-specific SCGs. The Department has developed SCGs for groundwater, surface water, sediments, and soil. The NYSDOH has developed SCGs for drinking water and soil vapor intrusion. The tables found in Exhibit A list the applicable SCGs in the footnotes. For a full listing of all SCGs see: http://www.dec.ny.gov/regulations/61794.html

6.1.2: RI Results

The data have identified contaminants of concern. A "contaminant of concern" is a hazardous waste that is sufficiently present in frequency and concentration in the environment to require evaluation for remedial action. Not all contaminants identified on the property are contaminants of concern. The nature and extent of contamination and environmental media requiring action are summarized in Exhibit A. Additionally, the RI Report contains a full discussion of the data. The contaminant(s) of concern identified for this Operable Unit at this site is/are:

- Coal Tar
- Benzene
- (PAHs), total
- Ethylbenzene
- Xylene (mixed)
- Toluene
- Arsenic
- Cyanides (soluble cyanide salts)

As illustrated in Exhibit A, the contaminants of concern exceed the applicable SCGs for:

- Groundwater
- Soil

6.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before issuance of the Record of Decision.

There were no IRMs performed at this site during the RI.

6.3: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts may include existing and potential future exposure pathways to fish and wildlife receptors, wetlands, groundwater resources, and surface water.

The Fish and Wildlife Resources Impact Analysis (FWRIA) for OU 01, which is included in the RI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

The site investigation performed in 2013 and 2014 detected coal tar wastes and significantly elevated levels of manufactured gas plant (MGP) wastes above NYS standards, criteria, and guidance levels in the soil and groundwater at the former MGP site; along with coal tar wastes and significantly elevated levels of MGP wastes in the sediments of Brandy Brook and Pontiac Bay of Lake Flower. Lake Flower is a Class AA waterbody. The site presents a significant environmental threat due to the numerous media impacted and the ongoing releases from impacted sediment and soil source areas.

Manufactured gas was cooled and purified prior to distribution. The process generated a significant amount of MGP wastes in the form of tars, oils, cinders, coke, and ash. Two principal waste materials were produced in this process: coal tar and purifier waste. Coal tar is a reddish brown oily liquid by-product which formed as a condensate as the gas cooled. Purifier waste is a mixture of wood chips and iron filings which was used to remove sulfur and other compounds from the manufactured gas before the gas was distributed to the public. Purifier waste which was no longer capable of removing the impurities was often disposed of on site.

Coal tar does not readily dissolve in water. Materials such as this are commonly referred to as non-aqueous phase liquids, or NAPLs. Although most coal tars are slightly denser than water, the difference in density is slight. Consequently, they can either float or sink when in contact with water.

Specific volatile organic compounds (VOCs) of concern with coal tar are benzene, toluene, ethylbenzene and xylenes. Specific semi-volatile organic compounds of concern with coal tar are numerous polycyclic aromatic hydrocarbons (PAHs).

Coal tars contain high levels of PAH compounds, often greater than 100,000 parts per million (ppm). Tars also exceed SCGs for BTEX by several orders of magnitude. In certain tar samples, enough benzene may be present to require the material be managed as a hazardous waste.

6.4: Summary of Human Exposure Pathways

This human exposure assessment identifies ways in which people may be exposed to site-related contaminants. Chemicals can enter the body through three major pathways (breathing, touching or swallowing). This is referred to as *exposure.*

The former gasification plant (OU01) is completely fenced, which restricts public access. However, persons who enter the former gasification plant could contact contaminants in the soil by walking on the site, digging or otherwise disturbing the soil. Contaminated groundwater at the former gasification plant is not used for drinking or other purposes and the surrounding area is served by a public water supply that obtains water from a different source not affected by this contamination. Volatile organic compounds in the groundwater or soil may move into the soil vapor (air spaces within the soil), which in turn may move into overlying buildings and affect the indoor air quality. This process, which is similar to the movement of radon gas from the subsurface into the indoor air of buildings, is referred to as soil vapor intrusion. The inhalation of site-related contaminants due to soil vapor intrusion does not represent a current concern because there are no occupied buildings on the site. Furthermore, environmental sampling indicates soil vapor intrusion is not a concern for off-site buildings. People using Pontiac Bay (OU03) for recreational purposes such as swimming and boating may come into direct contact with site-related contaminants in sediment. People may come in contact with contaminants present in the soils and sediments along Brandy Brook (OU02) while entering or exiting the shallow creek during recreational activities.

6.5: Summary of the Remediation Objectives

The objectives for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. The goal for the remedial program is to restore the site to pre-disposal conditions to the extent feasible. At a minimum, the remedy shall eliminate or mitigate all significant threats to public health and the environment presented by the contamination identified at the site through the proper application of scientific and engineering principles.

The remedial action objectives for this site are:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground or surface water contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

SECTION 7: SUMMARY OF THE SELECTED REMEDY

To be selected the remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. The remedy must also attain the remedial action objectives identified for the site, which are presented in Section 6.5. Potential remedial alternatives for the Site were identified, screened and evaluated in the feasibility study (FS) report.

A summary of the remedial alternatives that were considered for this site is presented in Exhibit B. Cost information is presented in the form of present worth, which represents the amount of money invested in the current year that would be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring would cease after 30 years if remediation goals are not achieved. A summary of the Remedial Alternatives Costs is included as Exhibit C.

The basis for the Department's remedy is set forth at Exhibit D.

The selected remedy is referred to as the Excavation of Purifier Waste and In-situ Solidification of MGP Source Materials, remedy.

The estimated present worth cost to implement the remedy is $14,648,000. The cost to construct the remedy is estimated to be $13,851,000 and the estimated average annual cost is $42,000.

The elements of the selected remedy are as follows:

1. Remedial Design: A remedial design program will be implemented to provide the details necessary for the construction, operation, optimization, maintenance, and monitoring of the remedial program. Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major green remediation components are as follows;

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling and increasing reuse of materials which would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible;
- Fostering green and healthy communities and working landscapes which balance ecological, economic and social goals; and
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development.

2. In-Situ Solidification: In-situ solidification (ISS) of soils will be implemented in a 1.37 acre area (59,500 square feet) where source material exists or total polycyclic aromatic hydrocarbon (PAHs) concentrations exceed 500 ppm. Approximately 24,500 cubic yards of soil will be solidified. The treatment zone will generally extend from approximately five feet below present grade to twenty feet below present grade. The actual contamination depth varies throughout the site so the depth of ISS will vary accordingly. Should the predesign investigation identify any contamination offsite, this material will be consolidated into the onsite area at depth and solidified. ISS is a process that binds the soil particles in place creating a low permeability mass. The contaminated soil will be mixed in place together with solidifying agents (typically Portland cement) or other binding agents using an excavator or augers. The soil and binding agents are mixed to produce a solidified mass resulting in a low permeability monolith. The resulting solid matrix reduces or eliminates mobility of contamination and reduces or eliminates the matrix as a source of groundwater contamination. An estimated six foot pre-excavation will be required to allow for the swelling of the solidified soil during mixing. Of this excavated material, any MGP waste, coal tar, purifier waste, or contaminated soil meeting one or more of the following criteria: visible tar or oil; the presence of sheen or odors with total PAHs over 500 ppm; or total BTEX concentrations of 10 ppm or above, encountered will be disposed of at an off-site treatment or disposal facility. Excavated materials which are below the criteria will be stockpiled and evaluated for use as backfill.

3. Site Cover: A site cover will be required to allow for commercial use of the site, and to protect the ISS component of the remedy. The cover will consist either of the structures such as buildings, pavement, or sidewalks comprising site development, or a site cover in areas where the upper one foot of exposed surface soil will exceed the applicable soil cleanup objectives

(SCOs). In the ISS area, the function of this cover will be to provide sufficient thermal protection of the solidified mass from seasonal freeze/thaw cycles, and to protect the ISS mass from deep root penetration while still allowing re-establishment of an appropriate vegetative cover. To provide this protection, four feet of soil will be established between the solidified matrix and the finished ground surface. Excavated soil below the disposal criteria identified in Element 2 above may be used as backfill with the upper one foot, as well as any fill material brought to the site, meeting the requirements for commercial site use as set forth in 6 NYCRR Part 375-6.7(d).

In areas outside ISS treatment area, a one foot cover will be installed where contamination concentrations are between the commercial SCOs and 500 ppm total PAHs; the imported soil will be placed over a demarcation layer. The upper six inches of the soil in all cover areas will be of sufficient quality to maintain a vegetation layer.

4. Institutional Control: Imposition of an institutional control in the for m of environmental easement for the controlled property that:

- Requires the remedial party or site owner to complete and submit to the Department a periodic certification of institutional and engineering controls in accordance with Part 375-1.8 (h)(3);
- Allows the use and development of the controlled property for commercial and industrial uses as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
- Restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or County DOH; and
- Requires compliance with the Department approved Site Management Plan.

5. Site Management Plan: A Site Management Plan is required, which includes the following:

a. An Institutional and Engineering Control Plan that identifies all use restrictions and engineering controls for the site and any off-site impacts, and details the steps and media-specific requirements necessary to ensure the following institutional and/or engineering controls remain in place and effective:

Institutional Controls: The Environmental Easement discussed in Paragraph 4 above.

Engineering Controls: The solidified soil discussed in Paragraph 2 above, and the site cover system as discussed in Paragraph 3 above. This plan includes, but may not be limited to:

- An Excavation Plan which details the provisions for management of future excavations in areas of remaining contamination;
- Descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;
- A provision for evaluation of the potential for soil vapor intrusion for any existing buildings to be reoccupied or any buildings developed on the site, including

provision for implementing actions recommended to address exposures related to soil vapor intrusion;

- Provisions for the management and inspection of the identified engineering controls;
- Maintaining site access controls and Department notification; and
- The steps necessary for the periodic reviews and certification of the institutional and/or engineering controls.

b. A Monitoring Plan to assess the performance and effectiveness of the remedy. The plan includes, but may not be limited to:

- Monitoring of groundwater to assess the performance and effectiveness of the remedy;
- A contingency for in-situ groundwater treatment, such as enhanced bioremediation, to address downgradient groundwater contamination;
- A schedule of monitoring and frequency of submittals to the Department; and
- Monitoring for vapor intrusion for any buildings, as may be required by the Institutional and Engineering Control Plan discussed above.

Exhibit A

Nature and Extent of Contamination

This section describes the findings of the Remedial Investigation for all environmental media that were evaluated. As described in Section 6.1, samples were collected from various environmental media to characterize the nature and extent of contamination.

For each medium for which contamination was identified, a table summarizes the findings of the investigation. The tables present the range of contamination found at the site in the media and compares the data with the applicable SCGs for the site. The contaminants are arranged into 4 categories; volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), inorganics (metals and cyanide), and PCBs/pesticides. For comparison purposes, the SCGs are provided for each medium that allows for unrestricted use. For soil the Restricted Use SCGs identified in Section 4 and Section 6.1.1 are also presented.

Groundwater

Numerous groundwater samples were collected from monitoring wells within the site as part of the Remedial Investigation. Naphthalene was detected at concentrations exceeding its groundwater standard in seven of the sixteen monitoring wells and numerous VOCs and SVOCs were detected at concentrations exceeding SCGs in nine of the sixteen monitoring wells.

Benzene and naphthalene groundwater concentrations suggest that MGP-related contamination is migrating southward from the site source area. Groundwater contamination to the south of the site (off-site) is observed at depths of fifteen to twenty five feet below ground surface within the aquifer in monitoring wells MW-205D and MW-205S. Naphthalene was detected at a concentration greater than ten percent of its solubility approximately 300 feet south of the site at a depth of approximately twenty five feet below ground surface at 2,200 parts per billion (ppb) at MW-205D. Naphthalene was also detected below the SCG in the shallow groundwater (approximately fifteen feet below ground surface) at the same location (MW-205S) at 2.9 ppb, indicating a layer of relatively clean water overlying the deeper contaminated zone. Of note is that groundwater flow is in a southerly direction away from Brandy Brook.

Cyanide was the only site-related inorganic contaminant of concern detected in groundwater that exceeded its groundwater standard. This exceedance was at monitoring well GW-02 located within the source area. Cyanide concentrations are highest within the interpreted site source area and show limited migration, with concentrations decreasing with distance from the source area. Lead was detected above its standard in two monitoring wells (GW2 and GW6) within the source area. Lead was not detected in soil samples above commercial SCG and is also not considered a contaminant of concern. Iron and manganese were also detected in groundwater at concentrations exceeding their SCGs. However, iron and manganese are naturally occurring in the environment, are not contaminants associated with the MGP process, and are not present in site soils above the SCGs. Therefore, these two metals are not considered COCs for this site. Four pesticides were detected and are also not associated with the MGP process and not considered to be contaminants of concern for this site. Refer to Table 1.

Based on the findings of the RI, the presence of MGP wastes has resulted in the contamination of groundwater. The site contaminants that are considered to be the primary contaminants of concern which will drive the remediation of groundwater to be addressed by the remedy selection process are benzene and naphthalene.

Table 1 – Groundwater

Detected Constituent	Range of Detected Concentrations (ppb)[a]			SCG[b] (ppb)	Frequency Exceeding SCG		
Volatile Organic Compounds							
1,2,4-Trimethylbenzene	4	-	200	5	7	/	16
1,2-Dibromo-3-chloropropane	9.4	-	9.4	0.04	1	/	30
1,3,5-Trimethylbenzene	2	-	64	5	6	/	16
4-iso-Propyltoluene	4	-	7	5	2	/	16
Benzene	0.52	-	2500	1	17	/	30
Ethyl benzene	3	-	2900	5	16	/	30
Isopropylbenzene	1.3	-	56	5	8	/	30
Naphthalene	2	-	6400	10	8	/	13
n-Butylbenzene	6	-	7	5	2	/	16
Propylbenzene	2	-	20	5	2	/	16
Styrene	8	-	860	5	12	/	30
Toluene	0.58	-	5200	5	16	/	30
Xylenes (mixed)	1	-	500	5	6	/	13
Semivolatile Organic Compounds							
2,4-Dimethylphenol	1.2	-	3.7	1	3	/	29
Acenaphthene	0.42	-	580	20	11	/	29
Anthracene	0.41	-	1900	50	2	/	29
Benzo(a)anthracene	0.83	-	1300	0.002	6	/	29
Benzo(b)fluoranthene	0.7	-	1000	0.002	7	/	29
Benzo(k)fluoranthene	5	-	430	0.002	3	/	29
Biphenyl	0.69	-	1400	5	7	/	17
Chrysene	0.93	-	1000	0.002	7	/	29
Fluoranthene	0.44	-	4300	50	3	/	29
Fluorene	0.4	-	3000	50	6	/	29
Indeno(1,2,3-cd)pyrene	1.7	-	190	0.002	5	/	29
Naphthalene	2.9	-	29000	10	14	/	29
Phenanthrene	0.53	-	9500	50	6	/	29
Phenol	0.4	-	3	1	2	/	29
Pyrene	0.38	-	4700	50	4	/	29
Inorganics							
Arsenic	17.5	-	47	25	1	/	18
Beryllium	0.16	-	8.8	3	1	/	18
Copper	1.9	-	2000	200	1	/	18
Cyanide, Total	24	-	540	200	1	/	14
Iron	400	-	257000	300	18	/	18
Lead	0.64	-	580	25	2	/	18
Manganese	21	-	918	300	6	/	18
Selenium	2.7	-	10.4	10	1	/	18
Thallium	3.6	-	3.6	0.5	1	/	18
Pesticides/PCBs							
4,4'-DDD	0.53	-	0.53	0.3	1	/	8
4,4'-DDT	0.2	-	0.2	0.2	1	/	8
Alpha-BHC	1.3	-	3.2	0.01	3	/	7
Gamma-BHC/Lindane	0.052	-	0.074	0.05	2	/	8

a - ppb: parts per billion, which is equivalent to micrograms per liter, ug/L, in water.
b- SCG: Standard Criteria or Guidance - Ambient Water Quality Standards and Guidance Values (TOGs 1.1.1), 6 NYCRR Part 703, Surface water and Groundwater Quality Standards, and Part 5 of the New York State Sanitary Code (10 NYCRR Part 5).

Soil

Subsurface soils throughout the site show evidence of impact from MGP-related contamination. S oil contamination was evaluated primarily based on field observations (visual, olfactory and PID readings). A subset of these samples, both with and without observed impacts, were submitted for laboratory analysis. The analytical data collected supports the field observations and confirms either the presence or absence of MGP-related waste. For example, at location D-5, field observations indicated MGP-impacts by visual (observable DNAPL), olfactory (distinctive odor), and field instrumentreadings and subsequent analytical results confirmed the field observations with a total PAH contaminant concentration of 1,163,700 parts per million (ppm). MGP-impacted soil and contaminant concentrations throughout the site exceed unrestricted, residential, commercial and industrial use SCGs for many BTEX and PAH compounds. DNAPL in the form of coal tar was present in twenty seven of the fifty four borings advanced during the remedial investigation. The extent of impacted soil (i.e., source area) is estimated to be approximately 38,500 cubic yards. Purifier box wastes (typically wood chips and/or blue cyanide staining) were observed in soil profiles. The majority of the source area is located within the fenced interior perimeter of the site, with a portion extending beyond the fence to the north and south. Field screening indicated the greatest extent of MGP-impact was generally present between eight feet and twenty feet below ground surface. A three-dimensional interpretation of the volume of MGP-impacted soil is shown in Figure 2.

Inorganic subsurface soil results exceeded the commercial use SCOs for cyanide at two locations (E-4 and TP-04) and arsenic at two locations (E-6 and TP-05). All locations are within the MGP-impacted soil area. No other inorganics or pesticide results exceeded commercial SCGs. Refer to Table 2.

Surface soil samples we re collected during Site Characterization and did not identif y contamination above unrestricted SCOs.

Table 2 - Subsurface Soil

Detected Constituents	Concentration Range Detected (ppm)[a]			Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG			Commercial Use SCG[c]	Frequency Exceeding Commercial SCG		
Volatile Organic Compounds											
1,2,4-Trimethylbenzene	0.001	-	60	3.6	4	/	28	190	0	/	28
1,3,5-Trimethylbenzene	0.001	-	9.8	8.4	1	/	28	190	0	/	28
Acetone	0.014	-	0.068	0.05	1	/	40	500	0	/	40
Benzene	0.004	-	100	0.06	12	/	53	44	4	/	53
Ethyl benzene	0.0008	-	210	1	17	/	53	390	0	/	53
Methylene chloride	0.001	-	4.4	0.05	7	/	53	500	0	/	53
Naphthalene	0.002	-	3300	12	4	/	24	500	3	/	24
Toluene	0.001	-	380	0.7	15	/	53	500	0	/	53
Xylenes (mixed)	0.002	-	100	0.26	5	/	23	500	0	/	23
Semivolatile Organic Compounds											
Acenaphthene	0.0042	-	870	20	15	/	52	500	1	/	52
Acenaphthylene	0.0041	-	690	100	11	/	52	500	3	/	52

Detected Constituents	Concentration Range Detected (ppm)[a]			Unrestricted SCG[b] (ppm)	Frequency Exceeding Unrestricted SCG			Commercial Use SCG[c]	Frequency Exceeding Commercial SCG		
Semivolatile Organic Compounds (cont.)											
Anthracene	0.0063	-	740	100	8	/	52	500	1	/	52
Benzo(a)anthracene	0.0051	-	470	1	29	/	52	5.6	1	/	52
Benzo(a)pyrene	0.01	-	420	1	29	/	52	1	29	/	52
Benzo(b)fluoranthene	0.0091	-	340	1	29	/	52	5.6	27	/	52
Benzo(ghi)perylene	0.064	-	300	100	2	/	52	500	0	/	52
Benzo(k)fluoranthene	0.0046	-	120	0.8	29	/	52	56	2	/	52
Chrysene	0.01	-	430	1	29	/	52	56	10	/	52
Dibenz(a,h)anthracene	0.077	-	26	0.33	18	/	52	0.56	16	/	52
Fluoranthene	0.0048	-	1100	100	12	/	52	500	1	/	52
Fluorene	0.0054	-	820	30	16	/	52	500	1	/	52
Indeno(1,2,3-cd)pyrene	0.09	-	190	0.5	26	/	52	5.6	16	/	52
Naphthalene	0.004	-	6000	12	24	/	52	500	9	/	52
Phenanthrene	0.0088	-	3000	100	16	/	52	500	5	/	52
Pyrene	0.0044	-	1500	100	13	/	52	500	2	/	52
Inorganics											
Arsenic	0.42	-	45.6	13	2	/	31	16	2	/	31
Chromium	1.3	-	21.9	1	31	/	31	400	0	/	31
Copper	0.37	-	57.6	50	1	/	31	270	0	/	31
Lead	0.45	-	639	63	3	/	31	1000	0	/	31
Mercury	0.013	-	0.53	0.18	2	/	31	2.8	0	/	31
Selenium	0.53	-	10.5	3.9	2	/	31	1500	0	/	31
Silver	0.73	-	8.3	2	4	/	31	1500	0	/	31
Zinc	6.4	-	395	109	3	/	31	10,000	0	/	31
Cyanide, Total	0.99	-	423	27	2	/	31	27	2	/	30
Pesticides											
4,4'-DDD	0.019	-	0.18	0.0033	3	/	11	92	0	/	11
4,4'-DDE	0.02	-	0.036	0.0033	2	/	11	62	0	/	10
4,4'-DDT	0.071	-	0.2	0.0033	3	/	11	47	0	/	11
Alpha-BHC	0.36	-	0.36	0.02	1	/	11	3.4	0	/	11
Beta-BHC	0.018	-	0.057	0.036	1	/	11	3	0	/	11
Dieldrin	0.052	-	0.052	0.005	1	/	11	1.4	0	/	11
Endrin	0.019	-	0.28	0.014	2	/	11	89	0	/	11

a - ppm: parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil;
b - SCG: Part 375-6.8(a), Unrestricted Soil Cleanup Objectives;
c - SCG: Part 375-6.8(b) Restricted Use Soil Cleanup Objectives for the Protection of Public Health for Commercial Use

Based on the findings of the Remedial Investigation, the presence of coal tar and MGP and purifier wastes has resulted in the contamination of soil. The site contaminants identified in soil which are considered to be the primary contaminants of concern, to be addressed by the remedy selection process are total PAHs, VOCs, arsenic and cyanide.

Exhibit B

Description of Remedial Alternatives

The following alternatives were considered based on the remedial action objectives (see Section 6.5) to address the contaminated media identified at the site as described in Exhibit A.

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. This alternative leaves the site in its present condition and does not provide any additional protection to public health and the environment.

Alternative 2: Capping & Vertical Barrier

This alternative will include the installation of a low-permeability vertical barrier wall and low-permeability surface cap over the soil with visual MGP impacts. This alternative will result in eliminating the potential for direct exposure to impacted soil and reduced mobility of contamination by controlling the source of groundwater contamination. Continued site monitoring with a contingency for groundwater treatment will be used to address downgradient groundwater.

Alternative 2 consists of the following components: pre-design investigation, pre-remediation pumping/reduction of DNAPL, mobilization of temporary facilities and controls, clearing and grubbing, rough grading on site and removal of large building remnants to establish an even surface for applying the soil cap and vertical barrier, installation of the vertical barrier wall, placement of an impermeable soil cap, continued site monitoring with biological enhancement (if determined necessary), institutional controls, and long-term monitoring and reporting.

The vertical barrier will be designed and constructed along the perimeter of the impacted soil and will be approximately 1,300 linear feet. The barrier will consist of a either a sheet-pile wall or low permeability soil bentonite or cement bentonite slurry. The depth of the slurry wall will extend from near ground surface to approximately forty feet below grade, which is about twice as deep as the average depth of observed MGP impacts. However, if a low permeability layer is identified during the pre-design investigations, the depth may extend to key into this layer. This will be determined during the design phase of the project.

For the placement of the cap the existing 1-story building and concrete pads will be demolished and transported off-site for disposal or re-use. Existing soils and spoils from the vertical wall installation will be graded to provide a smooth area for the surface cap so storm water drains freely off of the cap. The impermeable cap will be composed of a twenty four inch low-permeability layer which will promote surface runoff, thereby limiting infiltration that could impact groundwater quality. The cap will consist of a geocomposite clay layer followed by a clean clay/silt layer compacted to a permeability of approximately 10^{-7} centimeters/second overlain by at least six inches of topsoil. Placement of the cap will cover an approximate 100,500 square-foot area, which will extend approximately five feet beyond the vertical barrier. The capped area will be seeded and erosion control blankets will be installed on sloped areas as needed.

Long term site monitoring will be performed to ensure the effectiveness of the remedy. Semi-annual monitoring will include a visual inspection of the capped area, and groundwater samples will be collected to evaluate potential

ongoing impacts to groundwater. It is assumed that sampling frequency will be reduced to annually after the first two years. Monitoring results will be presented in an annual report. Bio-enhancement, most likely using a controlled oxygen release technology, may be considered to increase aerobic biodegradation of contamination outside the capped area. In addition to monitoring, the capped area will be mowed semiannually to prevent woody vegetation from growing and impacting the cap. Institutional and engineering controls include groundwater use restrictions and soil vapor intrusion evaluation for future site development.

It is estimated it would take one construction season to implement this alternative.

Present Worth: *$3,822,000*
Capital Cost: *$2,612,000*
Annual Costs: *$52,000*

Alternative 3A: In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls

In-Situ Solidification (ISS) will involve mixing the source material soil with solidifying or binding agents, such as Portland cement, using an excavator or augers. The soil and binding agents produce a solidified mass resulting in a low permeability solid matrix that reduces or eliminates mobility of contamination by controlling the source of groundwater contamination.

This alternative would include: pre-design investigation and studies, mobilization and temporary facilities and controls, set-up of staging areas, performance of in-situ solidification within designated OU01 areas, continued site monitoring with biological enhancement, restoration, and long term monitoring.

Prior to conducting ISS, the existing surface cover materials, subsurface obstructions, and several feet of soil (to the top of the groundwater table estimated at five feet) will be removed using the following criteria: visible tar or oil; the presence of sheen or odors with total PAHs over 500 ppm; or total BTEX concentrations of 10 ppm or above and stockpiled. Samples will be collected from the stockpiled material to evaluate if the soil can be reused onsite. Material not suitable for reuse, and purifier waste that is not amenable to the ISS technology will be properly disposed of. It is estimated that approximately 40% of the excavated soil will be reused as backfill after solidification is complete, and the remaining excavated soil will be transported off-site for disposal.

ISS will be performed by mixing a fluid cement/grout into a column of soil without excavating or removing the soil. The design mix of the cement/grout will be based on results of the pilot test. ISS will likely use a large crane or excavator-mounted auger to mix the soil while cement-bentonite grout is pumped through the auger and mixed into the soil. The resulting material is generally a homogeneous mixture of soil and grout that hardens to become a weakly-cemented material. The mixing auger may be six to twelve feet in diameter and the columns of mixed soil and cement will be overlapped to provide continuity. The result will be a significant reduction in leaching and mobility of the contaminants in the soil by reducing the free liquids and hydraulic conductivity of the soil. It is anticipated that the solidification of the soil will increase the overall volume of the treated area by approximately twenty percent.

ISS will be applied to the estimated extent of MGP-impacted soils/source area as shown in Figure 2. ISS will be performed on average from eight to twenty feet below ground surface, depending on location, within an approximately 94,000 square feet area. A soil cover consisting of approximately three feet of re-usable soil from the ISS excavation, overlain by one foot of clean, imported fill and topsoil will be installed for a total of four feet of fill over the solidified soil. The soil cover will be higher than current grades due to the swelling of the soil

during the solidification process and will be graded as a gentle mound. Grass seed will be planted on the soil cover.

Long term site monitoring will be performed to ensure the effectiveness of the remedy. Groundwater samples will be collected semi-annually the first two years and annually for the next three to evaluate ongoing impacts to groundwater. Monitoring results will be presented in an annual report. A five year review report is expected to determine if bio-enhancement is required to address on-site and off-site residual groundwater contamination. It has been assumed that sampling frequency will be reduced to annually after five years. Bio-enhancement, most likely using a controlled release oxygen technology, may be considered to increase aerobic biodegradation of contamination outside the ISS treated area. Soil cover inspections will also be conducted on an annual basis. Institutional and engineering controls include groundwater use restrictions and soil vapor intrusion evaluation for future site development.

It is estimated it would take one construction season to implement this alternative.

Present Worth: *$11,701,000*
Capital Cost: *$10,904,000*
Annual Costs: *$42,000*

Alternative 3B: Partial In-situ Solidification of MGP Source Materials, NAPL Collection, Site Cover, and Institutional Controls

Alternative 3B is similar to 3A with two significant differences. First, ISS will only be applied to the most concentrated area of MGP-impacted soil located near the purifier waste area. ISS in this area will be performed on average from five to twenty feet below ground surface over an approximate 34,500 square feet area. Secondly, this alternative will also include the installation of a non-aqueous phase liquid (NAPL) collection system at the southern portion of OU01, consisting of a stone-filled trench holding three extraction wells with NAPL pumps, solar powered control panels and an enclosed NAPL tank. Extracted NAPL will be transported off-site for disposal.

As with Alternative 3A long term site monitoring will be carried out for a total of up to 30 years and be similar in sampling frequency and potential bio-enhancement. At a minimum, monthly inspections will occur to maintain the NAPL collection system. Site cover inspections will also be conducted on an annual basis. Institutional and engineering controls include groundwater use restrictions and soil vapor intrusion evaluation for future site development.

It is estimated it would take one construction season to implement this alternative, NAPL collection will likely continue to several years.

Present Worth: *$10,760,000*
Capital Cost: *$7,914,000*
Annual Costs: *$152,000*

Alternative 4A: Excavation of MGP Source Materials Area to Meet Commercial SCGs with Site Monitoring

Excavation of impacted soil will involve excavation support, dewatering, excavation, transportation and disposal of soil, backfilling and site restoration. Prior to excavation of MGP impacted soil, the existing surface cover materials and upper several feet of soil from above the impacted area will be removed, characterized, and temporarily stockpiled for re-use as backfill in the excavation.

A steel sheet pile wall will be advanced around the perimeter of the excavation area and will extend to a depth of approximately forty feet, more than twice the average depth of the excavation. Dewatering will be required while excavating. Groundwater removed from the excavation will be treated through a temporary onsite treatment system and will be discharged to Brandy Brook after sampling. Confirmation samples will be collected from the bottom of the excavation after visually impacted soil has been removed. The depth of the excavation will extend as required based on analytical results. Odor controls will be required during excavation, which may include phased excavation within a temporary tent-like structure. Excavated soil will be temporarily stockpiled, sampled and ultimately transported off-site for disposal.

For Alternative 4A, the excavation will occur within the area of MGP-impacted soil in excess of the commercial SCOs. Soil will be excavated for off-site disposal on average from eight to twenty feet below ground surface within an approximately 94,000 square feet area. The excavations will be backfilled with the reusable soil from the upper several feet, and with soil and topsoil meeting the SCOs for commercial use. The final grade of the surface cover will promote surface runoff, thereby limiting infiltration that could impact groundwater quality.

The alternative will also include long term site monitoring and a contingency for enhanced bioremediation of groundwater to increase aerobic biodegradation of contamination outside of the excavated area. Site cover inspections and groundwater monitoring and reporting will be conducted. Institutional and engineering controls include groundwater use restrictions and soil vapor intrusion evaluation for future site development.

It is estimated it would take one construction season to implement this alternative.

Present Worth: *$21,189,000*
Capital Cost: *$20,392,000*
Annual Costs: *$42,000*

Alternative 4B: Partial Excavation of MGP Source Materials with NAPL Collection, Site Cover, and Institutional Controls

Excavation will occur as described in the first two paragraphs of Alternative 4A. For Alternative 4B the excavation process will remove soil from the most concentrated area of MGP-impacts located in the vicinity of the area of the purifier waste material. The average thickness of the excavation in this area will be from five to twenty feet below ground surface over an approximate 34,500 square feet area. This alternative will also include the installation of a NAPL collection system at the southern border of the site, consisting of a stone-filled trench holding extraction wells with NAPL pumps and an enclosed treatment system. Extracted NAPL will be transported off-site for disposal.

Additionally, the top foot of soil outside of the excavation area, but within the MGP-impacted zone will also be removed and used as backfill within the excavation to allow placement of soil and topsoil meeting the SCOs for commercial use in the upper foot. The remaining excavation area will also be backfilled with soil and topsoil meeting the SCOs for commercial use. The final grade of the surface cover will promote surface runoff, thereby limiting infiltration that could impact groundwater quality.

The alternative will also include long term site monitoring, remedial system operation and maintenance, and a contingency for enhanced bioremediation of groundwater to increase aerobic biodegradation of contamination outside of the excavated area. Site cover inspections, groundwater monitoring and treatment system reporting will be conducted. Institutional and engineering controls include groundwater use restrictions and soil vapor intrusion evaluation for future site development.

It is estimated it would take one construction season to implement this alternative, NAPL collection will likely continue to several years.

Present Worth: *$15,278,000*
Capital Cost: *$12,432,000*
Annual Costs: *$152,000*

Alternative 4C: Excavation to Meet Pre-Disposal Conditions with Site Monitoring

Excavation will occur similar in manner described in the first two paragraphs of Alternative 4A. Alternative 4C will include excavation of all MGP-contaminated soils to meet pre-disposal conditions, and will remove soils with site-related contaminant concentrations exceeding the SCOs for unrestricted use. The extent of contamination is currently estimated based on visual/olfactory evidence of MGP waste, but will be refined based on the unrestricted SCOs. The excavation is estimated to occur within a 224,000 square feet area. It is assumed that soil will be excavated for off-site disposal on average from five to twenty feet below ground surface within the 224,000 square feet area.

The excavation will be backfilled with the reusable soil from the upper several feet, and with soil and topsoil meeting the SCOs for unrestricted use. The final grade of the surface cover will promote surface runoff.

The alternative will also include long term site monitoring and a contingency for enhanced bioremediation of groundwater to increase aerobic biodegradation of contamination outside of the excavated area.to increase aerobic biodegradation of contamination outside of the excavated area. Groundwater impacts continue quite distant and deep from the soil impact area. Site cover inspections and groundwater monitoring and reporting will be conducted.

It is estimated it would take two construction seasons to implement this alternative.

Present Worth: *$58,903,000*
Capital Cost: *$58,106,000*
Annual Costs: *$42,000*

Alternative 5: Excavation of Purifier Waste and In-Situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls

This alternative will combine purifier waste area excavation with in-situ solidification of the remaining impacted areas. Purifier waste typically contains complex cyanides and is typically highly acidic and not compatible to ISS treatment.

As with Alternative 3A and 3B in-situ solidification will involve mixing the source material soil with solidifying or binding agents, such as Portland cement, using an excavator or augers. The soil and binding agents produce a solidified mass resulting in a low permeability solid matrix that reduces or eliminates mobility of contamination by controlling the source of groundwater contamination.

This alternative would include: pre-design investigation and studies, mobilization and temporary facilities and controls, set-up of staging areas, excavation followed by performance of in-situ solidification within designated OU01 areas, continued site monitoring with biological enhancement, restoration, and long term monitoring.

Prior to conducting ISS, the existing surface cover materials and several feet of soil will be removed and segregated based of the following criteria: visible tar or oil; the presence of sheen or odors with total PAHs over 500 ppm; or total BTEX concentrations of 10 ppm or above, and stockpiled. The area of purifier waste and existing concrete slabs will be removed and disposed of off-site at this time. Samples will be collected from the stockpiled material to evaluate if the soil can be reused onsite. Material not suitable for reuse will be properly disposed of. It is estimated that approximately forty percent of the excavated soil will be reused as backfill after solidification is complete, and the remaining excavated soil will be transported off-site for disposal. It is anticipated that the solidification of the soil will increase the overall volume of the treated area by approximately twenty percent.

ISS will be applied to the estimated extent of visual MGP-impacted soils/source area as shown in Figure 3. ISS will be performed on average from eight to twenty feet below ground surface, depending on location, within an approximately 59,500 square feet area. A soil cover consisting of approximately three feet of re-usable soil from the ISS excavation, overlain by one foot of soil and topsoil meeting the SCOs for commercial use will be installed, for a total of four feet of clean fill over the solidified soil. The soil cover will be higher than current grades due to the swelling of the soil during the solidification process and will be graded as a gentle mound. Grass seed will be planted on the soil cover.

The alternative will also include long term site monitoring and a contingency for enhanced bioremediation of groundwater to increase aerobic biodegradation of contamination outside of the excavated area. Site cover inspections and groundwater monitoring and reporting will be conducted. Institutional and engineering controls include groundwater use restrictions and soil vapor intrusion evaluation for future site development.

It is estimated it would take one construction season to implement this alternative.

Present Worth: *$14,648,000*
Capital Cost: *$13,851,000*
Annual Costs: *$42,000*

Exhibit C

Remedial Alternative Costs

Remedial Alternative	Capital Cost ($)	Annual Costs($)	Total Present Worth ($)
Alternative 1: No Action	0	0	0
Alternative 2: Capping & Vertical Barrier	2,469,000	42,000	3,266,000
Alternative 3A: In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls	10,904,000	42,000	11,701,000
Alternative 3B: Partial In-situ Solidification of MGP Source Materials, NAPL Collection, Site Cover, and Institutional Controls.	7,914,000	152,000	10,760,000
Alternative 4A: Excavation of MGP Source Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls	20,392,000	42,000	21,189,000
Alternative 4B: Partial Excavation of MGP Source Materials Area with NAPL Collection, Site Cover, and Institution Controls	12,432,000	152,000	15,278,000
Alternative 4C: Excavation to Meet Pre-Disposal Conditions with Site Monitoring	58,903,000	42,000	58,903,000
Alternative 5: Combined Excavation of Purifier Waste and In-Situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls	13,851,000	42,000	14,648,000

Exhibit D

SUMMARY OF THE SELECTED REMEDY

The Department has selected Alternative 5: Excavation of Purifier Waste and In-Situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls as the remedy for this site. Alternative 5 achieves the remediation goals for the site by removing the purifier waste and providing treatment of the source area by in-situ solidification and the establishment and implementation of institutional and engineering controls which includes a site cover system, potential exposure mitigation, and groundwater monitoring to determine the effectiveness of the remedy. The elements of this remedy are described in Section 7. The remedy is depicted in Figure 3.

Basis for Selection

The remedy is based on the results of the RI and the evaluation of alternatives. The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed "threshold criteria" and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.

The selected remedy satisfies this criterion by eliminating the potential for direct contact with contaminated surface soil and immobilizing source material and contaminants of concern by solidification of the subsurface soils, thereby eliminating the potential ongoing release of contaminants into groundwater. Impacts to groundwater are presently minor and are addressed by restricting groundwater use via institutional controls, in combination with groundwater monitoring and potential biological enhancement to verify the effectiveness of the remedy. Soil vapor intrusion will be evaluated with any future site development.

Alternative 1 (No Action) does not address site contamination and does not provide any additional protection to public health and the environment and will not be evaluated further. Alternative 2 (Capping and Vertical Barrier) eliminates direct contact with any contaminated soil, but poses a continued concern for the presence of coal tar in the soil matrix and also creates the potential for ongoing release of contaminants into groundwater. Alternative 3B (Partial ISS of Source Materials, NAPL Collection, Site Cover, and Institutional Controls) and 4B (Partial Excavation with NAPL Collection and Site Monitoring) mitigates the most impacted MGP and purifier waste areas and would extract NAPL, reducing contaminant migration, but the potential for the on going release of contamination to groundwater remains. Alternative 3A (In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls), Alternative 4A (Excavation of MGP Source Materials Area, Site Cover, and Institutional Controls) and Alternative 5 also satisfies this criterion by eliminating direct contact with contaminated subsurface soils through removal and eliminates the potential ongoing release of contaminants into groundwater. All the alternatives rely on a restriction of groundwater use at the site via institutional controls to protect human health until the treatment or removal of the contaminant source results in compliance with groundwater quality standards. Alternatives 3B and 4B would require this restriction in the long term. Alternative 4C, (Excavation to Meet Pre-Disposal Conditions) meets this threshold criterion by removal of all contaminated soils and long-term groundwater monitoring to confirm that stopping the release of coal tar from the soil matrix has resulted in the restoration of groundwater quality. Soil vapor intrusion will be evaluated with any future site

development except for Alternative 4C.

2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

All the retained Alternatives, 2 through 5, comply with SCGs, but do so to different degrees over different time scales. Alternative 2 (Capping and Vertical Barrier) will meet chemical specific SCGs by capping soil contamination in the top two feet of soil and minimize contaminant migration by installation of an impermeable barrier. Alternative 3A (In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls) and Alternatives 4A (Excavation of MGP Source Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls) satisfy the threshold criteria for commercial SCGs. Alternative 3B (Partial ISS of Source Materials, NAPL Collection, Site Cover, and Institutional Controls) and 4B (Partial Excavation with NAPL Collection and Site Monitoring) may contribute to the ongoing release of contaminants into groundwater and may take decades for NAPL recovery to be completed. Alternative 4C (Excavation to Meet Pre-Disposal Conditions) complies with SGCs through removal or treatment of soils with any level of PAHs. Alternative 5 also complies with SGCs to the extent practicable. It addresses source areas of contamination to the groundwater and achieves the commercial use cleanup objectives at the surface through construction of a site cover. It also creates the conditions necessary to restore groundwater quality to the extent practicable by solidifying contaminants in subsurface soils and preventing their migration and release into groundwater. The remaining criteria are particularly important in selecting a final remedy for the site

The next six "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

3. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

Long-term effectiveness is best accomplished by those alternatives involving excavation of the contaminated subsurface soils (Alternatives 4A, 4B, 4C, and 5). Alternative 4A (Excavation of MGP Source Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls) would remove soils above commercial SCGs but not to unrestricted conditions; institutional controls such as groundwater and land use restrictions and monitoring will address any remaining contamination. Alternative 4C (Excavation to Meet Pre-Disposal Conditions) would meet unrestricted SCGs. Alternative 4B (Partial Excavation with NAPL Collection and Site Monitoring) would only remove the most contaminated soils and leave soil above commercial SCGs. Alternative 5 excavates the area of purifier waste to the extent practical. Since Alternative 5 solidifies the remaining impacted subsurface soils rather than removing them, some level of long-term management of coal tar and contaminants of concern in the in-situ solidified mass will be necessary. However, the potential for direct contact and the leaching of contaminants in the in-situ solidified mass to groundwater will be greatly reduced. The contaminants remaining in the in-situ solidified mass will be addressed by institutional controls such as groundwater and land use restrictions and groundwater monitoring and potential bio-enhancement. The institutional controls required for the Alternative 5 and Alternative 3A (In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls) are effective methods of control in the long-term. Alternative 3B (Partial ISS of Source Materials, NAPL Collection, Site Cover, and Institutional Controls) would only treat the most contaminated soils and also

leave soil above commercial SCGs. All Alternatives except Alternative 4C will require mowing, inspections, and maintenance to ensure the cap remains effective.

4. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

Alternative 2 (Capping and Vertical Barrier) would leave the majority of the contaminants on site beneath the cap and within the limits of the barrier wall. Alternative 3B (Partial ISS of Source Materials, NAPL Collection, Site Cover, and Institutional Controls) and 4B (Partial Excavation with NAPL Collection and Site Monitoring) would only remove or treat the most concentrated area of MGP-impacted soil located in the purifier waste area. Alternatives 4A (Excavation of MGP Source Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls) and 4C (Excavation to Meet Pre-Disposal Conditions) will reduce the volume of contamination present at the site by the removal of impacted soil and source material. This soil and source removal under Alternatives 4A and 4C also reduces the mobility of contaminants. Both Alternative 5 and Alternative 3A (In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls) will partially reduce the volume of contamination by excavation for the ISS expansion, however much of the volume of contamination will remain in the solidified mass. Alternative 5 will directly reduce the mobility of coal-tar and contaminants of concern in soils by excavation of the purifier waste and the physical solidification of the MGP impacted soil. Groundwater monitoring and site management are required for Alternatives 2, 3A, 3B, 4A 4B, and 5 and to a lesser degree with Alternative 4C. Alternative 4C provides the greatest reduction in mobility and volume of contamination.

5. Short-term Impacts and Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.

Alternative 2 (Capping and Vertical Barrier) would be the quickest to implement. Alternative 3A (In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls), Alternative 3B (Partial ISS of Source Materials, NAPL Collection, Site Cover, and Institutional Controls) and Alternative 5 have similar short-term impacts resulting from the implementation of ISS and removal of the building foundations and associated debris, and excavation and restoration of soils. The methods available to control these impacts are available and reliable. Alternatives 4A (Excavation of MGP Source Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls) and 4B (Partial Excavation with NAPL Collection and Site Monitoring) would have additional negative short term impacts due to contaminant excavation, off-site trucking, and off-site disposal. Alternative 4C (Excavation to Meet Pre-Disposal Conditions) will involve the greatest excavation quantities and depths, resulting in the greatest and significant negative short-term impacts with a high level of disruption due to the removal and replacement and the largest truck traffic volume.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

Alternative 2 (Capping and Vertical Barrier) will have technical concerns with implementing associated primarily with the size of the equipment required to install the barrier wall and will be contingent upon cooperation of the community and land owners surrounding the site as portions of the barrier wall and monitoring wells will likely

require installation on adjacent par cels. Additionally, Alternative 3A (In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls) and Alternative 3B (Partial ISS of Source Materials, NAPL Collection, Site Cover, and Institutional Controls) involves ISS of purifier waste; purifier waste typically contains complexed cyanides and is highly acidic and typically not amenable to ISS treatment. Alternative 4A (Excavation of MGP Sour ce Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls), 4B (Partial Excavation with NAPL Collection and Site Monitoring) and 4C (Excavation to Meet Pre-Disposal Conditions) would be l ess implementable because deep excavation would require greater structural controls and wat er management. Alternative 4C would be least implementable due to the si ze of the ex cavation area, volume of excavated soils a nd required backfill, and need for extensive dewatering and associated water treatment. Alternative 5 is the most implementable because ISS poses a lower level of difficulty for implementation in the geological conditions identified at the site.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

The costs of the alternatives vary significantly. Alternative 2 (Capping and Vertical Barrier) costs the least. Alternative 3A (In-situ Solidification of MGP S ource Materials, Site Cover, and Institutional Controls) and Alternative 3B (Partial ISS of Source Materials, NAPL Collection, Site Cover, and Institutional Controls) costs are the next most cost-e ffective option but conc ern regarding the effectiveness of ISS in purifier waste areas remain. Alternative 5 is the next most c ost-effective option and provides for the current and future land use, addresses source areas and purifier waste areas and possible future groundwater impacts via source material solidification. The excavation alternatives: Alternative 4A (Excavation of MGP Source Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls), 4B (Partial Excavation with NAPL Collection and Site Monitoring) and Alternative 4C (Excavation to Meet Pre-Disposal Conditions) cost the most. Alternative 4C (Excavation to Me et Pre-Disposal Conditions) is the least cost effective as its hig h cost will not le ad to a comparatively higher value in added environmental protection or increase in actual land use in a ddition to the current and future planned land use.

8. Land Use. When cleanup to pre-disposal co nditions is determined to be infeas ible, the Dep artment may consider the current, intended, and reasonable anticipated future land use of the site and its surroundings in the selection of the soil remedy.

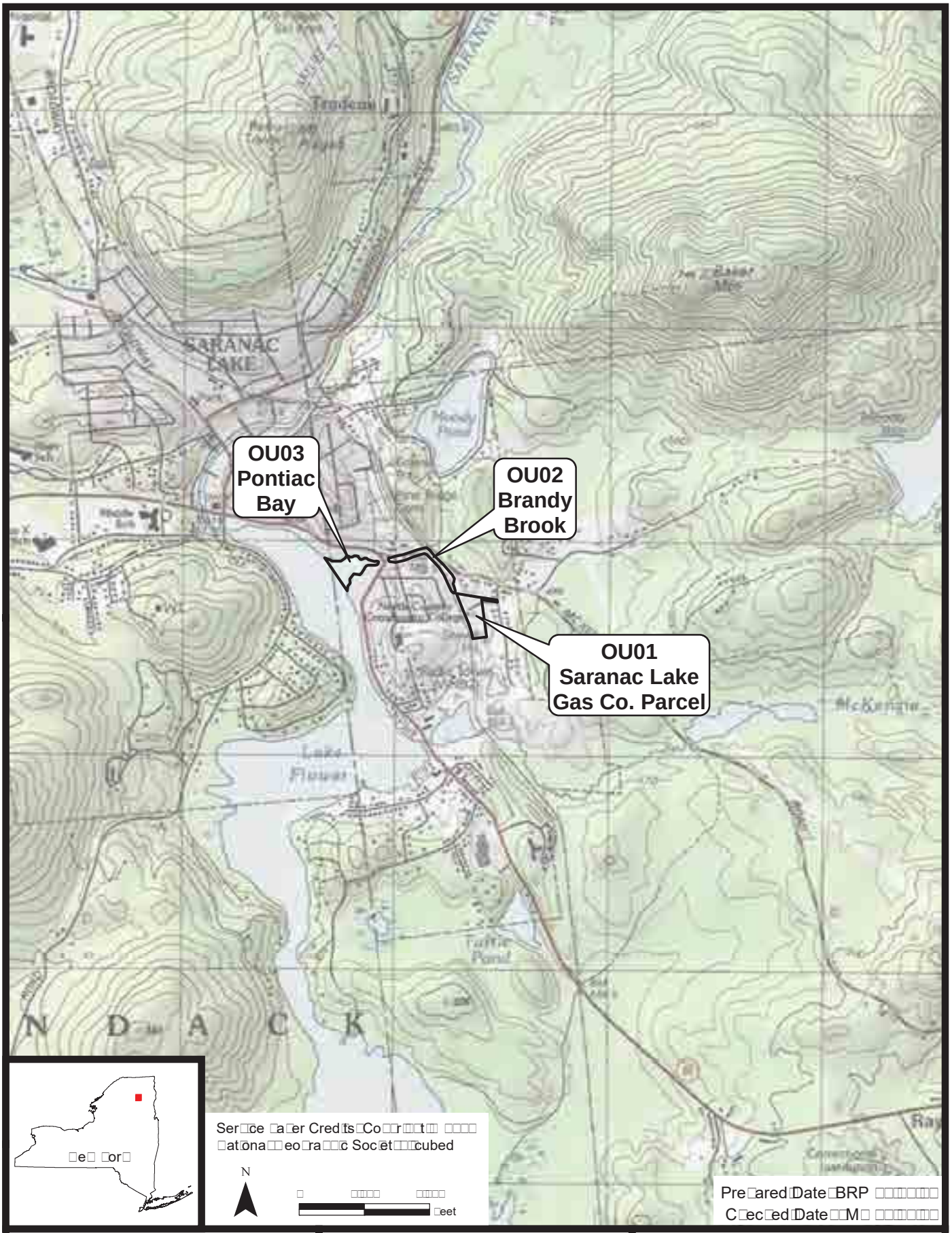
All Alternatives 2 thru Alternative 5 are consistent with the reasonably-anticipated commercial land use of the site. Alternative 4A (Ex cavation of MGP Sour ce Materials Area to Meet Commercial SCGs, Site Cover, and Institution Controls) and 4C (Excavation to Meet Pre-Disposal Conditions) will remove contaminants of concern while allowing for cur rent and planned land use. Al ternative 5 and 3A (In-situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls) will allow for the current and future planned land use with some contaminants remaining in the solidified mass. Finally, Alternative 4C (Excavation to Me et Pre-Disposal Conditions) would allow for any future land use. The site currently is a 4.5 acre vacant lot zoned for commercial use.

The final criterion, Community Acceptance, is considered a "modifying criterion" and is taken into account after evaluating those above. It is evaluated after public comments on the Remedial Action Plan have been received.

9. Community Acceptance. Concerns of the community regarding the investigation, the evaluation of alternatives, and the PRAP are evaluat ed. A re sponsiveness summary will be prepared that describes public

comments received and the manner in which the Department will address the concerns raised.

Alternative 5: Excavation of Purifier Waste and In-Situ Solidification of MGP Source Materials, Site Cover, and Institutional Controls is selected because, as described above, it satisfies the threshold criteria and provides the best balance of the balancing criterion.



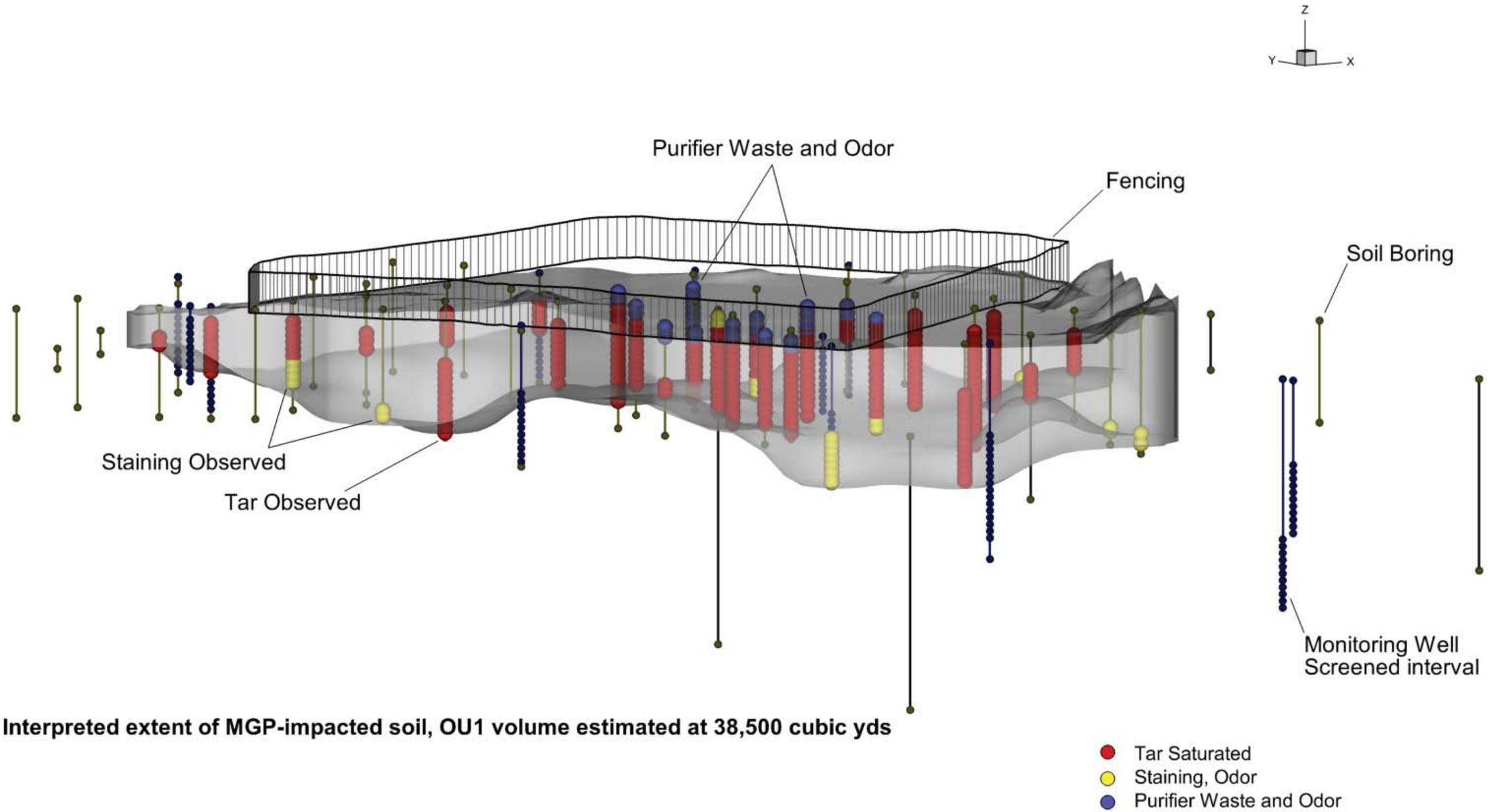
SD C S te
Saranac a e as Co nc
Saranac a e e or

MACTEC

S te ocat on Ma

Pro ect ure

Document: P:\Projects\nsdec\Contract D\Projects\Saranac a e R S\Deliverables\Databases\S Ma\Documents\Phase R\Site Location Ov m d
PD: P:\Projects\nsdec\Contract D\Projects\Saranac a e R S\Deliverables\Reports\R Report\Figures\Figure Site Location d PM bran eters



NYSDEC – Site # 516008 **Saranac Lake Gas Company** **Saranac Lake, New York**	MACTEC	**Interpretation of the Volume of MGP-Impacted Soil from OU01 (showing translucency)** **Project 3612132271** **Figure 2**

Property Boundary/
OU1 Site Boundary

The eastern boundary/access road is not shown but extends approximately 50' east to Payeville Road

E4		
Cyanide	62.8	1.4 - 1.7 ft bgs

Potential for Off-Site Impacts to Soils Exist

Estimated Extent of In-Situ Solidification (59,500 square feet)

GW-02		
Lead	580 ug/L	5.0 ft bgs

E6		
Arsenic	34.8	1.5 - 2.0 ft bgs
Lead	639	1.5 - 2.0 ft bgs
Benzene	75,000	10.4 - 12 ft bgs

GS-06		
Benzene	67,000	7 ft bgs

TP-04		
Cyanide	423	6.0 ft bgs

G8		
Benzene	100,000	5.2 - 6 ft bgs

GW-06		
Lead	142 ug/L	8.0 ft bgs

TP-05		
Arsenic	45.6	2.0 ft bgs

Estimated Visual Extent of Purifier Box Waste Material to be Excavated (~34,500 square feet)

Temporary NAPL Collection Area

Potential for Off-Site Impacts to Soils Exist

F8		
Benzene	50,000	3.5 - 4 ft bgs

Property Boundary/
OU1 Site Boundary

Legend

PA□ Concentrat□ons Detected □n □round□ater□

- □ot Detected Abo□e t□e Re□ort□n□ □□m□t
- Detected □ C□ass □A Standard
- □□ceeds C□ass □A Standard

PA□ Concentrat□ons Detected □n So□□

- □ot Sam□□ed
- □ot Detected Abo□e t□e Re□ort□n□ □□m□t
- Detected □ Restr□□ted Res□dent□□ Cr□ter□
- □□ceeds Restr□□ted Res□dent□□ Cr□ter□
- □□ceeds Commerc□□ Cr□ter□
- □□ceeds □ndustr□□ Cr□ter□

TP□□□ □□□□ SC Data

M□ □□□□ □□□□□□□□□□ R□Data

□□□□ Sam□□e De□t□ □□t b□s□

Sam□□e □□□□□□□□ Ana□□t□□□ Data

A□□ro□□mate □round□ater □□□ D□□□□□□□

□u□□Source Area □n□S□tu So□d□□□□□□

□st□mated □□□tent o□□□sua□ M□P□m□acted So□s

□st□mated □□sua□□□tent o□ Pur□□er Bo□□ aste Mater□□ to be □□□□□□ated □□□□□□□ S□□

Tem□orar□ □AP□ Co□□□□□□ Area

□ence

Brand□ Broo□

□□st□n□ Structure

□ormer Structure

Ad□□rondac□ Scen□c Ra□□road

Pro□□□□□□□□ Boundar□□ O□□ S□te Boundar□

Soil Cleanup Objective - mg/kg		
RES	COMM	IND

Groundwater SCG - ug/L	
	Exceedance of TOGS 1.1.1

S□uare Pos□□□□ □n Stac□ □nd□cates So□□De□t□□

□□□ □t b□s
□□□ □t b□s
□□□□ □t b□s
□□□□□ □t b□s
□ □□ □t b□s

PA□s □Po□□c□□c Aromat□c □□drocarbons

Cr□ter□□
So□□C□eanu□ Ob□ect□□es Cr□ter□ □rom Sub□art □□□□□□□□b□

□round□ater Cr□ter□ □rom Tec□n□□□ and O□□□□□□□□□ □□□□□□□□□□

APPENDIX A

Responsiveness Summary

RESPONSIVENESS SUMMARY

Saranac Lake Gas Co. Inc.
Operable Unit No. OU01 Former Gas Plant Property
State Superfund Project
Saranac Lake, Essex County, New York
Site No. 516008

The Proposed Remedial Action Plan (PRAP) for the Saranac Lake Gas Co. Inc. site was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on February 24, 2017. The PRAP outlined the remedial measure proposed for the contaminated soil and groundwater at the Saranac Lake Gas Co. Inc. site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on March 8, 2107, which included a presentation of the remedial investigation, feasibility study (RI/FS) for the Saranac Lake Gas Co. Inc. as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on March 27, 2017.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

COMMENT 1: Is there somewhere on site to dump the coal tar soil? If not, where would it go?

RESPONSE 1: Only soil that meets commercial standards can remain on site and be used for fill under the site cover. Permitted landfills and treatment facilities may accept the coal tar contaminated soil if sample results indicate it meets their permit requirements.

COMMENT 2: If there is 35,000 cubic yards of contaminated soil why are we only addressing 24,500 cubic yards?

RESPONSE 2: The estimated 24,500 cubic yards is volume of soil that will undergo in-situ solidification treatment. This is that portion of the soil where source material exists or the total polycyclic aromatic hydrocarbon concentrations exceed 500 ppm. Some contaminated soil will remain at the site as noted in RESPONSE 1, which with the imposition of engineering and institutional controls, will be protective of public health and the environment for the intended future commercial use of the property.

COMMENT 3: What will the clean-up site order be?

RESPONSE 3: It is anticipated that Operable Unit No. 2, Brandy Brook, and Operable Unit No. 3, Pontiac Bay, will be addressed prior to Operable Unit No. 1, the former MGP Site.

COMMENT 4: How long will it take to complete the cleanup in OU02 and OU03?

RESPONSE 4: It is currently estimated that the work will take two construction seasons.

COMMENT 5: Residents use the former rail corridor for exercise. What is the exposure that can be expected?

RESPONSE 5: The contamination in the rail corridor is at depth or in areas not readily accessible to use of the corridor.

COMMENT 6: Groundwater contamination is headed south?

RESPONSE 6: Yes, the groundwater flow direction from the site is in a southerly direction and not towards Brandy Brook.

COMMENT 7: Will there be monitoring wells around the operable units and will they be monitored?

RESPONSE 7: There will be monitoring wells installed around the former gas plant that will be periodically monitored to ensure the remedy is functioning as designed and constructed.

COMMENT 8: What if the local landfill can't take the waste?

RESPONSE 8: The local landfills can accept petroleum contaminated soils and coal tar contaminated soils at non-hazardous levels. If they do not accept the material or cannot accept the material due to contaminant concentrations, additional disposal facilities are available and will be solicited.

COMMENT 9: Will solidification reduce the odors?

RESPONSE 9: Yes, there is less likelihood of odor issues with solidification versus excavation of contaminated soils, as a majority of the soil treatment will occur in the subsurface environment. There is excavation of purifier waste and some coal tar contaminated materials involved in the remedy. Odors will be monitored and mitigated, as necessary.

COMMENT 10: What if you have an odor complaint? Where do general complaints and questions go?

RESPONSE 10: The public will be notified when the work is to occur and a number to call with questions or concerns will be established. A field office will also be established at or near the site and can be contacted if need be.

APPENDIX B

Administrative Record

Administrative Record

Saranac Lake Gas Co. Inc.
Operable Unit No. 01: Former Gas Plant Property
State Superfund Project
Saranac Lake, Essex County, New York
Site No. 516008

1. "Final Site Characterization Work Plan, Saranac Lake Gas Company Site, Saranac Lake, New York" prepared by MACTEC dated December 2006.

2. "Final Site Characterization Report, Former Saranac Lake Gas Company Site" prepared by MACTEC October 26, 2007.

3. Department of Environmental Conservation Referral Memorandum dated February 8, 2010 for state funding for the Remedial Investigation and Feasibility Study.

4. Site Investigation to begin at Superfund Site Fact Sheet prepared by the Department dated August 2013.

5. "Final Field Activities Plan, Remedial Investigation, Saranac Lake Gas Company Site, Saranac Lake, New York" prepared by MACTEC August 2013.

6. 6 New York Codes, Rules and Regulations Part 375 "Environmental Remediation Programs".

7. "Remedial Investigation Report, Saranac Lake Gas Company, Site #516008" prepared by MACTEC dated January 2015.

8. "Focused Feasibility Study Report, Saranac Lake Gas Company, Site #516008, Operable Unit No. 01" prepared by MACTEC dated January 2016.

9. PRAP Fact Sheet prepared by the Department dated February 2017.

10. Proposed Remedial Action Plan for the Saranac Lake Gas Co. Inc. site, Operable Unit Number 01: Former Gas Plant Property, dated February 2017, prepared by the Department.

APPENDIX D

GROUNDWATER MODELING

Appendix D contains a memo describing the calculations performed as part of groundwater modeling at the Site. This information is offered for consideration when planning the remedial work.

Groundwater modeling in support of the OU-1 remedial measure

Introduction/Purpose:

Alternative plans to stabilize and solidify wastes at the OU-1 site at Saranac Lake raised concerns about the possible effect of a low permeable mass in the aquifer resulting in an unacceptable increase of groundwater level at homes east of OU-1 along Payeville Lane. In addition, due to concerns about excavation of wastes below the water table in the OU-1 area proper, dewatering of certain areas would be necessary. This groundwater modeling has been conducted: 1) in order to estimate potential increase in the water table elevation along the road; and 2) to aid in the estimation of potential groundwater that may need to be handled during potential dewatering activities required for preparing excavation and stabilization procedures.

Model Domain:

A groundwater flow model, using the USGS model code MODFLOW2000, was set up with a domain that covers an area approximately 1050 feet wide (east-west) and 1350 feet long (north-south), the latter being the general inferred direction of groundwater flow headed southerly eventually to Saranac Lake. The model has a uniform 10-by-10-ft grid, yielding 135 rows and 105 columns. The model has an upgradient no-flow boundary condition that represents an inferred groundwater divide about 300 to 400 feet north of Brandy Brook (see Figure 1). The model domain than is about 91.3 percent active, covering about 30 acres. The model to accomplish the first goal has two layers to represent a conservative resulting depth of stabilization of the waste mass. The bottom of layer one in the model is taken as round surface minus 15 feet. Additional layers were added as needed (and discussed below) in order to approximate a potential sequence of dewatering activities. The model origin (its lower, SW corner) is at coordinates (591800E, 1998800N) New York State Plane Coordinate System East Zone based on the North American Datum of 1983 (NAD83).

Boundary Conditions:

Constant head boundaries: In addition to the no-flow boundary north of Brandy Brook, two constant head (CH) boundaries have been added. The first, along the northeast boundary is meant to represent potential flow into the model domain by recharge over an area east of the model domain which represent a rising topography to a probable distant recharge divide. The second CH represent an artificial downgradient boundary as elevations of a wetland area into which site-related groundwater would likely discharge is not known. The elevation assigned to this boundary was adjusted during model calibration but was initially set by assuming some uniform hydraulic gradient in the southerly direction. (See Figure 1.)

Stream: Brandy Brook is represented in the model using the MODFLOW river package. Stage elevations were assigned by linearizing elevations between surveyed inverts at culvert locations and adding one foot. The brook was assumed to be five feet wide and to have one-foot of sediment in its base with an initial hydraulic conductivity equal to that of the aquifer. The resulting conductance value assigned to each brook segment was adjusted in calibration. (See Figure 1.)

Model bottom: The base of the model is assumed to represent the full vertical extent of the aquifer. Based on limited boring data to determine the base of the aquifer (to a confining unit), a total depth from ground surface (input based on available DEM data for the area) of 74.3 feet was specified in

Groundwater Vistas version 6 which is used for the modeling input and output processor. Spot checks on the data extracted from the DEM with surveyed locations indicate a close agreement in the respective elevations.

Recharge:

Recharge is that portion of precipitation infiltration that reaches the groundwater table and becomes a part of the aquifer. Four recharge zones were set up, representing impermeable areas, roads, heavily vegetated areas (such as stands of trees), and open areas (e.g., grassed). Initial recharge rates assigned to each of these was 0, 4.7, 7.0, and 10.5 inches per year (in/yr). During calibration and simulations, these rates would be adjusted or changed. (See Figure 2 for recharge zonation.)

For stabilized waste in place, it is assumed that there will be a cap with underdrain system which allows only minor potential recharge through the cap.

Hydraulic Conductivity Data:

Hydraulic conductivity (K) data for the Site are sparse. For previous work on OU-2 and OU-3, empirical formulas were applied to grain size data to estimate an average K for the aquifer. These results suggested a K value ranging from about 7 to 36 feet per day (ft/d) with a geometric mean of about 16 ft/d. A few slug test data indicated a somewhat lower range of about 7 (average) to 15 ft/d (max). The 2019 Pre-Design Investigation (PDI) had scheduled slug testing at two additional wells, MW-108 and temporary well TW-701. Ks at these locations were estimated as 12.0 and 7.4 ft/d, with an average of 9.7 ft/d. However, these tests were conducted in 1-inch diameter wells which straddles the water table. As a result, much of the initial head displacement by the slug was taken up by the exposed sand pack leading to a double straight line plot leaving only a few hundredths of a foot remaining to collect data for the formation response. The data for the end of the tests were erratic leaving considerable doubt as to the proper alignment of the straight portion representing the K of the formation. Hence, these data, although, in the same general range as previous estimates are still uncertain. Ks in the model would be guided by these ranges, but more determined by the best model fit to water level target data. (See Figure 3 for K zonation.)

Calibration Targets:

Water level data were available from the 2014 RI consisting of 19 data points within the domain of the model. However, the data were erratic, probably due to the response of infiltration to variable effective Ks within the waste mass, and did not yield indications of a uniform hydraulic gradient. The data could only be crudely contoured. It was hopes that perhaps these data represented a transient condition and that data collected during the PDI. In addition, it was hoped that two temporary wells could be installed along Payeville Road to provide data in this area of the model which would have increased confidence in the model fit. However, due to loss of some monitoring well locations in the interim, and the final placement of the two temporary wells near the waste mass rather than farther east, there resulted only 10 water level measurements (accurate survey of the top of casing for the temporary wells was not provided). These measurements also produced erratic elevations similar to the 2014 data set. Hence, due to all of these factors, the 2014 water level data set has been used to calibrate the model to, despite the erratic results for some wells. These lead to a relatively large standard deviation for the residuals, but the objective here is to provide a reasonable modeled water table surface to see if

solidification of the waster mass could result in unacceptable rises in the water table at the homes along Payeville Road. Despite uncertainty in the fit, the model should be adequate for this task and also for preliminary estimates of required dewatering flow rates as these depend mainly only on the K of the aquifer, the open area of the excavation, and the depth of dewatering below the excavation area.

Model Calibration:

Model calibration was carried out by varying Ks, recharge and streambed conductance first using automated programs within Groundwater Vistas. These trials yielded higher end Ks that seemed unreasonable. The K for the aquifer was set at 16 ft/day, that for the in-place wastes at 2 ft/d, and recharge and constant head values were adjusted through calibration. The final input parameter values are presented in Table 1. The final model calibration residuals statistics are presented in Table 2, and the resultant head distribution is presented on Figure 4 for layer 1 and on Figure 5 for layer 2.

The model fit would not be considered good for the reasons explained above. While the average residual is only 0.02 ft, the average absolute residual is 1.42 ft, and the standard deviation of the residuals is 1.76 ft. With a range of water levels of only 10.39 feet, the standard of a normalized standard deviation of < 0.1 could not be met and was 0.169. The maximum and minimum residuals, while large, are balanced, i.e., 3.33 and -3.65 ft.

However, as the use of the model depends more on the K and the representation of the waste mass remediation as a relative change, the model is sufficiently representative of the aquifer system and sufficiently reflects known aquifer characteristics. i.e., input variables are within known or typical ranges.

Simulation of effect of solidification on water level at Payeville Road homes:

The K assigned to the waste mass was educed to an equivalent to 1e-6 centimeters per second (cm/s), i.e., 0.002835 ft/d. This had impacts on the statistics on residuals and the overall mass balance components which are tabulated in Tables 3 and 4, respectively. However, the apparent effect at the homes was a maximum rise of only 0.05 feet.

Sensitivity to changes in K and recharge:

As sensitivity, two additional runs were made, one to lower the K of the aquifer by 50 percent to 8 ft/d and the second to increase the recharge by 25 percent for all zones except that directly over the stabilized area (more would excessively mound above ground surface and be unrealistic). The results on the residuals statistics and the overall water balance are presented in Tables 3 and 4, respectively.

Dropping the K to 8 ft/d in the aquifer produced a rise of 1.13 feet at homes along Payeville Road. This scenario is unlikely as the model itself would have been better calibrated with less impact if calibrated to 8 ft/d in the first place.

Increasing annual average recharge by 25 percent, however, is a more realistic scenario. In this eventuality (seasonal variation), the maximum rise in the water table at the homes was only 0.10 ft. Effects on residuals statistics and overall water balance are presented in Tables 3 and 4.

In both cases, the model fit statistics demonstrate sensitivity to these parameters, but effects along Payeville Road are modest in the case of K and minor in the case of recharge.

Simulation of anticipated rates of dewatering:

Plans for the remediation of wastes at OU-1 have been proposed and include necessary dewatering of specified areas 1, 2, 3 and 4 as shown on Figure 6. While dewatering without enclosure, e.g., sheet piling to surround the area to be excavated, has been considered, concerns were raised for the relatively high estimated hydraulic conductivity (approximately 16 ft/d) and the thickness of the aquifer could lead to high initial and sustained rates of dewatering that would need containerization and treatment. Further with the relatively high transmissivity of the aquifer, drawdowns were anticipated to propagate slowly. The modeling here considers preliminary estimates of flow rates that might be necessary to attain proposed depths of the waste and dewatering to this depth and a foot below that to provide a stable working surface if necessary and examines the feasibility of proceeding with dewatering in this manner.

Dewatering simulations:

Four dewatering simulation runs were made:

First, to dewater a working of Areas 1, 2 and 4 and estimate the flow rate needed to maintain the target water level at that depth while the area was being processed;

Second, to dewater Area 3 to the target depth to estimate the flow rate needed to maintain that target level;

Third, to conduct a transient simulation of what rates might be required to attain the target level for Areas 1, 2 and 4; and

Fourth, to conduct a transient simulation of what rates might be required to attain the target level for Area 3.

Several assumptions were made for the transient modeling. Pumping wells, represented either by the MODFLOW well package (steady-state runs) or drain package (transient runs) were placed at the periphery of the areas to be dewatered and outside laydown areas adjacent to the areas to be dewatered. In the case of Area 3, this limited the placement of wells as the laydown area was very close to the railroad tracks. In addition, to help focus the dewatering, a tight sheet pile wall (assumed 1-ft thick at an effective K of 1e-7 cm/sec) was simulated as between Areas 4 and 5 and also between Areas 3 and 6. The wall was set to extend approximately 50 feet bgs. Further, the river nodes representing Brandy Brook were removed as it was assumed that the brook would be temporarily rerouted so as to not contribute water to the subsurface and would clear this area for remediation of soils if necessary. Lastly, the head distribution from the calibrated model was used as initial heads for the transient runs. A well spacing of about 20-ft was assumed, i.e., about every other column.

The proper placement of wells, drains and sheet pile wall required some restructuring of the model. To this end, two additional model layers were created to allow better definition vertically of the features placed in the model. For example, the wells were placed in new model layer 2, while the sheet pile extended to the bottom of model layer 3.

First simulation:

Figure 7 shows the array of 18 wells (red squares) and the sheet pile wall (dark blue line) for this simulation. The total flow rate was assumed to be equally distributed among the wells. The target dewatering elevation was 1530. Flow rates to the array of wells was increased until this target elevation was attained throughout the Areas. The estimated total flow rate to maintain this elevation once attained (not including any precipitation which might fall into the open excavation was determined to be 36 gallons per minute (gpm). Figure 7 also shows the resulting simulated water level contours.

Second simulation:

Similarly, an estimated steady-state flow rate to maintain the target elevation for Area 3 was determined to be 39 gpm. Although this area is smaller, the target elevation was deeper, at 1526, and only 6 wells could be placed about the area as the layback area was very close to the railroad tracks. As in the previous run, the pumping rates (equal for each well) were increased until the target depth was obtained. This was at 6.5 gpm for each well. The locations of the wells, of the sheet pile wall, and the final groundwater contours are shown on Figure 8.

Third simulation:

In this simulation of dewater in Areas 1, 3 and 4, drain nodes in MODFLOW were used to replace wells as wells can often go dry complicating the manipulation of extraction flow rates. The drain nodes also simulate a decrease in flow rate as the water table drops in the dewatering area. The flow into the simulated well can be easily controlled by increasing or decreasing the drain invert elevation Using a high conductance for the drain allowed it to behave as a well in that there was no resistance to flow into the simulated well. The same array of wells was used for this simulation as in the first, steady-state run for Areas 1, 2 and 4. Figure 9 shows the drain nodes locations with head distribution. Figure 10 is a graph of pumping rate with time (varying from about 200 gpm initially and 77 gpm at 30 days) and Figure 11 is a graph of head in a hypothetical monitoring well with time.

As the plots depict, the target elevation is not reached until day 25, even at these relatively high pumping rates. The drawdown is slow to propagate in the open aquifer of such a relatively high transmissivity. Naturally higher flow rates if they can be maintained could shorten the time to reach the target elevation, but the rates in this simulation are already high, suggesting the need for an alternate approach.

Fourth simulation:

A similar, but longer 60-day transient simulation was conducted for Area 3. Here the 6 wells struggled to reach the target elevation, and in this simulation did not actually achieve it. The drain node invert elevation was set just above the bottom of model layer 2, or about 30 feet bgs. Figure 12 shows the well locations, the sheet pile wall, and the 30-day heads. Again, a hypothetical monitoring well has been included to track the decline in the water level toward the target of 1526 ft. Figure 13 graphs the flux rate over time (initially about 230 gpm, declining to about 65 gpm at day 20, and about 57 gpm at day 60). Figure 14 tracks the decrease in head in the area as registered by the hypothetical monitoring well shown on Figure 11.

The pumping rate could be increased with deeper wells and higher dewatering rates to lessen the time required to reach the target dewatering levels, but they would likely be greater than those considered in this simulation run.

Limitations of the modeling:

The above estimates should be considered approximate given the uncertainties noted in the description of the construction and calibration of the model. There were limited data that could be used to develop the model. In addition, the high flow rates examined in the dewatering simulations may alter the boundary conditions. Some instability in the model was noted but time steps were relatively small and the head closure criterion was met for all steps of the transient runs.

Conclusions:

The model, however, has been a useful tool in determining that: 1) the projected head rises at the Payeville Road home locations due to OU-1 remediation are likely minimal; and 2) that relatively high dewatering rates could be expected with high total volume to handle under the dewatering conditions assumed for these simulations. These high rates and slow drawdown responses may be problematic and alternate dewatering or other measures should be considered.

FIGURES

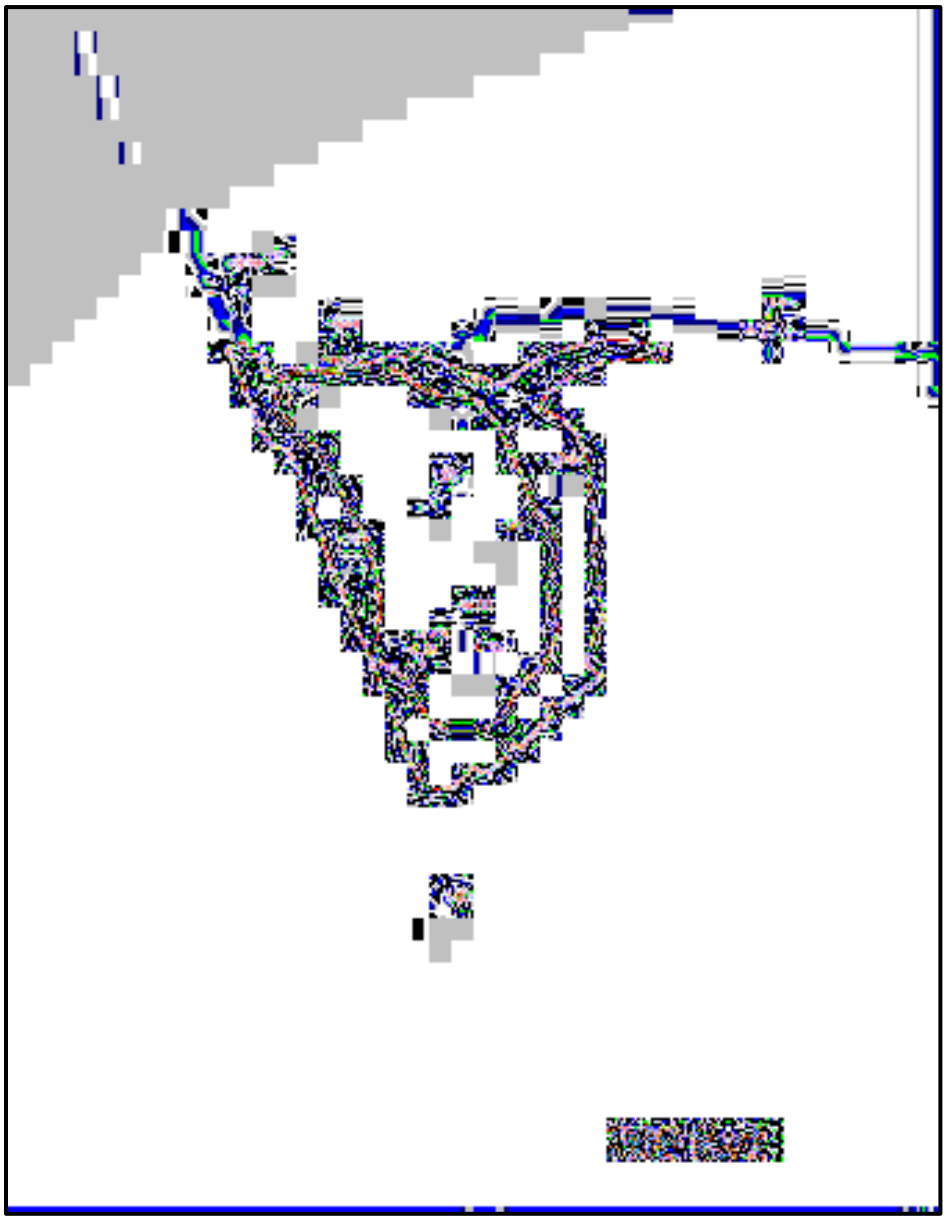


Figure 1: OU-1 model domain, boundary conditions and water level target locations (layer 1). Green nodes signify Brandy Brook. The solid dark blue lines are constant heads. The blue circles indicate well locations and the posted numbers the residuals. The gray area represents inactive cells defining the upgradient groundwater divide. The brown and dark green lines indicate the area to be stabilized and the extent of cap, respectively. Constant heads and no-flow areas are carried down into lower model layers.

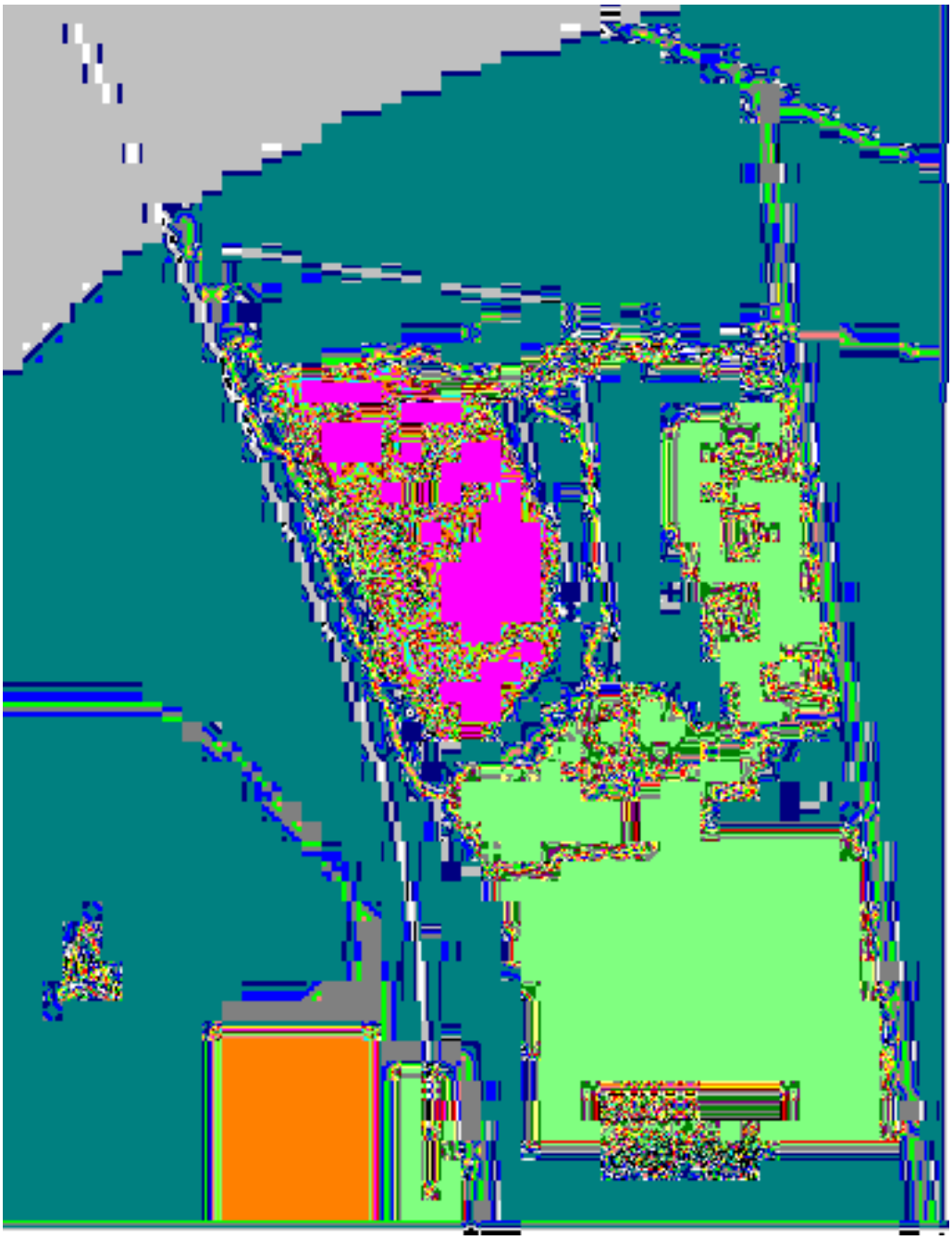


Figure 2: Assigned recharge zones. Light green (open areas) at 7.3 inches per year; dark green (forested areas) at 4.9 inches per year; gray (roads) at 3.3 inches per year; and orange (building/pavement) impermeable.

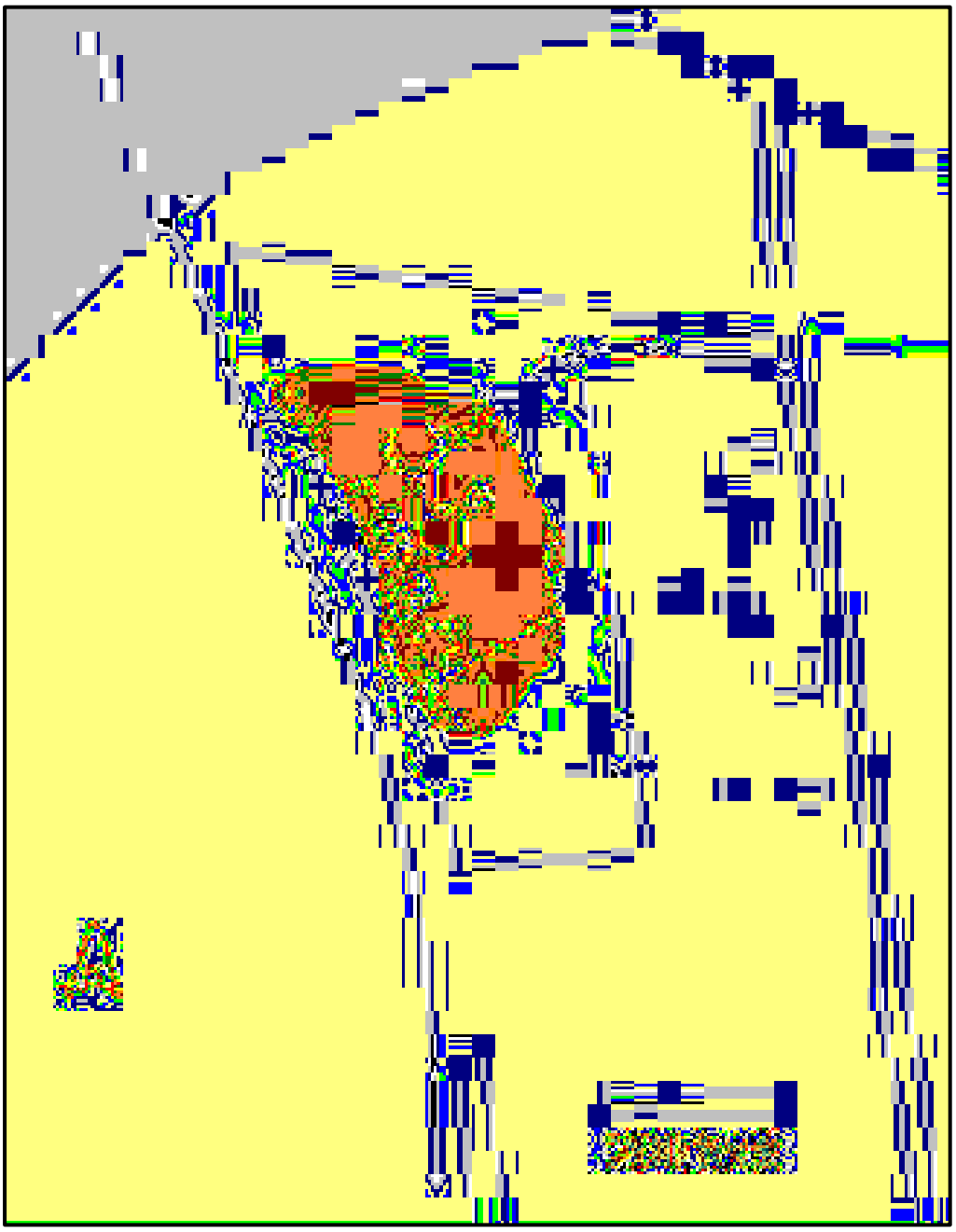


Figure 3: Hydraulic conductivity zones. Yellow area set at 16 ft/d horizontal and 1.6 ft/d vertical, the orange is the waste volume set at 2 ft/d horizontal and 0.2 ft/d vertical. The gray area is inactive. The K in layer 2 is set at a uniform 16 ft/d horizontal and 1.6 ft/d vertical.

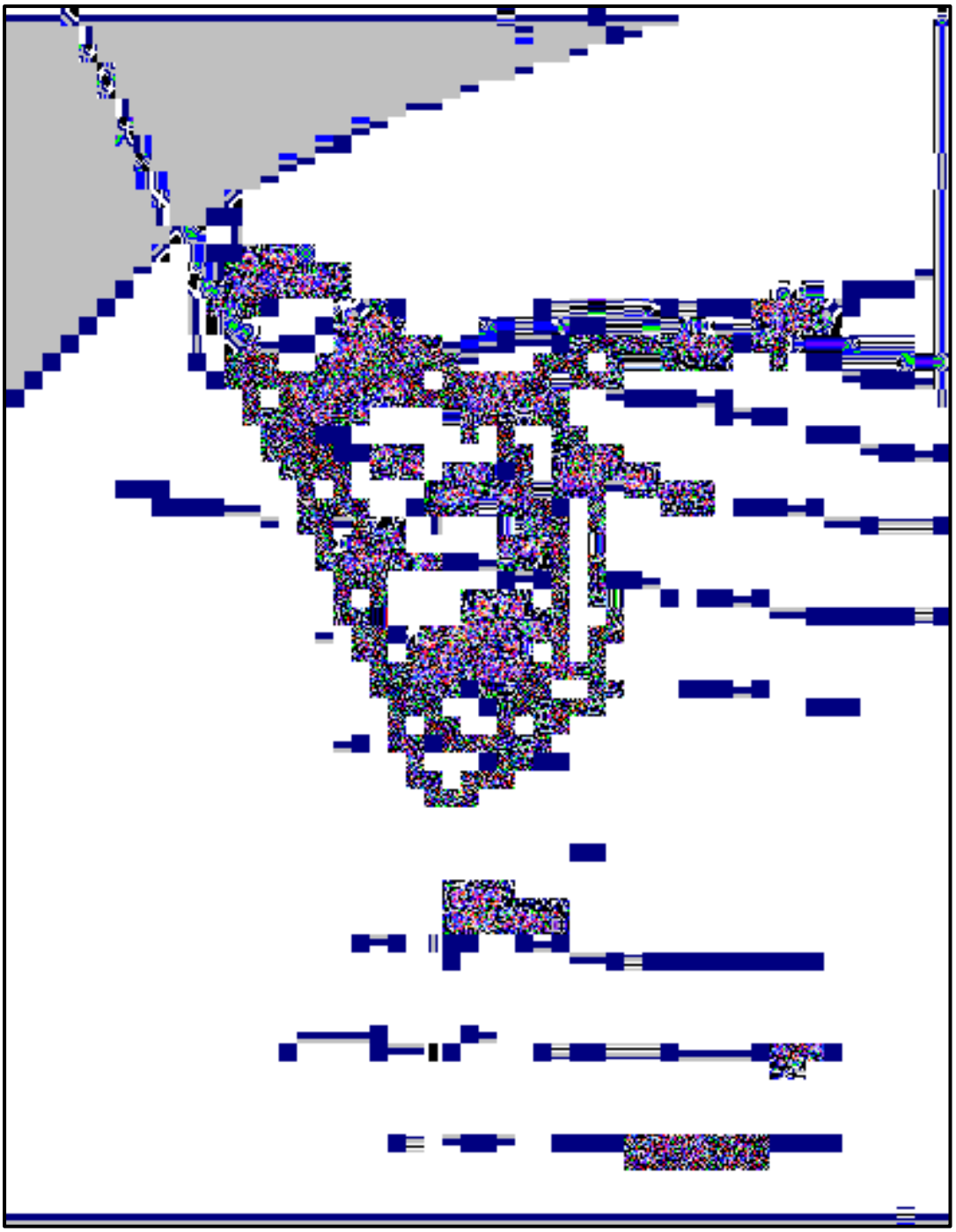


Figure 4: Model generated heads in layer 1 for the calibrated model. Residuals (observed minus computed) are posted in blue (positive), or red (negative).

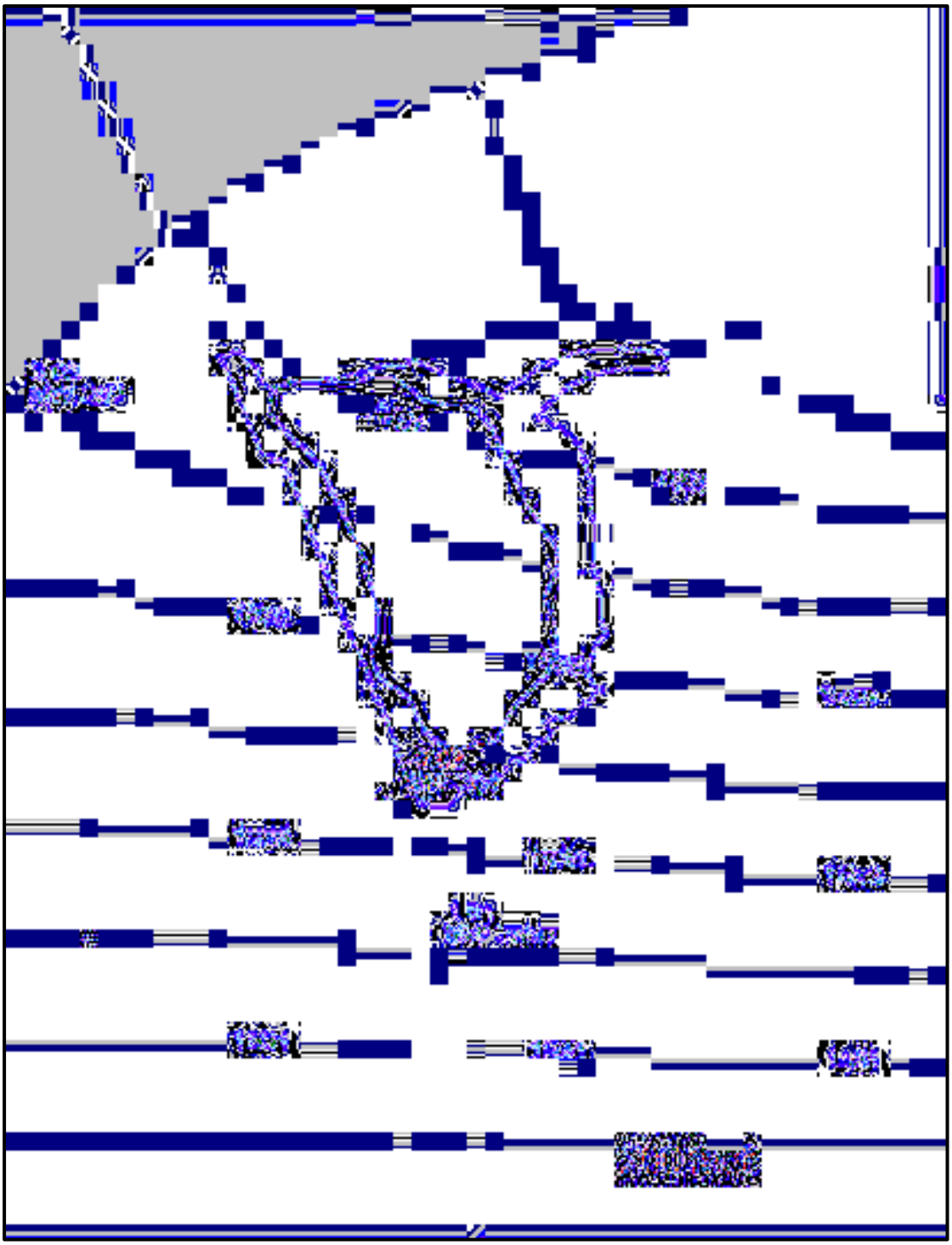


Figure 5: Model generated heads in layer 2 for the calibrated model. Residuals (observed minus computed) are posted in blue (positive), or red (negative).

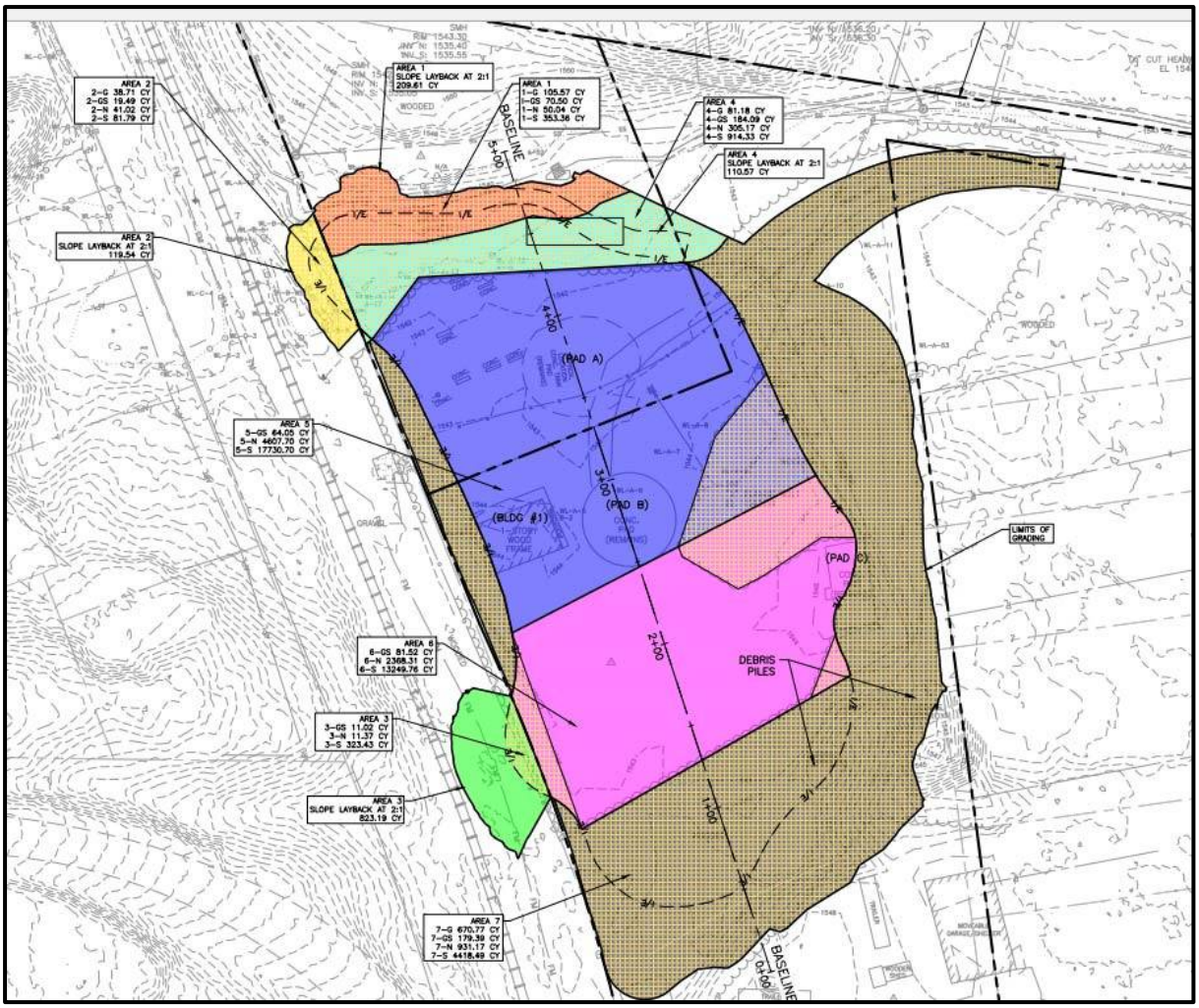
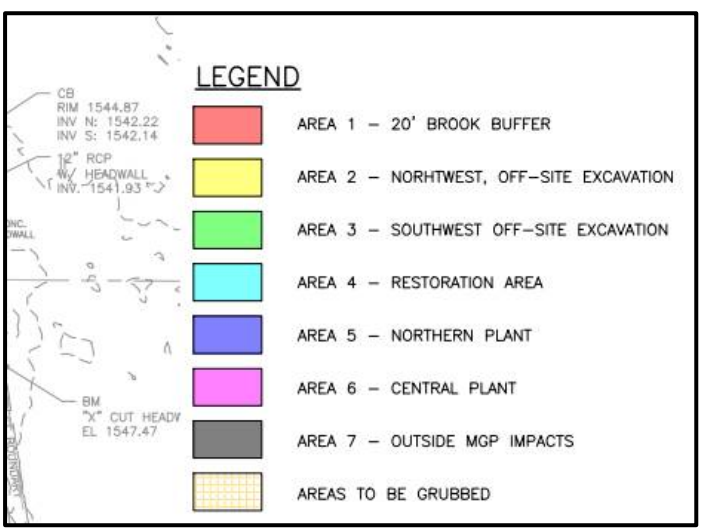


Figure 6: Depicting the various areas for dewatering.



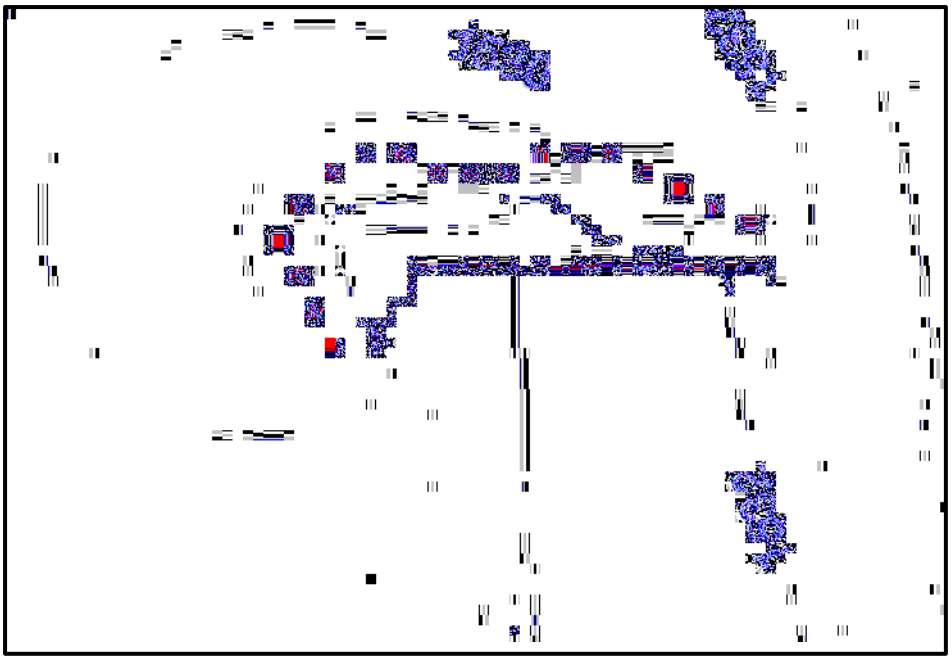


Figure 7: Simulation of flow rate to maintain the dewatering target level once it has been reached in Areas 1, 2 and 4 – steady-state run, model layer 2. Red squares are locations of wells, the dark blue line, the sheet pile wall. Grid dimensions are 10-by-10 feet.

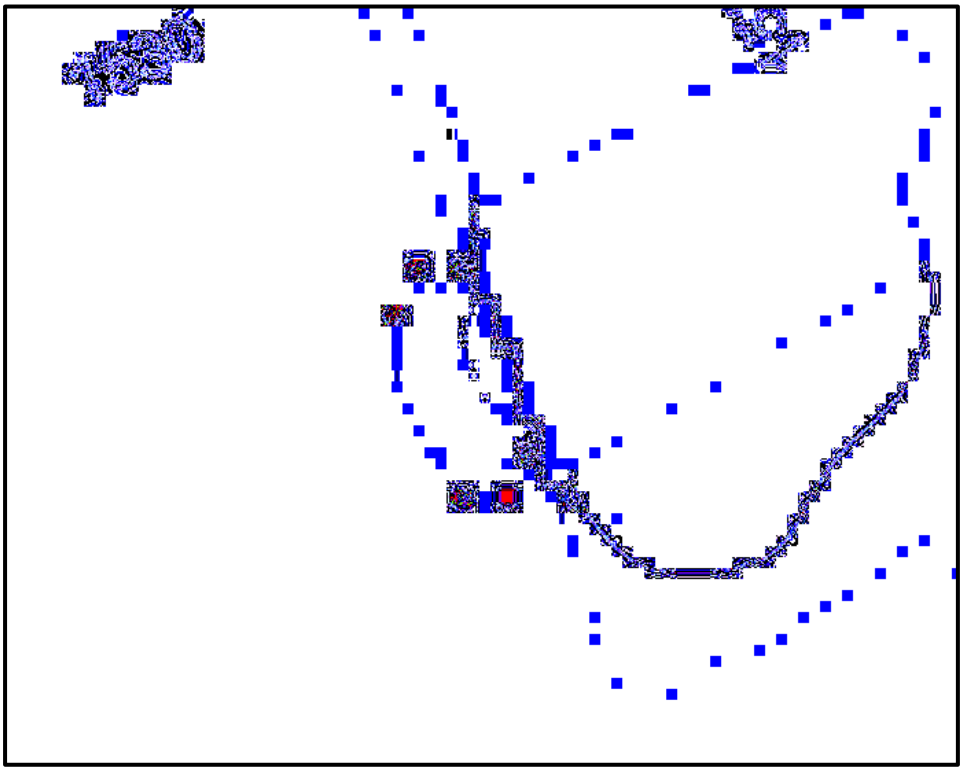


Figure 8: Simulation of flow rate to maintain the dewatering target level once it has been reached in Area 3 – steady-state run, model layer 2. Red squares are locations of wells, the dark blue line, the sheet pile wall. Grid dimensions are 10-by-10 feet.

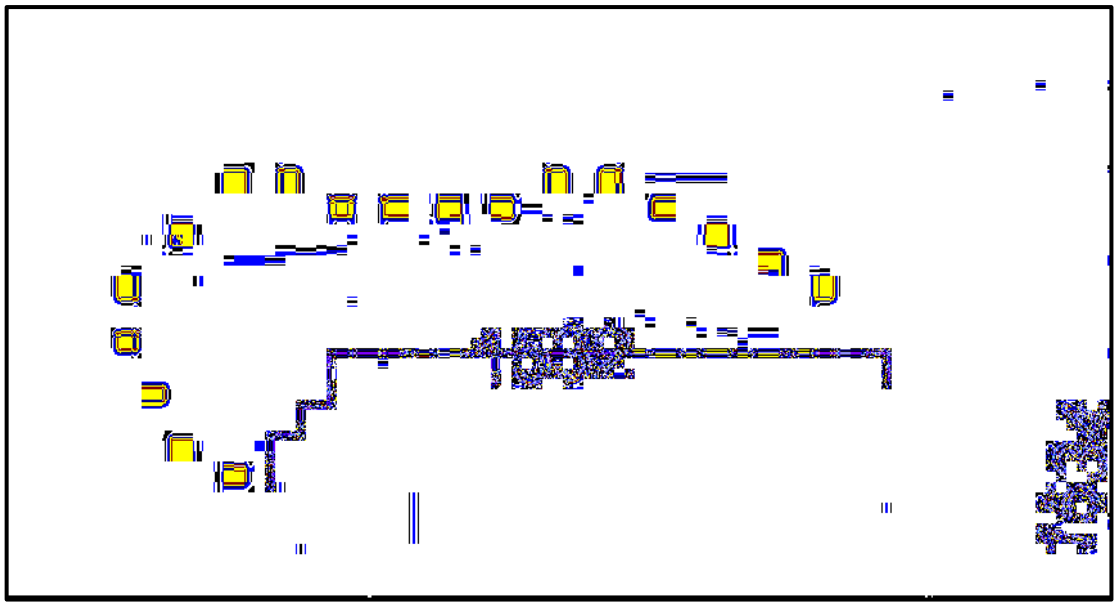


Figure 9: Location of wells (yellow squares as drain nodes), sheet pile, and resultant heads at the end of a 30-day transient run. The blue circle with the blue 'x' is a hypothetical monitoring well used to observe the rate at which the target elevation (1530 ft) was reached.

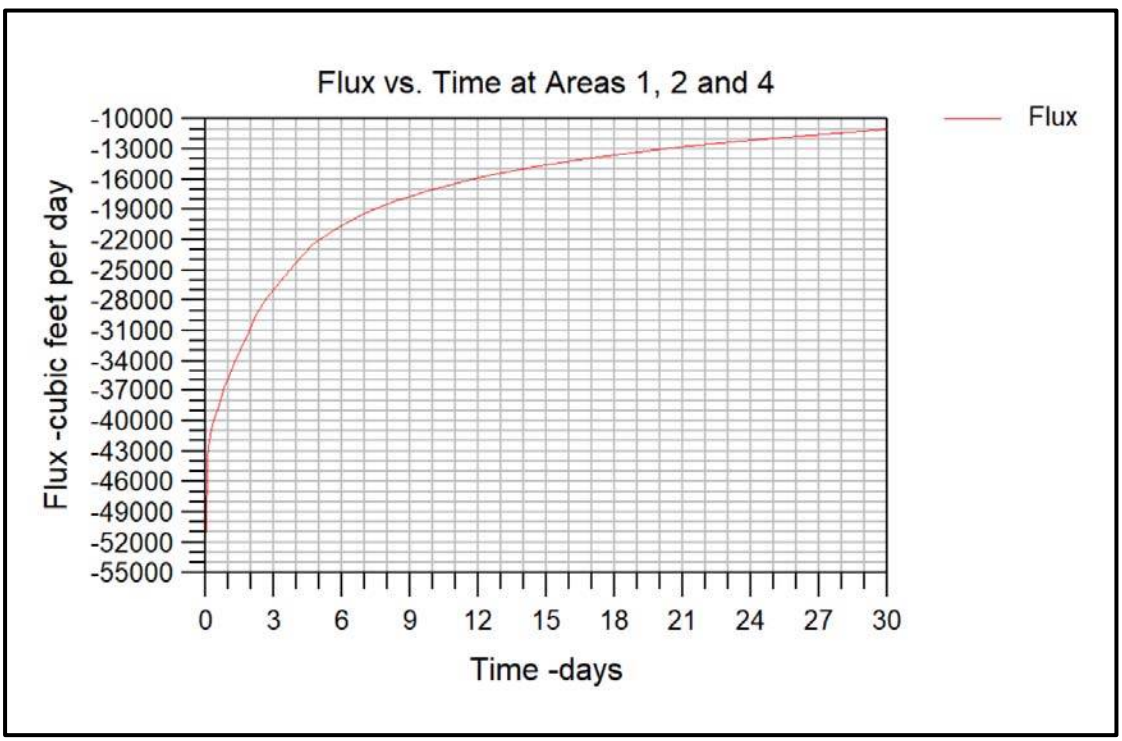


Figure 10: Dewatering flux at Areas 1, 2 and 4. Initial average rate for the first day is about 200 gpm, tapering off to about 77 gpm at day 14, and about 57 gpm at day 30.

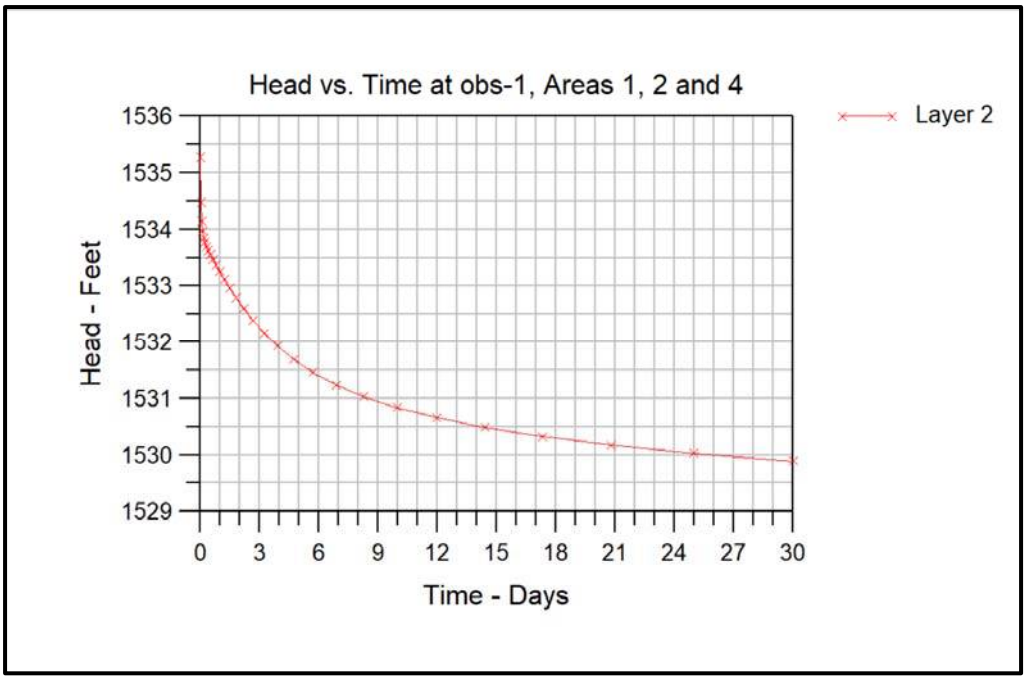


Figure 11: Rate of head decline in Areas 1, 2 and 4 at the flow rates indicated in the previous figure.

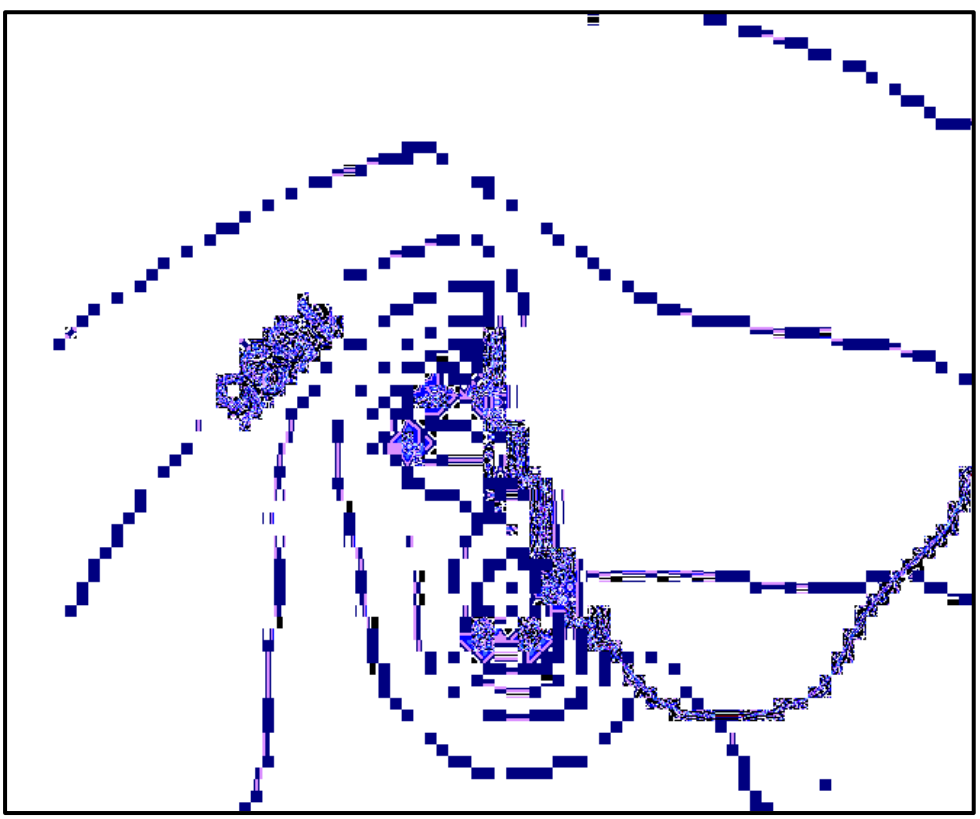


Figure 12: Location of wells, sheet pile wall, resultant heads at 60-days simulation, and location of hypothetical monitoring well (OBS-2), the small circle with the ‘x” inscribed.

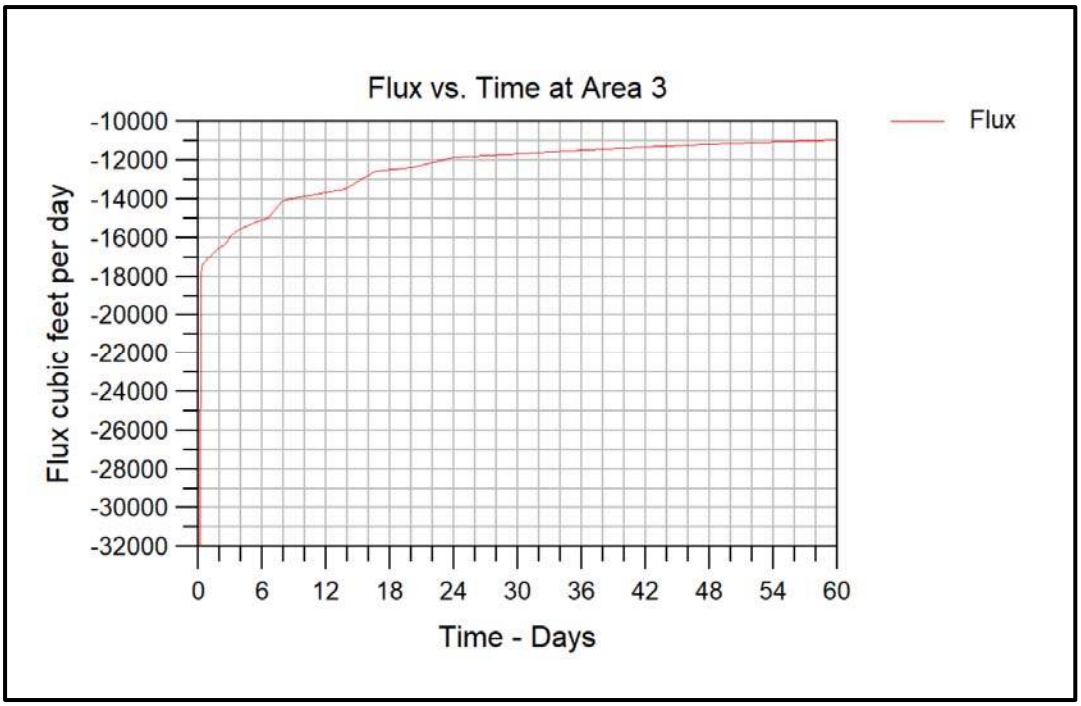


Figure 13: Dewatering flux at Area 3. Initial average rate for the first day is about 200 gpm, tapering off to about 77 gpm at day 14, and about 57 gpm at day 30.

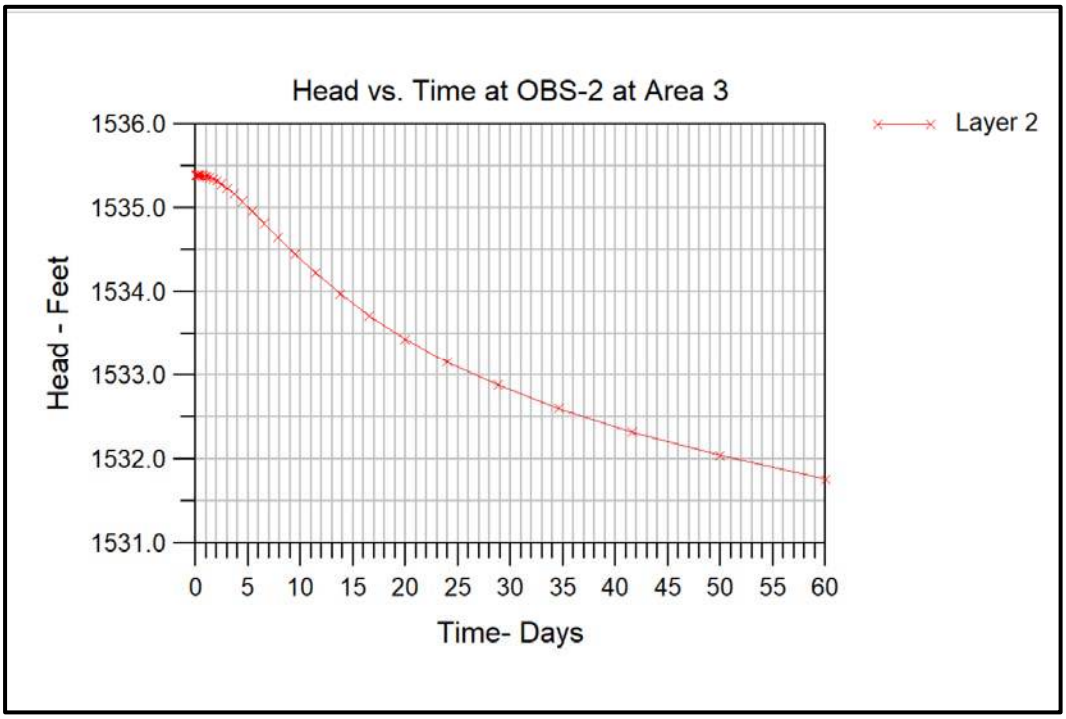


Figure 14: Rate of head decline in Area 3 at the flow rates indicated in the previous figure.

TABLES

Table 1
Calibrated Model Parameter Values

Parameter	Description	Value	Units	Comment
Hydraulic Conductivity				
Zone 1	Principal aquifer	16	ft/d	From testing
Zone 2	Waste volume	2	ft/d	Assumed effect of waste
Recharge				
Zone 1	Open areas	0.0016765	ft/d	7.34 inches per year
Zone 2	Forested	0.0011179	ft/d	4.9 inches per year
Zone 3	Roads	0.000756	ft/d	3.31 inches peryear
Zone 4	Impermeable	0	ft/d	
Constant Head				
Reach 1	Inflow from upgradient	1539	ft	
Reach 0	Outflow to the south	1529	ft	

Table 2
Calibrated Model Residuals

Name	X	Y	Layer	Observed	Computed	Weight	Group	Residual
MW-101	592313	1999449	1	1534.37	1535.11	1	1	-0.74
MW-102	592281	1999597	1	1538.05	1536.45	1	1	1.60
MW-103	592254.1	1999401	1	1532.05	1534.47	1	1	-2.42
MW-104	592054.2	1999834	1	1537.17	1537.40	1	1	-0.23
MW-105	592166.9	1999766	1	1537.18	1538.61	1	1	-1.43
MW-106	592151.2	1999720	1	1537.21	1537.93	1	1	-0.72
MW-107	592314.4	1999701	1	1537.75	1537.83	1	1	-0.08
MW-108	592418.3	1999615	1	1533.18	1536.83	1	1	-3.65
MW-109	592332.4	1999403	1	1535.60	1534.69	1	1	0.91
MW-110	592176.7	1999525	1	1533.15	1535.52	1	1	-2.37
MW-202	591841.6	1999712	2	1539.05	1535.96	1	1	3.09
MW-204	592255.5	1999286	2	1532.87	1533.49	1	1	-0.62
MW-205D	592297.7	1999119	2	1533.02	1532.01	1	1	1.01
MW-205S	592295.9	1999124	1	1532.90	1532.01	1	1	0.89
PZ-302	592086.2	1999842	1	1538.71	1537.40	1	1	1.31
GW-2	592352.9	1999539	1	1537.23	1536.04	1	1	1.19
GW-11	592120.1	1999693	1	1537.24	1536.87	1	1	0.37
GW-14	592261.8	1999419	1	1533.60	1534.68	1	1	-1.08
BB-1	592658.4	1999792	1	1542.44	1539.11	1	1	3.33

Residual Mean	0.02
Absolute Residual Mean	1.42
Residual Std. Deviation	1.76
Sum of Squares	58.66
RMS Error	1.76
Min. Residual	-3.65
Max. Residual	3.33
Number of Observations	19
Range in Observations	10.39
Scaled Residual Std. Deviation	0.169
Scaled Absolute Residual Mean	0.137
Scaled RMS Error	0.169
Scaled Residual Mean	0.00186

Table 3
Residuals Statistics for Simulations

Model Run	Sim_1	Sim_2	Sim_3	Sim_4
Description	Calibrated	Stabilized	Sens on K	Sens on Rch
Mean	0.02	-1.4	-2.4	-1.53
Abs. mean	1.42	2.5	2.94	2.55
Std Dev	1.76	2.59	2.61	2.6
SSR	58.7	164	239	172
RMS	1.76	2.94	3.55	3.55
Min	-3.65	-6.27	-7.24	-6.4
Max	3.33	3.34	2.17	3.26
Range	10.39	10.39	10.39	10.39
Sc Std	0.169	0.249	0.251	0.259
Number	19	19	19	19

Legend: Abs. mean = mean of the absolute value of the residual
Std Dev = standard deviation of the residuals
SSR = sum of the squares of the residuals
RMS = root mean square error
Min - minimum residual
Max = maximum residual
Range = range of the observed water level readings
Sc Std = Std Dev/Range
Numbe = number of observations

Table 4
Model Run Water Balance

Model Run	Sim_1	Sim_2	Sim_3	Sim_4
Description	Calibrated	Stabilized	Sens on K	Sens on Rch
Water In:				
Constant head	1992.8	2033.9	135.7	1804.9
River	5570.9	5676.5	4248.4	5540.0
Recharge	3038.9	2849.1	2849.1	3557.1
Water Out:				
Constant Head	10435.0	10290.0	6861.2	10706.9
River	176.7	169.8	271.5	195.1
Total water	10602.7	10459.4	7232.7	10901.0

Note: Units are cubic feet, based on one day

APPENDIX E

ISS PRELIMINARY BENCH SCALE MIX STUDY REPORT

Appendix E contains the ISS Preliminary Bench Scale Test Report. This information is offered for consideration when planning the remedial work.

IN-SITU SOLIDIFICATION
PRELIMINARY BENCH SCALE MIX STUDY REPORT
OPERABLE UNIT OU01

SARANAC LAKE GAS COMPANY, INC
SITE NO. 516008

WORK ASSIGNMENT NO. D007619-50

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Geology, P.C.
Portland, Maine

MACTEC: 611191237

MARCH 2020

DRAFT

IN-SITU SOLIDIFICATION

PRELIMINARY BENCH SCALE MIX STUDY REPORT

OPERABLE UNIT OU01

SARANAC LAKE GAS COMPANY, INC.

SITE NO. 516008

WORK ASSIGNMENT NO. D007619-50

Prepared for:

New York State Department of Environmental Conservation

Albany, New York

Prepared by:

MACTEC Engineering and Geology, P.C.

Portland, Maine

MACTEC: 611191237

March 2020

DRAFT

Submitted by:

Jamie Welch

Project Manager

Reviewed by:

Brian B. Johnson

Sr. Associate Engineer

TABLE OF CONTENTS

IN-SITU SOLIDIFICATION

PRELIMINARY BENCH SCALE MIX STUDY REPORT

OPERABLE UNIT OU01

SARANAC LAKE GAS COMPANY, INC

Section | Description | Page

GLOSSARY OF ACRONYMS AND ABBREVIATIONS ii

1.0 INTRODUCTION 1-1

2.0 STUDY SUMMARY 2-1

2.1 PHASE 1: MATERIAL CHARACTERIZATION 2-1
2.2 PHASE 2: SLURRY/GROUT MIXING AND TESTING 2-5
2.3 PHASE 3: SOIL-GROUT MIXING AND TESTING 2-7

3.0 CONCLUSIONS AND RECOMMENDATIONS 3-1

4.0 REFERENCES 4-1

List of Figures

Figure 1: OU01 Pre-Design Investigation Areas

List of Tables

Table 1: Phase 1 Summary of Material (Site Soil and Reagent) Characteristics

Table 2: Phase 2 Summary of Slurry/Grout Mixtures

Table 3: Phase 3 Summary of Soil-Grout Mixtures

List of Attachments

Attachment A: Phase 1 Laboratory Test Reports

Attachment B: Phase 2 Laboratory Test Reports

Attachment C: Phase 3 Laboratory Test Reports

Attachment D: Preliminary Swell Calculation

DRAFT

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

bgs	below ground surface
BODR	Basis of Design Report
cm/sec	centimeters per second
DNAPL	Dense Non-Aqueous Phase Liquid
ft	feet
g/cm^3	grams per cubic centimeter
ISS	In-Situ Solidification
k	Hydraulic Conductivity
LNAPL	Light Non-Aqueous Phase Liquid
MACTEC	MACTEC Engineering and Geology, P.C.
MGP	Manufactured Gas Plant
NYSDEC	New York State Department of Environmental Conservation
pcf	pounds per cubic foot
PDI	Pre-Design Investigation
psi	pounds per square inch
RA	Remedial Action
RD	Remedial Design
RSA	RSA GEOLAB, LLC
sec/L	seconds per liter

DRAFT

GLOSSARY OF ACRONYMS AND ABBREVIATIONS (CONTINUED)

UCS	Unconfined Compressive Strength
WA	Work Assignment

DRAFT

1.0 INTRODUCTION

On behalf of the New York State Department of Environmental Conservation (NYSDEC), MACTEC Engineering and Geology, P.C. (MACTEC) has prepared this document to report the results of a preliminary bench-scale mix study (Study) to identify possible reagent additions to inform In-Situ Solidification (ISS) activities that can be reasonably expected to achieve Project Requirements. The Study was conducted in support of MACTEC's remedial design for environmental remediation at Saranac Lake Gas Company Operable Unit 01 (Site # 516008) (Site) in the Village of Saranac Lake, Town of North Elba, New York. The Study generally consisted of mixing three representative Soil Samples with water collected during field activities in support of the 2019 Pre-Design Investigation (PDI) Report (MACTEC, 2020a) and reagents (Portland cement, bentonite, and calciment) to produce mixtures. These mixtures were then assessed for their ability to achieve Project Requirements of hydraulic conductivity (k) and unconfined compressive strength (UCS), using commonly used solidification reagent proportions. The Site constituents of potential concern are related to its former use as a Manufactured Gas Plant (MGP), which are assumed present in the samples used in this Study due to the fact that they contained Product (dense- and light-phase non-aqueous phase liquids [DNAPLs and LNAPLs, respectively]).

The Study was performed under NYSDEC Work Assignment (WA) Number D007619-50 in general accordance with MACTEC's Scope of Work (MACTEC, 2019). The WA authorized MACTEC to perform PDI activities, including this Study, to inform the remedial design (RD). The RD includes project specifications and drawings for remedial action (RA) at the Site in accordance with the Superfund Standby Contract between MACTEC and the NYSDEC, Work Element III of Schedule 1.

MACTEC completed PDI activities in support of RA, which includes ISS of MGP-impacted materials identified at the Site. The PDI included collection of representative Site Soils, Mix Water, Site Water, and Product for use in this Study. MACTEC subcontracted with RSA GEOLAB, LLC, of Union, New Jersey (RSA) to complete the Study and provided direction throughout the study. The findings of this Study will be used to inform the RD (i.e., expected swelling from the ISS process for use in assessing material balances at the Site) and for bidding purposes (i.e., provide bidders with an assumed preliminary mix design that may achieve Project Requirements, so that consistent base assumptions are used by bidders), as summarized in the 30% Basis of Design

DRAFT

Report (BODR) (MACTEC, 2020b). Ultimately, the RA contractor will be responsible for performing a Design Mix Program and a Pilot Study, which will inform full-scale solidification activities to be implemented at the Site.

This Study was intended to identify appropriate mixing proportions to achieve the Performance Requirements identified for solidification at the Site. The Performance Requirements are as follows:

- Maximum k of 1 x 10^{-6} centimeters per second (cm/sec) after a 28-day curing period, using Site Water (refer to Section 2.1) as a permeant (ASTM D5084). Additional details are presented in the Basis of Design Report and specifications.
- Minimum USC (maximum within the linear elastic range, not peak) of 30 pounds per square inch (psi) after a 28-day curing period (ASTM D1633). Additional details are presented in the Basis of Design Report and specifications

DRAFT

2.0 STUDY SUMMARY

The scope of this Study was originally provided in a request for proposal, which was reviewed by NYSDEC and issued by MACTEC to six specialty laboratories. Based on the bids received, RSA Geolab, LLC in Union, NJ (RSA) was awarded the work, and Site Soil, Mix Water, and samples of NAPL were sent to RSA for testing. Site-specific soil and groundwater analytical data from the Remedial Investigation Report (MACTEC, 2015) was provided to RSA prior to testing for information and health and safety purposes.

The following phased/sequential approach was used to execute the Study, to allow flexibility during testing:

- Phase 1: Testing to determine material characterization.
- Phase 2a: Preparation and testing of grout mixes. Performed concurrently with Phase 3a.
- Phase 3a: Preparation and testing of soil-grout mixes. Performed concurrently with Phase 2a.
- Data assessment/evaluation from Phases 1, 2a, and 3a.
- Phase 2a – Supplemental: Preparation and testing of slurry and additional grout mixes based on the results of Phases 2a and 3a.
- Phase 3a – Supplemental: Preparation and testing of soil-grout mixes based on the results of Phases 2a and 3a. Performed concurrently with Phase 2a – Supplemental.
- Data assessment/evaluation from Phases 2a – Supplemental and 3a - Supplemental.
- Phase 2b: Preparation and testing of additional grout mixes based on the results from previous phases. Performed concurrently with Phase 3b.
- Phase 3b: Preparation and testing of additional soil-grout mixes based on the results from previous phases. Performed concurrently with Phase 2b.
- Final data evaluation and reporting.

2.1 PHASE 1: MATERIAL CHARACTERIZATION

The materials used in the Study, including site soils and reagents, were tested to assess their characteristics. The results are summarized in Table 1, and laboratory test reports are provided in Attachment A. The materials tested were as follows:

- Sakrete Portland Cement type I/II

DRAFT

- American Colloids Company Bentonite (an American Petroleum Institute Section 9 bentonite)
- Soil Type 1: Central Deep portion of the Site (Figure 1), contains approximately 3 percent DNAPL (MACTEC, 2020a). The sample was selectively collected during the PDI from the most contaminated interval at each boring/test pit and composited together from depths ranging from about 10 to 30 feet (ft) below ground surface (bgs). Approximately 16 gallons of sample was collected, sealed in five-gallon buckets, and sent to RSA for use in testing.
- Soil Type 2: Central Shallow portion of the Site (Figure 1), contains approximately 6 percent light and dense NAPL (MACTEC, 2020a). The sample was selectively collected during the PDI from the most contaminated interval at each boring/test pit and composited together from depths ranging from about 0 to 10 ft bgs. Approximately 16 gallons of sample was collected, sealed in five-gallon buckets, and sent to RSA for use in testing.
- Soil Type 3: North Central portion off the Site (Figure 1), where trace amounts of NAPL and MGP impacts exist. The sample was selectively collected from the most contaminated interval at each boring/test pit and composited together from depths ranging from about 0 to 6 ft bgs. Approximately 16 gallons of sample was collected, sealed in five-gallon buckets, and sent to RSA for use in testing.

Other materials used, but not tested independently in this Study, include the following:

- Site Water: The samples were collected from groundwater that accumulated in the bottom of TP-H8A on September 17, 2019 using a peristaltic pump. Samples were pumped into a five-gallon carboy and stored inside the site structure until transported to RSA for use in testing on September 27, 2019. Analytical samples were submitted to Eurofins TestAmerica for VOCs, SVOCS, PCBs, Pesticides, Oil/Grease, total metals, dissolved metals, chlorine, TDS, BOD, pH, TSS, and TOC, and the results are presented in the PDI Report (MACTEC, 2020a).
- Mix Water:The sample was collected on September 25, 2019 from a fire hydrant located between 9 and 35 Payeville Lane, directly across from the Site entrance. Analytical testing was not performed on Mix Water.
- Tap Water: taken from RSA laboratory water source, used in testing. Analytical analysis was not performed on Tap Water.

DRAFT

- DNAPL was collected from TW-702 using a peristaltic pump and sent to RSA for use in testing. Approximately 500 mL was collected. Groundwater was decanted to the extent possible, however DNAPL samples are considered mixed media samples. Samples were not submitted for analytical testing as there was insufficient sample volume.
- LNAPL was collected from TW-702 using a peristaltic pump and sent to RSA for use in testing. Approximately 500 mL was collected. Groundwater was decanted to the extent possible, however LNAPL samples are considered mixed media samples. Samples were not submitted for analytical testing as there was insufficient sample volume.

Soil, water, and NAPL samples were maintained by RSA at temperatures between 35 and 40 degrees fahrenheit when not in-use in sealed containers and homoginized as needed throughout testing.

DRAFT

Table 1: Phase 1 Summary of Material (Site Soil and Reagent) Characteristics

Test	Test Method	Test Parameter (units)	Phase 1(a) (Site Soils)			Phase 1(b) (Reagents)	
			Soil Type 1	Soil Type 2	Soil Type 3	Bentonite	Portland Cement
Particle-Size Analysis (Sieve & Hydrometer)	ASTM D6913/D7928	Maximum Size (mm)	< 9.525	< 25.4	< 19.05	-	-
		Gravel Size, > 4.75 mm (%)	0.6	7.9	4.5		
		Sand Size, 4.75 mm to 0.075 mm (%)	60.1	81.1	86.0		
		Silt Size, 0.075 mm to 0.005 mm (%)	28.8	6.0	6.3		
		Clay Size, < 0.005 mm (%)	10.5	5.0	3.2		
		USCS Classification	SM	SP-SM	SP-SM		
Moisture Content	ASTM D2216	Moisture Content (%)	26.5	14.8	11.5	-	-
Atterberg Limits	ASTM D4318	Atterberg Limits (%)	Non-Plastic	Non-Plastic	Non-Plastic	-	-
Hydraulic Conductivity[2] (Constant Head Method)	ASTM D2434	Hydraulic Conductivity, k (cm/sec)	1.9×10^{-3}	1.3×10^{-3}	2.7×10^{-3}	-	-
		Initial Dry / Wet Density (pcf)[3]	96.5 / 119.6	95.4 / 111.8	101.7 / 114.1		
		Initial / Final Moisture Content (%)	24.0 / 25.3	17.2 / 22.1	12.2 / 20.9		
		Initial Void Ratio (-)	0.7243	0.7242	0.6462		
Specific Gravity	ASTM D854	Specific Gravity (-)	2.666	2.636	2.683	2.706	3.375
Organic Content	ASTM D2974	Organic Content (%)	1.13	3.01	1.30	-	-

Notes
1. Particle sizes are based on Unified Soil Classification System (USCS) and general geotechnical practice.
2. Hydraulic conductivity tests were performed on remolded samples compacted at natural moisture content using approximately 90-percent of ASTM D698 compaction effort and permeated with Site Water.
3. pcf represents pounds per cubic foot.

DRAFT

2.2 PHASE 2: SLURRY/GROUT MIXING AND TESTING

Mixtures consisting of water and reagents were prepared in three Phases on a weight basis and subsequently tested by RSA (Phases 2a, 2a – Supplemental, and 2b). Mix proportions were specified by MACTEC. Herein, "slurry" refers to bentonite-water mixtures, and "grout" refers to bentonite-water-cement mixtures. Grout mixtures were allowed to cure for 3, 7, or 14 days prior to strength testing. Phase 2 mixes and testing results are sumarized in Table 2, and laboratory testing reports are provided in Attachment B.

Phase 2a: Six grout mixtures, identified as G1a, G1b, G2a, G2b, G3a, and G3b, were made using the materials and proportions listed in Table 2. These six grouts were mixed and tested prior to subsequent testing in Phase 2a – Supplemental and Phase 2b. Cement and bentonite were added simultaneously (i.e., bentonite-water slurry was not allowed to hydrate for 24-hours prior to cement addition).

Phase 2a – Supplemental: Following Phase 2a, two slurry mixtures (G2a Slurry and G2b Slurry) were made to assess the impacts of allowing bentonite-water slurry to hydrate for 24-hours on slurry viscosity and density. Following slurry testing, cement was added to the slurries to make grout mixtures G2a and G2b to assess the impacts of using 24-hour hydrated bentonite-water slurry on grout viscosity, density, and strength. Three other grout mixtures (GX, GY, and GZ) were made to assess the impact of DNAPL and LNAPL addition on grout strength.

Phase 2b: Two grout mixtures (G2a and G4a) were made based on the results of Phase 2a and Phase 2a – Supplemental. The grouts were made with Tap Water (insufficient amount of Mix Water remained) and hydrated bentonite-water slurry.

DRAFT

Table 2: Phase 2 Summary of Slurry/Grout Mixtures

Phase	Slurry/Grout Mix Designation	Slurry/Grout Mix Proportions (by weight)						Slurry/Grout Mixture Test Results							
		Water		Reagents [2]		Site Product[1]		Marsh Funnel Viscosity API RP 13B-1		Density[3] ASTM D4380		Pocket Penetrometer Unconfined Compressive Strength[6]		Unconfined Compressive Strength (UCS) ASTM D1633	
		Tap	Mix[1]	Cement	Bentonite	DNAPL	LNAPL	Initial[3] (sec/L)	24-Hours[4] (sec/L)	Initial[3] (g/cm^3)	24-Hours[4] (g/cm^3)	3-Day (psi)	7-Day (psi)	Bulk Density (pcf)	14-Day, Peak (psi)
2a	G1a	-	1	1	-	-	-	31.03	-	1.50	-	> 62.5	> 62.5	-	-
	G1b	-	1.5	1	-	-	-	28.69	-	1.28	-	> 62.5	> 62.5	-	-
	G2a	-	1	1	0.025	-	-	36.69	-	1.51	-	> 62.5	> 62.5	-	-
	G2b	-	1.5	1	0.025	-	-	29.04	-	1.37	-	> 62.5	> 62.5	-	-
	G3a	-	1	1	0.05	-	-	37.06	-	1.52	-	> 62.5	> 62.5	-	-
	G3b	-	1.5	1	0.05	-	-	31.47	-	1.40	-	> 62.5	> 62.5	-	-
2a-Supplemental	G2a Slurry	-	1	-	0.025	-	-	28.84	28.93	1.01	1.01	-	-	-	-
	G2a	-	1	1	0.025	-	-	-	69.44	-	1.51	> 62.5	> 62.5	-	-
	G2b Slurry	-	1.5	-	0.025	-	-	28.19	28.23	1.01	1.01	-	-	-	-
	G2b	-	1.5	1	0.025	-	-	-	34.16	-	1.35	> 62.5	> 62.5	-	-
	GX	-	0.5	1	-	-	-	-	-	-	-	-	-	122.6	1,339
	GY	-	0.5	1	-	0.1	-	-	-	-	-	-	-	114.3	1,070
	GZ	-	0.5	1	-	-	0.1	-	-	-	-	-	-	118.3	1,369
2b	G2a	1	-	1	0.025	-	-	-	70.09	-	1.51	> 62.5	> 62.5	-	-
	G4a	0.75	-	1	0.025	-	-	-	> 600[5]	-	1.63	> 62.5	> 62.5	-	-

Notes
1. Mix Water and Site Product were provided by MACTEC.
2. Reagents were provided by RSA and were identified in Phase 1.
3. Testing performed on freshly mixed slurry/grout.
4. Testing performed on slurry/grout 24-hours following bentonite-water mixing.
5. 6 mL collected in 600 seconds.
6. > 62.5 psi indicates strength is greater than 62.5 psi (maximum strength reading of pocket penetrometer instrument).

DRAFT

2.3 PHASE 3: SOIL-GROUT MIXING AND TESTING

Soil-grout mixtures, consisting of the grouts made in Phase 2 (Section 2.2) and specific Soil Types (Section 2.1), were prepared on a weight basis and subsequently tested by RSA in two Phases (3a and 3b). Mix proportions were provided by MACTEC. The soil-grout mixtures were prepared using the materials and mix proportions presented in Table 3 and allowed to cure for 3, 7, 14, or 28 days prior to testing. A summary of test results is provided in Table 3 and laboratory test reports are provided in Attachment C.

Phase 3a: In Phase 3a, 15 soil-grout mixtures were prepared (samples 1 through 15), with the addition of Site Water and NAPL to conservatively add liquids that may not have been present in the soil samples.

Phase 3a - Supplemental: In Phase 3a - Supplemental, three soil-grout mixtures were prepared (samples 5, 12, and 15 from Phase 3a) using 24-hour hydrated bentonite-water slurry, with the addition of Tap Water to conservatively add liquids that may not have been present in the soil samples.

Phase 3b: In Phase 3b, nine soil-grout mixtures were prepared (samples 16 through 24) based on the results of Phase 3a. Calciment was added to three of the mixtures to dry the soil-grout mixtures and assess its impacts on soil-grout strength and hydraulic conductivity.

DRAFT

Table 3: Phase 3 Summary of Soil-Grout Mixtures

Phase	Lab Sample No.	Soil-Grout Mix Components			Soil-Grout Mix Proportions (by weight)		Additional Mix Materials and Proportions (by weight)					Bulk Density	Pocket Penetrometer Unconfined Compressive Strength[7]			Unconfined Compressive Strength (UCS)[9] ASTM D1633			Hydraulic Conductivity (k)[8,9] ASTM D5084	
		Soil Type[1]	Grout Mix[2]	Grout Mix Proportions Water: Cement: Bentonite	Wet Soil[3]	Grout	Site Water[4,5]	Tap Water	Site Product[5] DNAPL	Site Product[5] LNAPL	Calciment[6]	(pcf)	3-Day (psi)	7-day (psi)	14-day (psi)	Bulk Density (pcf)	14-Day, Peak (psi)	28-Day, Peak (psi)	Bulk Density (pcf)	28-Day (cm/sec)
3a	1	1	G1a	1:1:0	20	2.0	0.3	-	0.03	-	-	120.8	0	3.5	13.9	123.1, 120.6[10]	-	2.69, 7.03[10]	122.4	2.06×10^{-6}
	2	1	G2a	1:1:0.025	20	2.0	0.3	-	0.03	-	-	123.5	0	0	3.5	124.1	-	1.65	130.0	3.68×10^{-6}
	3	1	G2b	1.5:1:0.025	20	2.5	0.3	-	0.03	-	-	124.0	0	0	0	122.1	-	1.52	123.8	3.55×10^{-6}
	4	2	G1a	1:1:0	20	2.0	0.3	-	-	0.03	-	124.3	38.2	>62.5	>62.5	124.1, 124.2[10]	-	13.1, 16.15[10]	124.0	9.15×10^{-7}
	5	2	G2a	1:1:0.025	20	2.0	0.3	-	-	0.03	-	124.9	10.4	24.3	>62.5	119.2, 125.0[10]	-	4.76, 2.78[10]	119.7	3.99×10^{-6}
	6	2	G3a	1:1:0.05	20	2.0	0.3	-	-	0.03	-	106.9	0	0	3.5	105.2	-	1.14	106.9	1.06×10^{-6}
	7	2	G1b	1.5:1:0	20	2.5	0.3	-	-	0.03	-	123.2	24.3	>62.5	>62.5	124.9, 123.1[10]	-	7.59, 17.17[10]	123.0	2.20×10^{-6}
	8	2	G2b	1.5:1:0.025	20	2.5	0.3	-	-	0.03	-	110.5	0	0	6.9	107.7	-	1.26	107.3	2.16×10^{-6}
	9	2	G3b	1.5:1:0.05	20	2.5	0.3	-	-	0.03	-	117.6	0	0	3.5	116.6	-	2.00	115.4	3.10×10^{-6}
	10	3	G1a	1:1:0	20	2.0	0.3	-	-	-	-	131.8	3.5	10.4	17.4	122.9, 131.6[10]	-	3.03, 4.41[10]	125.6	4.14×10^{-6}
	11	3	G2a	1:1:0.025	20	2.0	0.3	-	-	-	-	128.6	0	0	13.9	125.1	-	1.44	124.7	3.91×10^{-6}
	12	3	G2b	1.5:1:0.025	20	2.5	0.3	-	-	-	-	118.9	0	0	10.4	118.9	-	2.15	100.7	2.43×10^{-6}
	13	1	G1a	1:1:0	10	2.0	0.15	-	0.015	-	-	122.2	0	3.5	31.25	124.8	-	31.47	128.9	3.75×10^{-6}
	14	1	G2a	1:1:0.025	10	2.0	0.15	-	0.015	-	-	113.8	0	52.1	>62.5	115.9, 113.9[10]	-	1.22, 20.19[10]	113.9	1.88×10^{-6}
	15	1	G2b	1.5:1:0.025	10	2.5	0.15	-	0.015	-	-	123.5	24.3	>62.5	>62.5	124.8	-	56.83	125.7	1.78×10^{-6}
3a-Supplemental[11]	5	2	G2a	1:1:0.025	20	2.0	-	0.3	-	-	-	-	0	0	3.5	119.7	3.58	-	120.5	1.01×10^{-6}
	12	3	G2b	1.5:1:0.025	20	2.5	-	0.3	-	-	-	-	0	0	0	124.7	2.56	-	124.6	3.79×10^{-6}
	15	1	G2b	1.5:1:0.025	10	2.5	-	0.15	-	-	-	-	>62.5	>62.5	>62.5	124.0	**31.14**	-	125.9	**7.71×10^{-7}**
3b[11]	16	1	G2a	1:1:0.025	10	2.0	-	-	-	-	0.5	-	-	>62.5	>62.5	126.2	-	**271.0**	126.1	**4.17×10^{-7}**

DRAFT

Phase	Lab Sample No.	Soil-Grout Mix Components			Soil-Grout Mix Proportions (by weight)		Additional Mix Materials and Proportions (by weight)					Bulk Density	Pocket Penetrometer Unconfined Compressive Strength[7]			Unconfined Compressive Strength (UCS)[9] ASTM D1633			Hydraulic Conductivity (k)[8,9] ASTM D5084	
		Soil Type[1]	Grout Mix[2]	Grout Mix Proportions Water: Cement: Bentonite	Wet Soil[3]	Grout	Site Water[4,5]	Tap Water	Site Product[5] DNAPL	Site Product[5] LNAPL	Calciment[6]	(pcf)	3-Day (psi)	7-day (psi)	14-day (psi)	Bulk Density (pcf)	14-Day, Peak (psi)	28-Day, Peak (psi)	Bulk Density (pcf)	28-Day (cm/sec)
	17	**1**	**G2a**	**1:1:0.025**	**10**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**>62.5**	**>62.5**	**127.0**	**-**	**192.4**	**128.1**	**5.52 x 10^{-7}**
	18	**1**	**G4a**	**0.75:1:0.025**	**10**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**>62.5**	**>62.5**	**126.1**	**-**	**378.1**	**125.8**	**1.96 x 10^{-7}**
	19	2	G2a	1:1:0.025	10	2.0	-	-	-	-	0.5	-	-	>62.5	>62.5	117.4	-	**131.6**	115.4	**5.02 x 10^{-7}**
	20	**2**	**G2a**	**1:1:0.025**	**10**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**13.9**	**>62.5**	**119.3**	**-**	**63.5**	**118.5**	**7.91 x 10^{-7}**
	21	**2**	**G4a**	**0.75:1:0.025**	**10**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**>62.5**	**>62.5**	**119.6**	**-**	**150.2**	**119.2**	**4.89 x 10^{-7}**
	22	3	G2a	1:1:0.025	10	2.0	-	-	-	-	0.5	-	-	>62.5	>62.5	124.2	-	**196.5**	125.7	**4.98 x 10^{-7}**
	23	**3**	**G2a**	**1:1:0.025**	**10**	**2.0**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**>62.5**	**>62.5**	**124.5**	**-**	**140.9**	**127.5**	**7.89 x 10^{-7}**
	24	**3**	**G4a**	**0.75:1:0.025**	**10**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**>62.5**	**>62.5**	**125.7**	**-**	**243.4**	**125.6**	**3.19 x 10^{-7}**

Notes

1. Soil Types are identified in Phase 1.
2. Bold text indicates mix meets or exceeds the cement: water ratio with bentonite recommended in Section 3 and/or Performance Requirements were met for the given mix.
3. Wet soil at as received moisture content.
4. Site Water is described in Phase 1.
5. Site Water and Site Product were provided by MACTEC.
6. Calciment supplied to RSA by Mintek Resources, Inc.
7. > 62.5 psi indicates strength is greater than 62.5 psi (maximum strength reading of pocket penetrometer instrument).
8. Hydraulic conductivity tests were performed at a net confining stress of 10 psi, and after at-least 90-percent consolidation. Soft, uncompacted samples may have required stepped confining pressures to limit sample deformation. Used laboratory tap water as permeant.
9. Photographs were taken of test samples, before and after UCS and hydraulic testing.
10. Test performed on Pocket Penetrometer specimen.
11. Soil-grout mixtures prepared using 24-hour hydrated bentonite-water slurry.

DRAFT

3.0 CONCLUSIONS AND RECOMMENDATIONS

The findings of this Study will be used to inform the RD (i.e., estimated swelling from the ISS process for use in assessing material balances at the Site) and for bidding purposes (i.e., provide bidders with an assumed preliminary mix design that may achieve Project Requirements, so that consistent base assumptions are used by bidders), as summarized in the BODR (MACTEC, 2020b). Ultimately, the RA contractor will be responsible for performing a Design Mix Program and Pilot Study, which will inform final solidification activities to be implemented at the Site. Recommendations for the RD are as follows:

- Saturated in-situ soil unit weight of 120 pounds per cubic foot (pcf) for all soil types.
- Grout mix (for all soil types) proportions, by weight:
    - Water: 1
    - Portland Cement (Type I/II): 1
    - Bentonite (Section 9): 0.025
- Soil-grout mix (for all soil types) proportions, by weight:
    - Saturated soil: 10
    - Grout: 2
- Volumetric swell of 25 percent (relative to in-situ soil) following soil-grout mixing (preliminary swell calculation provided in Attachment D).

The RA contractor should consider the following items during performance of their Design Mix Program and Pilot Study:

- Allow bentonite-water slurry to hydrate for 24-hours prior to cement addition to help keep cement particles in suspension during curing.
- Addition of Site Water to soil-grout mixtures (during mix study) to replace water drained from free-draining soils during sampling (i.e., saturated soils versus laboratory received moisture) to represent saturated (i.e., below groundwater table) soil conditions.
- Addition of Site Product to soil-grout mixtures (during mix study) if Site Soils used in RA contractor's Mix Study Program are not representative of in-situ conditions relative to maximum NAPL present. Approximate in-situ NAPL percentages for each Site Soil Type are provided in Section 2.1.

DRAFT

- The results for Sample 15 in Phase 3a – Supplemental indicate that Performance Requirements can potentially be met using a lower cement:water ratio grout mix than recommended above (tap water was added to the soil-grout mix as well). This grout mix was only mixed/tested with Soil Type 1. Based on the results from Phase 3b, soil type does not appear to have a significant impact on soil-grout strength or hydraulic conductivity. However, the RA contractor should consider mixing and testing lower cement:water grouts with all soil types in their Design Mix Program if pumpability of the recommended grout mix is expected to be a concern.
- The addition of calciment increased strength by approximately 40 to 50 percent and reduced hydraulic conductivity by approximately 25 to 37 percent.
- Variations in soil water content significantly impact strength and, to a lesser degree, hydrualic conductivity, which may be compensated for through the addition of calciment in dry form.
- Adjustment of volumetric swell percentage following pilot study, prior to importing backfill material.

DRAFT

4.0 REFERENCES

MACTEC, 2015. Remedial Investigation Report– Saranac Lake Gas Company Site #516008. Prepared for New York State Department of Environmental Conservation, Albany, New York. January 2015.

MACTEC Engineering and Geology, P.C. (2019). Request for Proposal, Saranac Lake OU01 (Site No. 516008) Remedial Design, In-situ Stabilization Bench Scale Study. May 2019.

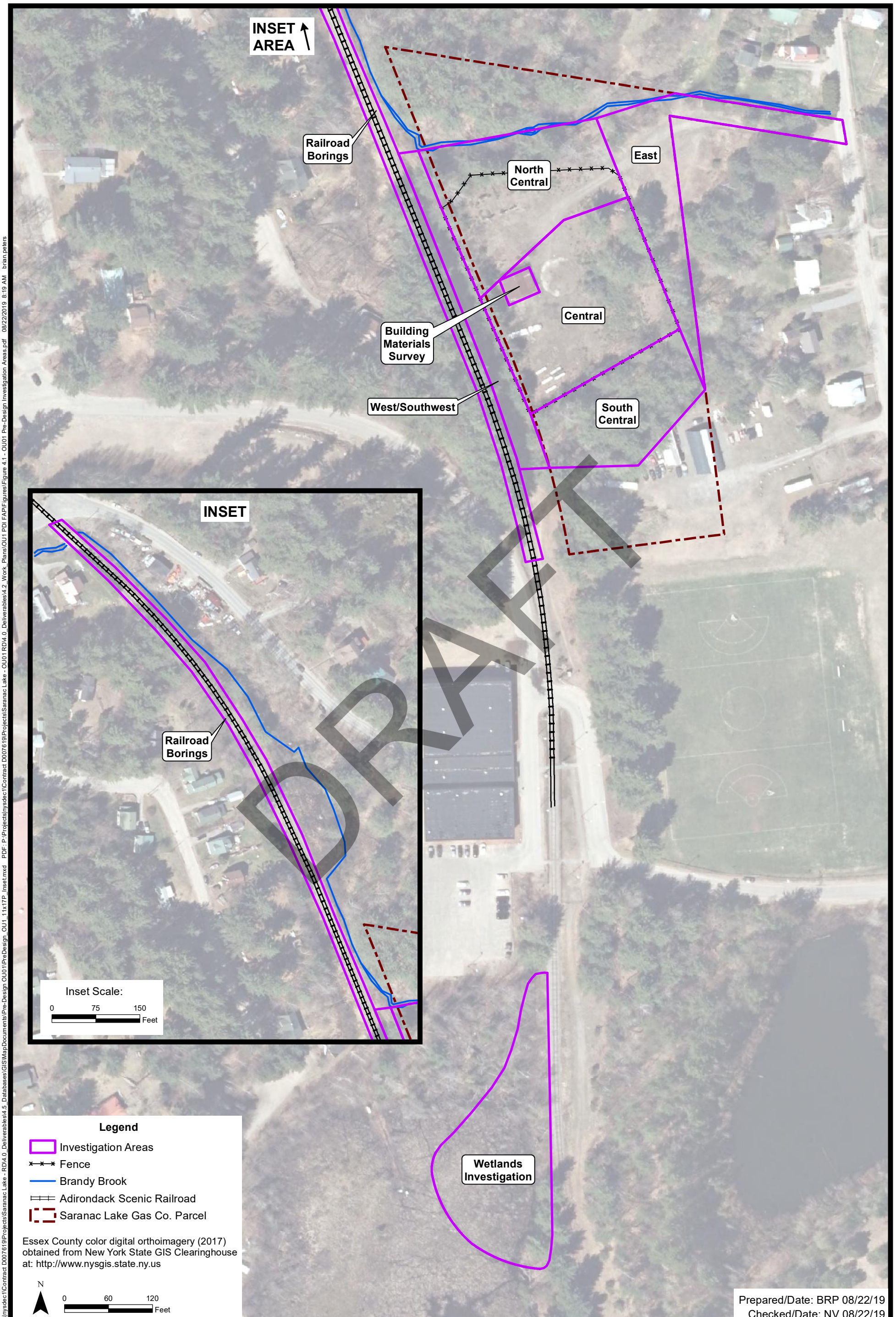
MACTEC Engineering and Geology, P.C. (2020a). Pre-Design Investigation Field Activities Report, Operable Unit OU01, Saranac Lake Gas Company, Inc., Site No. 516008. April 2020.

MACTEC Engineering and Geology, P.C. (2020b). Remedial Design Basis Report, Operable Unit OU01, Saranac Lake Gas Company, Inc., Site No. 516008. April 2020.

DRAFT

FIGURES

DRAFT



NYSDEC Site # 516008
Saranac Lake Gas Co., Inc.
Saranac Lake, New York

MACTEC

OU01 Pre-Design
Investigation Areas
Project 3611191237 Figure 1

Document: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - RD\4.0_Deliverables\4.5_Databases\GIS\MapDocuments\Pre-Design OU01\PreDesign_OU1_11x17P_Inset.mxd PDF: P:\Projects\nysdec1\Contract D007619\Projects\Saranac Lake - OU01 RD\4.0_Deliverables\4.2_Work_Plans\OU1 PDI FAP\Figures\Figure 4.1 - OU01 Pre-Design Investigation Areas.pdf 08/22/2019 8:19 AM brian.peters

ATTACHMENT A

PHASE 1 LABORATORY TEST REPORTS

DRAFT

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 10-10-19 Job No.: 912 Lab Log: 19-376

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)

Samples: Soil Type I, Soil Type II, Soil Type III, Cement, Bentonite

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D2434 Permeability (recompacted) (Soil Type I, II, & III)
- ASTM D854 Specific Gravity (Cement & Bentonite)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab

PERMEABILITY TEST BY CONSTANT HEAD METHOD
ASTM D2434

Project: Saranac Lake OU01 (Site No. 516008) Proj. #: 912

Client: Wood PLC/Mactec Date: 10-10-19

Sample ID: Soil Type I
Description: Grayish Brown silty sand

Unit Weight Determination:

Diameter,D	11.35	cm	Height of Mold	8.25	in.
Area, A	101.2	cm2	Height from top of Mold	1.25	in.
Length, L	11.43	cm	Height of Sample, H, in.	7.00	in.

	Initial (lbs.)	Final (lbs.)	Dry (lbs.)
Soil & Tare	7.60	8.78	7.23
Tare	0.00	1.10	1.10
Soil	7.60	7.68	6.13

Moisture Content

Initial:	24.0	%
Final:	25.3	%
Density Dry, W	96.49	pcf

Void Ratio,e: 0.7243
Specific Gravity: 2.6663

Test #	Manometers h1	Manometers h2	Head,h cm	Q ml	t sec.	Q/At	h/L	Temp C	k cm/s
1	44.1	42.1	2.0	26	900	0.0003	0.17	0.965	1.575E-03
	44.1	42.1	2.0	25	900	0.0003	0.17	0.965	1.514E-03
	44.1	42.1	2.0	25	900	0.0003	0.17	0.965	1.514E-03
2	44.7	42.1	2.6	36	900	0.0004	0.23	0.965	1.677E-03
	44.7	42.1	2.6	36	900	0.0004	0.23	0.965	1.677E-03
	44.7	42.1	2.6	35	900	0.0004	0.23	0.965	1.631E-03
3	45.1	42.1	3.0	46	900	0.0005	0.26	0.965	1.857E-03
	45.1	42.1	3.0	46	900	0.0005	0.26	0.965	1.857E-03
	45.1	42.1	3.0	45	900	0.0005	0.26	0.965	1.817E-03
4	45.6	42.2	3.4	55	900	0.0006	0.30	0.965	1.959E-03
	45.6	42.2	3.4	54	900	0.0006	0.30	0.965	1.924E-03
	45.6	42.2	3.4	54	900	0.0006	0.30	0.965	1.924E-03
5	46.3	42.2	4.1	66	900	0.0007	0.36	0.965	1.950E-03
	46.3	42.2	4.1	66	900	0.0007	0.36	0.965	1.950E-03
	46.3	42.2	4.1	65	900	0.0007	0.36	0.965	1.920E-03
6	47.3	42.3	5.0	92	900	0.0010	0.44	0.965	2.229E-03
	47.3	42.3	5.0	91	900	0.0010	0.44	0.965	2.204E-03
	47.3	42.3	5.0	91	900	0.0010	0.44	0.965	2.204E-03
									Average
									1.855E-03

Remarks: Recompacted sample (equal to 90% ASTM D698, as received MC).
Tested with site water.

DRAFT

RSA Geolab

PERMEABILITY TEST BY CONSTANT HEAD METHOD
ASTM D2434

Project: Saranac Lake OU01 (Site No. 516008) Proj. #: 912

Client: Wood PLC/Mactec Date: 10-10-19

Sample ID: Soil Type II
Description: Grayish Brown poorly graded sand with silt

Unit Weight Determination:

Diameter,D	11.35	cm	Height of Mold	8.25	in.
Area, A	101.2	cm2	Height from top of Mold	1.25	in.
Length, L	11.43	cm	Height of Sample, H, in.	7.00	in.

	Initial (lbs.)	Final (lbs.)	Dry (lbs.)
Soil & Tare	7.10	8.50	7.16
Tare	0.00	1.10	1.10
Soil	7.10	7.40	6.06

Moisture Content

Initial:	17.2	%
Final:	22.1	%
Density Dry, W	95.39	pcf

Void Ratio,e: 0.7242
Specific Gravity: 2.6357

Test #	Manometers h1	Manometers h2	Head,h cm	Q ml	t sec.	Q/At	h/L	Temp C	k cm/s
1	44.5	42.5	2.0	21	900	0.0002	0.17	0.955	1.259E-03
	44.5	42.5	2.0	20	900	0.0002	0.17	0.955	1.199E-03
	44.5	42.5	2.0	20	900	0.0002	0.17	0.955	1.199E-03
2	44.9	42.5	2.4	26	900	0.0003	0.21	0.955	1.299E-03
	44.9	42.5	2.4	26	900	0.0003	0.21	0.955	1.299E-03
	44.9	42.5	2.4	25	900	0.0003	0.21	0.955	1.249E-03
3	45.5	42.6	2.9	31	900	0.0003	0.25	0.955	1.281E-03
	45.5	42.6	2.9	31	900	0.0003	0.25	0.955	1.281E-03
	45.5	42.6	2.9	30	900	0.0003	0.25	0.955	1.240E-03
4	46.1	42.6	3.5	38	900	0.0004	0.31	0.955	1.301E-03
	46.1	42.6	3.5	38	900	0.0004	0.31	0.955	1.301E-03
	46.1	42.6	3.5	38	900	0.0004	0.31	0.955	1.301E-03
5	46.6	42.6	4.0	45	900	0.0005	0.35	0.955	1.349E-03
	46.6	42.6	4.0	44	900	0.0005	0.35	0.955	1.319E-03
	46.6	42.6	4.0	44	900	0.0005	0.35	0.955	1.319E-03
6	47.6	42.6	5.0	58	900	0.0006	0.44	0.955	1.390E-03
	47.6	42.6	5.0	57	900	0.0006	0.44	0.955	1.367E-03
	47.6	42.6	5.0	57	900	0.0006	0.44	0.955	1.367E-03
									Average
									1.295E-03

Remarks: Recompacted sample (equal to 90% ASTM D698, as received MC).
Tested with site water.

DRAFT

RSA Geolab

PERMEABILITY TEST BY CONSTANT HEAD METHOD
ASTM D2434

Project: Saranac Lake OU01 (Site No. 516008) Proj. #: 912

Client: Wood PLC/Mactec Date: 10-10-19

Sample ID: Soil Type III
Description: Pale Brown poorly graded sand with silt

Unit Weight Determination:

Diameter,D	11.35	cm	Height of Mold	8.25	in.
Area, A	101.2	cm2	Height from top of Mold	1.25	in.
Length, L	11.43	cm	Height of Sample, H, in.	7.00	in.

	Initial (lbs.)	Final (lbs.)	Dry (lbs.)
Soil & Tare	7.25	8.91	7.56
Tare	0.00	1.10	1.10
Soil	7.25	7.81	6.46

Moisture Content

Initial:	12.2	%
Final:	20.9	%
Density Dry, W	101.69	pcf

Void Ratio,e: 0.6462
Specific Gravity: 2.6827

Test #	Manometers h1	Manometers h2	Head,h cm	Q ml	t sec.	Q/At	h/L	Temp C	k cm/s
1	45.0	43.0	2.0	43	900	0.0005	0.17	0.947	2.556E-03
	45.0	43.0	2.0	43	900	0.0005	0.17	0.947	2.556E-03
	45.0	43.0	2.0	42	900	0.0005	0.17	0.947	2.496E-03
2	45.5	43.0	2.5	55	900	0.0006	0.22	0.947	2.615E-03
	45.5	43.0	2.5	55	900	0.0006	0.22	0.947	2.615E-03
	45.5	43.0	2.5	54	900	0.0006	0.22	0.947	2.568E-03
3	46.1	43.1	3.0	67	900	0.0007	0.26	0.947	2.655E-03
	46.1	43.1	3.0	67	900	0.0007	0.26	0.947	2.655E-03
	46.1	43.1	3.0	66	900	0.0007	0.26	0.947	2.615E-03
4	46.5	43.1	3.4	77	900	0.0008	0.30	0.947	2.692E-03
	46.5	43.1	3.4	77	900	0.0008	0.30	0.947	2.692E-03
	46.5	43.1	3.4	76	900	0.0008	0.30	0.947	2.657E-03
5	47.1	43.1	4.0	95	900	0.0010	0.35	0.947	2.823E-03
	47.1	43.1	4.0	94	900	0.0010	0.35	0.947	2.793E-03
	47.1	43.1	4.0	94	900	0.0010	0.35	0.947	2.793E-03
6	48.2	43.2	5.0	130	900	0.0014	0.44	0.947	3.091E-03
	48.2	43.2	5.0	130	900	0.0014	0.44	0.947	3.091E-03
	48.2	43.2	5.0	128	900	0.0014	0.44	0.947	3.043E-03
									Average
									2.722E-03

Remarks: Recompacted sample (equal to 90% ASTM D698, as received MC).
Tested with site water.

DRAFT

RSA Geolab

10-Oct-19

SPECIFIC GRAVITY TESTS

ASTM D854

CLIENT: Wood PLC
MACTEC

PROJECT NO.: 912

PROJECT: Saranac Lake OU01 (Site No. 516008)

SAMPLE	Bentonite API Section 9	Type II Portland Cement		
DEPTH				
DATE	08-Oct-19			
PYCNOMETER NO.	B	2		
1. TARE AND DRY SOIL	123.16	127.56		
2. TARE WEIGHT	87.41	92.20		
3. WT. DRY SOIL	35.75	35.36	0.00	0.00
4. TEMP	23.5	23.6		
5. WT. PYC SOIL	358.18	365.42		
6. WT. PYC. AT TEMP	335.63	340.53		
7. AW (5-6)	22.55	24.89	0.00	0.00
8. SP. GR. = 3/(6-(5-3))	2.7083	3.3773	0	0
9. TEMP. CORRECTION	0.9992	0.9992		
10. SPEC. GRAVITY	2.7062	3.3746	0.0000	0.0000

DRAFT

PERFORMED BY: MF
COMPUTED BY: KH

CHECKED BY: KP

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 10-3-19 Job No.: 912 Lab Log: 19-376

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)

Samples: Soil Type I, Soil Type II, Soil Type III

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D2216 Moisture Content
- ASTM D4318 Atterberg Limits
- ASTM D422 Sieve & Hydrometer Analysis
- ASTM D854 Specific Gravity

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____
Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab	MOISTURE CONTENTS TEST METHOD ASTM D-2216

CLIENT:	Wood PLC MACTEC	**DATE:**	03-Oct-19
PROJECT:	Saranac Lake OU01 (Site No. 516008)	**PROJECT #**	912

HOLE #/ SAMPLE #	Soil Type I	Soil Type II	Soil Type III		
DEPTH					
WET WGT. + tare (gms.)	1740.2	1594.0	1504.2		
DRY WGT. + tare (gms.)	1378.4	1390.1	1350.1		
WGT. WATER (gms.)	361.8	203.9	154.1	0.0	0.0
TARE (gms.)	13.0	13.0	13.0		
DRY WGT. (gms.)	1365.4	1377.1	1337.1	0.0	0.0
MOISTURE CONTENT	26.5%	14.8%	11.5%		

HOLE #/ SAMPLE #					
DEPTH					
WET WGT. + tare (gms.)					
DRY WGT. + tare (gms.)					
WGT. WATER (gms.)	0.0	0.0	0.0	0.0	0.0
TARE (gms.)					
DRY WGT. (gms.)	0.0	0.0	0.0	0.0	0.0
MOISTURE CONTENT					

DRAFT

Performed by: EE Entered by: KH Checked by: KP

RSA Geolab

03-Oct-19

SPECIFIC GRAVITY TESTS

ASTM D854

CLIENT: Wood PLC
MACTEC

PROJECT NO.: 912

PROJECT: Saranac Lake OU01 (Site No. 516008)

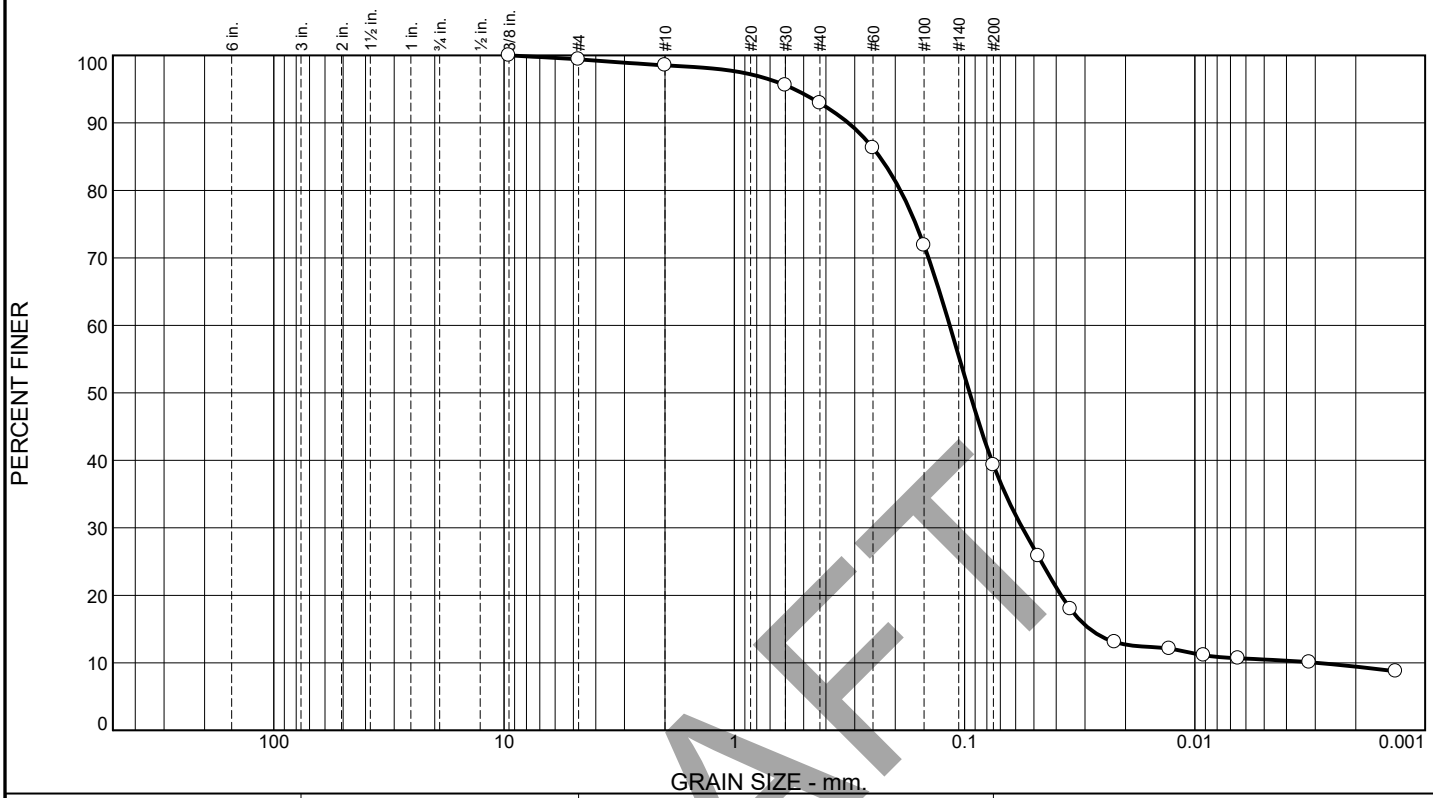
SAMPLE	Soil Type I	Soil Type II	Soil Type III	
DEPTH				
DATE	29-Sep-19			
PYCNOMETER NO.	2	5	B	
1. TARE AND DRY SOIL	127.61	124.35	124.47	
2. TARE WEIGHT	92.23	89.27	87.45	
3. WT. DRY SOIL	35.38	35.08	37.02	0.00
4. TEMP	23.3	23.3	23.3	
5. WT. PYC SOIL	362.62	359.39	358.84	
6. WT. PYC. AT TEMP	340.50	337.61	335.61	
7. AW (5-6)	22.12	21.78	23.23	0.00
8. SP. GR. = 3/(6-(5-3))	2.6682	2.6376	2.6846	0
9. TEMP. CORRECTION	0.9993	0.9993	0.9993	
10. SPEC. GRAVITY	2.6663	2.6357	2.6827	0.0000

DRAFT

PERFORMED BY: MF
COMPUTED BY: KH

CHECKED BY: KP

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.6	0.9	5.6	53.6	28.8	10.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.4		
#10	98.5		
#30	95.6		
#40	92.9		
#60	86.3		
#100	71.9		
#200	39.3		

* (no specification provided)

Material Description

Grayish Brown silty sand

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 0.3201 D_{85}= 0.2339 D_{60}= 0.1161
D_{50}= 0.0951 D_{30}= 0.0561 D_{15}= 0.0286
D_{10}= 0.0030 C_u= 39.23 C_c= 9.17

Classification

USCS= SM AASHTO= A-4(0)

Remarks

Sample Number: Soil Type I

Date: 10-3-19

RSA Geolab

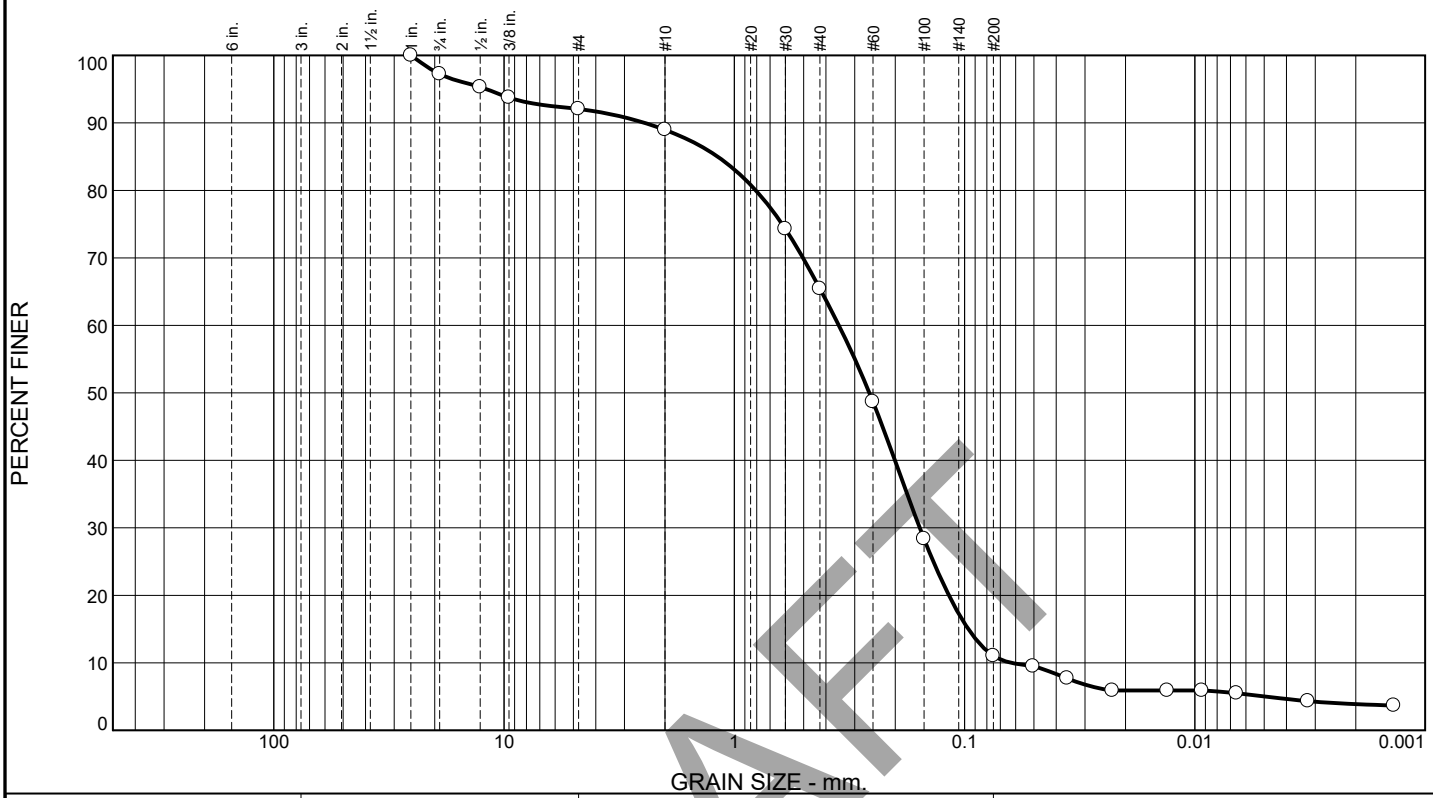
Union, New Jersey

Client: Wood PLC
Project: MACTEC
Project No: 912 **Figure**

Tested By: MF **Checked By:** KP

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.8	5.1	3.1	23.6	54.4	6.0	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	97.2		
.5	95.3		
.375	93.7		
#4	92.1		
#10	89.0		
#30	74.3		
#40	65.4		
#60	48.7		
#100	28.4		
#200	11.0		

* (no specification provided)

Material Description

Grayish Brown poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 2.4544 D_{85}= 1.1817 D_{60}= 0.3517
D_{50}= 0.2591 D_{30}= 0.1566 D_{15}= 0.0964
D_{10}= 0.0628 C_u= 5.60 C_c= 1.11

Classification

USCS= SP-SM AASHTO= A-2-4(0)

Remarks

Sample Number: Soil Type II

Date: 10-3-19

RSA Geolab

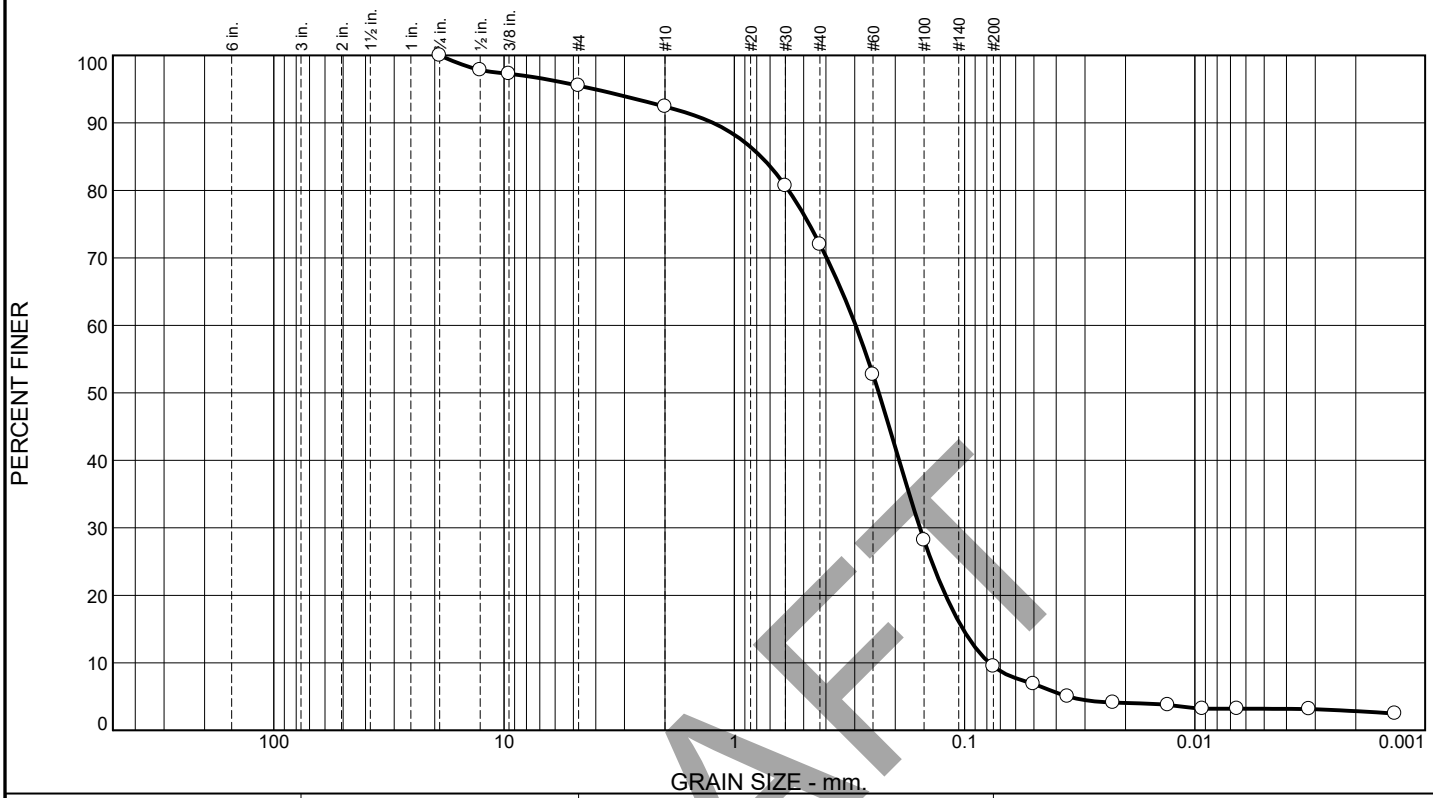
Union, New Jersey

Client: Wood PLC
Project: MACTEC
Project No: 912 **Figure**

Tested By: MF **Checked By:** KP

DRAFT

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.5	3.1	20.4	62.5	6.3	3.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	97.8		
.375	97.3		
#4	95.5		
#10	92.4		
#30	80.7		
#40	72.0		
#60	52.7		
#100	28.2		
#200	9.5		

* (no specification provided)

Material Description

Pale Brown poorly graded sand with silt

Atterberg Limits

PL= NP LL= NV PI= NP

Coefficients

D_{90}= 1.2363 D_{85}= 0.7659 D_{60}= 0.2973
D_{50}= 0.2358 D_{30}= 0.1563 D_{15}= 0.1017
D_{10}= 0.0782 C_u= 3.80 C_c= 1.05

Classification

USCS= SP-SM AASHTO= A-3

Remarks

Sample Number: Soil Type III

Date: 10-3-19

RSA Geolab

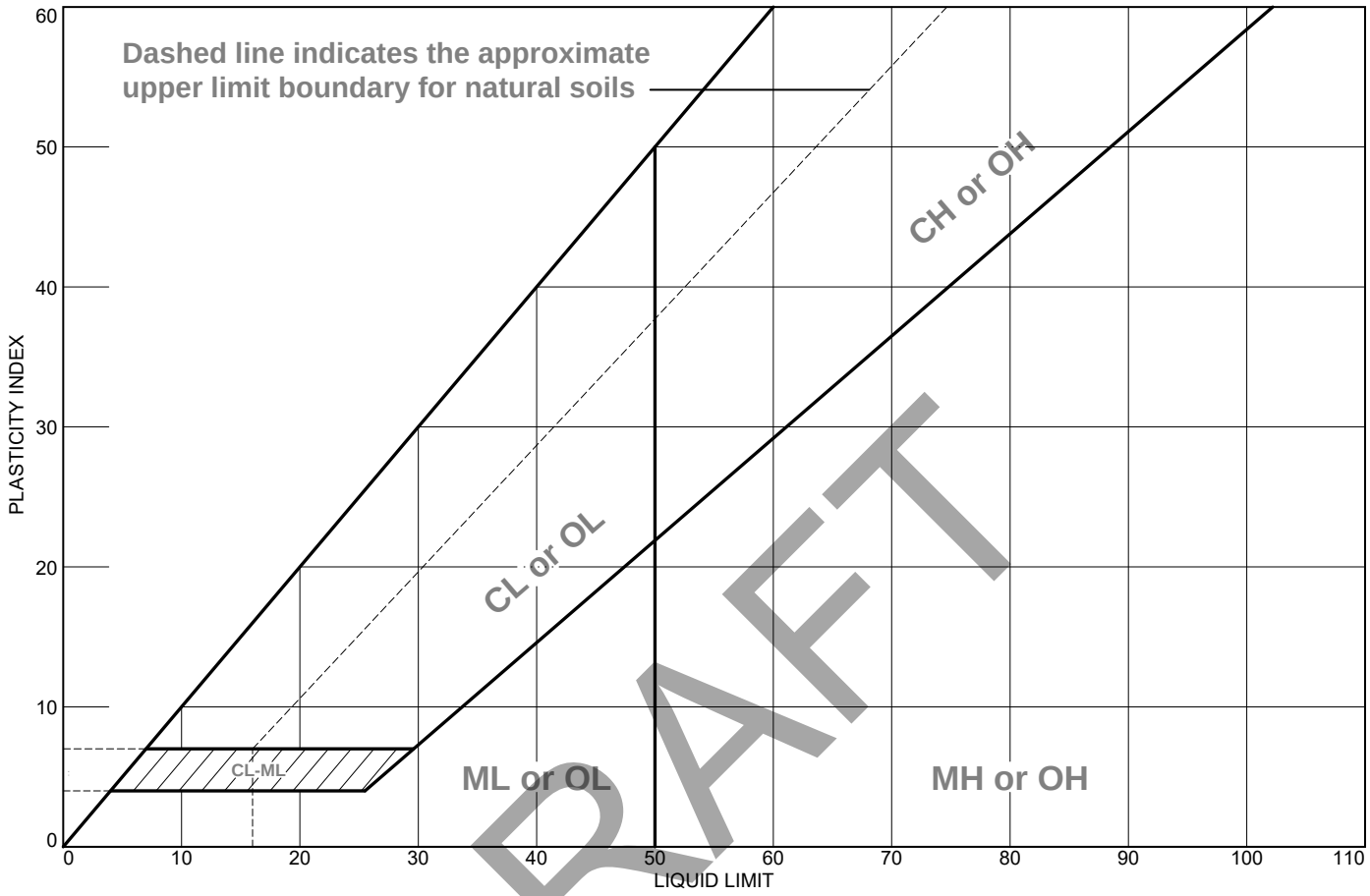
Union, New Jersey

Client: Wood PLC
Project: MACTEC
Project No: 912 **Figure**

Tested By: MF **Checked By:** KP

DRAFT

LIQUID AND PLASTIC LIMITS TEST REPORT



DRAFT

	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Grayish Brown silty sand	NV	NP	NP	92.9	39.3	SM
■	Grayish Brown poorly graded sand with silt	NV	NP	NP	65.4	11.0	SP-SM
▲	Pale Brown poorly graded sand with silt	NV	NP	NP	72.0	9.5	SP-SM

Project No. 912 **Client:** Wood PLC

Project: MACTEC

●**Sample Number:** Soil Type I

■**Sample Number:** Soil Type II

▲**Sample Number:** Soil Type III

Remarks:

●10-3-19

RSA Geolab

Union, New Jersey

Figure

Tested By: MF **Checked By:** KP

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 1-3-20 Job No.: 912 Lab Log: 19-548

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)
Phase 1 Supplemental Testing

Samples: Soil Type I, Soil Type II, Soil Type III, Water:Cement mixes

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D2974 Organic Content (Soil Type I, II, & III)
- ASTM D1633 Unconfined Compression (Water:Cement mixes) (3 tests)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab

MOISTURE CONTENT (ASTM D2216)/
LOSS ON IGNITION (ASTM D2974)

Project: Saranac Lake OU01 (Site No. 516008) Project #: 912
Phase 1 Supplemental Testing
Client: Wood PLC/Mactec Date: 1-3-20

HOLE #/ SAMPLE #	Type 1	Type 2	Type 3			
DEPTH						
WET WGT. + TARE (gm	578.4	482.9	479.1			
DRY WGT. + TARE (gm	496.5	422.8	400.3			
WGT. WATER (gms.)	81.9	60.1	78.8	0.0	0.0	0.0
TARE (gms.)	15.2	13.2	15.2			
DRY WGT. (gms.)	481.3	409.6	385.1	0.0	0.0	0.0
MOISTURE CONTENT (%)	**17.0**	**14.7**	**20.5**	**0.0**	**0.0**	**0.0**
OVEN DRIED SAMPLE + TARE (gms.)	109.79	108.09	78.56			
AFTER IGNITION SAMPLE + TARE (gms.)	109.14	106.56	77.89			
LOSS ON IGNITION (gms.)	0.65	1.53	0.67	0.00	0.00	0.00
TARE (gms.)	52.09	57.20	26.96			
INITIAL WGT. OF OVEN DRIED SAMPLE (gms.)	57.70	50.89	51.60	0.00	0.00	0.00
LOSS ON IGNITION (%)	**1.13**	**3.01**	**1.30**	**0.00**	**0.00**	**0.00**

DRAFT

Performed by: MF Entered by: KH Checked by: KP

ATTACHMENT B

PHASE 2 LABORATORY TEST REPORTS

DRAFT

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 11-4-19 Job No.: 912 Lab Log: 19-376

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)

Samples: Grout Mix G1a,G1b,G2a,G2b,G3a,G3b

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D4380 Density of Bentonitic Slurries
- ASTM D6910 Marsh Funnel Viscosity (API RP 13B-1)
- Pocket Penetrometer

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____
Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab

GROUT MIX TESTING

Project: Saranac Lake OU01 (Site No. 516008)

Client: Wood PLC/Mactec

Proj. No. 912

Date: 11-4-19

Tested by: MF
Entered by: KH
Checked by: KP

Sample	Density of Bentinitic Slurries ASTM D4380 (g/cm^3)	Marsh Funnel Viscosity API RP 13B-1/ASTM D6910 (sec/L)	Pocket Penetrometer (TSF) After 3 Days Curing	Pocket Penetrometer (TSF) After 7 Days Curing
Grout Mix G1a	1.50	31.03	>4.5	>4.5
Grout Mix G1b	1.28	28.69	>4.5	>4.5
Grout Mix G2a	1.51	36.69	>4.5	>4.5
Grout Mix G2b	1.37	29.04	>4.5	>4.5
Grout Mix G3a	1.52	37.06	>4.5	>4.5
Grout Mix G3b	1.40	31.47	>4.5	>4.5

Remarks:
Grout Mix G1a water:cement 1:1 by wt.
Grout Mix G1b water:cement 1.5:1 by wt.
Grout Mix G2a water:cement:bentonite 1:1:0.025 by wt.
Grout Mix G2b water:cement:bentonite 1.5:1:0.025 by wt.
Grout Mix G3a water:cement:bentonite 1:1:0.05 by wt.
Grout Mix G3b water:cement:bentonite 1.5:1:0.05 by wt.

DRAFT

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 1-3-20 Job No.: 912 Lab Log: 19-548

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)
Phase 2 Supplemental Testing

Samples: Water:Bentonite:Cement mixes

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D4380 Density of Bentonitic Slurries (6 tests)
- ASTM D6910 Marsh Funnel Viscosity (6 tests)
- Pocket Penetrometer (4 tests)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____
Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab

DENSITY (ASTM D4380)/VISCOSITY(ASTM D6910)/
POCKET PENETROMETER

Project: Saranac Lake OU01 (Site No. 516008) Project #: 912
Phase 2 Supplemental Testing
Client: Wood PLC/Mactec Date: 1-3-20

SAMPLE	Density of Bentonitic Slurry g/cm3	Marsh Funnel Viscosity sec/L	Pocket Penetrometer TSF	
			3 day	7 day
G2a - before hydration mix water:bentonite (1:0.025)	1.009	28.84	NA	NA
G2b - before hydration mix water:bentonite (1.5:0.025)	1.005	28.19	NA	NA
G2a - after 24 h hydration mix water:bentonite (1:0.025)	1.009	28.93	NA	NA
G2b - after 24 h hydration mix water:bentonite (1.5:0.025)	1.005	28.23	NA	NA
G2a - after cement addition mix water:bentonite:cement (1:0.025:1)	1.505	69.44	>4.5	>4.5
G2b - after cement addition mix water:bentonite:cement (1.5:0.025:1)	1.346	34.16	>4.5	>4.5

DRAFT

Remarks: Cement: Portland Type I/II

Performed by: MF Entered by: KH Checked by: KP

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 1-3-20 Job No.: 912 Lab Log: 19-548

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)
Phase 1 Supplemental Testing

Samples: Soil Type I, Soil Type II, Soil Type III, Water:Cement mixes

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D2974 Organic Content (Soil Type I, II, & III)
- ASTM D1633 Unconfined Compression (Water:Cement mixes) (3 tests)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

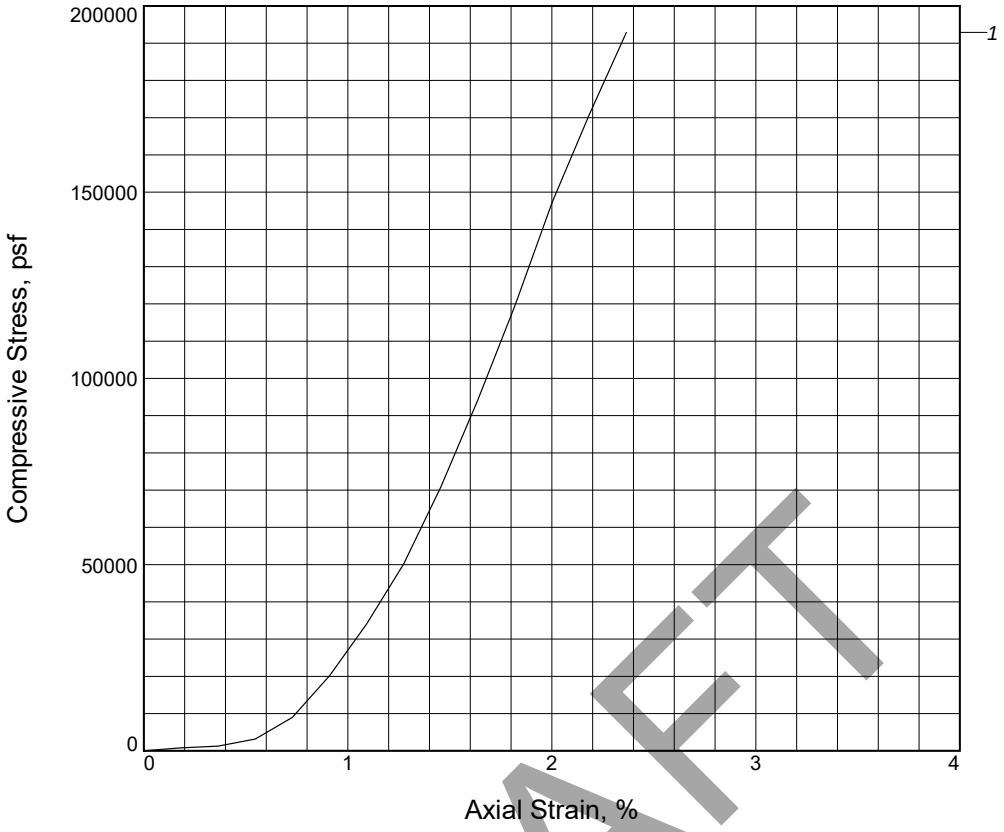
Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	192902			
Undrained shear strength, psf	96451			
Failure strain, %	2.4			
Strain rate, in./min.	0.050			
Water content, %	N/A			
Wet density, pcf	122.6			
Dry density, pcf	N/A			
Saturation, %	N/A			
Void ratio	N/A			
Specimen diameter, in.	3.00			
Specimen height, in.	5.50			
Height/diameter ratio	1.83			

Description: Cement: Portland Type I/II

LL =	**PL =**	**PI =**	**Assumed GS=**	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 1-3-20

Remarks:
Tested after 14 days curing

Figure _____

Client: Wood PLC

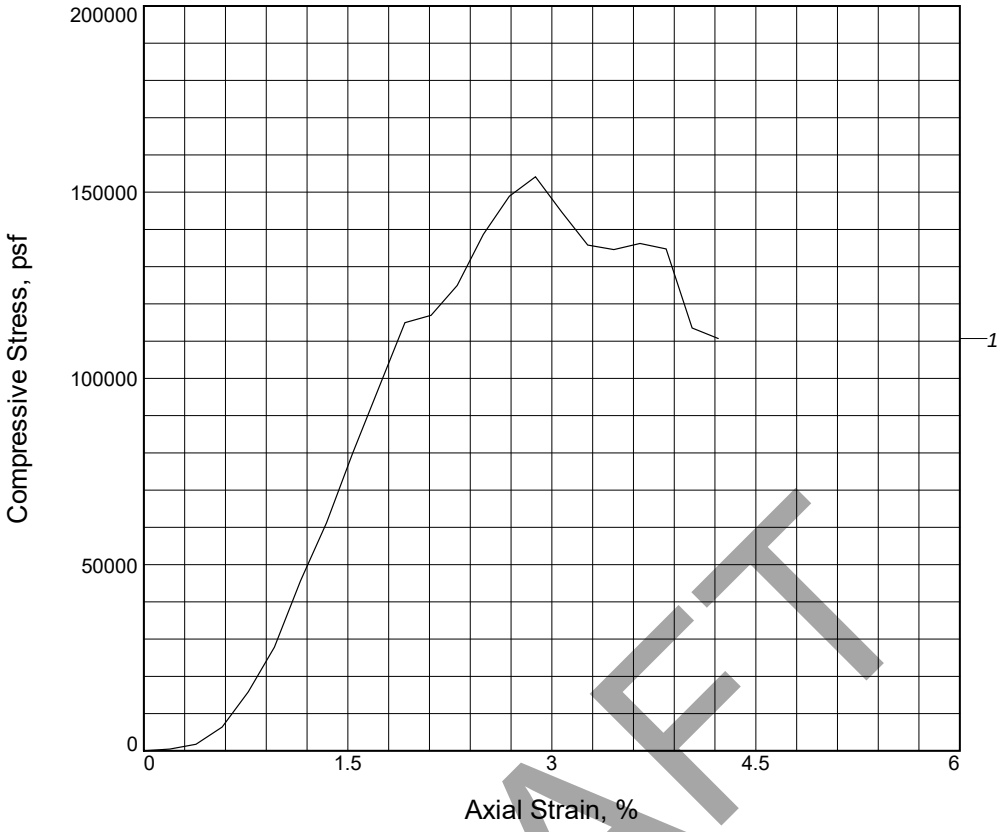
Project: MACTEC
Phase 1 Supplemental Testing

Location: Water:Cement (0.5:1) by wt.

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	154122			
Undrained shear strength, psf	77061			
Failure strain, %	2.9			
Strain rate, in./min.	0.050			
Water content, %	N/A			
Wet density, pcf	114.3			
Dry density, pcf	N/A			
Saturation, %	N/A			
Void ratio	N/A			
Specimen diameter, in.	3.01			
Specimen height, in.	5.21			
Height/diameter ratio	1.73			

Description: Cement: Portland Type I/II

LL =	**PL =**	**PI =**	**Assumed GS=**	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 1-3-20

Remarks:
Tested after 14 days curing

Figure _____

Client: Wood PLC

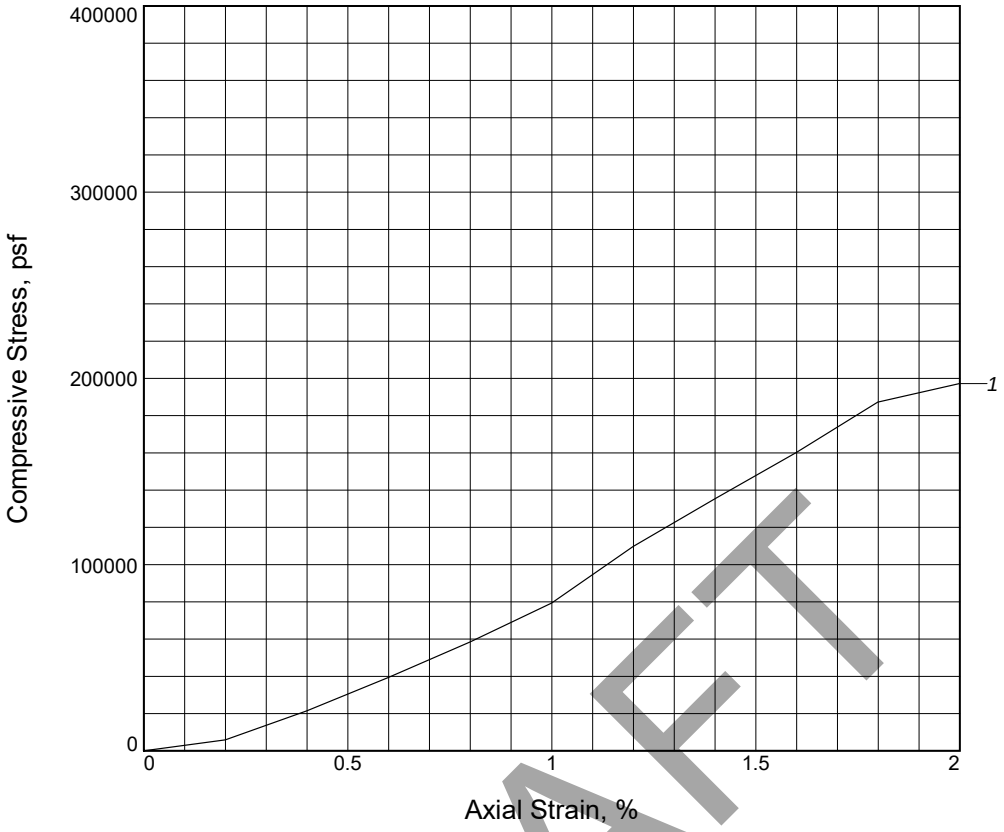
Project: MACTEC
Phase 1 Supplemental Testing

Location: Water:Cement:DNAPL (0.5:1:0.1) by wt.

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	197228			
Undrained shear strength, psf	98614			
Failure strain, %	2.0			
Strain rate, in./min.	0.050			
Water content, %	N/A			
Wet density, pcf	118.3			
Dry density, pcf	N/A			
Saturation, %	N/A			
Void ratio	N/A			
Specimen diameter, in.	3.01			
Specimen height, in.	5.00			
Height/diameter ratio	1.66			

Description: Cement: Portland Type I/II

LL =	**PL =**	**PI =**	**Assumed GS=**	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 1-3-20

Remarks:
Tested after 14 days curing

Figure _____

Client: Wood PLC

Project: MACTEC
Phase 1 Supplemental Testing

Location: Water:Cement:LNAPL (0.5:1:0.1) by wt.

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 1-22-20 Job No.: 912 Lab Log: 19-548

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)
Phase 2 Supplemental Testing

Samples: Grout testing

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D4380 Density of Bentonitic Slurries (2 tests)
- ASTM D6910 Marsh Funnel Viscosity (2 tests)
- Pocket Penetrometer (4 tests)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab

DENSITY (ASTM D4380)/VISCOSITY(ASTM D6910)/
POCKET PENETROMETER

Project: Saranac Lake OU01 (Site No. 516008) Project #: 912
Phase 2 Supplemental Testing
Client: Wood PLC/Mactec Date: 1-22-20

SAMPLE	Density of Bentonitic Slurry g/cm3	Marsh Funnel Viscosity sec/L	Pocket Penetrometer TSF	
			3 day	7 day
G2a Tap water : Bentonite : Cement (1 : 0.025 : 1) (4000g : 100g : 4000g)	1.505	70.09	>4.5	>4.5
G4a Tap water : Bentonite : Cement (0.75 : 0.025 : 1) (3000g : 100g : 4000g)	1.629	~6ml collected in 600 secs	>4.5	>4.5

Remarks: 1. Cement: Portland Type I/II
2. laboratory Tap water used (as replacement for Mix water)

Performed by: EE/MF
Checked by: KP

DRAFT

ATTACHMENT C

PHASE 3 LABORATORY TEST REPORTS

DRAFT

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 12-9-19 Job No.: 912 Lab Log: 19-376

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)

Samples: Grout Mix Phase 3a Testing

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D1633 Unconfined Compression (15 tests)
- ASTM D5084 Permeability (recompacted) (15 tests)
- Pocket Penetrometer (45 tests)
- Photographs (60)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____
Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab

GROUT MIX TESTING

Project: Saranac Lake OU01 (Site No. 516008) Phase 3a — Proj. No. 912

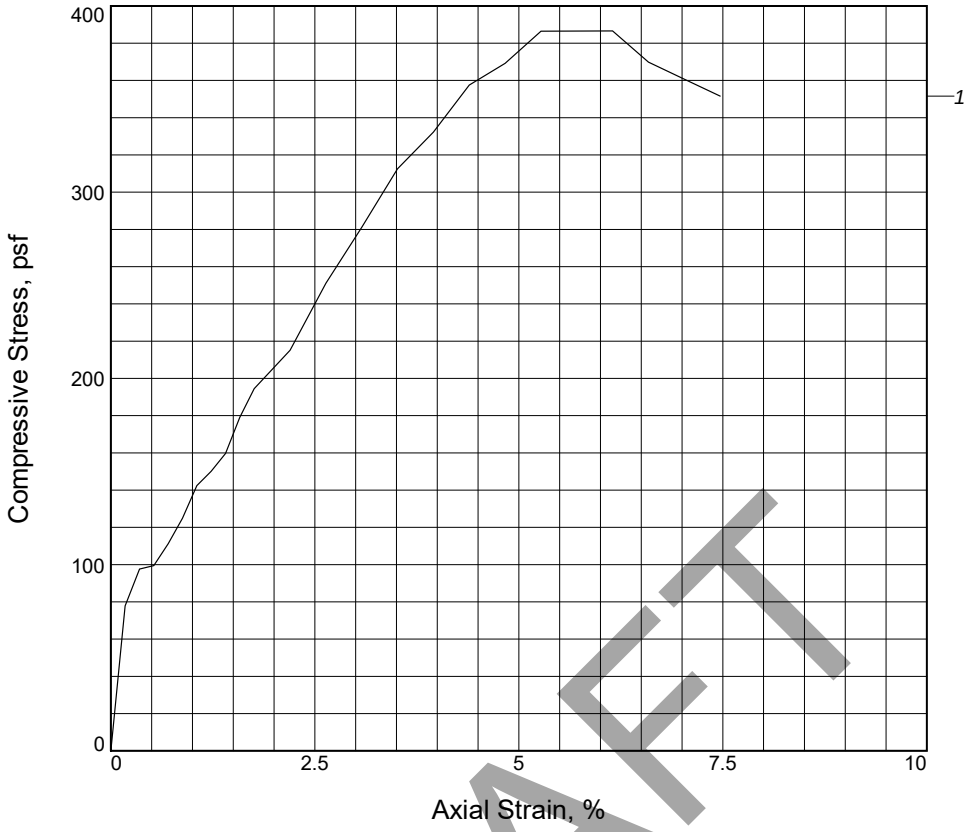
Client: Wood PLC/Mactec — Date: 12-9-19

S#	Sample				Pocket Penetrometer (TSF)		
	Wet Soil	Grout Mix	Site Water	Product Type	After 3 Days Curing	After 7 Days Curing	After 14 Days Curing
	Mix Ratios (by Wt.)						
1	Type 1 20	G1a 2.0	0.30	DNAPL 0.03	0	0.25	1.00
2	Type 1 20	G2a 2.0	0.30	DNAPL 0.03	0	0	0.25
3	Type 1 20	G2b 2.5	0.30	DNAPL 0.03	0	0	0
4	Type 2 20	G1a 2.0	0.30	LNAPL 0.03	2.75	>4.5	>4.5
5	Type 2 20	G2a 2.0	0.30	LNAPL 0.03	0.75	1.75	>4.5
6	Type 2 Type 1	G3a 2.0	0.30	LNAPL 0.03	0	0	0.25
7	Type 2 20	G1b 2.5	0.30	LNAPL 0.03	1.75	>4.5	>4.5
8	Type 2 20	G2b 2.5	0.30	LNAPL 0.03	0	0	0.5
9	Type 2 20	G3b 2.5	0.30	LNAPL 0.03	0	0	0.25
10	Type 3 20	G1a 2.0	0.30	NA	0.25	0.75	1.25
11	Type 3 20	G2a 2.0	0.30	NA	0	0	1.00
12	Type 3 20	G2b 2.5	0.30	NA	0	0	0.75
13	Type 1 10	G1a 2.0	0.15	DNAPL 0.015	0	0.25	2.25
14	Type 1 10	G2a 2.0	0.15	DNAPL 0.015	0	3.75	>4.5
15	Type 1 10	G2b 2.5	0.15	DNAPL 0.015	1.75	>4.5	>4.5

Tested by: MF
Entered by: KH
Checked by: KP

DRAFT

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	387			
Undrained shear strength, psf	193			
Failure strain, %	6.2			
Strain rate, in./min.	0.050			
Water content, %	25.0			
Wet density, pcf	123.1			
Dry density, pcf	98.5			
Saturation, %	94.9			
Void ratio	0.7114			
Specimen diameter, in.	3.03			
Specimen height, in.	5.69			
Height/diameter ratio	1.88			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 12-9-19
Remarks:
Mix poured in mold (no compaction) and tested after curing 28 days.

Figure _____

Client: Wood PLC

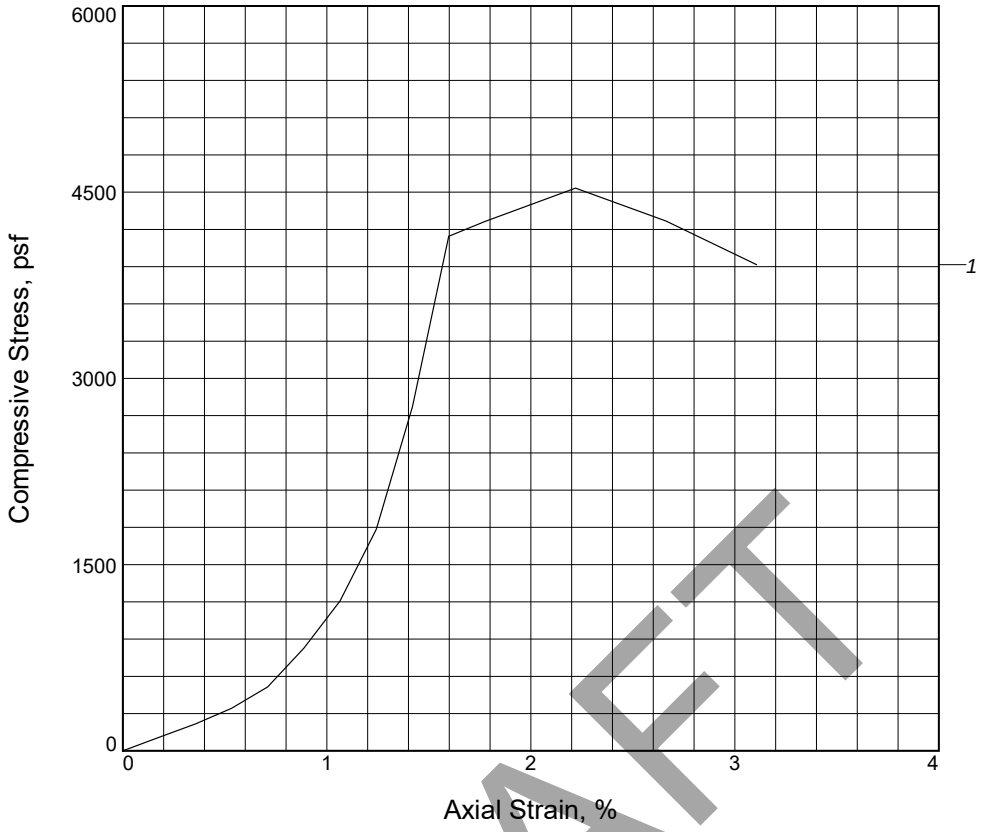
Project: MACTEC

Location: Type 1:G1a:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	4532			
Undrained shear strength, psf	2266			
Failure strain, %	2.2			
Strain rate, in./min.	0.050			
Water content, %	23.1			
Wet density, pcf	124.8			
Dry density, pcf	101.4			
Saturation, %	94.1			
Void ratio	0.6618			
Specimen diameter, in.	3.01			
Specimen height, in.	5.63			
Height/diameter ratio	1.87			

Description: 10:2.0:0.15:0.015 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

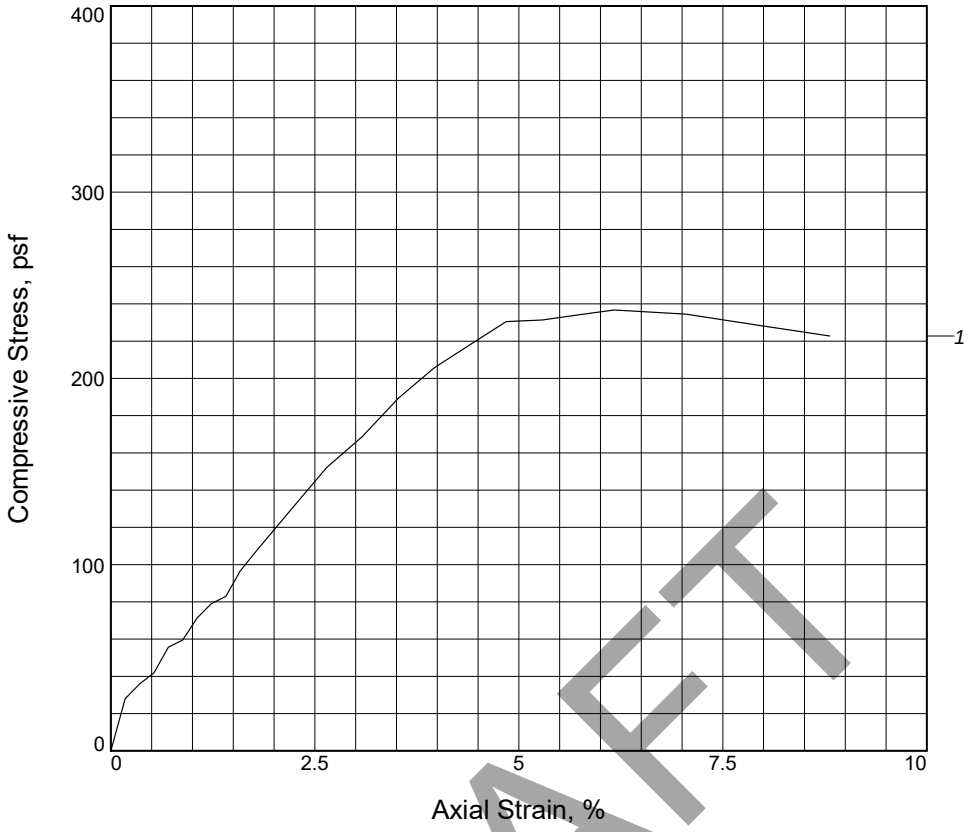
Project: MACTEC

Location: Type 1:G1a:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	237			
Undrained shear strength, psf	118			
Failure strain, %	6.2			
Strain rate, in./min.	0.050			
Water content, %	22.5			
Wet density, pcf	124.1			
Dry density, pcf	101.3			
Saturation, %	91.4			
Void ratio	0.6641			
Specimen diameter, in.	3.03			
Specimen height, in.	5.67			
Height/diameter ratio	1.88			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

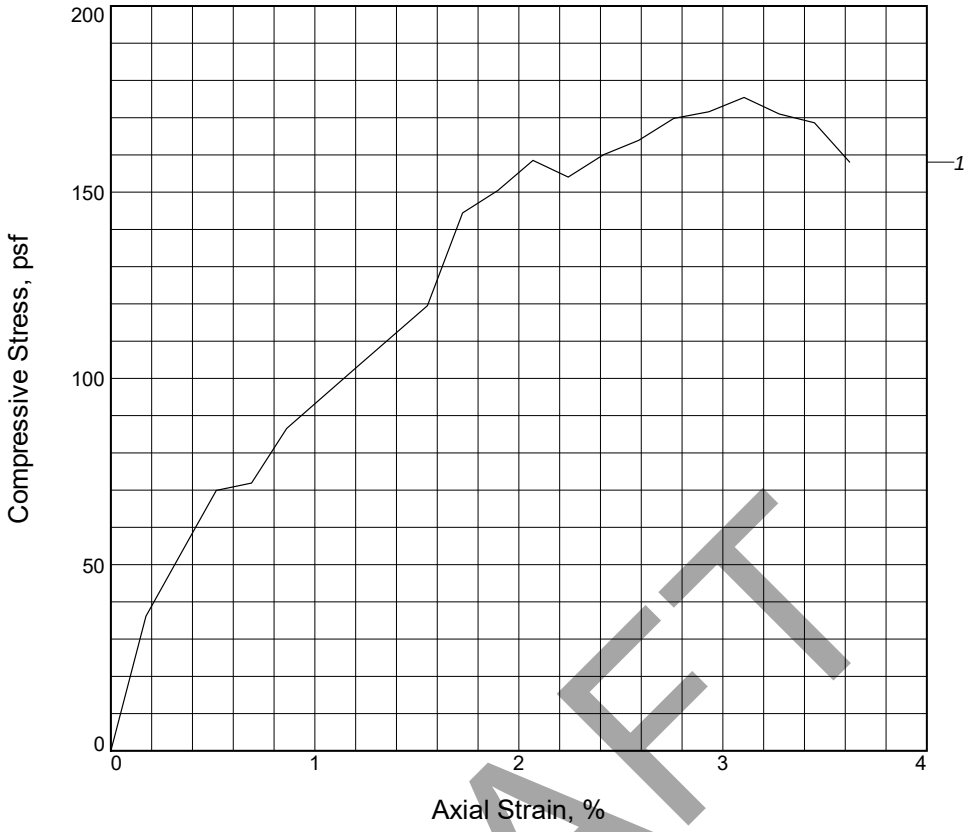
Project: MACTEC

Location: Type 1:G2a:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	175			
Undrained shear strength, psf	88			
Failure strain, %	3.1			
Strain rate, in./min.	0.050			
Water content, %	22.4			
Wet density, pcf	115.9			
Dry density, pcf	94.7			
Saturation, %	77.7			
Void ratio	0.7798			
Specimen diameter, in.	2.93			
Specimen height, in.	5.80			
Height/diameter ratio	1.98			

Description: 10:2.0:0.15:0.015 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

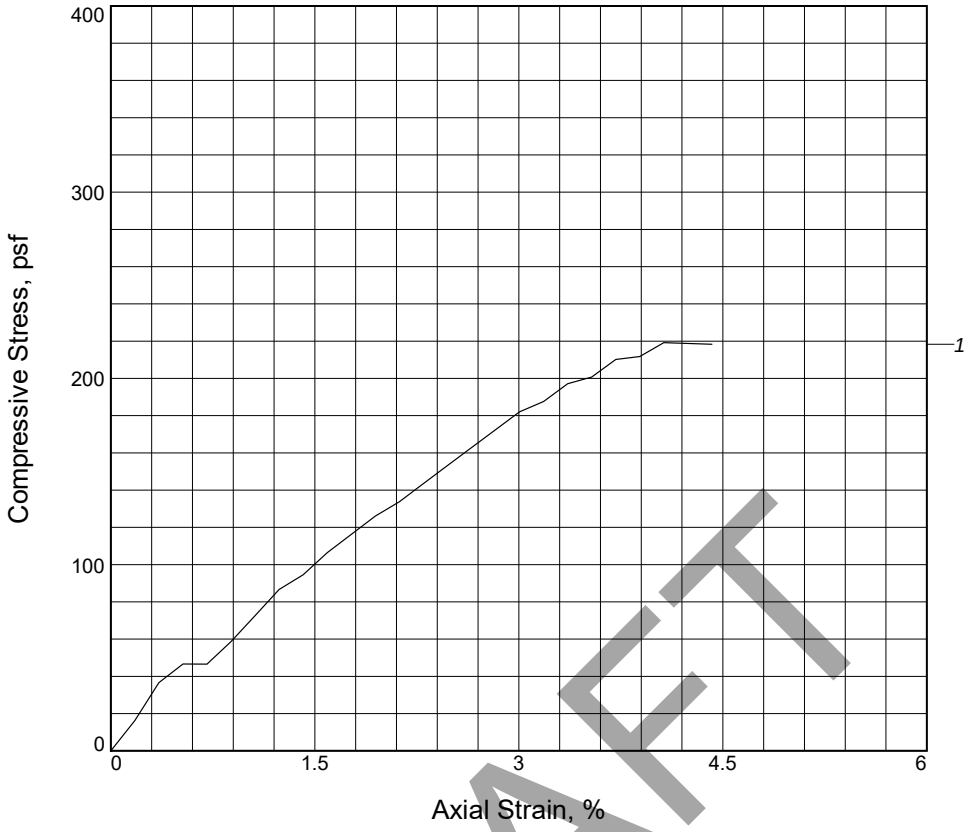
Project: MACTEC

Location: Type 1:G2a:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	219			
Undrained shear strength, psf	110			
Failure strain, %	4.1			
Strain rate, in./min.	0.050			
Water content, %	23.0			
Wet density, pcf	122.1			
Dry density, pcf	99.2			
Saturation, %	89.1			
Void ratio	0.6984			
Specimen diameter, in.	3.00			
Specimen height, in.	5.66			
Height/diameter ratio	1.89			

Description: 20:2.5:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

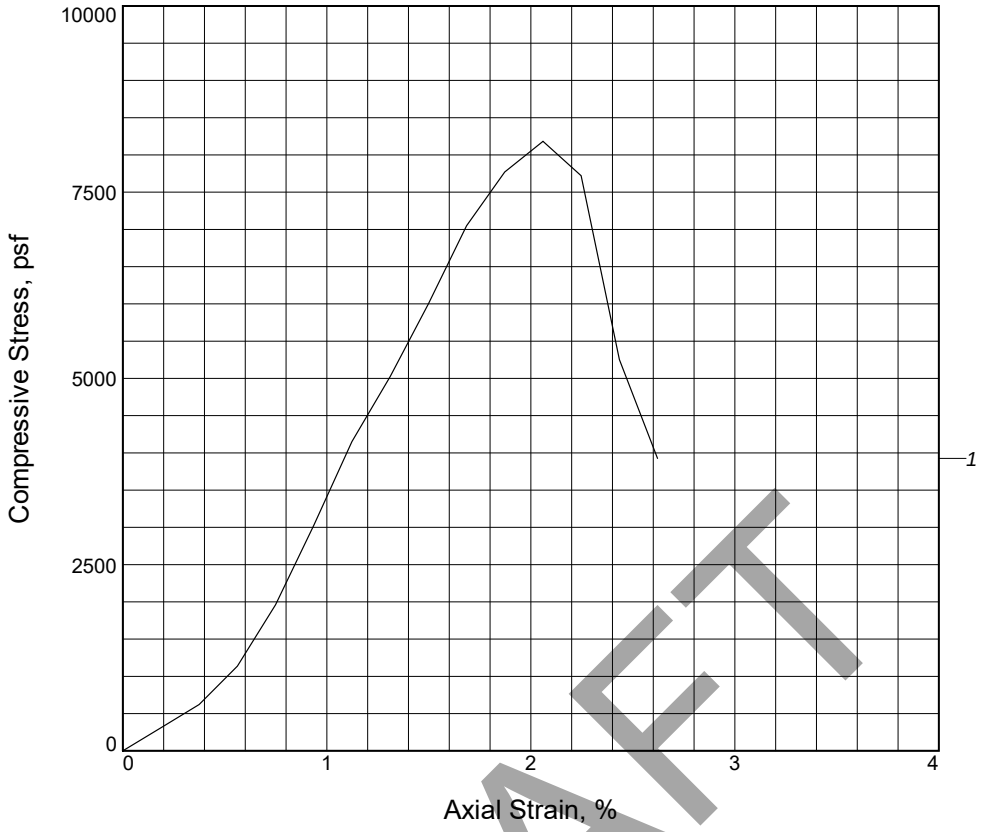
Project: MACTEC

Location: Type 1:G2b:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	8184			
Undrained shear strength, psf	4092			
Failure strain, %	2.1			
Strain rate, in./min.	0.050			
Water content, %	22.9			
Wet density, pcf	124.8			
Dry density, pcf	101.6			
Saturation, %	93.6			
Void ratio	0.6597			
Specimen diameter, in.	2.97			
Specimen height, in.	5.34			
Height/diameter ratio	1.80			

Description: 10:2.5:0.15:0.015 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

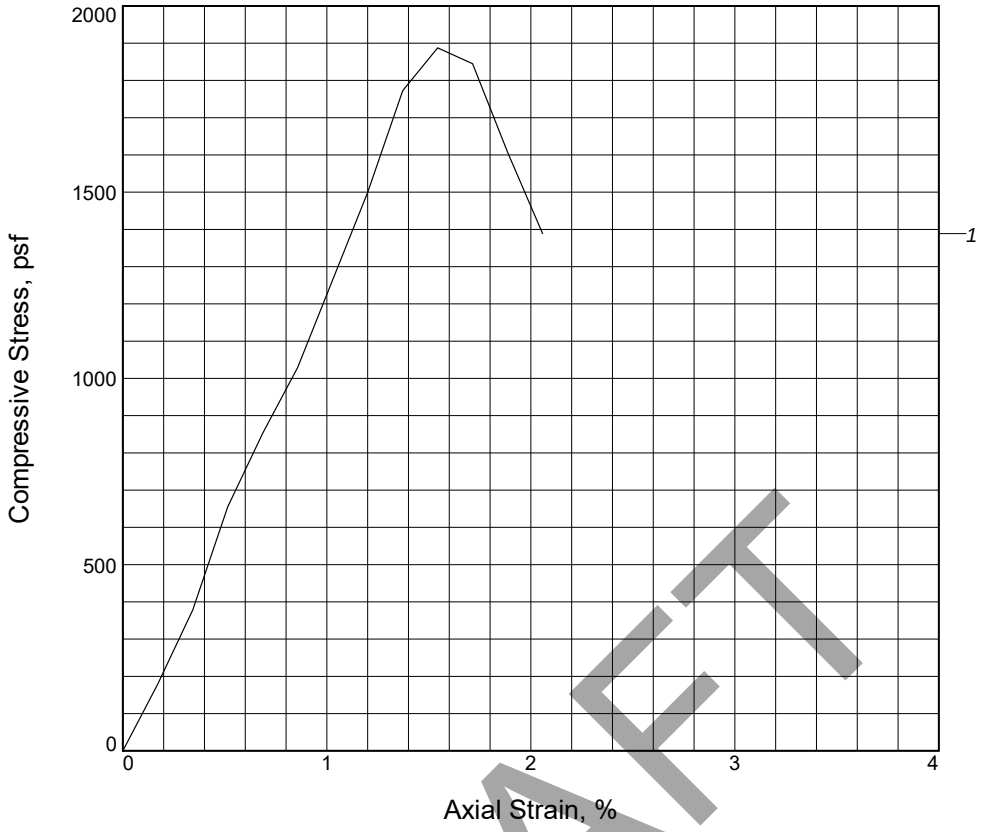
Project: MACTEC

Location: Type 1:G2b:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	1888			
Undrained shear strength, psf	944			
Failure strain, %	1.5			
Strain rate, in./min.	0.050			
Water content, %	18.7			
Wet density, pcf	124.1			
Dry density, pcf	104.5			
Saturation, %	82.4			
Void ratio	0.6126			
Specimen diameter, in.	3.03			
Specimen height, in.	5.83			
Height/diameter ratio	1.92			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

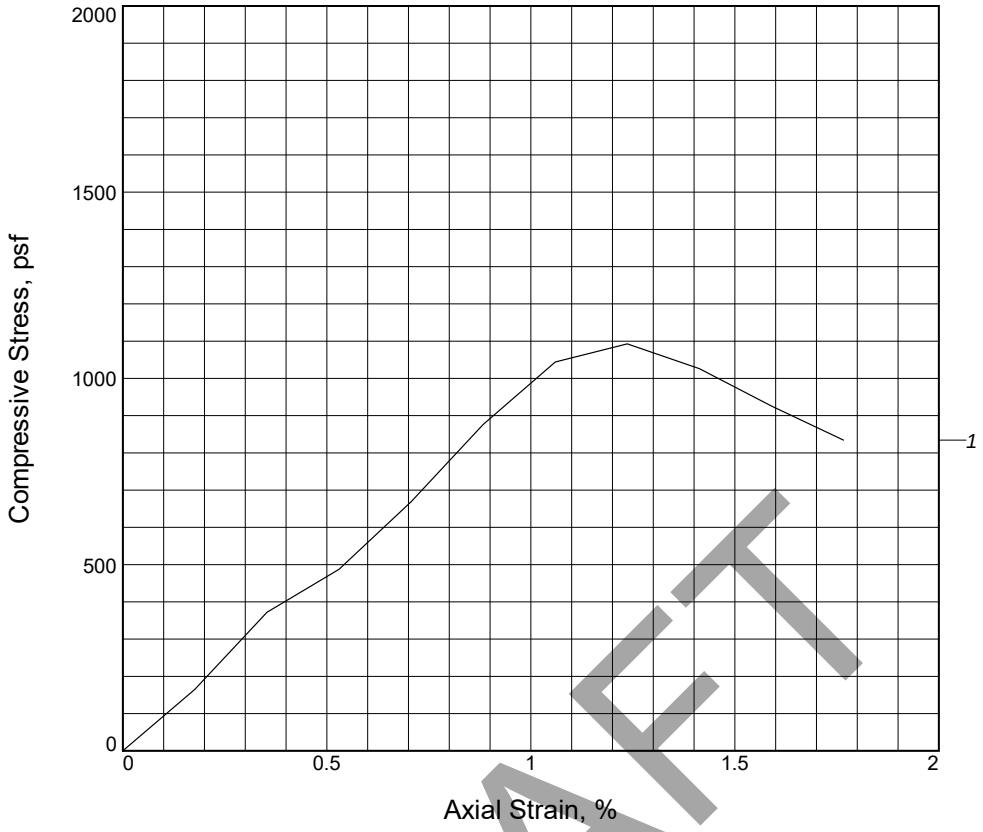
Project: MACTEC

Location: Type 2:G1a:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	1093			
Undrained shear strength, psf	546			
Failure strain, %	1.2			
Strain rate, in./min.	0.050			
Water content, %	21.5			
Wet density, pcf	124.9			
Dry density, pcf	102.8			
Saturation, %	90.7			
Void ratio	0.6391			
Specimen diameter, in.	3.00			
Specimen height, in.	5.66			
Height/diameter ratio	1.89			

Description: 20:2.5:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

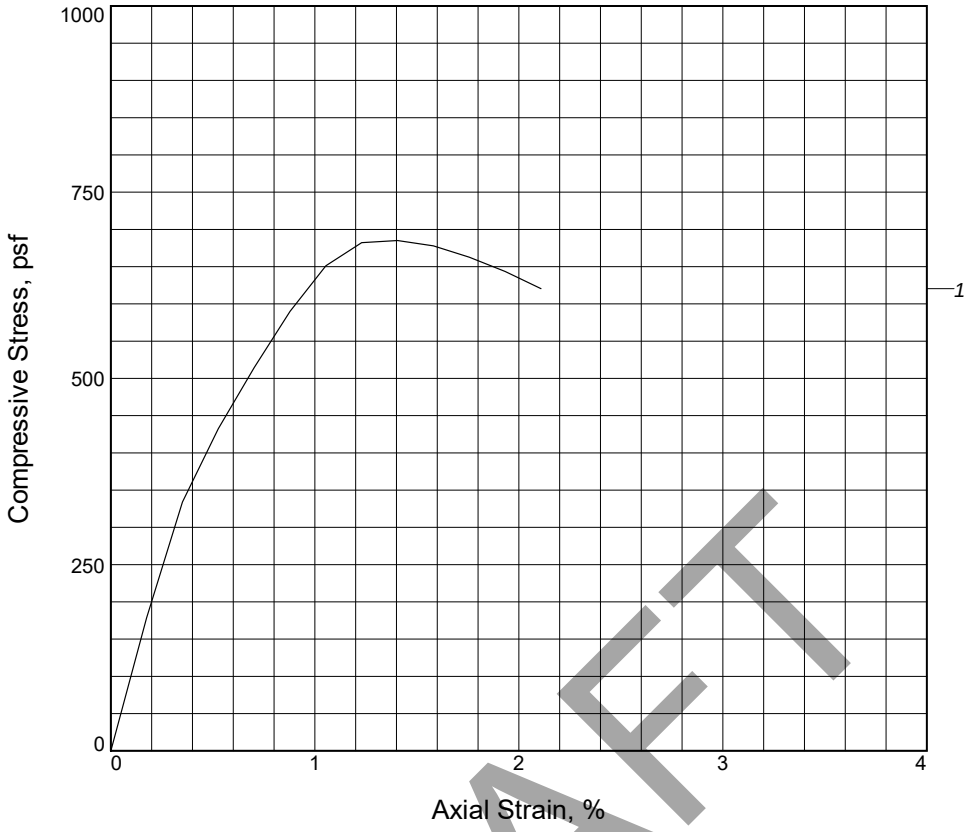
Project: MACTEC

Location: Type 2:G1b:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	685			
Undrained shear strength, psf	343			
Failure strain, %	1.4			
Strain rate, in./min.	0.050			
Water content, %	23.6			
Wet density, pcf	119.2			
Dry density, pcf	96.5			
Saturation, %	85.3			
Void ratio	0.7476			
Specimen diameter, in.	3.00			
Specimen height, in.	5.69			
Height/diameter ratio	1.89			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

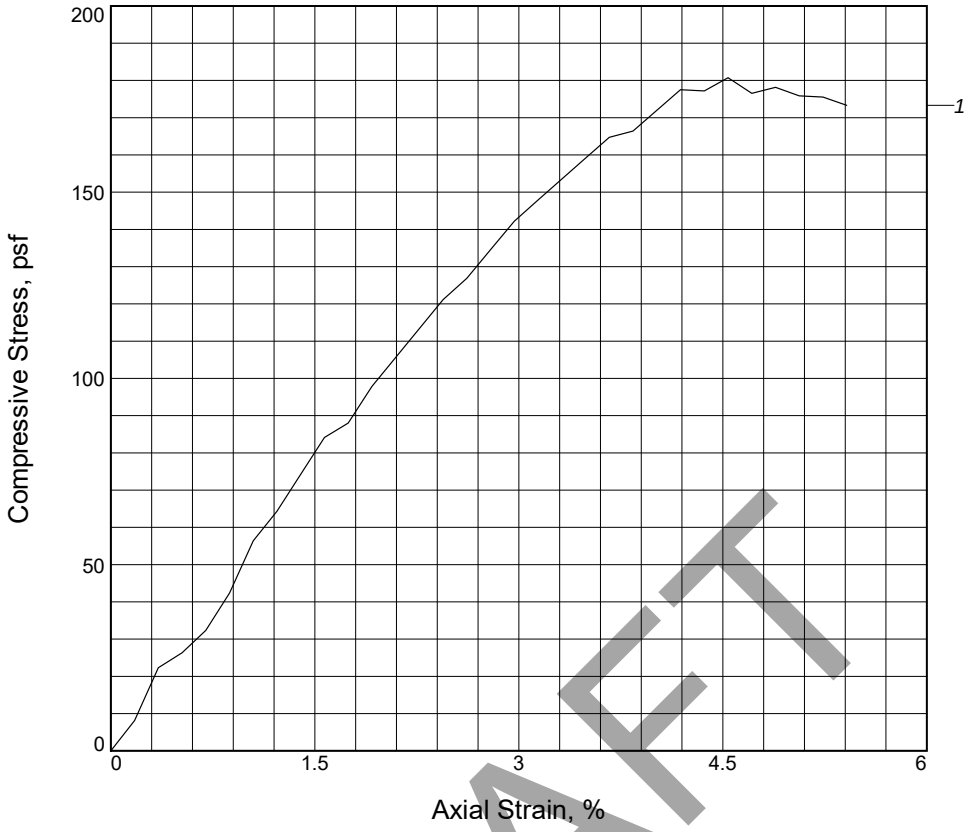
Project: MACTEC

Location: Type 2:G2a:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	181			
Undrained shear strength, psf	90			
Failure strain, %	4.5			
Strain rate, in./min.	0.050			
Water content, %	35.6			
Wet density, pcf	107.7			
Dry density, pcf	79.4			
Saturation, %	85.6			
Void ratio	1.1216			
Specimen diameter, in.	3.00			
Specimen height, in.	5.73			
Height/diameter ratio	1.91			

Description: 20:2.5:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

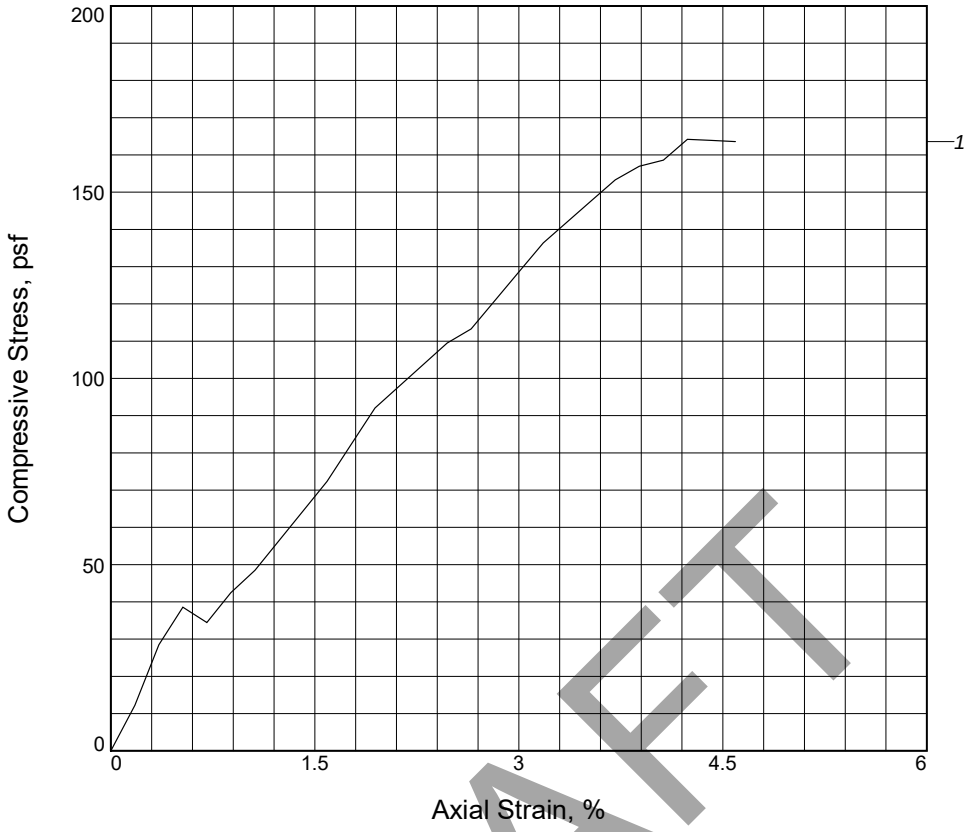
Project: MACTEC

Location: Type 2:G2b:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	164			
Undrained shear strength, psf	82			
Failure strain, %	4.2			
Strain rate, in./min.	0.050			
Water content, %	35.5			
Wet density, pcf	105.2			
Dry density, pcf	77.6			
Saturation, %	81.8			
Void ratio	1.1712			
Specimen diameter, in.	3.00			
Specimen height, in.	5.66			
Height/diameter ratio	1.89			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

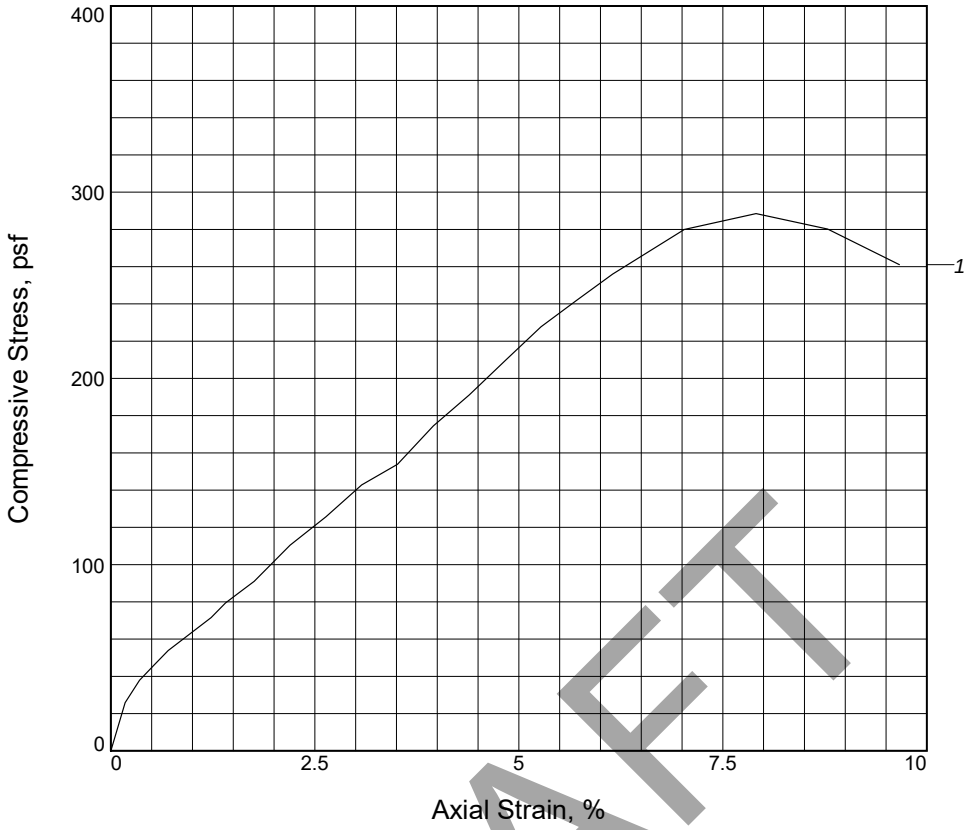
Project: MACTEC

Location: Type 2:G3a:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	288			
Undrained shear strength, psf	144			
Failure strain, %	7.9			
Strain rate, in./min.	0.050			
Water content, %	27.4			
Wet density, pcf	116.6			
Dry density, pcf	91.5			
Saturation, %	87.9			
Void ratio	0.8418			
Specimen diameter, in.	3.01			
Specimen height, in.	5.69			
Height/diameter ratio	1.89			

Description: 20:2.5:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

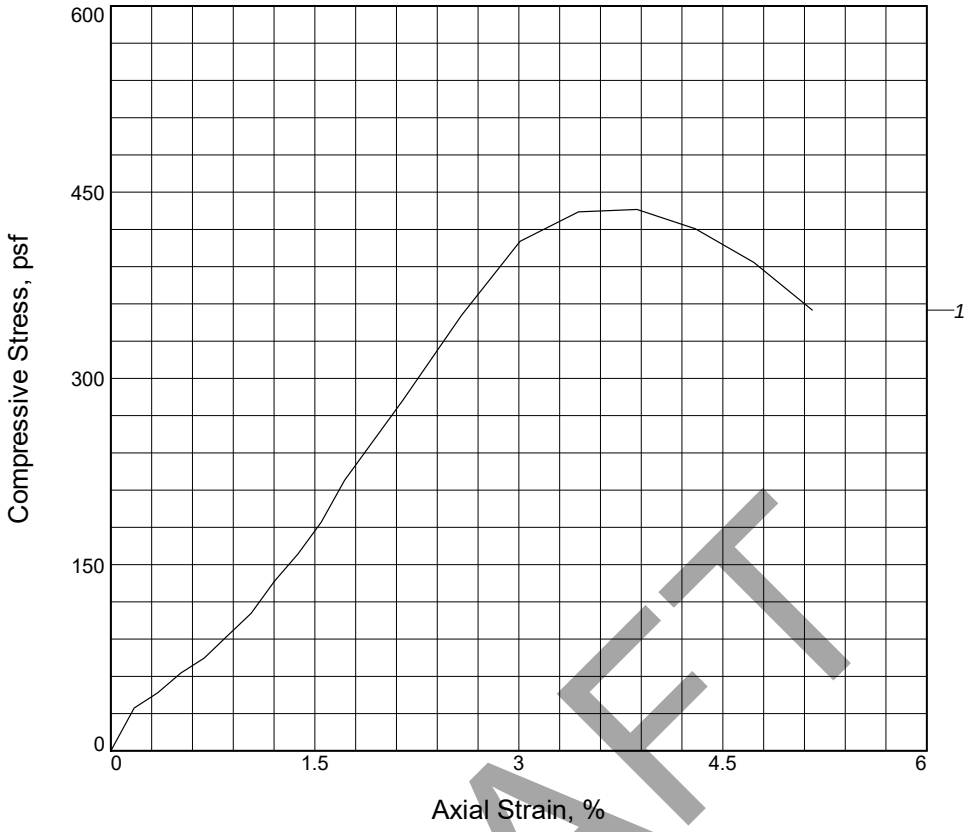
Project: MACTEC

Location: Type 2:G3b:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	436			
Undrained shear strength, psf	218			
Failure strain, %	3.9			
Strain rate, in./min.	0.050			
Water content, %	20.2			
Wet density, pcf	122.9			
Dry density, pcf	102.2			
Saturation, %	84.1			
Void ratio	0.6489			
Specimen diameter, in.	3.00			
Specimen height, in.	5.82			
Height/diameter ratio	1.94			

Description: 20:2.0:0.3 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

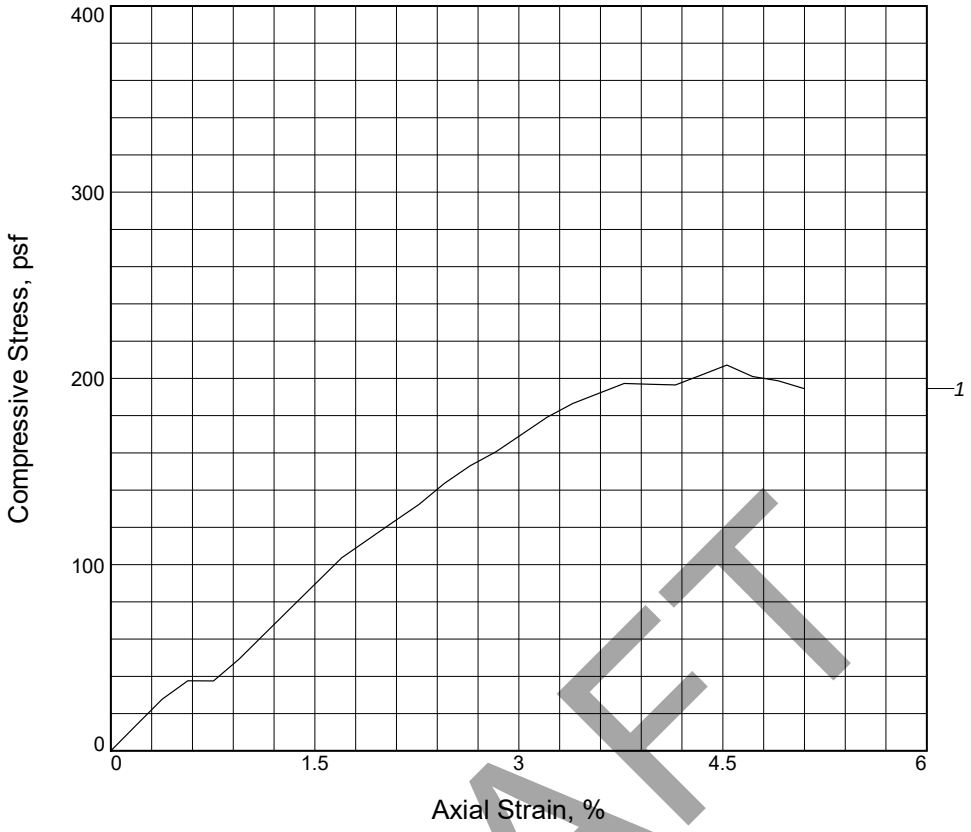
Project: MACTEC

Location: Type 3:G1a:Site Water

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	207			
Undrained shear strength, psf	104			
Failure strain, %	4.5			
Strain rate, in./min.	0.050			
Water content, %	23.1			
Wet density, pcf	125.1			
Dry density, pcf	101.6			
Saturation, %	94.7			
Void ratio	0.6590			
Specimen diameter, in.	3.04			
Specimen height, in.	5.30			
Height/diameter ratio	1.75			

Description: 20:2.0:0.3 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

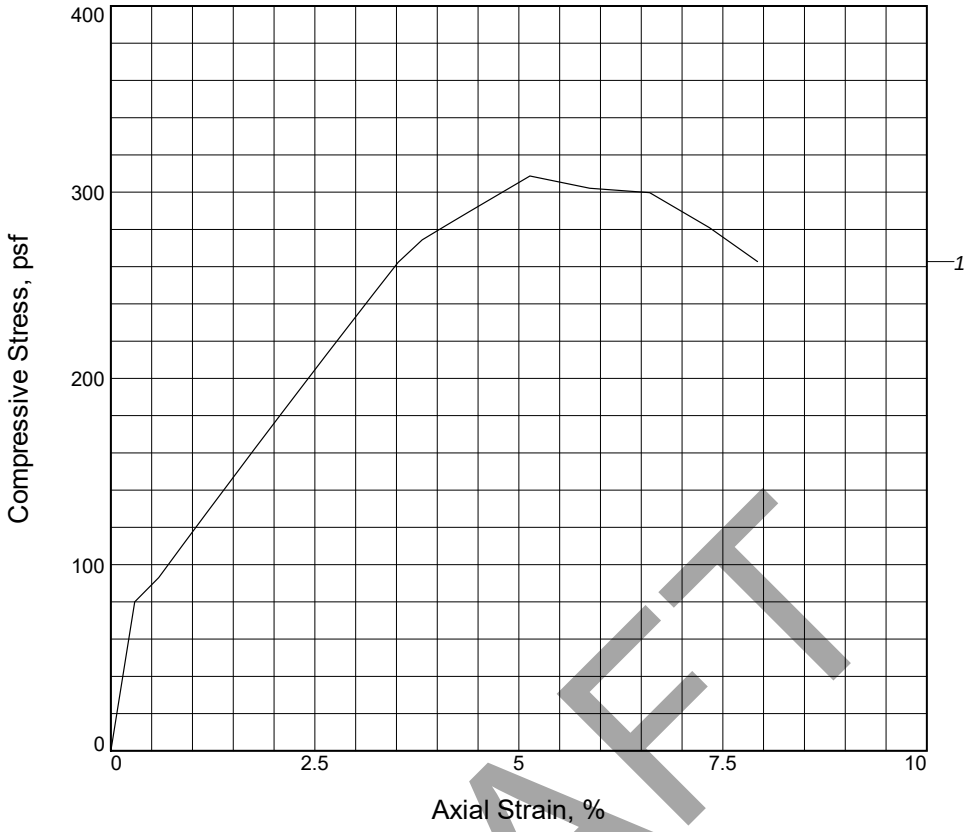
Project: MACTEC

Location: Type 3:G2a:Site Water

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	309			
Undrained shear strength, psf	154			
Failure strain, %	5.1			
Strain rate, in./min.	0.050			
Water content, %	23.5			
Wet density, pcf	118.9			
Dry density, pcf	96.3			
Saturation, %	84.6			
Void ratio	0.7503			
Specimen diameter, in.	2.03			
Specimen height, in.	3.41			
Height/diameter ratio	1.68			

Description: 20:2.5:0.3 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-9-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing.

Figure _____

Client: Wood PLC

Project: MACTEC

Location: Type 3:G2b:Site Water

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 1: G1a: Site Water:DNAPL
(10:2.0:0.15:0.015 mix ratio by wt.)

Cell 6

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.561	1.	2.991
2.	5.562	2.	2.993
3.	5.559	3.	2.990
4.	5.563	4.	2.989
5.	5.564	5.	2.994

Weight of Specimen:

Initial Weight	1322.6	Grams
	2.913	Lbs.
Final Weight	1311.7	Grams
	2.889	Lbs.
Dry Weight	1085.1	Grams
	2.390	Lbs.

Avg.	5.562	In	Ave.	2.991	In
	14.127	CM		7.598	CM
Area	7.028	In^2		45.343	CM^2
Volume	39.089	In^3		0.023	Cft.

Moisture Content:

Initial	21.89	%
Final	20.88	%

Density, Wet Initial	128.90	pcf
Density, Dry	105.75	pcf
Density, Wet Final:	127.84	pcf
Back Pressure:	90	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.127	14.127	14.127	14.127
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.343	45.343	45.343	45.343
t Sec.	490	500	505	515
K_{20} cm/sec	3.840E-06	3.763E-06	3.726E-06	3.654E-06

K_{20} Avg. cm/sec: 3.746E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 1: G1a: Site Water: DNAPL
(20:2.0:0.3:0.03 mix ratio by wt.)

Cell 5

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.087	1.	3.005
2.	5.090	2.	3.001
3.	5.088	3.	3.009
4.	5.085	4.	3.006
5.	5.086	5.	3.008

Weight of Specimen:

Initial Weight	1159.9	Grams
	2.555	Lbs.
Final Weight	1119.3	Grams
	2.465	Lbs.
Dry Weight	925.2	Grams
	2.038	Lbs.

Avg.	5.087	In	Ave.	3.006	In
	12.921	CM		7.635	CM
Area	7.096	In^2		45.780	CM^2
Volume	36.098	In^3		0.021	Cft.

Moisture Content:

Initial	25.37	%
Final	20.98	%

Density, Wet Initial	122.41	pcf
Density, Dry	97.64	pcf
Density, Wet Final:	118.12	pcf
Back Pressure:	90	psi
Saturation:	102	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	12.921	12.921	12.921	12.921
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.780	45.780	45.780	45.780
t Sec.	805	820	835	850
K_{20} cm/sec	2.118E-06	2.079E-06	2.041E-06	2.005E-06

K_{20} Avg. cm/sec **2.061E-06**

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 1: G2a: Site Water:DNAPL
(10:2.0:0.15:0.015 mix ratio by wt.)

Cell 1

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	3.090	1.	3.006
2.	3.089	2.	3.002
3.	3.091	3.	3.004
4.	3.089	4.	3.005
5.	3.092	5.	3.002

Weight of Specimen:

Initial Weight	655.0	Grams
	1.443	Lbs.
Final Weight	629.8	Grams
	1.387	Lbs.
Dry Weight	524.1	Grams
	1.154	Lbs.

Avg.	3.090	In	Ave.	3.004	In
	7.849	CM		7.630	CM
Area	7.087	In^2		45.719	CM^2
Volume	21.899	In^3		0.013	Cft.

Moisture Content:

Initial	24.98	%
Final	20.17	%

Density, Wet Initial	113.94	pcf
Density, Dry	91.17	pcf
Density, Wet Final:	109.56	pcf
Back Pressure:	90	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	7.849	7.849	7.849	7.849
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.719	45.719	45.719	45.719
t Sec.	540	550	555	565
K_{20} cm/sec	1.920E-06	1.885E-06	1.868E-06	1.835E-06

K_{20} Avg. cm/sec 1.877E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 1: G2a: Site Water: DNAPL
(20:2.0:0.3:0.03 mix ratio by wt.)

Cell 6

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.265	1.	3.002
2.	5.268	2.	3.005
3.	5.270	3.	3.010
4.	5.266	4.	3.008
5.	5.269	5.	3.006

Weight of Specimen:

Initial Weight	1276.3	Grams
	2.811	Lbs.
Final Weight	1230.8	Grams
	2.711	Lbs.
Dry Weight	1045.6	Grams
	2.303	Lbs.

Avg.	5.268	In	Ave.	3.006	In
	13.380	CM		7.636	CM
Area	7.098	In^2		45.792	CM^2
Volume	37.389	In^3		0.022	Cft.

Moisture Content:

Initial	22.06	%
Final	17.71	%

Density, Wet Initial	130.04	pcf
Density, Dry	106.54	pcf
Density, Wet Final:	125.41	pcf
Back Pressure:	90	psi
Saturation:	102	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

K 20°C $\frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	13.380	13.380	13.380	13.380
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.792	45.792	45.792	45.792
t Sec.	225	235	245	255
K 20 cm/sec	3.921E-06	3.754E-06	3.601E-06	3.460E-06

K 20 Avg. cm/sec 3.684E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 1: G2b: Site Water:DNAPL
(10:2.5:0.15:0.015 mix ratio by wt.)

Cell 6

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.472	1.	3.001
2.	5.470	2.	3.000
3.	5.471	3.	3.000
4.	5.471	4.	3.001
5.	5.472	5.	3.001

Weight of Specimen:

Initial Weight	1276.6	Grams
	2.812	Lbs.
Final Weight	1268.6	Grams
	2.794	Lbs.
Dry Weight	1030.0	Grams
	2.269	Lbs.

Avg.	5.471	In	Ave.	3.001	In
	13.897	CM		7.622	CM
Area	7.071	In^2		45.622	CM^2
Volume	38.689	In^3		0.022	Cft.

Moisture Content:

Initial	23.94	%
Final	23.17	%

Density, Wet Initial	125.70	pcf
Density, Dry	101.42	pcf
Density, Wet Final:	124.91	pcf
Back Pressure:	90	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	13.897	13.897	13.897	13.897
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.622	45.622	45.622	45.622
t Sec.	1005	1025	1045	1060
K_{20} cm/sec	1.830E-06	1.795E-06	1.760E-06	1.735E-06

K_{20} Avg. cm/sec 1.780E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 1: G2b: Site Water: DNAPL
(20:2.5:0.3:0.03 mix ratio by wt.)

Cell 9

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.590	1.	2.996
2.	5.592	2.	2.993
3.	5.596	3.	2.994
4.	5.594	4.	2.992
5.	5.595	5.	2.993

Weight of Specimen:

Initial Weight	1279.0	Grams
	2.817	Lbs.
Final Weight	1197.8	Grams
	2.638	Lbs.
Dry Weight	1013.6	Grams
	2.233	Lbs.

Avg.	5.593	In	Ave.	2.994	In
	14.207	CM		7.604	CM
Area	7.038	In^2		45.409	CM^2
Volume	39.369	In^3		0.023	Cft.

Moisture Content:

Initial	26.18	%
Final	18.17	%

Density, Wet Initial	123.76	pcf
Density, Dry	98.08	pcf
Density, Wet Final:	115.90	pcf
Back Pressure:	90	psi
Saturation:	102	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.207	14.207	14.207	14.207
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.409	45.409	45.409	45.409
t Sec.	255	260	270	280
K_{20} cm/sec	3.705E-06	3.634E-06	3.499E-06	3.374E-06

K_{20} Avg. cm/sec 3.553E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 2: G1a: Site Water: LNAPL
(20:2.0:0.3:0.03 mix ratio by wt.)

Cell 9

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	2.605	1.	3.035
2.	2.607	2.	3.034
3.	2.604	3.	3.035
4.	2.606	4.	3.033
5.	2.607	5.	3.034

Weight of Specimen:

Initial Weight	613.2	Grams
	1.351	Lbs.
Final Weight	614.2	Grams
	1.353	Lbs.
Dry Weight	512.5	Grams
	1.129	Lbs.

Avg.	2.606	In	Ave.	3.034	In
	6.619	CM		7.707	CM
Area	7.231	In^2		46.649	CM^2
Volume	18.842	In^3		0.011	Cft.

Moisture Content:

Initial	19.65	%
Final	19.84	%

Density, Wet Initial	123.98	pcf
Density, Dry	103.62	pcf
Density, Wet Final:	124.18	pcf
Back Pressure:	90	psi
Saturation:	99	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	6.619	6.619	6.619	6.619
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	46.649	46.649	46.649	46.649
t Sec.	920	930	940	955
K_{20} cm/sec	9.314E-07	9.214E-07	9.116E-07	8.972E-07

K_{20} Avg. cm/sec 9.154E-07

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 2: G1b: Site Water: LNAPL
(20:2.5:0.3:0.03 mix ratio by wt.)

Cell 5

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	4.158	1.	3.002
2.	4.157	2.	3.003
3.	4.156	3.	3.001
4.	4.156	4.	3.002
5.	4.158	5.	3.001

Weight of Specimen:

Initial Weight	949.8	Grams
	2.092	Lbs.
Final Weight	936.2	Grams
	2.062	Lbs.
Dry Weight	762.7	Grams
	1.680	Lbs.

Avg.	4.157	In	Ave.	3.002	In
	10.559	CM		7.625	CM
Area	7.077	In^2		45.658	CM^2
Volume	29.419	In^3		0.017	Cft.

Moisture Content:

Initial	24.53	%
Final	22.75	%

Density, Wet Initial	122.99	pcf
Density, Dry	98.76	pcf
Density, Wet Final:	121.23	pcf
Back Pressure:	90	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

K 20°C $\frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	10.559	10.559	10.559	10.559
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.658	45.658	45.658	45.658
t Sec.	620	630	640	655
K 20 cm/sec	2.253E-06	2.217E-06	2.182E-06	2.132E-06

K 20 Avg. cm/sec **2.196E-06**

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 2: G2a: Site Water: LNAPL
(20:2.0:0.3:0.03 mix ratio by wt.)

Cell 4

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	3.377	1.	3.007
2.	3.378	2.	3.006
3.	3.376	3.	3.006
4.	3.376	4.	3.007
5.	3.378	5.	3.006

Weight of Specimen:

Initial Weight	753.2	Grams
	1.659	Lbs.
Final Weight	727.0	Grams
	1.601	Lbs.
Dry Weight	601.2	Grams
	1.324	Lbs.

Avg.	3.377	In	Ave.	3.006	In
	8.578	CM		7.636	CM
Area	7.099	In^2		45.798	CM^2
Volume	23.973	In^3		0.014	Cft.

Moisture Content:

Initial	25.28	%
Final	20.92	%

Density, Wet Initial	119.69	pcf
Density, Dry	95.54	pcf
Density, Wet Final:	115.53	pcf
Back Pressure:	90	psi
Saturation:	101	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	8.578	8.578	8.578	8.578
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.798	45.798	45.798	45.798
t Sec.	275	280	285	295
K_{20} cm/sec	4.113E-06	4.040E-06	3.969E-06	3.834E-06

K_{20} Avg. cm/sec 3.989E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 2: G2b: Site Water: LNAPL
(20:2.5:0.3:0.03 mix ratio by wt.)

Cell 4

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.783	1.	3.026
2.	5.785	2.	3.026
3.	5.789	3.	3.028
4.	5.790	4.	3.030
5.	5.785	5.	3.029

Weight of Specimen:

Initial Weight	1173.6	Grams
	2.585	Lbs.
Final Weight	1100.1	Grams
	2.423	Lbs.
Dry Weight	854.1	Grams
	1.881	Lbs.

Avg.	5.786	In	Ave.	3.028	In
	14.697	CM		7.691	CM
Area	7.200	In^2		46.453	CM^2
Volume	41.663	In^3		0.024	Cft.

Moisture Content:

Initial	37.41	%
Final	28.80	%

Density, Wet Initial	107.31	pcf
Density, Dry	78.10	pcf
Efft. Confining Pressure	10	psi

Density, Wet Final: 100.59 pcf

Back Pressure: 90 psi

Saturation: 102 %

Specific Gravity: 2.72
(Assumed)

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.697	14.697	14.697	14.697
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	46.453	46.453	46.453	46.453
t Sec.	860	870	890	920
K_{20} cm/sec	2.222E-06	2.196E-06	2.147E-06	2.077E-06

K_{20} Avg. cm/sec 2.161E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 2: G3a: Site Water: LNAPL
(20:2.0:0.3:0.03 mix ratio by wt.)

Cell 5

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.595	1.	3.026
2.	5.596	2.	3.025
3.	5.594	3.	3.024
4.	5.593	4.	3.021
5.	5.592	5.	3.020

Weight of Specimen:

Initial Weight	1126.6	Grams
	2.481	Lbs.
Final Weight	1063.4	Grams
	2.342	Lbs.
Dry Weight	821.6	Grams
	1.810	Lbs.

Avg.	5.594	In	Ave.	3.023	In
	14.209	CM		7.679	CM
Area	7.178	In^2		46.312	CM^2
Volume	40.156	In^3		0.023	Cft.

Moisture Content:

Initial	37.12	%
Final	29.43	%

Density, Wet Initial	106.88	pcf
Density, Dry	77.94	pcf
Efft. Confining Pressure	10	psi

Density, Wet Final: 100.88 pcf

Back Pressure: 90 psi

Saturation: 101 %

Specific Gravity: 2.72
(Assumed)

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.209	14.209	14.209	14.209
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	31.56	31.56	31.56	31.56
A Sq. cms	46.312	46.312	46.312	46.312
t Sec.	860	865	880	885
K 20 cm/sec	1.077E-06	1.071E-06	1.053E-06	1.047E-06

K 20 Avg. cm/sec 1.062E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 2: G3b: Site Water: LNAPL
(20:2.5:0.3:0.03 mix ratio by wt.)

Cell 1

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.691	1.	3.028
2.	5.690	2.	3.030
3.	5.692	3.	3.026
4.	5.689	4.	3.029
5.	5.693	5.	3.028

Weight of Specimen:

Initial Weight	1241.6	Grams
	2.735	Lbs.
Final Weight	1167.2	Grams
	2.571	Lbs.
Dry Weight	958.7	Grams
	2.112	Lbs.

Avg.	5.691	In	Ave.	3.028	In
	14.455	CM		7.692	CM
Area	7.202	In^2		46.465	CM^2
Volume	40.987	In^3		0.024	Cft.

Moisture Content:

Initial	29.51	%
Final	21.75	%

Density, Wet Initial	115.40	pcf
Density, Dry	89.11	pcf
Density, Wet Final:	108.48	pcf
Back Pressure:	90	psi
Saturation:	102	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

K 20°C $\frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.455	14.455	14.455	14.455
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	46.465	46.465	46.465	46.465
t Sec.	590	600	615	620
K 20 cm/sec	3.184E-06	3.131E-06	3.055E-06	3.030E-06

K 20 Avg. cm/sec **3.100E-06**

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 3: G1a: Site Water
(20:2.0:0.3 mix ratio by wt.)

Cell 1

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.

Panel 4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.712	1.	3.001
2.	5.713	2.	3.004
3.	5.715	3.	2.999
4.	5.710	4.	3.005
5.	5.711	5.	3.001

Weight of Specimen:

Initial Weight	1333.4	Grams
	2.937	Lbs.
Final Weight	1308.5	Grams
	2.882	Lbs.
Dry Weight	1103.0	Grams
	2.430	Lbs.

Avg. 5.712 In — Ave. 3.002 In

14.509 CM — 7.625 CM

Area 7.078 In^2 — 45.664 CM^2

Volume 40.431 In^3 — 0.023 Cft.

Moisture Content:

Initial	20.89	%
Final	18.63	%

Density, Wet Initial	125.64	pcf
Density, Dry	103.93	pcf
Efft. Confining Pressure	10	psi

Density, Wet Final: 123.29 pcf

Back Pressure: 90 psi

Saturation: 101 %

Specific Gravity: 2.72
(Assumed)

K 20°C $\frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.509	14.509	14.509	14.509
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.664	45.664	45.664	45.664
t Sec.	450	460	470	475
K 20 cm/sec	4.264E-06	4.171E-06	4.083E-06	4.040E-06

K 20 Avg. cm/sec 4.139E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 3: G2a: Site Water
(20:2.0:0.3 mix ratio by wt.)

Cell 8
Panel 2

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.
Very Soft sample, slumped after removing from mold.

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.282	1.	2.989
2.	5.280	2.	3.040
3.	5.283	3.	3.042
4.	5.285	4.	3.138
5.	5.281	5.	3.139

Weight of Specimen:

Initial Weight	1279.9	Grams
	2.819	Lbs.
Final Weight	1220.4	Grams
	2.688	Lbs.
Dry Weight	1041.3	Grams
	2.294	Lbs.

Avg.	5.282	In	Ave.	3.070	In
	13.417	CM		7.797	CM
Area	7.400	In^2		47.744	CM^2
Volume	39.090	In^3		0.023	Cft.

Moisture Content:

Initial	22.91	%
Final	17.20	%

Density, Wet Initial	124.73	pcf
Density, Dry	101.48	pcf
Density, Wet Final:	118.93	pcf
Back Pressure:	90	psi
Saturation:	103	%
Specific Gravity: (Assumed)	2.72	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	13.417	13.417	13.417	13.417
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	47.744	47.744	47.744	47.744
t Sec.	425	430	435	445
K_{20} cm/sec	3.993E-06	3.947E-06	3.901E-06	3.814E-06

K_{20} Avg. cm/sec: 3.914E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008)	Proj. No.	912	Tested by:	MF
	Phase 3a			Entered by:	KH
Client:	Wood PLC/Mactec	Date:	12-9-19	Checked by:	KP

Sample: Type 3: G2b: Site Water
(20:2.5:0.3 mix ratio by wt.)

Cell 9
Panel 5

Remarks: Mix poured in mold (no compaction) and tested after 28 days curing.
Very Soft sample, slumped during testing.

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	4.362	1.	3.005
2.	4.360	2.	3.006
3.	4.359	3.	3.001
4.	4.358	4.	3.007
5.	4.360	5.	3.004

Weight of Specimen:

Initial Weight	817.2	Grams
	1.800	Lbs.
Final Weight	734.2	Grams
	1.617	Lbs.
Dry Weight	606.7	Grams
	1.336	Lbs.

Avg.	4.360	In	Ave.	3.005	In
	11.074	CM		7.632	CM
Area	7.090 In^2			45.744 CM^2	
Volume	30.912 In^3			0.018 Cft.	

Moisture Content:

Initial	34.70	%
Final	21.02	%

Density, Wet Initial	100.71	pcf
Density, Dry	74.77	pcf
Efft. Confining Pressure	10	psi

Density, Wet Final: 90.48 pcf

Back Pressure: 90 psi

Saturation: 103 %

Specific Gravity: 2.72
(Assumed)

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	11.074	11.074	11.074	11.074
Rt (Temp)	0.953	0.953	0.953	0.953
h cms	15.78	15.78	15.78	15.78
A Sq. cms	45.744	45.744	45.744	45.744
t Sec.	600	605	600	605
K_{20} cm/sec	2.437E-06	2.417E-06	2.437E-06	2.417E-06

K_{20} Avg. cm/sec 2.427E-06

DRAFT

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 12-18-19 Job No.: 912 Lab Log: 19-376

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)

Samples: Grout Mix Phase 3a Testing (Retest of Pocket Penetrometer samples)

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D1633 Unconfined Compression (7 tests)

Regards,
RSA Geolab, LLC

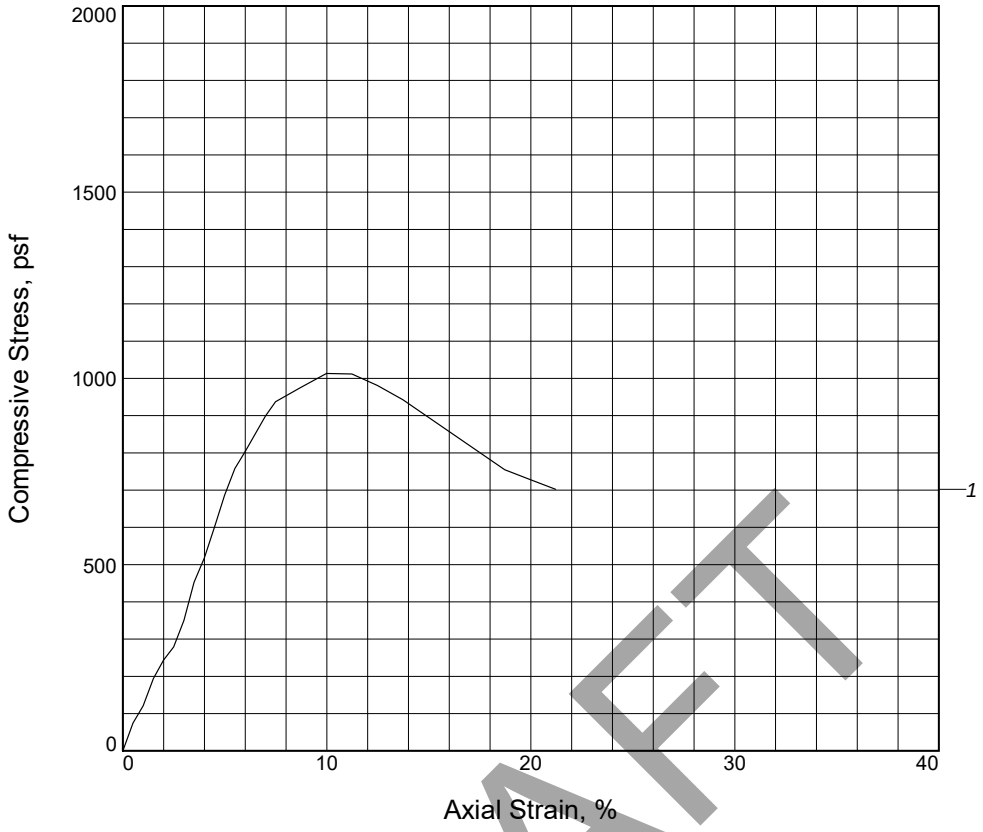
Remarks: If you have any questions, please call 908-964-0786.

Signed: _____
Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	1013			
Undrained shear strength, psf	507			
Failure strain, %	10.0			
Strain rate, in./min.	0.050			
Water content, %	23.1			
Wet density, pcf	120.6			
Dry density, pcf	98.0			
Saturation, %	86.5			
Void ratio	0.7207			
Specimen diameter, in.	1.98			
Specimen height, in.	2.00			
Height/diameter ratio	1.01			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 12-18-19
Remarks:
Mix poured in mold (no compaction) and tested after curing 28 days. Retest from Pocket Penetrometer sample.

Figure _____

Client: Wood PLC

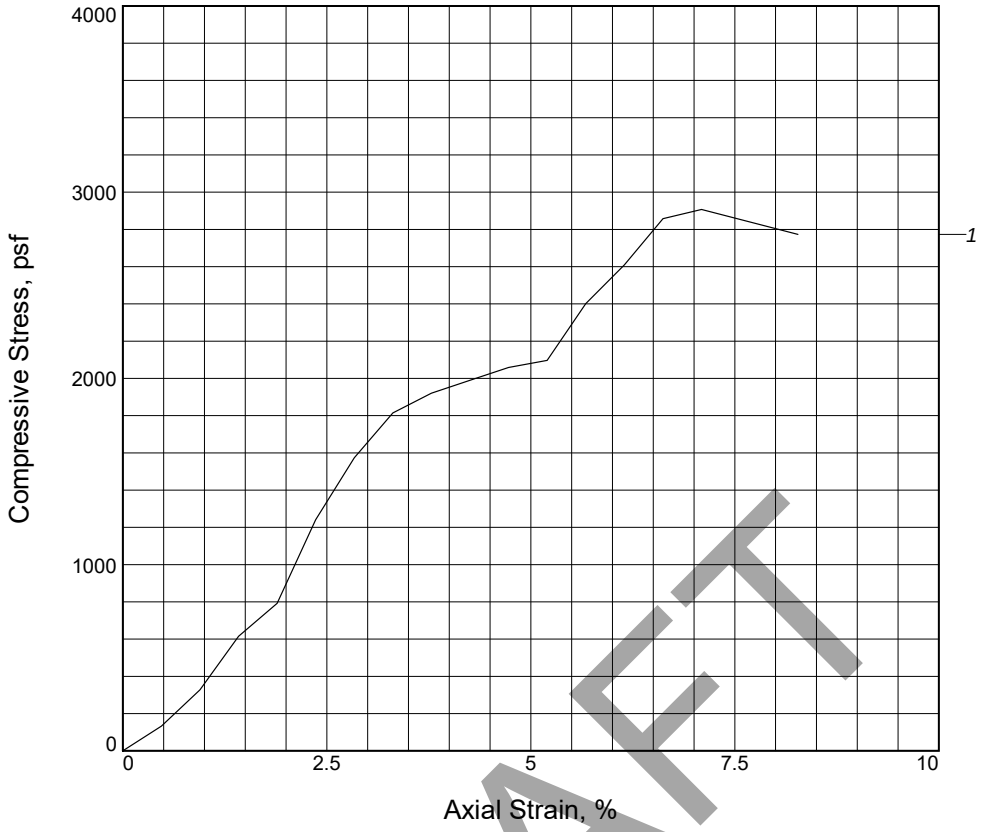
Project: MACTEC

Location: Type 1:G1a:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	2907			
Undrained shear strength, psf	1454			
Failure strain, %	7.1			
Strain rate, in./min.	0.050			
Water content, %	21.0			
Wet density, pcf	113.9			
Dry density, pcf	94.1			
Saturation, %	71.6			
Void ratio	0.7908			
Specimen diameter, in.	2.00			
Specimen height, in.	2.12			
Height/diameter ratio	1.06			

Description: 10:2.0:0.15:0.015 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-18-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing. Retest from Pocket Penetrometer sample.

Figure _____

Client: Wood PLC

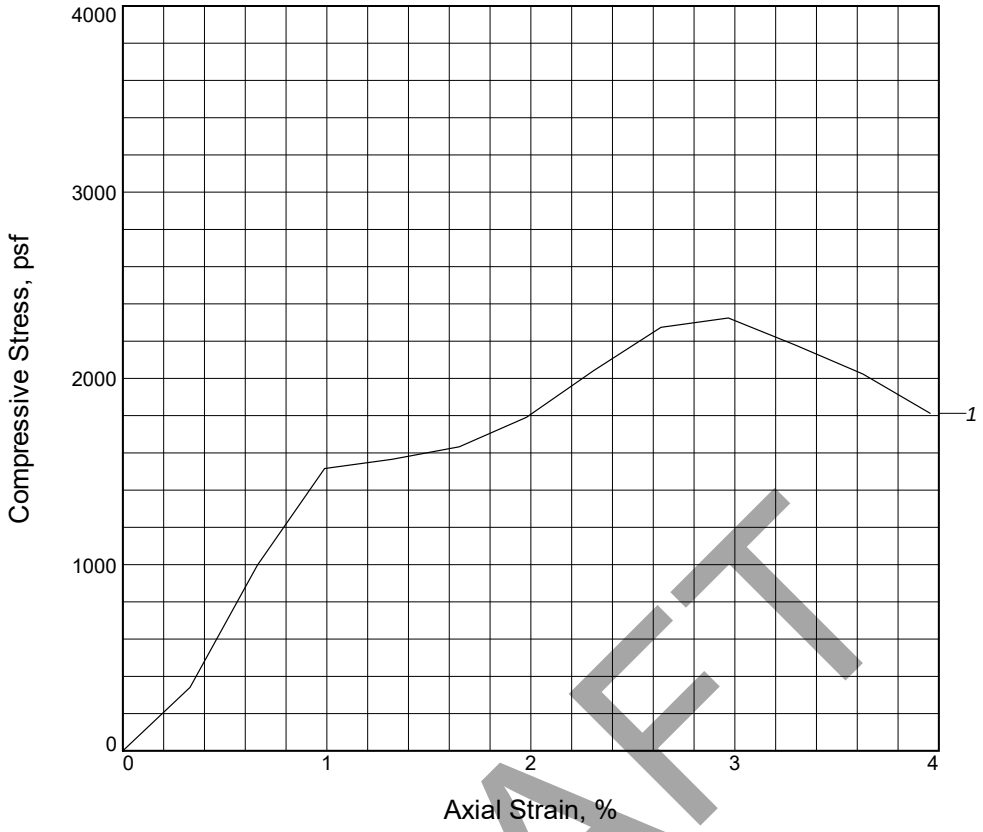
Project: MACTEC

Location: Type 1:G2a:Site Water:DNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	2325			
Undrained shear strength, psf	1162			
Failure strain, %	3.0			
Strain rate, in./min.	0.050			
Water content, %	16.0			
Wet density, pcf	124.2			
Dry density, pcf	107.1			
Saturation, %	75.2			
Void ratio	0.5737			
Specimen diameter, in.	1.99			
Specimen height, in.	3.03			
Height/diameter ratio	1.52			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-18-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing. Retest of Pocket Penetrometer sample.

Figure _____

Client: Wood PLC

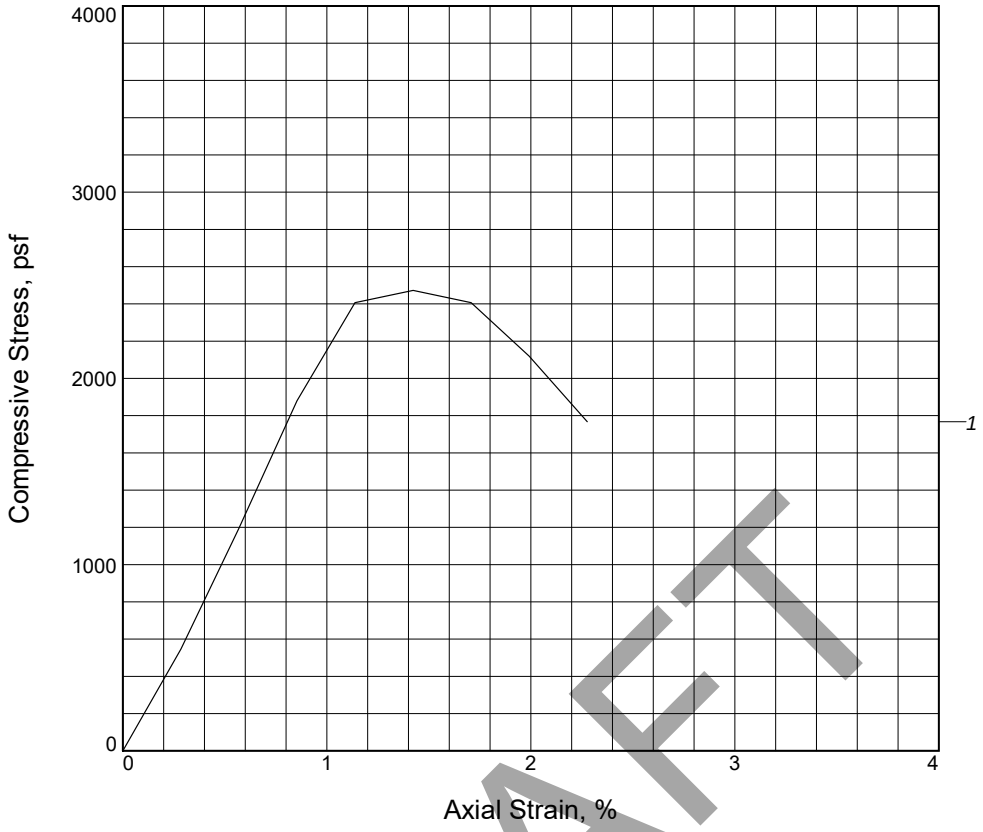
Project: MACTEC

Location: Type 2:G1a:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	2472			
Undrained shear strength, psf	1236			
Failure strain, %	1.4			
Strain rate, in./min.	0.050			
Water content, %	21.3			
Wet density, pcf	123.1			
Dry density, pcf	101.4			
Saturation, %	87.0			
Void ratio	0.6615			
Specimen diameter, in.	2.00			
Specimen height, in.	3.51			
Height/diameter ratio	1.76			

Description: 20:2.5:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-18-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing. Retest from Pocket Penetrometer sample.

Figure _____

Client: Wood PLC

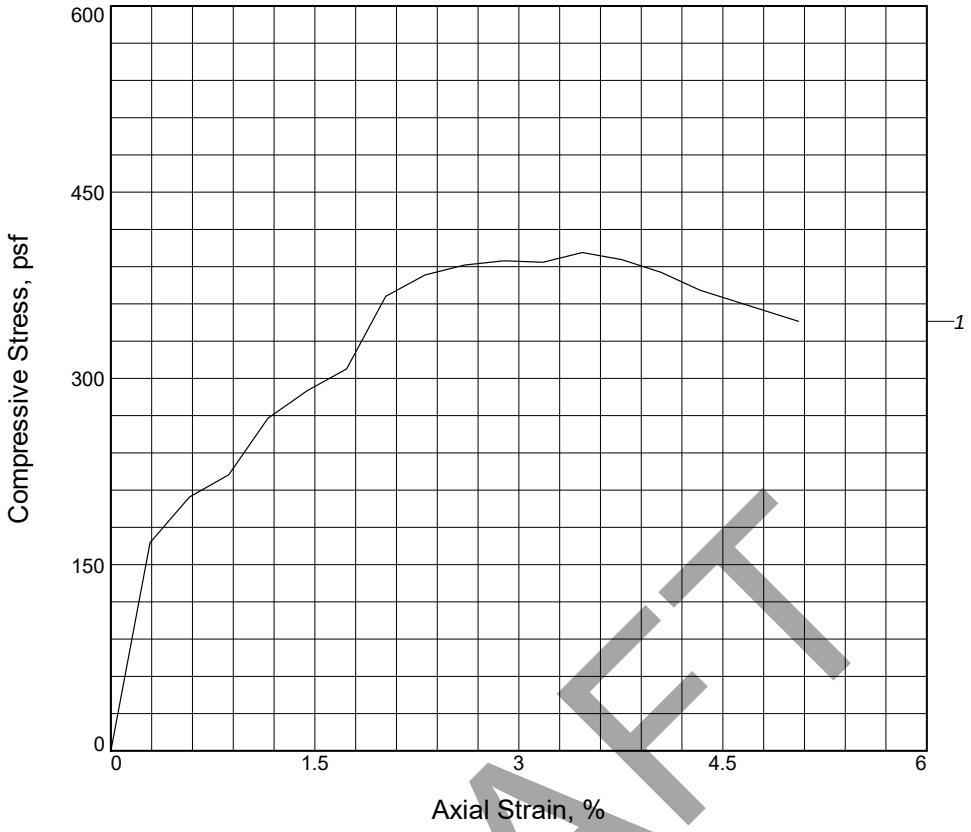
Project: MACTEC

Location: Type 2:G1b:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	401			
Undrained shear strength, psf	201			
Failure strain, %	3.5			
Strain rate, in./min.	0.050			
Water content, %	24.7			
Wet density, pcf	125.0			
Dry density, pcf	100.3			
Saturation, %	97.9			
Void ratio	0.6808			
Specimen diameter, in.	1.98			
Specimen height, in.	3.46			
Height/diameter ratio	1.75			

Description: 20:2.0:0.3:0.03 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-18-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing. Retest from Pocket Penetrometer sample.

Figure _____

Client: Wood PLC

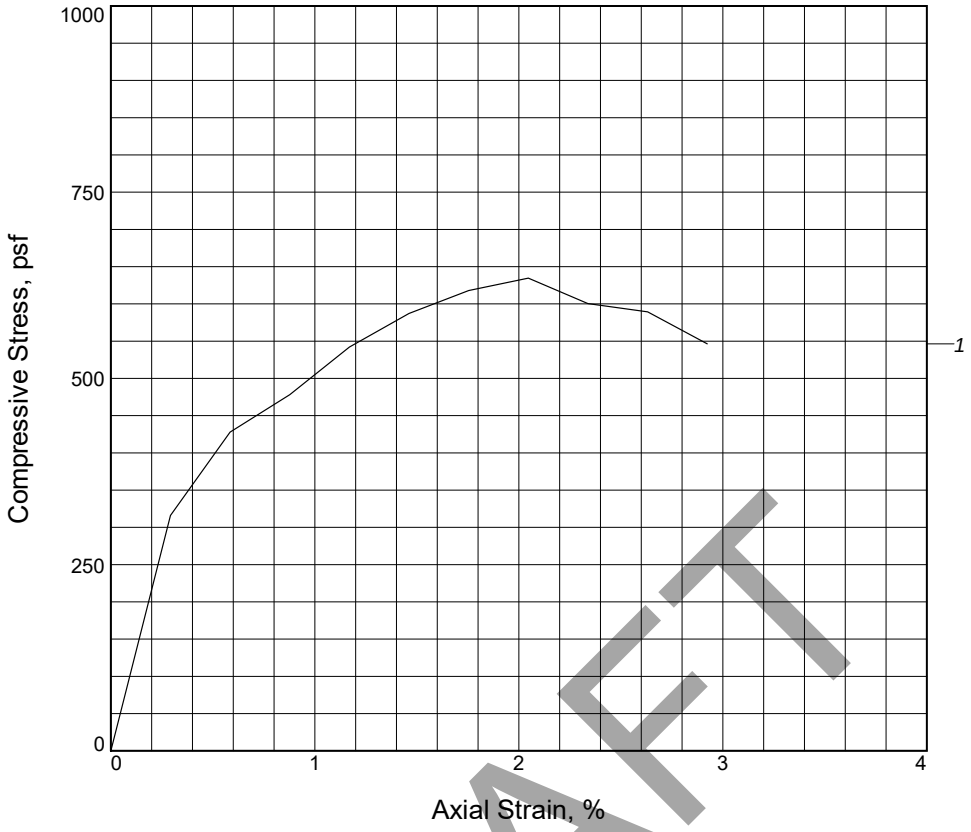
Project: MACTEC

Location: Type 2:G2a:Site Water:LNAPL

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	635			
Undrained shear strength, psf	317			
Failure strain, %	2.0			
Strain rate, in./min.	0.050			
Water content, %	17.9			
Wet density, pcf	131.6			
Dry density, pcf	111.6			
Saturation, %	94.8			
Void ratio	0.5107			
Specimen diameter, in.	1.97			
Specimen height, in.	3.42			
Height/diameter ratio	1.74			

Description: 20:2.0:0.3 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-18-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing. Retest from Pocket Penetrometer sample.

Figure _____

Client: Wood PLC

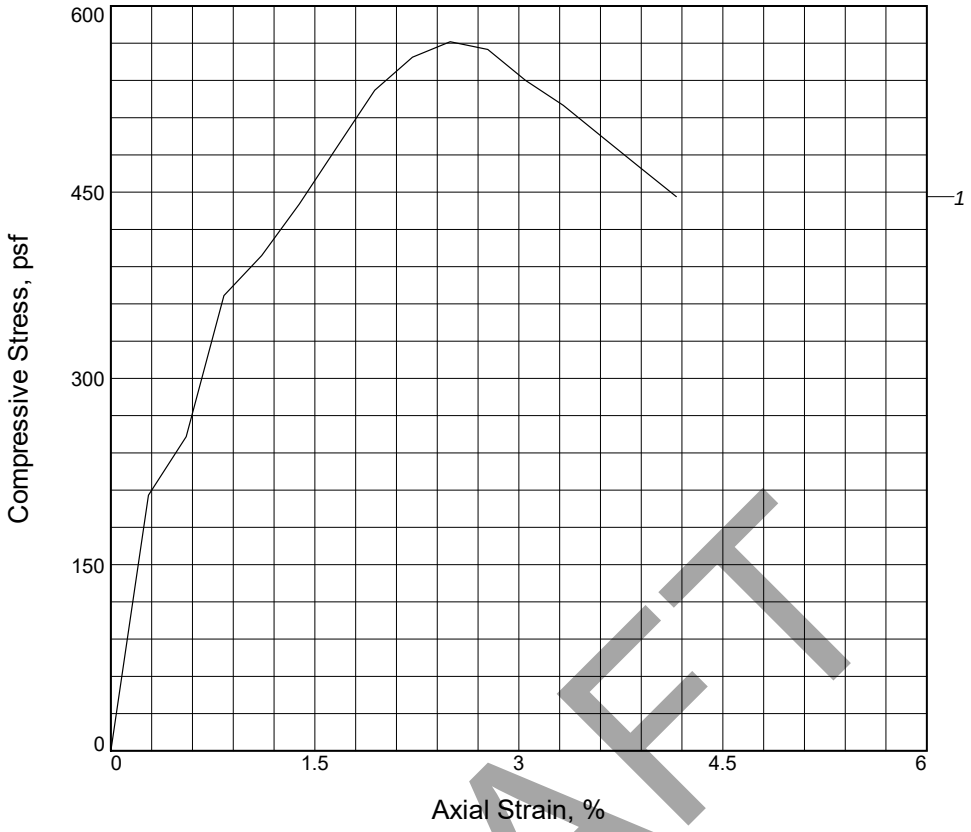
Project: MACTEC

Location: Type 3:G1a:Site Water

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	571			
Undrained shear strength, psf	286			
Failure strain, %	2.5			
Strain rate, in./min.	0.050			
Water content, %	20.5			
Wet density, pcf	128.5			
Dry density, pcf	106.6			
Saturation, %	95.4			
Void ratio	0.5805			
Specimen diameter, in.	1.95			
Specimen height, in.	3.61			
Height/diameter ratio	1.85			

Description: 20:2.0:0.3 mix by weight

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912

Date Sampled: 12-18-19

Remarks:
Mix poured into mold (no compaction) and tested after 28 days curing. Retest from Pocket Penetrometer sample.

Figure _____

Client: Wood PLC

Project: MACTEC

Location: Type 3:G2a:Site Water

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF/EE **Checked By:** KP

RSA GEOLAB, LLC

1017 Greeley Avenue North
Union, New Jersey 07083
908-964-0786 (P)
www.RSAgeolab.com

Letter of Transmittal

Date: 1-3-20 Job No.: 912 Lab Log: 19-548

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Site No. 516008)
Phase 3 Supplemental Testing

Samples: Water:Grout:Soil mixes

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D1633 Unconfined Compression (3 tests)
- ASTM D5084 Permeability (recompacted) (3 tests)
- Pocket Penetrometer (9 tests)
- Photographs (12)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA Geolab

POCKET PENETROMETER

Project: Saranac Lake OU01 (Site No. 516008) Project #: 912
Phase 3 Supplemental Testing
Client: Wood PLC/Mactec Date: 1-3-20

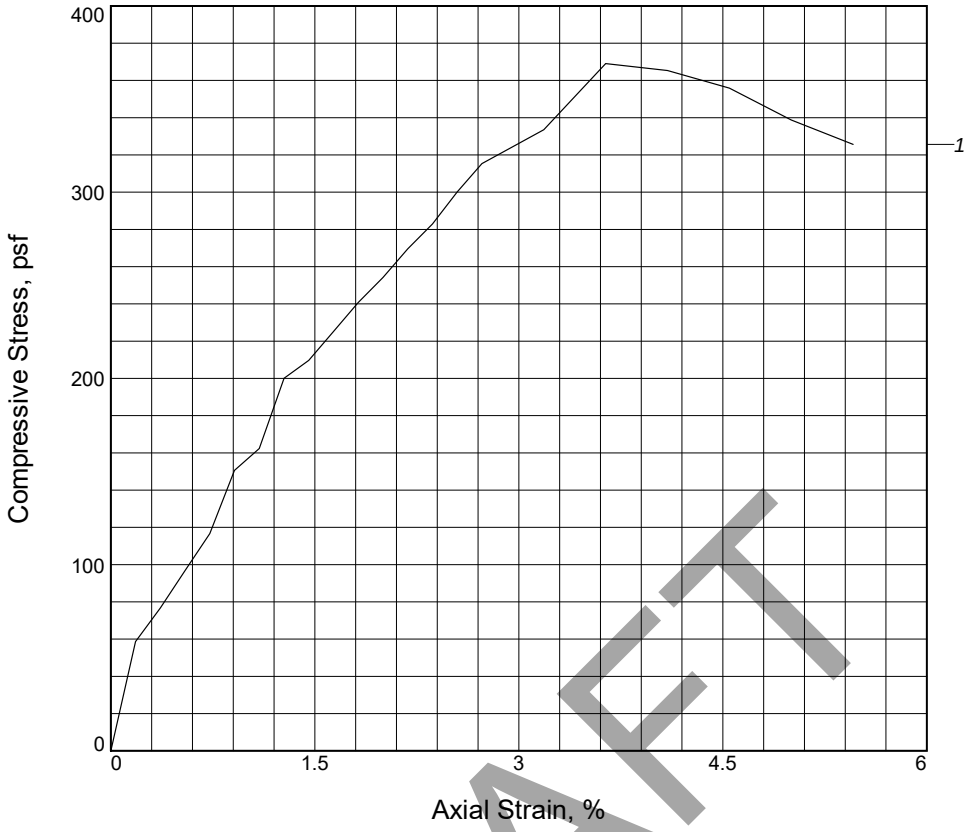
S. No.	Sample: Wet Soil (weight added in grams)	Sample: Grout Mix (weight added in grams)	Sample: Tap Water (weight added in grams)	Strength Measured	Pocket Penetrometer TSF: 3 day	Pocket Penetrometer TSF: 7 day	Pocket Penetrometer TSF: 14 day
5	Type 2 (7000)	G2a (700)	(105)	Along Length	0	0	0.25
				Along Radius	0	0	0
12	Type 3 (7000)	G2b (875)	(105)	Along Length	0	0	0
				Along Radius	0	0	0
15	Type 1 (7000)	G2b (750)	(105)	Along Length	>4.5	>4.5	>4.5
				Along Radius	2.5	>4.5	>4.5

Remarks: Insufficient Site water, tap water used instead.

DRAFT

Performed by: MF Entered by: KH Checked by: KP

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	369			
Undrained shear strength, psf	185			
Failure strain, %	3.6			
Strain rate, in./min.	0.050			
Water content, %	25.8			
Wet density, pcf	124.7			
Dry density, pcf	99.2			
Saturation, %	112.3			
Void ratio	0.5739			
Specimen diameter, in.	3.01			
Specimen height, in.	5.50			
Height/diameter ratio	1.83			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.5	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 1-3-20
Remarks:
Tested after 14 days curing

Figure _____

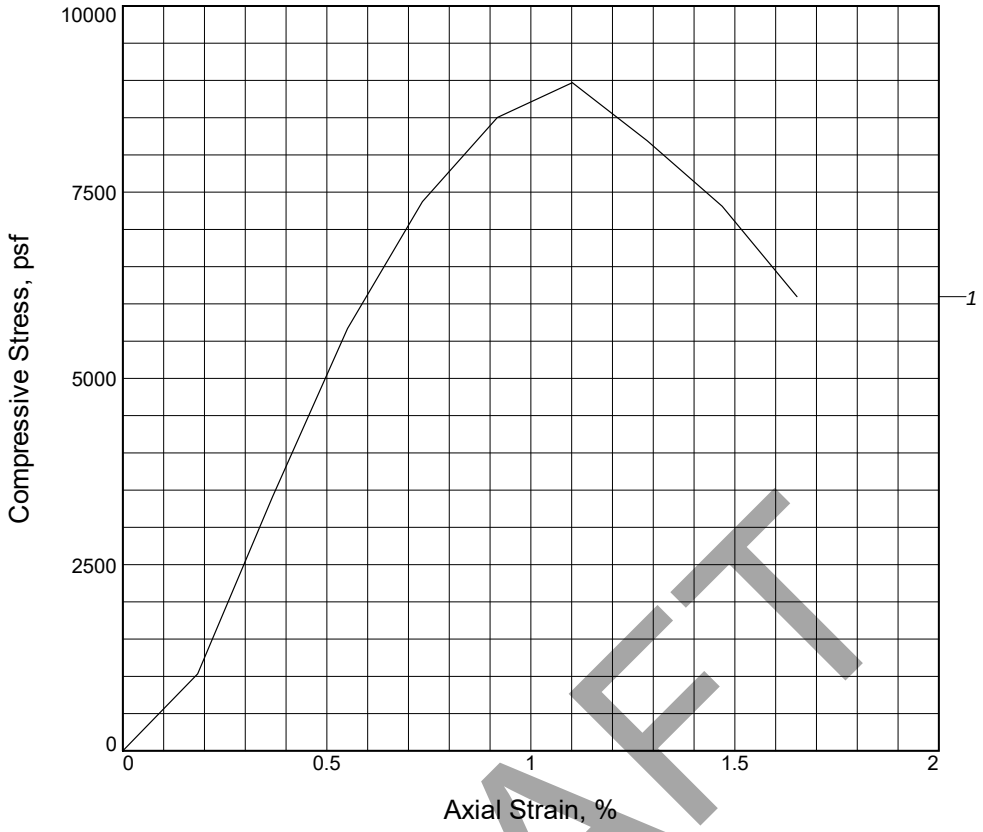
Client: Wood PLC

Project: MACTEC
Phase 3 Supplemental Testing
Location: Type 3 Soil:Grout Mix G2b:Tap Water (20:2.5:0.3)
Sample Number: 12

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	8970			
Undrained shear strength, psf	4485			
Failure strain, %	1.1			
Strain rate, in./min.	0.050			
Water content, %	23.9			
Wet density, pcf	124.0			
Dry density, pcf	100.1			
Saturation, %	106.7			
Void ratio	0.5589			
Specimen diameter, in.	3.01			
Specimen height, in.	5.45			
Height/diameter ratio	1.81			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.5	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 1-3-20
Remarks:
Tested after 14 days curing

Figure _____

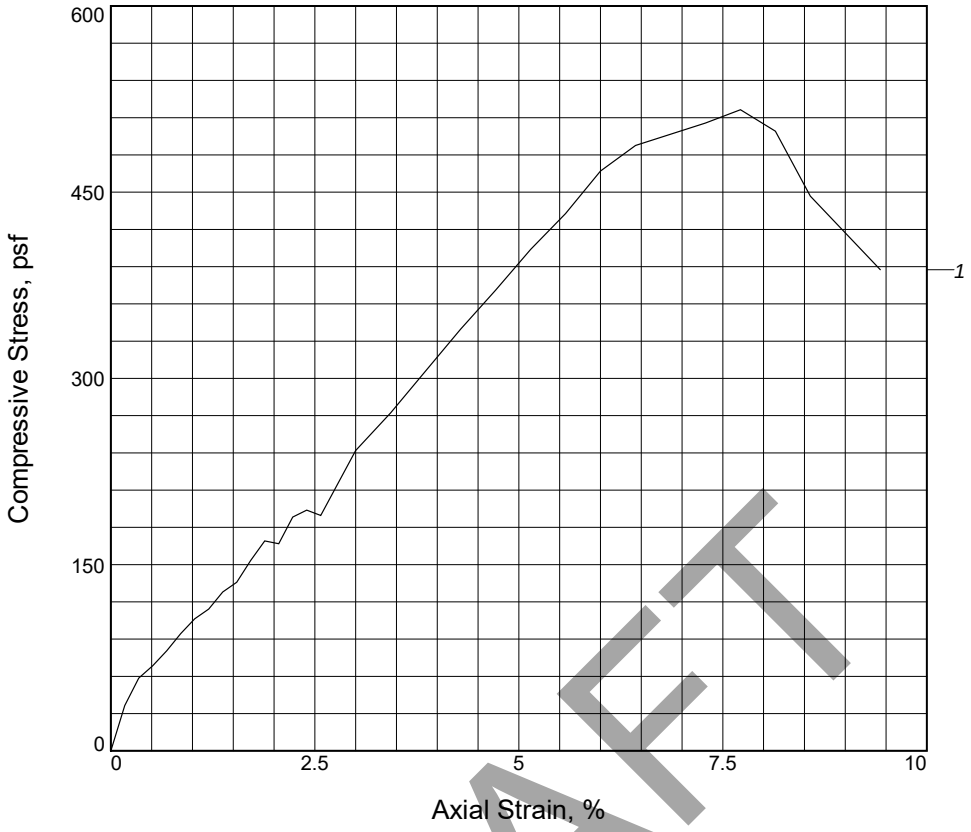
Client: Wood PLC

Project: MACTEC
Phase 3 Supplemental Testing
Location: Type 1 Soil:Grout Mix G2b:Tap Water (10:2.5:0.15)
Sample Number: 15

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	516			
Undrained shear strength, psf	258			
Failure strain, %	7.7			
Strain rate, in./min.	0.050			
Water content, %	21.1			
Wet density, pcf	119.7			
Dry density, pcf	98.9			
Saturation, %	91.2			
Void ratio	0.5784			
Specimen diameter, in.	3.01			
Specimen height, in.	5.83			
Height/diameter ratio	1.94			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.5	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 1-3-20
Remarks:
Tested after 14 days curing

Figure _____

Client: Wood PLC

Project: MACTEC
Phase 3 Supplemental Testing
Location: Type 2 Soil:Grout Mix G2a:Tap Water (20:2:0.3)
Sample Number: 5

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008) Phase 3 Supplemental Testing	Proj. No.	912	Tested by:	MF/EE
				Entered by:	KH
Sample:	12 (Type 3 Soil:Grout Mix G2b:Tap Water) (20:2.5:0.3)	Date:	1-3-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant.			Cell	9
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.681	1.	3.007
2.	5.684	2.	3.006
3.	5.680	3.	3.002
4.	5.679	4.	3.008
5.	5.683	5.	3.005

Weight of Specimen:

Initial Weight	1318.4	Grams
	2.904	Lbs.
Final Weight	1263.8	Grams
	2.784	Lbs.
Dry Weight	1052.2	Grams
	2.318	Lbs.

Avg.	5.681	In	Ave.	3.006	In
	14.431	CM		7.634	CM
Area	7.095	In^2		45.774	CM^2
Volume	40.310	In^3		0.023	Cft.

Moisture Content:

Initial	25.30	%
Final	20.11	%

Density, Wet Initial	124.60	pcf
Density, Dry	99.44	pcf
Density, Wet Final:	119.44	pcf
Back Pressure:	90	psi
Saturation:	102	%
Specific Gravity: (Assumed)	2.5	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.431	14.431	14.431	14.431
Rt (Temp)	1.000	1.000	1.000	1.000
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.774	45.774	45.774	45.774
t Sec.	250	260	270	275
K_{20} cm/sec	3.996E-06	3.842E-06	3.700E-06	3.632E-06

K_{20} Avg. cm/sec: 3.792E-06

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008) Phase 3 Supplemental Testing	Proj. No.	912	Tested by:	MF/EE
				Entered by:	KH
Sample:	15 (Type 1 Soil:Grout Mix G2b:Tap Water) (10:2.5:0.15)	Date:	1-3-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant.			Cell	6
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.470	1.	3.001
2.	5.472	2.	3.004
3.	5.471	3.	3.005
4.	5.474	4.	3.002
5.	5.475	5.	3.002

Weight of Specimen:

Initial Weight	1280.3	Grams
	2.820	Lbs.
Final Weight	1268.7	Grams
	2.794	Lbs.
Dry Weight	1036.8	Grams
	2.284	Lbs.

Avg.	5.472	In	Ave.	3.003	In
	13.900	CM		7.627	CM
Area	7.082	In^2		45.689	CM^2
Volume	38.754	In^3		0.022	Cft.

Moisture Content:

Initial	23.49	%
Final	22.37	%

Density, Wet Initial	125.85	pcf
Density, Dry	101.92	pcf
Density, Wet Final:	124.71	pcf
Back Pressure:	90	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.5	
Efft. Confining Pressure	10	psi

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	13.900	13.900	13.900	13.900
Rt (Temp)	1.000	1.000	1.000	1.000
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.689	45.689	45.689	45.689
t Sec.	1240	1245	1255	1260
K_{20} cm/sec	7.774E-07	7.743E-07	7.681E-07	7.651E-07

K_{20} Avg. cm/sec: 7.712E-07

DRAFT

RSA Geolab, LLC

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01 (Site No. 516008) Phase 3 Supplemental Testing	Proj. No.	912	Tested by:	MF/EE
				Entered by:	KH
Sample:	5 (Type 2 Soil:Grout Mix G2a:Tap Water) (20:2:0.3)	Date:	1-3-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant.			Cell	5
				Panel	5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.854	1.	3.007
2.	5.851	2.	3.009
3.	5.850	3.	3.010
4.	5.856	4.	3.004
5.	5.853	5.	3.005

Weight of Specimen:

Initial Weight	1315.0	Grams
	2.896	Lbs.
Final Weight	1285.6	Grams
	2.832	Lbs.
Dry Weight	1080.4	Grams
	2.380	Lbs.

Avg.	5.853	In	Ave.	3.007	In
	14.866	CM		7.638	CM
Area	7.102	In^2		45.817	CM^2
Volume	41.564	In^3		0.024	Cft.

Moisture Content:

Initial	21.71	%
Final	18.99	%

Density, Wet Initial	120.52	pcf
Density, Dry	99.02	pcf
Density, Wet Final:	117.83	pcf
Back Pressure:	90	psi
Saturation:	102	%
Specific Gravity: (Assumed)	2.5	
Efft. Confining Pressure	10	psi

$$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.866	14.866	14.866	14.866
Rt (Temp)	1.000	1.000	1.000	1.000
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.817	45.817	45.817	45.817
t Sec.	1010	1020	1025	1035
K_{20} cm/sec	1.018E-06	1.008E-06	1.003E-06	9.933E-07

K_{20} Avg. cm/sec: 1.006E-06

DRAFT

RSA GEOLAB

1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

Letter of Transmittal

Date: 2-19-20 Job No.: 912 Lab Log: 19-548

Attention: Mr. Brian Johnson
Wood PLC/MACTEC
511 Congress Street
Portland, ME 04101

CC: Nathan Vogan

Re: Saranac Lake OU01 (Stie No. 516008)
Phase 3b Supplemental Testing

Sample(s): Grout Mix Phase 3b Supplemental Testing

Dear Mr. Johnson,

Please find attached results for the samples referenced above. The following lab testing was performed:

- ASTM D1633 Unconfined Compression (9 tests)
- ASTM D5084 Permeability (recompacted)(9 tests)
- Pocket Penetrometer Readings (18 tests)
- Photographs (36)

Regards,
RSA Geolab, LLC

Remarks: If you have any questions, please call 908-964-0786.

Signed: _____

Dr. Raza S. Ahmed
President RSA Geolab, LLC

DRAFT

RSA's Geolab's Geotechnical Laboratory testing was performed and results reported in accordance with ASTM standards and accepted industry standards. No other representations or warranties either express or implied are given. RSA Geolab, LLC neither accepts responsibility for nor makes claim to the final use and purpose of the material tested.
RSA Geolab, LLC owns all rights, title and interest of the work product. This report is intended for client's sole and exclusive use and not for the benefit of others and may not be used or relied upon by others. These documents must be considered proprietary information and should not be reproduced without the written approval of RSA Geolab, LLC.

RSA GEOLAB

POCKET PENETROMETER

Project: Saranac Lake OU01 (Site No. 516008) Phase 3 Supplemental Testing
Project No.: 912
Client: Wood PLC/Mactec
Date: 2-19-20

S. No.	Sample (weight added in grams)			Pocket Penetrometer Readings	
	Wet Soil	Grout Mix	Calciment	7 day	14 day
16	Type 1 (4600)	G2a (920)	(230)	>4.5	>4.5
17	Type 1 (4600)	G2a (920)	NA	>4.5	>4.5
18	Type 1 (4600)	G4a (1150)	NA	>4.5	>4.5
19	Type 2 (4600)	G2a (920)	(230)	>4.5	>4.5
20	Type 2 (4600)	G2a (920)	NA	1	>4.5
21	Type 2 (4600)	G4a (1150)	NA	>4.5	>4.5
22	Type 3 (4600)	G2a (920)	(230)	>4.5	>4.5
23	Type 3 (4600)	G2a (920)	NA	>4.5	>4.5
24	Type 3 (4600)	G4a (1150)	NA	>4.5	>4.5

Remarks:

DRAFT

Performed by: MF Entered by: KH KP

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	16 (Type 1 Soil:Grout Mix G2a:Calciment) (10:2.0:0.5)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	5
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.914	1.	3.005
2.	5.916	2.	3.004
3.	5.915	3.	3.004
4.	5.914	4.	3.003
5.	5.912	5.	3.004

Weight of Specimen:

Initial Weight	1387.9	Grams
	3.057	Lbs.
Final Weight	1399.5	Grams
	3.083	Lbs.
Dry Weight	1127.2	Grams
	2.483	Lbs.

Avg.	5.914	In	Ave.	3.004	In
	15.022	CM		7.630	CM
Area	7.087	In^2		45.725	CM^2
Volume	41.917	In^3		0.024	Cft.

Moisture Content:

Initial	23.13	%
Final	24.16	%

Density, Wet Initial	126.14	pcf
Density, Dry	102.44	pcf
Density, Wet Final:	127.19	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	99	%
Specific Gravity: (Assumed)	2.7	

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	15.022	15.022	15.022	15.022
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.725	45.725	45.725	45.725
t Sec.	2290	2300	2310	2315
K 20 cm/sec	4.196E-07	4.177E-07	4.159E-07	4.150E-07

EM\NY-GL\PERMTEST\Wood Ph3b-16

K 20 Avg. cm/sec 4.171E-07

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	17 (Type 1 Soil:Grout Mix G2a) (10:2.0)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	9
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.802	1.	3.008
2.	5.798	2.	3.006
3.	5.799	3.	3.005
4.	5.796	4.	3.005
5.	5.797	5.	3.004

Weight of Specimen:

Initial Weight	1383.3	Grams
	3.047	Lbs.
Final Weight	1386.2	Grams
	3.053	Lbs.
Dry Weight	1118.7	Grams
	2.464	Lbs.

Avg.	5.798	In	Ave.	3.006	In
	14.728	CM		7.634	CM
Area	7.095	In^2		45.774	CM^2
Volume	41.140	In^3		0.024	Cft.

Moisture Content:

Initial	23.65	%
Final	23.91	%

Density, Wet Initial	128.09	pcf
Density, Dry	103.59	pcf
Density, Wet Final:	128.36	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.7	

K 20°C $\frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.728	14.728	14.728	14.728
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.774	45.774	45.774	45.774
t Sec.	1700	1705	1705	1715
K 20 cm/sec	5.535E-07	5.519E-07	5.519E-07	5.487E-07

EM\NY-GL\PERMTEST\Wood Ph3b-17

K 20 Avg. cm/sec 5.515E-07

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	18 (Type 1 Soil:Grout Mix G4a) (10:2.5)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	3
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.787	1.	3.009
2.	5.790	2.	3.010
3.	5.791	3.	3.008
4.	5.790	4.	3.009
5.	5.788	5.	3.006

Weight of Specimen:

Initial Weight	1359.1	Grams
	2.994	Lbs.
Final Weight	1362.8	Grams
	3.002	Lbs.
Dry Weight	1099.5	Grams
	2.422	Lbs.

Avg.	5.789	In	Ave.	3.008	In
	14.705	CM		7.641	CM
Area	7.108	In^2		45.859	CM^2
Volume	41.151	In^3		0.024	Cft.

Moisture Content:

Initial	23.61	%
Final	23.95	%

Density, Wet Initial	125.82	pcf
Density, Dry	101.79	pcf
Density, Wet Final:	126.16	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.7	

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.705	14.705	14.705	14.705
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.859	45.859	45.859	45.859
t Sec.	4765	4775	4785	4790
K 20 cm/sec	1.968E-07	1.964E-07	1.960E-07	1.958E-07

EM\NY-GL\PERMTEST\Wood Ph3b-18

K 20 Avg. cm/sec 1.962E-07

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	19 (Type 2 Soil:Grout Mix G2a:Calciment) (10:2.0:0.5)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	6
				Panel	5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.960	1.	3.031
2.	5.961	2.	3.029
3.	5.963	3.	3.028
4.	5.959	4.	3.032
5.	5.962	5.	3.030

Weight of Specimen:

Initial Weight	1301.6	Grams
	2.867	Lbs.
Final Weight	1324.2	Grams
	2.917	Lbs.
Dry Weight	1104.1	Grams
	2.432	Lbs.

Avg.	5.961	In	Ave.	3.030	In
	15.141	CM		7.696	CM
Area	7.211	In^2		46.520	CM^2
Volume	42.983	In^3		0.025	Cft.

Moisture Content:

Initial	17.89	%
Final	19.93	%

Density, Wet Initial	115.36	pcf
Density, Dry	97.86	pcf
Density, Wet Final:	117.36	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.7	

$$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	15.141	15.141	15.141	15.141
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	46.520	46.520	46.520	46.520
t Sec.	1885	1895	1900	1905
K 20 cm/sec	5.050E-07	5.023E-07	5.010E-07	4.997E-07

EM\NY-GL\PERMTEST\Wood Ph3b-19

K_{20} Avg. cm/sec 5.020E-07

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	20 (Type 2 Soil:Grout Mix G2a) (10:2.0)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	1
				Panel	5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.758	1.	3.033
2.	5.760	2.	3.030
3.	5.762	3.	3.029
4.	5.761	4.	3.031
5.	5.759	5.	3.029

Weight of Specimen:

Initial Weight	1291.7	Grams
	2.845	Lbs.
Final Weight	1297.8	Grams
	2.859	Lbs.
Dry Weight	1101.4	Grams
	2.426	Lbs.

Avg.	5.760	In	Ave.	3.030	In
	14.630	CM		7.697	CM
Area	7.213	In^2		46.533	CM^2
Volume	41.544	In^3		0.024	Cft.

Moisture Content:

Initial	17.28	%
Final	17.83	%

Density, Wet Initial	118.45	pcf
Density, Dry	101.00	pcf
Density, Wet Final:	119.01	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	99	%
Specific Gravity: (Assumed)	2.7	

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.630	14.630	14.630	14.630
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	46.533	46.533	46.533	46.533
t Sec.	1155	1160	1165	1170
K 20 cm/sec	7.961E-07	7.927E-07	7.893E-07	7.859E-07

EM\NY-GL\PERMTEST\Wood Ph3b-20

K 20 Avg. cm/sec 7.910E-07

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	21 (Type 2 Soil:Grout Mix G4a) (10:2.5)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	1
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.896	1.	3.018
2.	5.892	2.	3.017
3.	5.891	3.	3.020
4.	5.893	4.	3.019
5.	5.894	5.	3.019

Weight of Specimen:

Initial Weight	1319.2	Grams
	2.906	Lbs.
Final Weight	1327.2	Grams
	2.923	Lbs.
Dry Weight	1126.8	Grams
	2.482	Lbs.

Avg.	5.893	In	Ave.	3.019	In
	14.969	CM		7.667	CM
Area	7.157	In^2		46.171	CM^2
Volume	42.175	In^3		0.024	Cft.

Moisture Content:

Initial	17.07	%
Final	17.78	%

Density, Wet Initial	119.16	pcf
Density, Dry	101.78	pcf
Density, Wet Final:	119.88	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	99	%
Specific Gravity: (Assumed)	2.7	

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.969	14.969	14.969	14.969
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	46.171	46.171	46.171	46.171
t Sec.	1930	1935	1940	1945
K_{20} cm/sec	4.913E-07	4.900E-07	4.887E-07	4.875E-07

K_{20} Avg. cm/sec 4.894E-07

EM\NY-GL\PERMTEST\Wood Ph3b-21

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	22 (Type 3 Soil:Grout Mix G2a:Calciment) (10:2.0:0.5)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	6
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.944	1.	3.006
2.	5.941	2.	3.010
3.	5.940	3.	3.009
4.	5.943	4.	3.009
5.	5.942	5.	3.008

Weight of Specimen:

Initial Weight	1393.1	Grams
	3.069	Lbs.
Final Weight	1405.2	Grams
	3.095	Lbs.
Dry Weight	1203.1	Grams
	2.650	Lbs.

Avg.	5.942	In	Ave.	3.008	In
	15.093	CM		7.641	CM
Area	7.108	In^2		45.859	CM^2
Volume	42.237	In^3		0.024	Cft.

Moisture Content:

Initial	15.79	%
Final	16.80	%

Density, Wet Initial	125.65	pcf
Density, Dry	108.51	pcf
Density, Wet Final:	126.74	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	98	%
Specific Gravity: (Assumed)	2.7	

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	15.093	15.093	15.093	15.093
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.859	45.859	45.859	45.859
t Sec.	1920	1930	1935	1940
K_{20} cm/sec	5.013E-07	4.987E-07	4.974E-07	4.961E-07

EM\NY-GL\PERMTEST\Wood Ph3b-22

K_{20} Avg. cm/sec 4.984E-07

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	23 (Type 3 Soil:Grout Mix G2a) (10:2.0)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	9
				Panel	4

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.808	1.	3.009
2.	5.810	2.	3.010
3.	5.811	3.	3.009
4.	5.810	4.	3.008
5.	5.807	5.	3.011

Weight of Specimen:

Initial Weight	1382.8	Grams
	3.046	Lbs.
Final Weight	1384.9	Grams
	3.050	Lbs.
Dry Weight	1204.9	Grams
	2.654	Lbs.

Avg.	5.809	In	Ave.	3.009	In
	14.755	CM		7.644	CM
Area	7.113	In^2		45.890	CM^2
Volume	41.321	In^3		0.024	Cft.

Moisture Content:

Initial	14.76	%
Final	14.94	%

Density, Wet Initial	127.49	pcf
Density, Dry	111.09	pcf
Density, Wet Final:	127.68	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	99	%
Specific Gravity: (Assumed)	2.7	

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.755	14.755	14.755	14.755
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.890	45.890	45.890	45.890
t Sec.	1185	1190	1195	1195
K_{20} cm/sec	7.936E-07	7.902E-07	7.869E-07	7.869E-07

K_{20} Avg. cm/sec: 7.894E-07

EM\NY-GL\PERMTEST\Wood Ph3b-23

DRAFT

RSA GEOLAB
1017 Greeley Ave N
Union, NJ 07083
908-964-0786
www.RSAGeolab.com

PERMEABILITY TEST BY TRIAXIAL CELL WITH BACK PRESSURE

Constant Head Method (ASTM D5084)

Project:	Saranac Lake OU01(Site No. 516008) Phase 3b Supplemental Testing	Proj. No.	912	Tested by:	MF
				Entered by:	KH
Sample:	24 (Type 3 Soil:Grout Mix G4a) (10:2.5)	Date:	2-19-20	Checked by:	KP
Remarks:	Mix by weight. Tap water used as permeant. Tested after curing 28 days.			Cell	5
				Panel	5

Dimensions of Specimen :

	Length (Inches)		Diameter (Inches)
1.	5.860	1.	3.012
2.	5.862	2.	3.010
3.	5.861	3.	3.011
4.	5.863	4.	3.009
5.	5.861	5.	3.012

Weight of Specimen:

Initial Weight	1375.8	Grams
	3.030	Lbs.
Final Weight	1379.8	Grams
	3.039	Lbs.
Dry Weight	1192.6	Grams
	2.627	Lbs.

Avg.	5.861	In	Ave.	3.011	In
	14.888	CM		7.647	CM
Area	7.120	In^2		45.933	CM^2
Volume	41.731	In^3		0.024	Cft.

Moisture Content:

Initial	15.36	%
Final	15.70	%

Density, Wet Initial	125.59	pcf
Density, Dry	108.87	pcf
Density, Wet Final:	125.96	pcf
Back Pressure:	90	psi
Efft. Confining Pressure	10	psi
Saturation:	100	%
Specific Gravity: (Assumed)	2.7	

$K_{20°C} = \frac{Q \times L \times Rt}{h \times A \times t}$

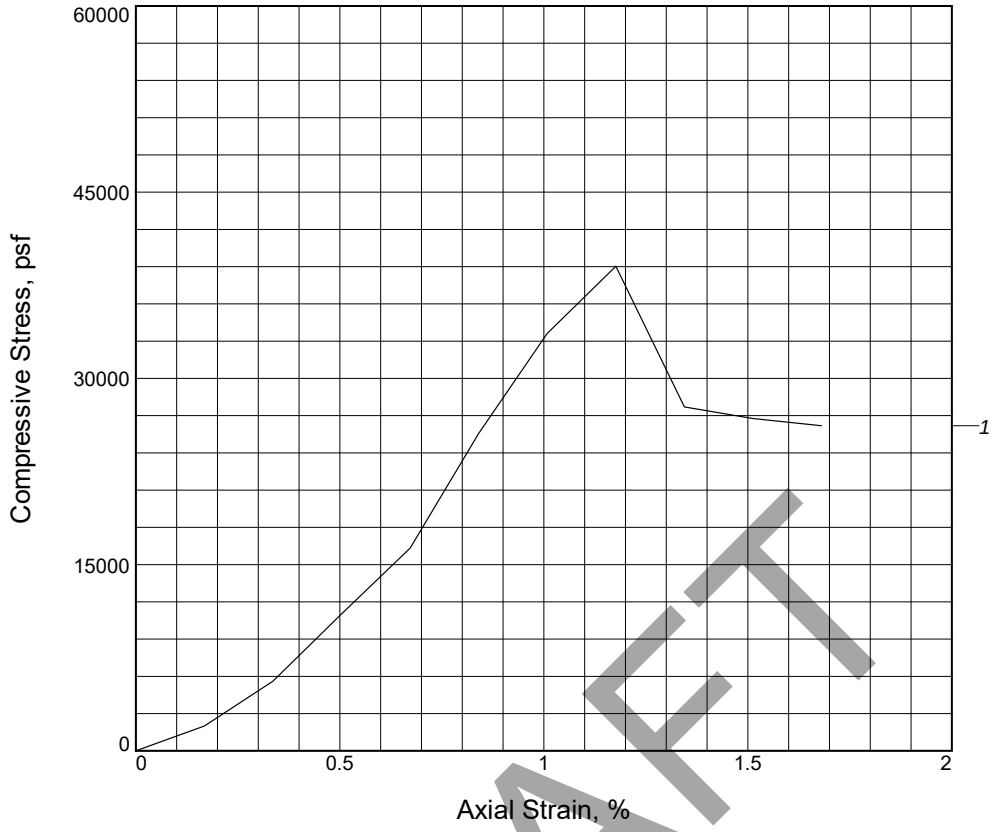
	Trial 1	Trial 2	Trial 3	Trial 4
Q cc	0.10	0.10	0.10	0.10
L cms	14.888	14.888	14.888	14.888
Rt (Temp)	0.923	0.923	0.923	0.923
h cms	31.56	31.56	31.56	31.56
A Sq. cms	45.933	45.933	45.933	45.933
t Sec.	2955	2965	2970	2980
K_{20} cm/sec	3.208E-07	3.197E-07	3.192E-07	3.181E-07

EM\NY-GL\PERMTEST\Wood Ph3b-24

K_{20} Avg. cm/sec 3.194E-07

DRAFT

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	39031			
Undrained shear strength, psf	19516			
Failure strain, %	1.2			
Strain rate, in./min.	0.050			
Water content, %	23.2			
Wet density, pcf	126.2			
Dry density, pcf	102.5			
Saturation, %	97.1			
Void ratio	0.6450			
Specimen diameter, in.	3.01			
Specimen height, in.	5.95			
Height/diameter ratio	1.98			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

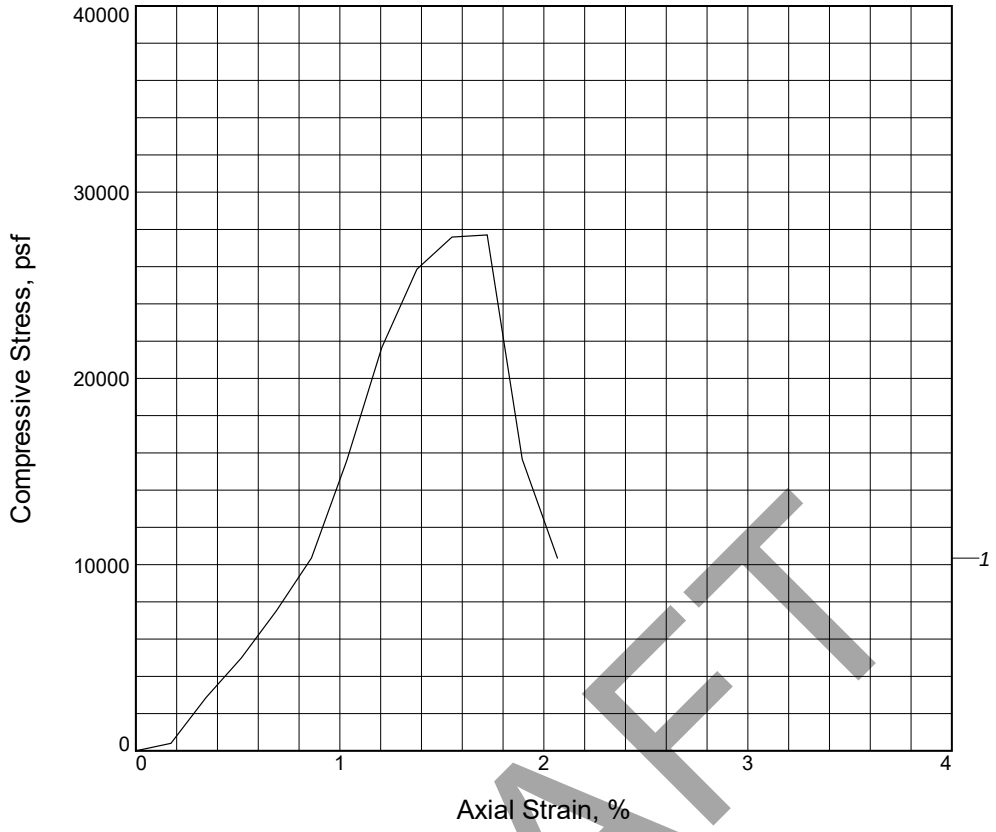
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 1 Soil:Grout Mix G2a:Calciment (10:2.0:0.5)
Sample Number: 16

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	27703			
Undrained shear strength, psf	13851			
Failure strain, %	1.7			
Strain rate, in./min.	0.050			
Water content, %	23.2			
Wet density, pcf	127.0			
Dry density, pcf	103.0			
Saturation, %	98.7			
Void ratio	0.6360			
Specimen diameter, in.	3.01			
Specimen height, in.	5.81			
Height/diameter ratio	1.93			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

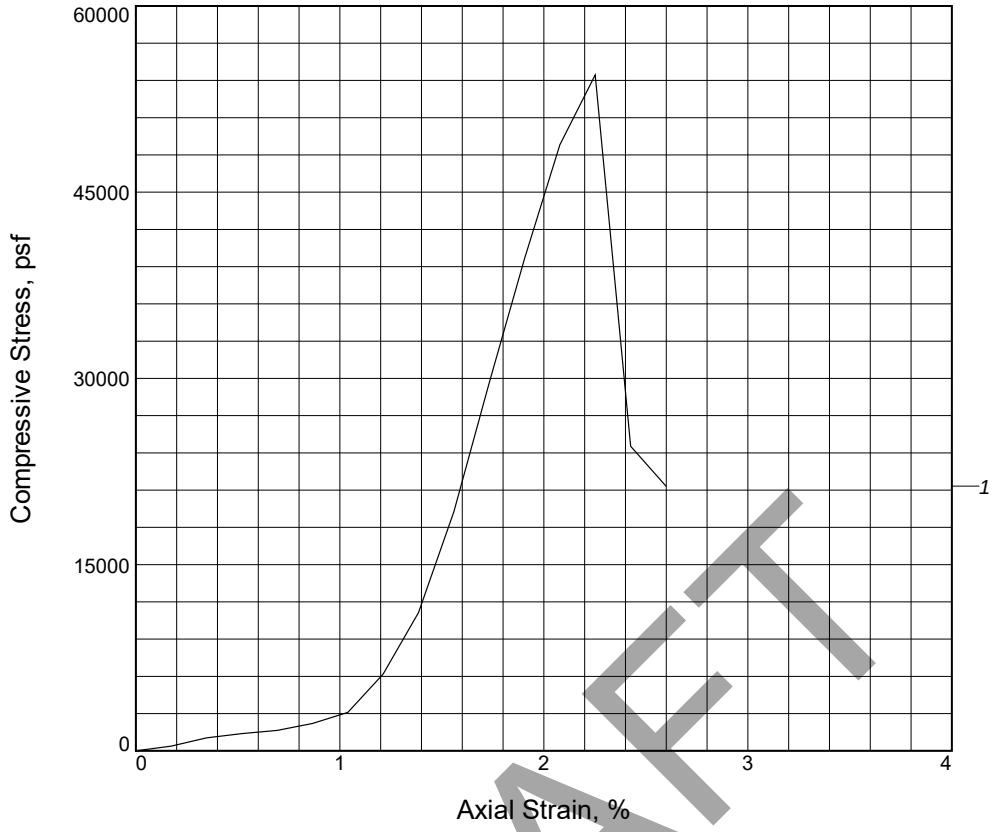
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 1 Soil:Grout Mix G2a (10:2.0)
Sample Number: 17

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	54444			
Undrained shear strength, psf	27222			
Failure strain, %	2.3			
Strain rate, in./min.	0.050			
Water content, %	22.8			
Wet density, pcf	126.1			
Dry density, pcf	102.6			
Saturation, %	96.0			
Void ratio	0.6423			
Specimen diameter, in.	3.01			
Specimen height, in.	5.77			
Height/diameter ratio	1.92			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

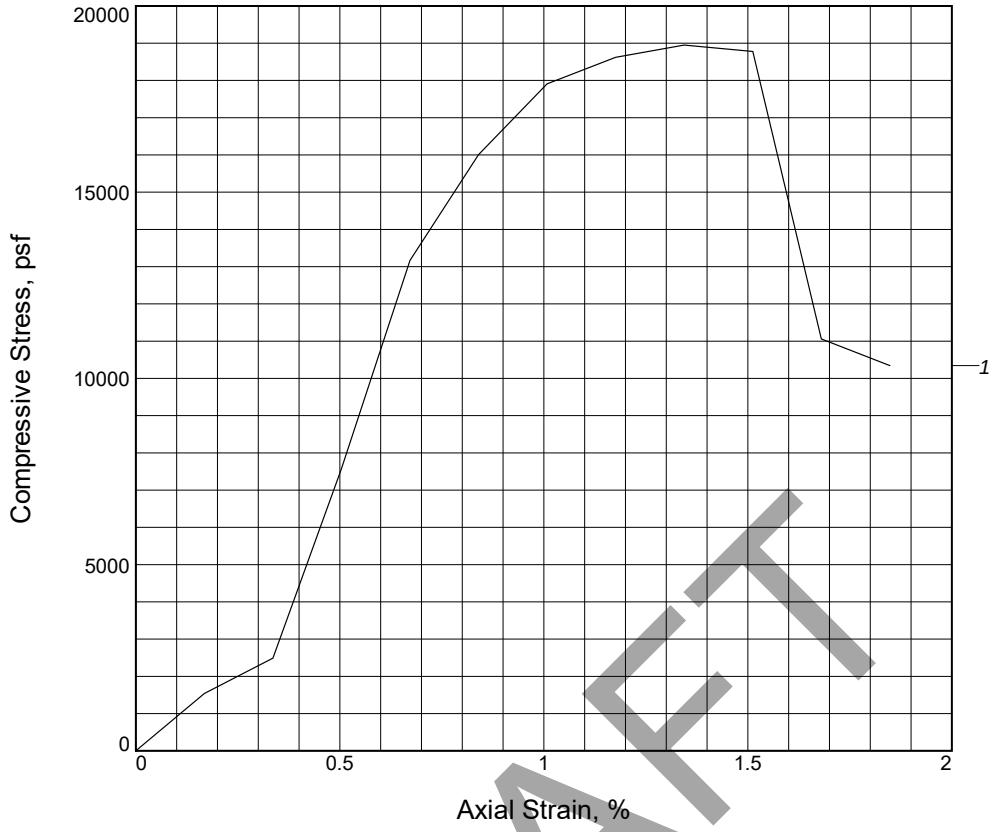
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 1 Soil:Grout Mix G4a (10:2.5)
Sample Number: 18

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	18950			
Undrained shear strength, psf	9475			
Failure strain, %	1.3			
Strain rate, in./min.	0.050			
Water content, %	17.9			
Wet density, pcf	117.4			
Dry density, pcf	99.6			
Saturation, %	69.7			
Void ratio	0.6921			
Specimen diameter, in.	3.00			
Specimen height, in.	5.95			
Height/diameter ratio	1.98			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

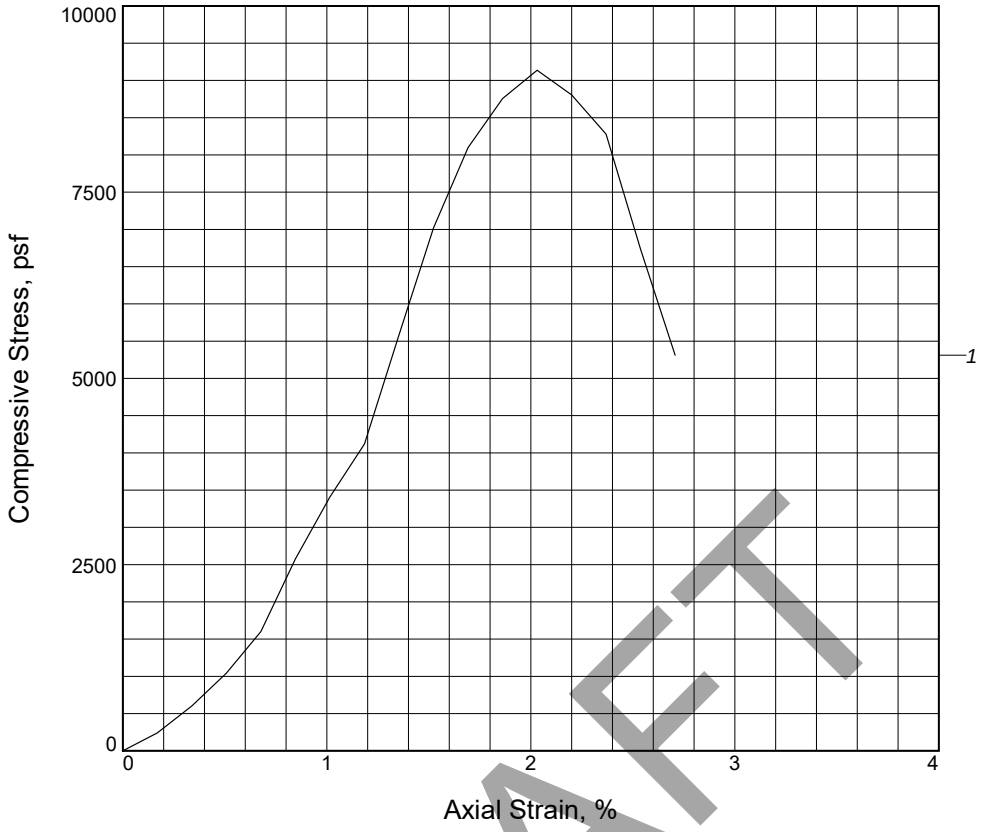
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 2 Soil:Grout Mix G2a:Calciment (10:2.0:0.5)
Sample Number: 19

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	9137			
Undrained shear strength, psf	4568			
Failure strain, %	2.0			
Strain rate, in./min.	0.050			
Water content, %	17.2			
Wet density, pcf	119.3			
Dry density, pcf	101.8			
Saturation, %	71.0			
Void ratio	0.6561			
Specimen diameter, in.	3.02			
Specimen height, in.	5.91			
Height/diameter ratio	1.96			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

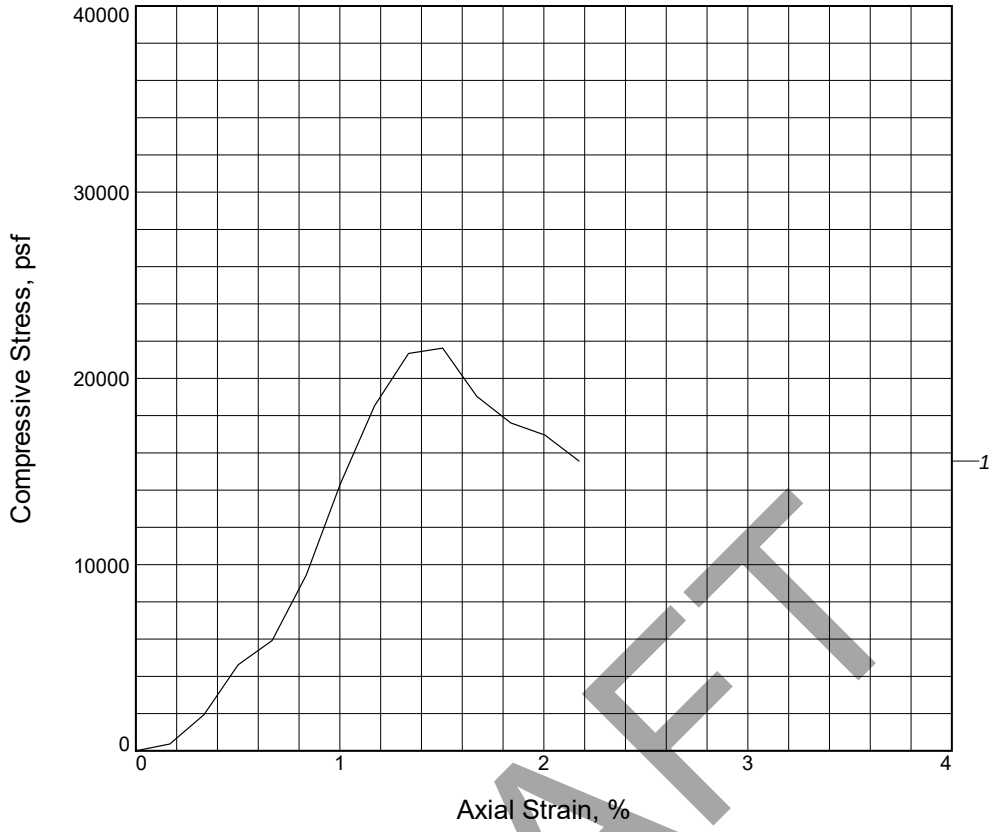
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 2 Soil:Grout Mix G2a (10:2.0)
Sample Number: 20

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	21624			
Undrained shear strength, psf	10812			
Failure strain, %	1.5			
Strain rate, in./min.	0.050			
Water content, %	17.9			
Wet density, pcf	119.6			
Dry density, pcf	101.4			
Saturation, %	73.2			
Void ratio	0.6617			
Specimen diameter, in.	3.01			
Specimen height, in.	5.98			
Height/diameter ratio	1.99			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

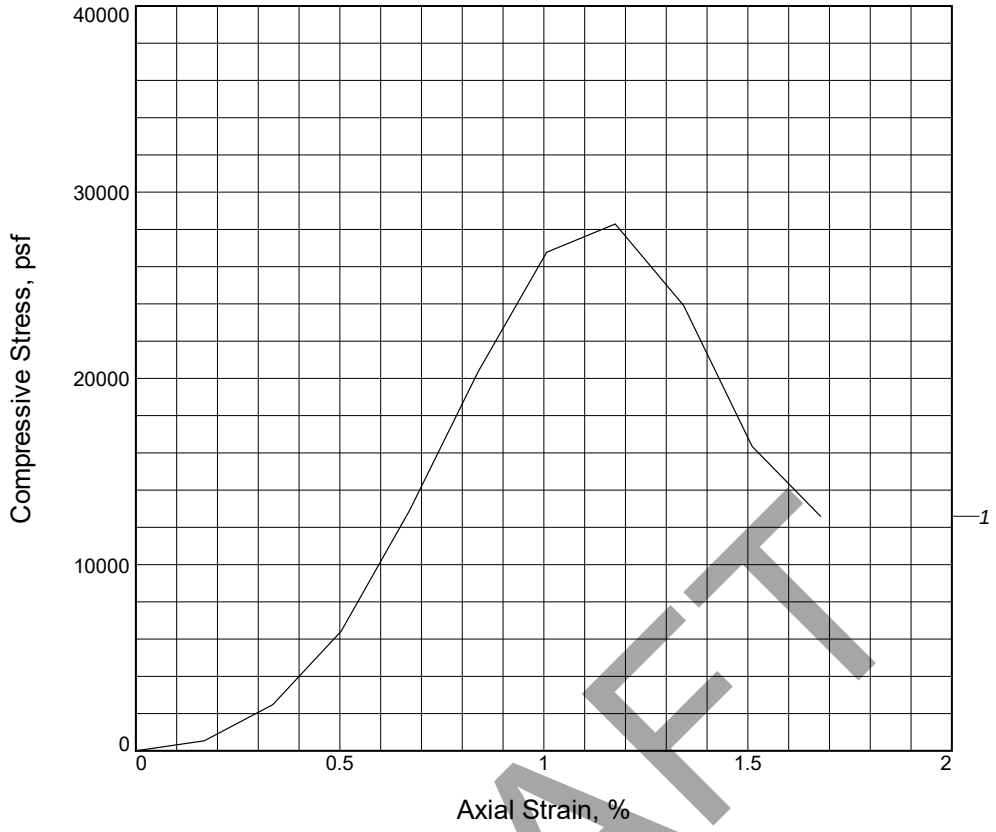
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 2 Soil:Grout Mix G4a (10:2.5)
Sample Number: 21

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	28295			
Undrained shear strength, psf	14147			
Failure strain, %	1.2			
Strain rate, in./min.	0.050			
Water content, %	15.1			
Wet density, pcf	124.2			
Dry density, pcf	107.8			
Saturation, %	72.6			
Void ratio	0.5630			
Specimen diameter, in.	3.02			
Specimen height, in.	5.96			
Height/diameter ratio	1.97			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

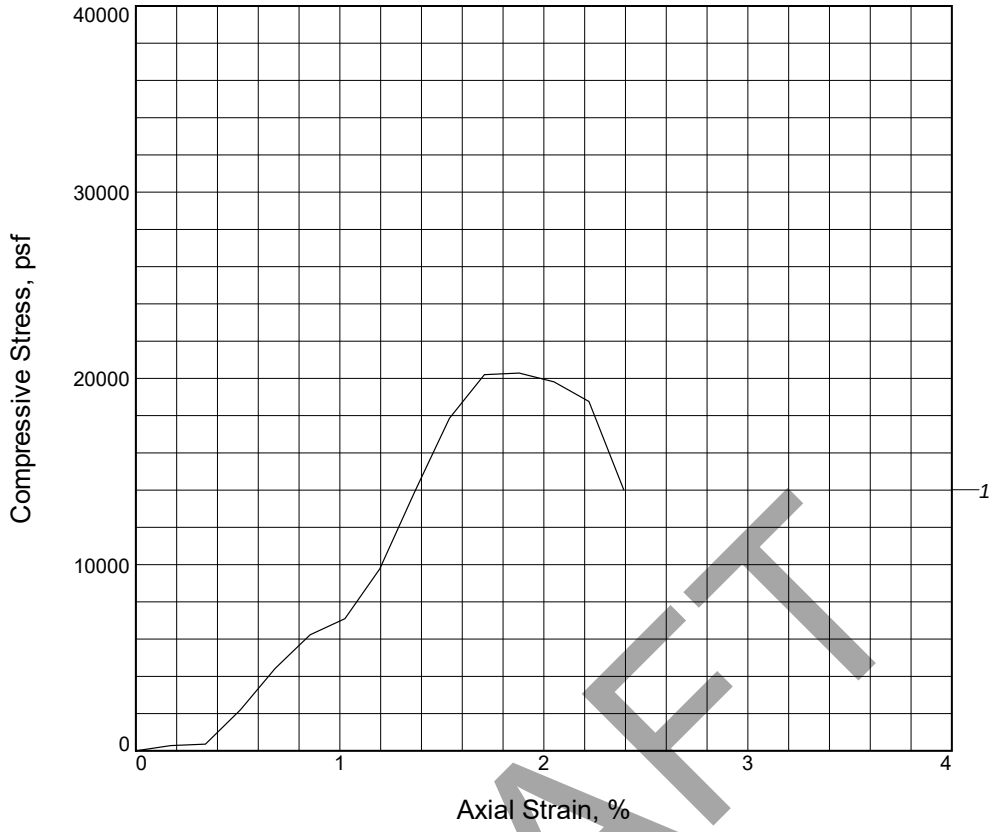
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 3 Soil:Grout Mix G2a:Calciment (10:2.0:0.5)
Sample Number: 22

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	20284			
Undrained shear strength, psf	10142			
Failure strain, %	1.9			
Strain rate, in./min.	0.050			
Water content, %	15.9			
Wet density, pcf	124.5			
Dry density, pcf	107.4			
Saturation, %	75.4			
Void ratio	0.5690			
Specimen diameter, in.	3.02			
Specimen height, in.	5.85			
Height/diameter ratio	1.94			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

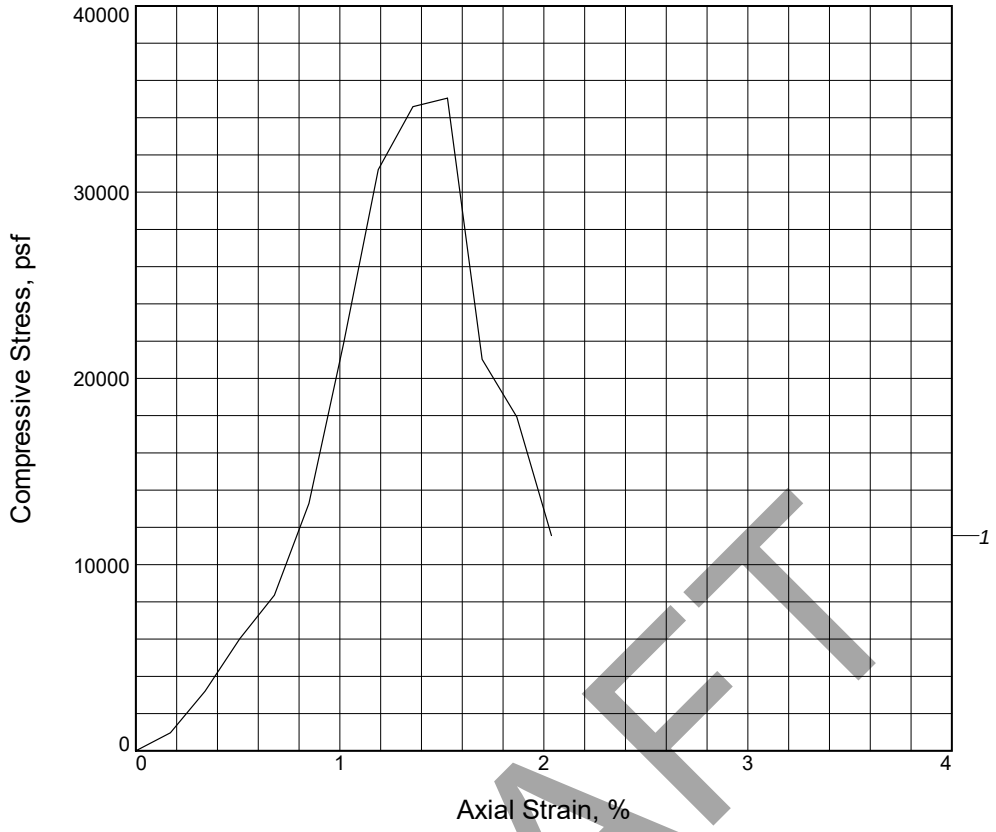
Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 3 Soil:Grout Mix G2a (10:2.0)
Sample Number: 23

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

UNCONFINED COMPRESSION TEST



DRAFT

Sample No.	1			
Unconfined strength, psf	35052			
Undrained shear strength, psf	17526			
Failure strain, %	1.5			
Strain rate, in./min.	0.050			
Water content, %	15.7			
Wet density, pcf	125.7			
Dry density, pcf	108.6			
Saturation, %	76.8			
Void ratio	0.5514			
Specimen diameter, in.	3.01			
Specimen height, in.	5.89			
Height/diameter ratio	1.96			

Description:

LL =	**PL =**	**PI =**	**Assumed GS=** 2.7	**Type:** ASTM D1633

Project No.: 912
Date Sampled: 2-19-20
Remarks:
Tested after 28 days curing.

Figure _____

Client: Wood PLC

Project: MACTEC
Phase 3b Supplemental Testing
Location: Type 3 Soil:Grout Mix G4a (10:2.5)
Sample Number: 24

UNCONFINED COMPRESSION TEST
RSA Geolab
Union, New Jersey

Tested By: MF

ATTACHMENT D

PRELIMINARY SWELL CALCULATION

DRAFT

Preliminary Swell Calculation

Project:	Saranac Lake OU1 ISS
Date:	3/11/20
By:	NDL
Checked:	BBJ

Inputs

Conversion Factors

Mass	1	lb	=	453.6	g	pounds to grams
Volume	1	cf	=	28316.8	cc	cubic feet to cubic centimeters

Soil Properties

γ_{soil} =	120	lb/cf	=	1.92	g/cc	saturated soil unit weight
V_{total} =	1	cf	=	28316.8	cc	total volume
M_{total} =	120	lb	=	54431.0	g	total mass
Wc =	27	%				water content
M_{soil} =	87.6	lb	=	39734.7	g	mass of soil
M_{water} =	32.4	lb	=	14696.4	g	mass of water

Grout Properties

Grout Addition = 20 % by weight of saturated soil weight

M_{Grout} =	24	lb	=	10886.2	g	mass of grout

Cement =	1
Water =	1
Bentonite =	0.025
Total =	2.025

M_{Cement} =	11.9	lb	=	5375.9	g	mass of cement
$M_{GroutWater}$ =	11.9	lb	=	5375.9	g	mass of grout water
$M_{Bentonite}$ =	0.3	lb	=	134.4	g	mass of bentonite
SG_{Cement} =	3.37					specific gravity of cement
$SG_{GroutWater}$ =	1.00					specific gravity of grout water
$SG_{Bentonite}$ =	2.71					specific gravity of bentonite
V_{Cement} =	0.056	cf	=	1593.0	cc	volume cement
$V_{GroutWater}$ =	0.190	cf	=	5375.9	cc	volume grout water
$V_{Bentonite}$ =	0.002	cf	=	49.7	cc	volume bentonite
V_{Grout} =	0.248	cf	=	7018.6	cc	

Swell = 24.8 %

DRAFT