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Ms. Jamie Verrigni
New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau C, 625 Broadway, 11th Floor
Albany, New York 12233-7014

Subject:
NAPL Recovery Well Installation, Monitoring, and Reporting
Orange and Rockland Utilities, Inc.
Port Jervis Former MGP Site
City of Port Jervis, Orange County, New York

ENVIRONMENT

Date:
November 10, 2014

Contact:
Adam Etringer

Phone:
518.250.7314

Email:
adam.etringer@
arcadis-us.com

Our ref:
B0043021.0009

Dear Ms. Verrigni:

ARCADIS of New York, Inc. (ARCADIS) has completed services in connection with the installation of angle non-aqueous phase liquid (NAPL) recovery wells at the Orange and Rockland Utilities (O&R) Port Jervis Former manufactured gas plant (MGP) site in Port Jervis, New York. These activities were conducted to implement a monitoring and recovery program if recoverable quantities of NAPL were observed during drilling beneath Pike Street.

This work was performed per the *NAPL Recovery Work Plan* that was approved by the New York State Department of Environmental Conservation (NYSDEC) on May 1, 2014. This letter report summarizes the scope and results of the following activities:

- Clearing each boring location for utilities by air knifing and/or hand clearing to a depth of five feet below ground surface (bgs) at each location,
- Drilling of five soil borings and installation of NAPL recovery wells at each boring location,
- Logging and classifying soils at each boring location, and
- Initiation of periodic NAPL gauging and recovery events.

Each of these activities is discussed in further detail below.

Utility Clearing

Based on historical utility figures provided by O&R and physical utility markings provided by DigSafe NY, each location was specifically selected to avoid contact with known utilities. The utilities in the vicinity of the drilling consisted of gas and electric provided by O&R, and water and sewage provided by the City of Port Jervis.

ARCADIS subcontracted Cascade Drilling, L.P. (Cascade) to clear each of the proposed boring locations with the use of hand tools or by air-knifing to a depth of at least five feet bgs. Each location was then visually cleared of utilities or other obstructions. In the event that drilling did not immediately commence at the cleared location, the open hole was temporarily backfilled with the removed soils. RW-5 and RW-6 were hand-cleared on August 5, 2014. Clearing by air-knife was conducted at RW-7, RW-8D on August 6, 2014, and at RW-8S on August 14, 2014.

Drilling Activities and Well Installation

The angled drilling and well installation activities were performed from August 5, 2014 to August 15, 2014 and included:

- Drilling of five soil borings (RW-5, RW-6, RW-7, RW-8S, and RW-8D), and
- Installation of five NAPL recovery wells, including well development and surface completion.

The primary goal of the program was to determine if recoverable quantities of NAPL were observed beneath Pike Street. If, through discussions with O&R and the NYSDEC, it was determined that visual observations of NAPL were deemed to be recoverable, then NAPL recovery wells were to be installed. The locations of the recovery wells are shown on Figure 1. The soil boring and recovery well construction logs are provided in Attachment A.

Soil Borings

Soil borings were drilled by Cascade using Sonic drilling methods. Oversight and documentation of subsurface conditions was conducted by an ARCADIS geologist. Soil samples were collected continuously at each location using 6-inch, 10-foot long core barrel sampler. Recovered soil was visually characterized for soil type and the presence of any NAPL. Representative soil samples from each boring location were also screened for the presence of volatile organic compound (VOC) vapors using a photoionization detector (PID) and were subsequently transferred to 55-gallon drums for off-site disposal.

Each boring was drilled at a 40 degree angle in order to target the subsurface beneath Pike Street. As such, boring and well depths are presented in feet as “drill string from ground surface” (dsfgs). This notation is not meant to represent the vertical depth below the ground surface, since the wells were installed at an angle. Rather, this is the length of well casing, as measured from the ground surface during drilling. The approximate depths of the angled wells in feet below the ground surface are listed in the notes on Table 1.

The soils in the upper 20 to 25 feet dsfgs primarily consisted of fine and fine-to-medium sands. From 25 to 40 feet dsfgs the lithology primarily consisted of a cobbles and gravel. Fine-to-medium sands were observed again between 40 and 70 feet dsfgs.

Yellow oil-like-material (OLM) and petroleum-like odors were observed between 20 and 30 feet dsfgs. Brown OLM and coal-tar-like odors were generally observed at deeper intervals between 40 and 60 feet dsfgs.

Monitoring Well Installation

Angled recovery wells were installed at each of the soil boring locations. Wells were constructed of 6-inch Schedule 40 polyvinyl chloride (PVC). The annulus around the well casing was filled by native material collapse, pea gravel, hydrated bentonite chips, and/or bentonite/concrete grout, depending on the specific well. The ground surface at each well was completed with a locking j-plug and a flush-mount steel cover. The specific well construction details are shown on the Well Logs. The following table summarizes the justification for the recovery well construction, based on observations of NAPL and discussions with O&R and the NYSDEC. Monitoring wells RW-5 and RW-8S were installed as light-NAPL (LNAPL) recovery wells, and therefore do not have sumps. The remaining wells were constructed as dense-NAPL (DNAPL) recovery wells.

Well ID	Screen Interval (feet dsfgs)	Sump Interval (feet dsfgs)	Justification
RW-5	22.15 - 31.60	No sump	Yellow OLM coated soil from 24-30 feet dsfgs
RW-6	45.15 – 55.00	55.00 – 57.00	brown OLM coated soil from 50-55 feet dsfgs
RW-7	45.15 – 54.61	54.61 – 57.00	moderate to heavy brown OLM from 50-55 feet dsfgs
RW-8S	24.50 – 33.48	No sump	yellow OLM coating on soil from 26.5 to 32 feet dsfgs
RW-8D	40.00 – 49.50	49.50 – 52.00	seams of brown OLM from 41 to 42 feet dsfgs; OLM coated soil at 49.6 feet dsfgs

Following installation, each well was developed by Cascade using air-lifting techniques to ensure that any accumulated sediment was removed, and to improve the hydraulic communication between the well and the surrounding formation.

Management of Investigation-Derived Waste

Investigation-derived waste (IDW) generated during the angled drilling and well installation included: 1) soil cuttings from the drilling activities; 2) decontamination wash-water and development water; 3) PVC from temporary well constructions; and 4) personal protective equipment and plastic sheeting (from the decontamination pad). IDW was stored in appropriately labeled 55-gallon drums and staged at the O&R Port Jervis Operations Center and at the former Meder property for subsequent off-site disposal.

NAPL Monitoring Events

Following the installation and development of the recovery wells, a periodic NAPL monitoring program was initiated to monitor for, and subsequently remove accumulated NAPL if observed. Per the *NAPL Recovery Work Plan*, four weekly monitoring events were conducted on August 26, September 2, September 9, and September 16, 2014. The first monthly event was conducted on October 20, 2014. In addition to the newly installed wells, the following existing wells were included in the monitoring events: RW-1, RW-2, RW-3, RW-4, and MW-8R.

During each event, static fluid level measurements were obtained using an oil/water interface probe and a weighted measuring tape, and observations of NAPL (if any) were recorded. Recovery well MW-8R was the only well where recoverable NAPL was observed during the events listed above. The NAPL thickness at MW-8R varied from between 6 and 9 feet. A stainless steel bailer was used to remove the NAPL during each event. A summary of the data collected during the NAPL monitoring events is presented on Table 1. Subsequent monitoring and removal data will be populated onto Table 1, which will be submitted following the completion of future events. NAPL removed during the events is being stored in a labeled drum located at the O&R Port Jervis Service Center. Disposal will be coordinated once a sufficient volume is generated.

If you have any questions regarding the information contained herein, please contact me at any time.

Sincerely,

ARCADIS of New York, Inc.

Adam Etringer
Senior Project Manager

Enclosures:
Table
1 Summary of NAPL Monitoring Data

Figure
1 Recovery Well Locations

Attachment
A Soil Boring Logs

Copies:
Megan Miller, ARCADIS
David Cornell, ARCADIS

Table 1
Summary of NAPL Monitoring Data
Orange and Rockland Utilities
Port Jervis Former MGP Site
Port Jervis, New York

Well ID	Date	Depth to Bottom (dsfgs)	Depth to Water (dsfgs)	Depth to Product (dsfgs)	NAPL Thickness (feet)	NAPL Removed (gallons)	Cunulative NAPL Removed (gallons)
RW-1	9/2/14	39.10	21.20	--	--	--	--
	9/9/14	39.30	21.45	--	--	--	--
	9/16/14	39.30	21.31	--	--	--	--
	10/20/14	39.20	21.00	--	--	--	--
RW-2	9/2/14	42.20	20.85	--	--	--	--
	9/9/14	42.40	21.10	--	--	--	--
	9/16/14	42.20	20.94	--	--	--	--
	10/20/14	42.60	23.73	--	--	--	--
RW-3	8/26/14	43.25	20.27	--	--	--	--
	9/2/14	43.23	20.38	--	--	--	--
	9/9/14	43.40	20.62	--	--	--	--
	9/16/14	43.40	20.52	--	--	--	--
	10/20/14	43.50	20.20	--	--	--	--
RW-4	8/26/14	41.50	20.20	--	--	--	--
	9/2/14	41.50	20.30	--	--	--	--
	9/9/14	40.65	20.57	--	--	--	--
	9/16/14	40.70	20.43	--	--	--	--
	10/20/14	41.00	20.17	--	--	--	--
RW-5	8/26/14	30.20	24.64	--	--	--	--
	9/2/14	30.20	24.48	--	--	--	--
	9/9/14	30.20	24.80	--	--	--	--
	9/16/14	30.20	24.75	--	--	--	--
	10/20/14	30.20	24.26	--	--	--	--
RW-6	8/26/14	54.60	25.73	--	--	--	--
	9/2/14	54.60	25.87	--	--	--	--
	9/9/14	54.60	26.21	--	--	--	--
	9/16/14	54.60	25.93	--	--	--	--
	10/20/14	54.60	25.65	--	--	--	--
RW-7	8/26/14	52.60	24.60	--	--	--	--
	9/2/14	52.60	24.77	--	--	--	--
	9/9/14	52.60	25.04	--	--	--	--
	9/16/14	52.60	25.02	--	--	--	--
	10/20/14	52.60	24.59	--	--	--	--
RW-8S	8/26/14	32.80	23.81	--	--	--	--
	9/2/14	32.80	24.20	--	--	--	--
	9/9/14	32.80	24.28	--	--	--	--
	9/16/14	32.80	24.30	--	--	--	--
	10/20/14	32.80	23.84	--	--	--	--
RW-8D	8/26/14	44.70	24.21	--	--	--	--
	9/2/14	45.40	24.25	--	--	--	--
	9/9/14	45.20	24.51	--	--	--	--
	9/16/14	44.60	24.49	--	--	--	--
	10/20/14	44.70	24.08	--	--	--	--
MW-8R	8/26/14	50.00	23.25	47.00	6.00	2	2
	9/2/14	50.00	22.97	43.00	7.00	3	5
	9/9/14	50.00	23.20	44.00	6.00	3	8
	9/16/14	50.00	22.15	44.00	6.00	3	11
	10/20/14	50.00	23.73	41.00	9.00	3	14

Notes:
dsfgs = drill string from ground surface
The following wells were drilled and set at a 40 degree angle: RW-5, RW-6, RW-7, RW-8S, RW-8D
RW-1 and RW-2 were not monitored on August 26, 2014 due to ground surface obstructions.

Approximate depths of angled wells (feet below ground surface)

RW-5	24.21
RW-6	43.66
RW-7	43.66
RW-8S	25.65
RW-8D	39.83

LEGEND:

- PROPERTY LINE
- EDGE OF WATER (APPROXIMATE)
- EXISTING BUILDING
- EXISTING CHAIN–LINK FENCE
- EXISTING WOOD FENCE
- EXISTING WIRE FENCE
- EXISTING GUARDRAIL
- 36–INCH–DIAMETER STORM SEWER LINE (APPROXIMATE)
- MW14S — MONITORING WELL LOCATION
- PZ1 — PIEZOMETER LOCATION
- RW-4 — EXISTING NAPL RECOVERY WELL
- RW-8 — NAPL RECOVERY WELL
- APPROXIMATE WELL PROJECTION

NOTES:

1. BASE MAP MODIFIED FROM DRAWINGS PORT_JERVIS_08.DWG AND FIG2–1_GW3–08.DWG PROVIDED BY AECOM AND BASED ON ELECTRONIC COPY OF SURVEY DRAWING NO. 100204, TITLED "SURVEY OF PROPERTY", DATED 03–25–10, PROVIDED BY BORBAS SURVEYING AND MAPPING, LLC.
2. HORIZONTAL DATUM IS THE NORTH AMERICAN DATUM OF 1983 (NAD 83); NEW YORK STATE PLANE EAST COORDINATE SYSTEM, IN U.S. SURVEY FEET. VERTICAL DATUM IS THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

0 30' 60'
GRAPHIC SCALE

PORT JERVIS FORMER MGP SITE
ORANGE AND ROCKLAND UTILITIES, INC.
PORT JERVIS, NEW YORK
NAPL RECOVERY WELL INSTALLATION LETTER REPORT

NAPL RECOVERY WELL LOCATIONS

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FIGURE 1

CITY: SYRACUSE, NY DIV/GROUP: ENV/WEST/IM-DV DB: G. STOWELL, R. BASSETT, P. LISTER PM: J. BRIEN TM: M. BENOIT TR: W. STEPHENS LYR: ON="OFF="REF*;X01 HISTORICAL*
G:\ENV\CAD\SYRACUSE\ACTIB\043021\0009\00003\DWG\REPORT\NAPL\43021G01.dwg LAYOUT: 1 SAVED: 11/3/2014 12:18 PM ACADVER: 18.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 11/3/2014 12:18 PM BY: GETTS, BRIAN
XREFS: 43021X01 43021X00
IMAGES:

Date Start/Finish: 8/7/14
Drilling Company: Cascade Drilling Inc.
Driller's Name: Frank Gardelli
Drilling Method: Rotosonic
Sampling Method: 6 inch X 10 foot corebarrel
Rig Type: Boart Longyear Rig 200C

Northing: 925005.498
Easting: 438315.773
Casing Elevation: NA

Borehole Depth: 70' dsfgs
Surface Elevation: 438.29 ft

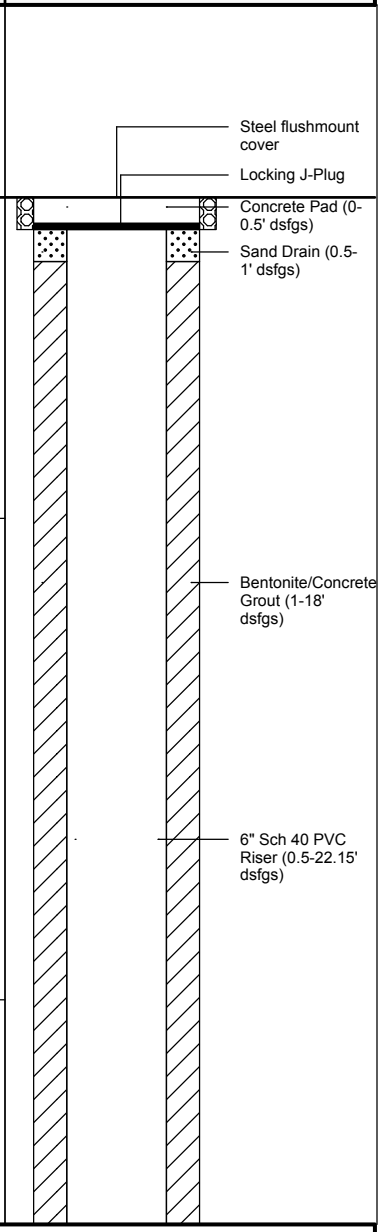
Descriptions By: Levia Terell

Well/Boring ID: **RW-5**

Client: Orange and Rockland Utilities, Inc.

Location: Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
440 / 0						Hand cleared to 5' dsfgs.
435 / 5	1	0-5	NA	NA		
	2	5-10	5	0.0 0.0 0.0 0.0 0.0		Brown very fine SAND, trace Silt, trace fine to coarse angular Gravel, moist.
430 / 10	3	10-15	5	0.0 0.0 0.0 0.0 0.0		Gravel is absent between 10-12.5' dsfgs.
425 / 15	4	15-20	5	0.0		Grayish light brown fine SAND, moist.



Well/Boring Construction

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-5**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
					0.0		Grayish light brown fine SAND, moist.
		4	15-20	5	0.0		
	420				0.0		
					0.0		
20							
					0.0		
					3.1		Trace fine to coarse rounded Gravel, petroleum like odor between 20-24.5' dsfgs. Yellow Oil like Material (OLM) coated soil, moist between 23-24.5' dsfgs.
		5	20-25	5	50.3		
	415				163.8		
							Grayish light brown fine SAND, some rounded Cobble, little fine to coarse rounded Gravel, yellow OLM coated soil, moist to wet.
25							Gray rounded COBBLES, some fine to coarse rounded Gravel, trace fine to coarse Sand, strong petroleum like odor, yellow OLM coated soil, wet.
							Water table at 26.04' dsfgs.
					69		
		6	25-30	4			
	410				54.6		
					6.8		
30							Yellow OLM coated sample is absent between 30-35' dsfgs, yellow OLM present in slough.
					44.6		
					8.8		
		7	30-35	3			
	405				3.0		
35							
		8	35-40	1.5	0.0		Gray coarse SAND and fine rounded Gravel, little Cobble, trace medium to coarse rounded Gravel, fine to medium Sand, wet.

Well/Boring Construction

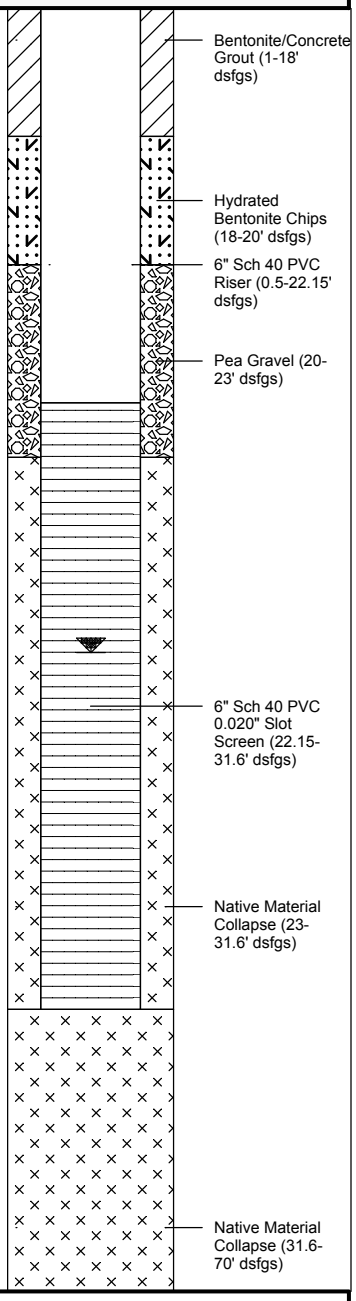

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-5**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
		8	35-40	1.5	0.0		Gray coarse SAND and fine rounded Gravel, little Cobble, trace medium to coarse rounded Gravel, fine to medium Sand, wet.	
	400							
40								
		9	40-45	NR	NA		No recovery.	
	395							
45								Native Material Collapse (31.6-70' dsfgs)
		10	45-50	0.3	0.0 0.1		Gray fine to medium SAND, little fine to coarse Gravel and Cobble, trace coarse Sand, Coal Tar Like (CTL) odor,	
	390							
50								
		11	50-55	4.0	1.8 0.4 0.7 0.3		Brownish gray fine to medium SAND, trace rounded fine to coarse Gravel and coarse Sand, trace sheen, mild CTL like and moth ball like odor, wet. 1' of slough wet with CTL like odors and trace brown blebs of OLM.	
	385							
55								
		12	55-60	5.0			Gray fine SAND, little medium Sand, trace coarse Sand, light brown fine Sand lense at 59.5' dsfgs, CTL and moth ball like odor, trace sheen, wet.	

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-5**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
380	12	55-60	5.0	17.5 9.4 84.4 2.6		Gray fine SAND, little medium Sand, trace coarse Sand, light brown fine Sand lense at 59.5' dsfgs, CTL and moth ball like odor, trace sheen, wet.	
60							
375	13	60-65	1.5	0.0 1.1		Gray fine SAND, mild CTL like odor, wet.	Native Material Collapse (31.6-70' dsfgs)
65							
370	14	65-70	3.5	0.0 0.0			
70						End of boring.	
365							
75							

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Date Start/Finish: 8/5/14
Drilling Company: Cascade Drilling Inc.
Driller's Name: Frank Gardelli
Drilling Method: Rotosonic
Sampling Method: 6 inch X 10 foot corebarrel
Rig Type: Boart Longyear Rig 200C

Northing: 925038.667
Easting: 438350.824
Casing Elevation: NA

Borehole Depth: 70' dsfgs
Surface Elevation: 439.08 ft

Descriptions By: Levia Terell

Well/Boring ID: **RW-6**

Client: Orange and Rockland Utilities, Inc.

Location: Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
440 / 0						
	1	0-5	NA	NA		Hand cleared to 5' dsfgs.
435 / 5	2	5-10	5	0.1 0.1 0.1 0.1 0.1		Brown very fine SAND, trace Silt and fine to coarse Gravel, moist.
430 / 10	3	10-15	5	0.0 0.0 0.0 0.0 0.0		Gravel is absent between 10-13' dsfgs. Grayish light brown fine SAND, moist.
425 / 15	4	15-20	5	0.0		Brown fine SAND, trace medium to coarse Sand and fine to coarse rounded Gravel, moist.

Well/Boring Construction

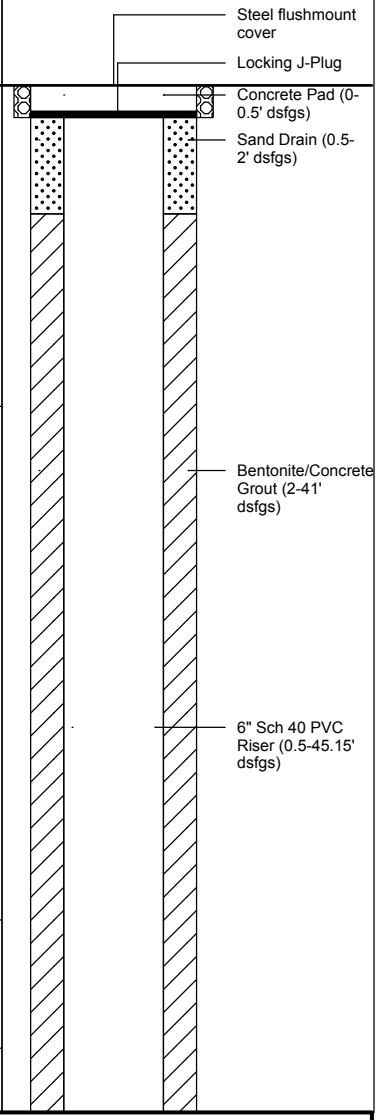

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-6**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
				0.0		Brown fine SAND, trace medium to coarse Sand and fine to coarse rounded Gravel, moist.
	4	15-20	5	0.0		
				0.0		
420				0.0		
20				0.0		Brown fine to coarse rounded GRAVEL, some Cobble, little fine Sand, trace medium to coarse Sand, moist. Petroleum like odor, moist to wet last 2' of the sample.
				0.0		
	5	20-25	5	0.0		
415				0.0		
25				6.1		Gray fine to coarse rounded GRAVEL, some Cobble, little fine Sand, trace medium to coarse Sand, moist, petroleum like odor, sheen, trace yellow Oil Like Material (OLM), wet. Water table at 27.2' dsfgs.
				30.7		
				41.7		
410				33.7		
30	6	25-35	10	18.1		Gray multicolored coarse SAND, little rounded fine to coarse Gravel, trace rounded Cobble, fine to medium Sand, wet.
				6.1		
				4.5		
405				3.0		
35	7	35-45	5	0.9		

Well/Boring Construction

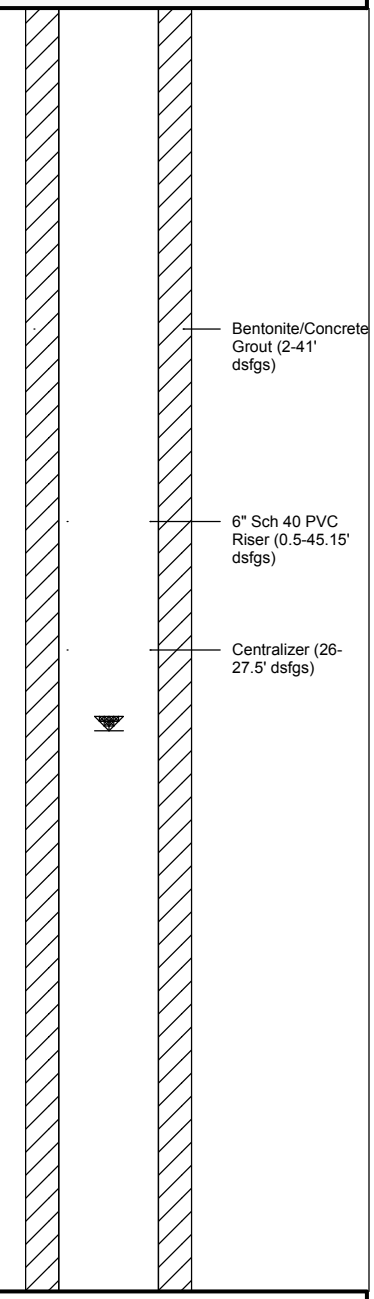

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-6**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
				1.9		Gray multicolored coarse SAND, little rounded fine to coarse Gravel, trace rounded Cobble, fine to medium Sand, wet.
				0.8		Brown multicolored rounded Cobble and fine to coarse rounded Gravel, trace fine to coarse Sand and Silt, wet.
400				0.4		
40	7	35-45	5	0.2		
395						
45	8	45-50	NR	NA		No recovery.
390						
50				7.8		Gray COBBLE, some fine Sand, little fine to coarse rounded Gravel, trace Silt, trace brown OLM, Coal Tar Like (CTL) like odor, wet. Sample coated with brown OLM.
	9	50-55	5	2.6		
				1.7		
385				0.8		
				0.4		Light brownish gray fine SAND, wet.
55	10	55-65	5	7.8		Light brownish gray fine SAND, CTL like odor top 3' of the sample (Moth ball like odor).

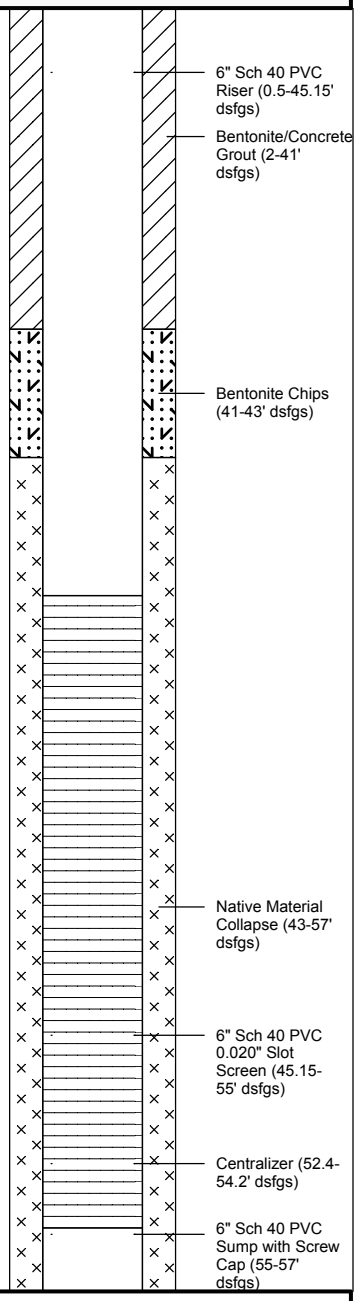

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-6**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
					4.4		Light brownish gray fine SAND, CTL like odor top 3' of the sample (Moth ball like odor).	6" Sch 40 PVC Sump with Screw Cap (55-57' dsfgs)
					13.9			
					41.3			
	380							
					11.1			
60		10	55-65	5				Native Material Collapse (57-70' dsfgs)
					7.1			
					1.7			
					2.4			
					1.4			
	375							
65								
					60.9		Light graysih brown fine SAND, CTL odors (possibly from water in hole overnight), moth ball like odors.	
					7.8			
		11	65-70	5	7.6			
					6.8			
	370							
					4.4			
70							End of boring.	
	365							
75								

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Date Start/Finish: 8/11/14
Drilling Company: Cascade Drilling Inc.
Driller's Name: Frank Gardelli
Drilling Method: Rotosonic
Sampling Method: 6 inch X 10 foot corebarrel
Rig Type: Boart Longyear Rig 200C

Northing: 925105.357
Easting: 438281.683
Casing Elevation: NA

Borehole Depth: 70' dsfgs
Surface Elevation: 438.03 ft

Descriptions By: Levia Terell

Well/Boring ID: **RW-7**

Client: Orange and Rockland Utilities, Inc.

Location: Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
440						
0						Hand cleared to 5' dsfgs.
	1	0-5	NA	NA		
435						
5						Grayish brown very fine SAND and SILT, trace fine to coarse rounded Gravel and Organics (roots), moist.
				0.0		
				0.0		Brown very fine SAND and SILT, trace Organics (roots), moist.
	2	5-10	5	0.0		
430				0.0		
				0.0		
10				0.0		
				0.0		Brown medium SAND, little fine Sand, trace Silt, moist.
				0.0		Brown very fine SAND and SILT, moist.
	3	10-15	5	0.0		Brown SILT, trace fine to coarse Sand and fine to coarse Gravel, moist.
425				0.0		
				0.0		Brown very fine SAND and SILT, moist.
15						
	4	15-20	5	0.0		

Well/Boring Construction

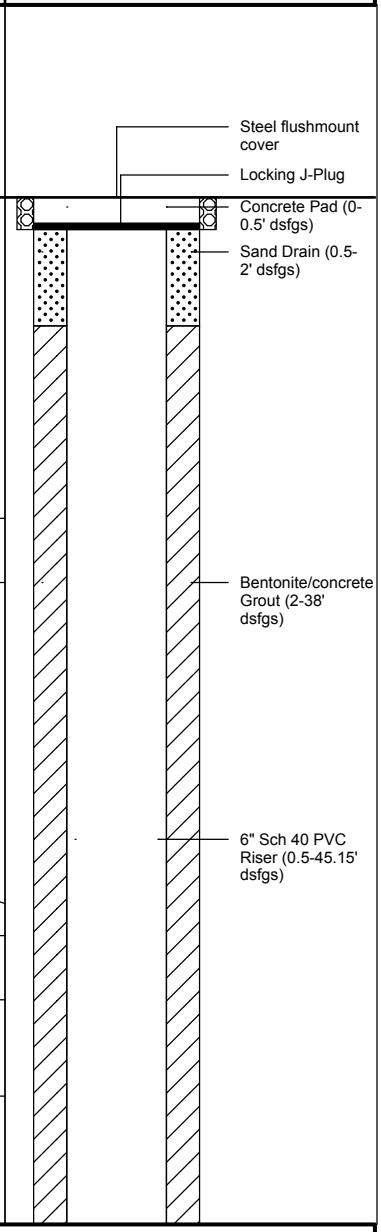

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-7**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
					0.0			
					0.0		Brown fine SAND, moist.	
		4	15-20	5	0.0			
	420				0.0			
					0.0		Brown fine to medium SAND, moist.	
20								
					0.0		Brown fine to coarse rounded GRAVEL, some fine to coarse Sand, little rounded Cobble, petroleum like odor last 1' dsfgs, wet.	Bentonite/Concrete Grout (2-38' dsfgs)
		5	20-25	5	0.0			
	415				0.0			6" Sch 40 PVC Riser (0.5-45.15' dsfgs)
					0.9		Water Table is at 24.65' below Top of Casing.	
25								
							Gray rounded COBBLE, some fine to coarse rounded Gravel, little fine to coarse Sand, petroleum like odor, sheen coated soil, wet. 7" Cobble present at the tip of the sample.	
		6	25-30	2	8.9			
	410				30.7			
30								
							Grayish brown fine to coarse rounded GRAVEL, some coarse Sand, little fine to medium Sand, petroleum like odor, wet.	
		7	30-35	1	0.3			
	405							
35								
		8	35-40	2.5			Multi-colored rounded COBBLE, trace fine to coarse rounded Gravel, wet.	

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-7**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
					0.0		
		8	35-40	2.5	0.0		Brown multi-colored fine to medium rounded GRAVEL and coarse SAND, little coarse rounded Gravel and Cobble, trace fine to medium Sand, wet.
	400						
40							
		9	40-45	NR	NA		No recovery.
	395						
45							
		10	45-50	1	0.3		Multi-colored rounded COBBLE, little fine to coarse rounded Gravel and coarse Sand, trace fine to medium Sand, trace sheen, mild Coal Tar Like (CTL) odor, wet.
	390						
50							
					4.3		Gray fine SAND, heavy sheen, moderate to heavy impacts of brown Oil Like Material (OLM) discoloration, strong CTL odor, wet.
					210		
		11	50-55	5	329.4		
	385						
					316.8		
55							
		12	55-60	5	7.2		Gray fine to medium SAND, trace sheen, trace brown OLM coating, CTL like odor, wet. Soil and Silt lense, brown OLM around lense in Sand between 55-55.4' dsfgs and at 55.7' dsfgs.

Well/Boring Construction

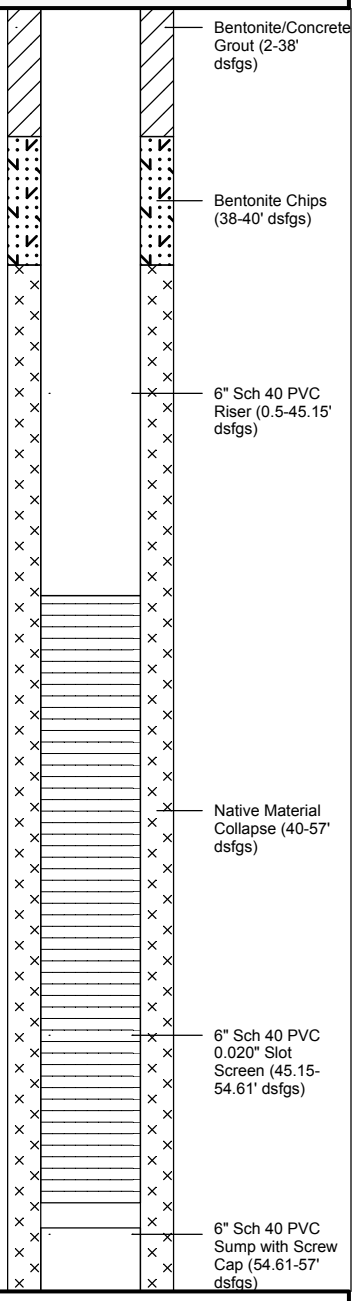

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-7**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
	12	55-60	5	35.6 22.7		Gray fine to medium SAND, trace sheen, trace brown OLM coating, CTL like odor, wet. Soil and Silt lense, brown OLM around lense in Sand between 55-55.4' dsfgs and at 55.7' dsfgs.	6" Sch 40 PVC Sump with Screw Cap (54.61-57' dsfgs)
380				10.8		Gray fine SAND, wet.	
60	13	60-65	5	1.4 4.7 26.1		Gray fine to medium SAND, wet.	
375				17.9		Gray fine SAND, moth ball like odor, wet.	
65	14	65-70	5	0.6 1.3 5.2		Gray fine SAND, mild moth ball like odor, wet.	Native material collapse (57-70' dsfgs)
370				1.7 10.9			
70						End of boring.	
365							
75							

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Date Start/Finish: 8/13/14
Drilling Company: Cascade Drilling Inc.
Driller's Name: Frank Gardelli
Drilling Method: Rotosonic
Sampling Method: 6 inch X 10 foot corebarrel
Rig Type: Boart Longyear Rig 200C

Northing: 925124.760
Easting: 438301.850
Casing Elevation: NA

Borehole Depth: 70' dsfgs
Surface Elevation: 437.68 ft

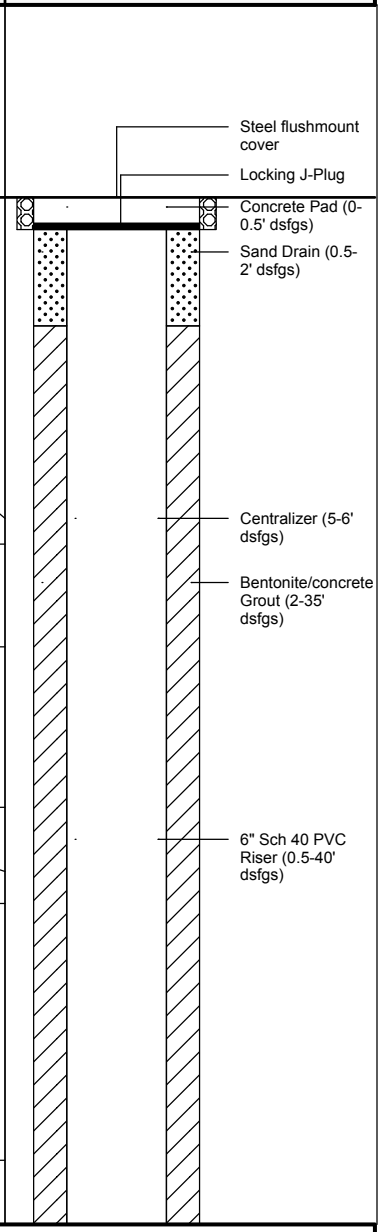
Descriptions By: Levia Terell

Well/Boring ID: **RW-8D**

Client: Orange and Rockland Utilities, Inc.

Location: Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
440						
0						Hand cleared to 5' dsfgs.
435	1	0-5	4.0	NA		
5						Dark brown SILT, trace fine to coarse Gravel, moist.
				0.0		Brown fine SAND, trace Organics (roots), moist.
				0.0		
430	2	5-10	5	0.0		Brown fine to medium SAND, moist.
				0.0		
				0.0		
10						Brown fine SAND, trace Organics, moist.
				0.0		Brown fine to medium SAND, moist.
				0.0		Brown fine SAND and SILT, moist.
425	3	10-15	4	0.0		
				0.0		
				0.0		
15						
	4	15-20	5	0.0		Brown fine to medium SAND, moist.



Well/Boring Construction

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-8D**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
					0.0		Brown fine to medium SAND, moist.	
	420	4	15-20	5	0.0			
					0.0			
					0.2		Brown fine SAND, petroleum like odor, moist.	
20					0.0		Brown fine to medium SAND, mild petroleum like odor, moist.	
					0.0			Bentonite/Concrete Grout (2-35' dsfgs)
	415	5	20-25	5	0.4		Gray rounded fine to coarse GRAVEL, some rounded Cobble, little fine to coarse Sand, strong petroleum like odor, trace yellow Oil like Material (OLM) coated soil last 1' of the recovery.	
					34.2			
					56.7			
25							Gray rounded COBBLE, little fine to coarse Sand and fine to coarse rounded Gravel, yellow OLM staining in sample, heavy impacts, strong petroleum like odor, wet.	Centralizer (25-26' dsfgs)
					77.4			
	410	6	25-30	2.5				
					90.4			
					92.5			
30							Gray rounded fine to coarse COBBLE and GRAVEL, little fine to coarse Sand, trace sheen, brown/black CTL blebs, sticky, mild CTL odor, wet.	6" Sch 40 PVC Riser (0.5-40' dsfgs)
					0.1			
					3.1			
	405	7	30-35	NR				
					1.8			
35								
		8	35-40	1.0			Multi-colored rounded COBBLES, trace fine to coarse Gravel and Sand, trace sheen, no trace of brown OLM in water, trace CTL like odor, wet.	Hydrated Bentonite Chips (35-40' dsfgs)

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Figure

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Well set at 40 degree angle.

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Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-8D**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
400	8	35-40	1.0	0.4		Multi-colored rounded COBBLES, trace fine to coarse Gravel and Sand, trace sheen, no trace of brown OLM in water, trace CTL like odor, wet.
40						Multi-colored coarse SAND, some fine to medium Sand, trace fine to coarse Sand and Gravel.
				17.0		Brown/gray fine SAND, some Cobble, little fine to coarse rounded Gravel, trace medium to coarse Sand, 1" thick heavy sheen, strong CTL like odor, wet. Seams of brown OLM heavy impacts between 41-42' dsfgs.
395	9	40-45	4.0	101.7 108.4 19.4		
45				2.2		Gray fine to medium SAND, trace fine to medium rounded Gravel, OLM coated brown Silt seams at 49.6' dsfgs, sheen 48-50' dsfgs, strong CTL and moth ball like odor.
				3.3		
390	10	45-50	5.0	1057 44.4 69.6 8.0		
50				2.2		Gray fine to medium SAND, trace sheen at 51' dsfgs, moth ball like odor, wet.
				5.6		
385	11	50-55	5.0	50.9 5.5		
55	12	55-60	5.0	1.5		Absence of moth ball like odor or sheen between 55-60' dsfgs.

Well/Boring Construction

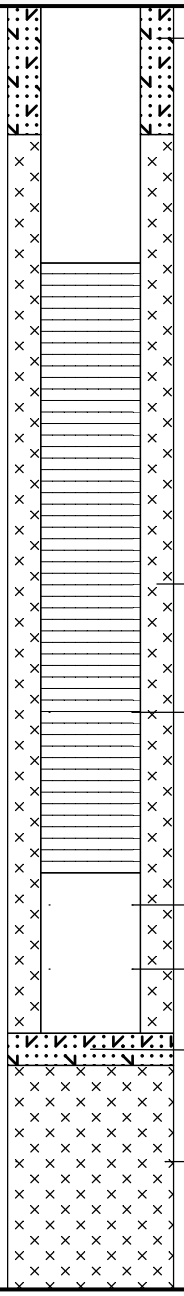

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Figure

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Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
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Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-8D**

Borehole Depth: 70' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description	Well/Boring Construction
380	12	55-60	5.0	2.0 1.2 0.8		Gray fine to medium SAND, trace sheen at 51' bgs, moth ball like odor, wet.	
60				0.7		Grayish brown fine to medium SAND, wet.	
375	13	60-65	5.0	1.0 0.7 0.4		Grayish brown fine SAND, wet.	Native Material Collapse (52.5-70' dsfgs)
65							
370	14	65-70	5.0	0.1 0.0 0.5 0.7			
70						End of boring.	
365							
75							

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Date Start/Finish: 8/14/14
Drilling Company: Cascade Drilling Inc.
Driller's Name: Frank Gardelli
Drilling Method: Rotosonic
Sampling Method: 6 inch X 10 foot corebarrel
Rig Type: Boart Longyear Rig 200C

Northing: 925119.433
Easting: 438296.276
Casing Elevation: NA

Borehole Depth: 35' dsfgs
Surface Elevation: 437.69 ft

Descriptions By: Levia Terell

Well/Boring ID: **RW-8S**

Client: Orange and Rockland Utilities, Inc.

Location: Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
440						
0						Blind drilled to 25' dsfgs. No descriptions collected.
435						
5						
430	1	0-25	NA	NA		
10						
425						
15						

Well/Boring Construction

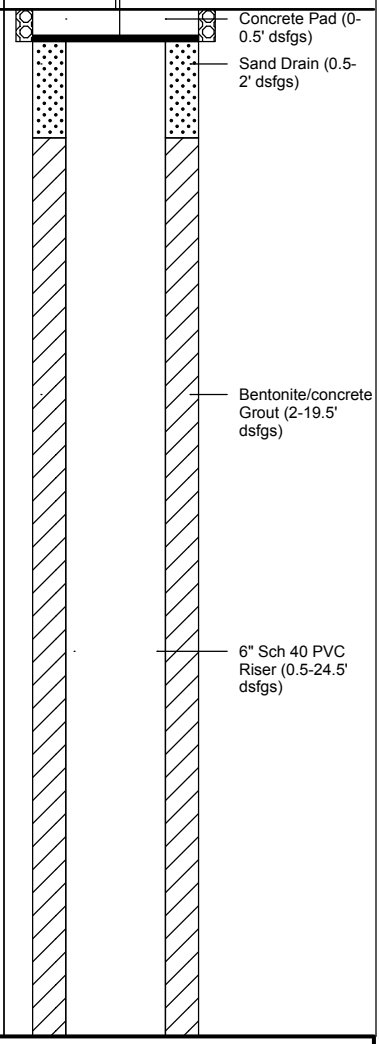

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.

Client: Orange and Rockland Utilities, Inc.

Well/Boring ID: **RW-8S**

Borehole Depth: 35' dsfgs

Site Location:
Port Jervis Former MGP Site

DEPTH / ELEVATION	Sample Run Number	Sample/Int/Type	Recovery	PID Headspace (ppm)	Geologic Column	Stratigraphic Description
420 / 0	1	0-25	NA	NA		Blind drilled to 25' dsfgs. No descriptions collected.
415 / 5						
410 / 10	2	25-30	3.0	18.8 36.8 104.4		Gray to brown fine to medium SAND, little medium to coarse Gravel, faint petroleum like odor, moist. Gray COBBLES, little fine to coarse Sand and Gravel, yellow Oil like Material, saturated coating on all surfaces, strong petroleum like odor, wet.
405 / 15	3	30-35	5.0	97.8 78.9 32.4 2.4		Gray COBBLES, some fine to coarse Sand, little fine to coarse Gravel, petroleum like odor, saturated/wet.
35						End of boring.

Well/Boring Construction

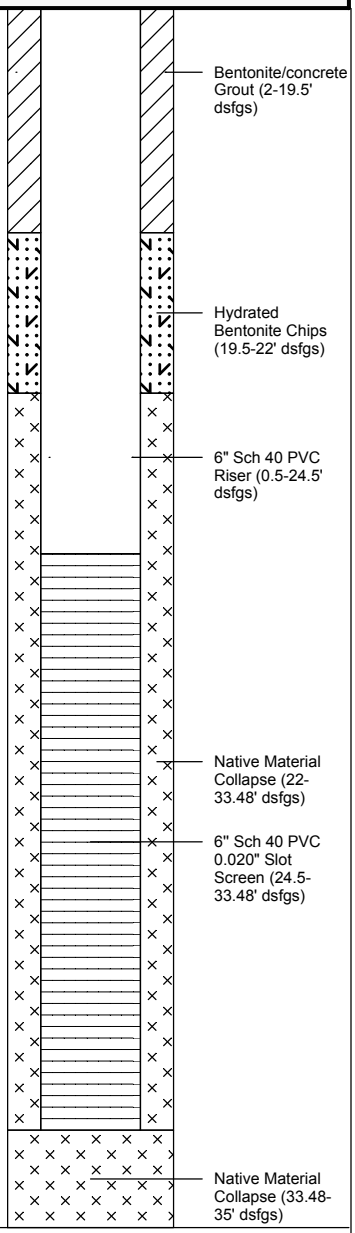

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Figure

Remarks: dsfgs= drill string from ground surface; NA = Not Applicable/Available, NR= No Recovery.

Well set at 40 degree angle.

Coordinates are based on the North American Datum of 1983, NEW YORK EASTERN Zone, U.S. Survey Foot.
Elevations are based on the North American Vertical Datum of 1988.