Well Installation Report

Olin Niagara Falls Plant
Niagara Falls, New York

Prepared for:

OLIN CORPORATION

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ABBREVIATIONS AND ACRONYMS

Acronym	Definition
bgs	below ground surface
BHCs	Benzene Hexachlorides
ft.	feet
GWTS	Groundwater Treatment System
HSA	Hollow Stem Auger
in.	inches
NYSDEC	New York State Department of Environmental Conservation
PR	Passive Relief

1.0 INTRODUCTION

Olin has implemented a Remedial Plan to address groundwater contamination in the Alundum Road Gill Creek (ARGC) area of the plant in Niagara Falls, New York. The Remedial Plan requires periodic monitoring and reporting of groundwater quality and groundwater elevation information collected during the operations of the GWTS.

To improve groundwater flow delineation north of Buffalo Avenue, Olin installed a new B-Zone Monitoring Well (PN-24B) north of Buffalo Avenue during the week of August 25, 2014. Additionally, to improve hydraulic communication between the A and B zone near Gill creek, Olin also installed an additional Passive Relief Well (PR-14) during the same week. Passive Relief (PR) Wells are designed to capture shallower A zone groundwater and transmit that water to the underlying B zone where it is extracted for treatment. .

The purpose of this report is to document the installation of these two wells and associated activities. The activities were conducted during August and September 2014 and included utility location clearance, drilling and well installation, well development, survey of existing and the newly installed monitoring wells. Field activities were performed in accordance with the Well Installation Work Plan dated August 13, 2014. A summary of these activities is presented in Section 2.0.

2.0 FIELD ACTIVITIES

This section describes the field activities performed during the drilling and installation of the monitoring and PR wells, as well as the survey of the newly installed wells and a network of existing monitoring wells at the site.

2.1 PERMITTING

Prior to commencing well installation activities, a highway work permit was obtained from the New York Department of Transportation to allow the placement of the monitoring well within the right-of-way of Veterans Dr. near the west bank of Gill Creek, approximately 70 feet north of Buffalo Avenue. A copy of the permit is included in Appendix A of this report. Additionally, an internal Olin excavation permit was obtained prior to the drilling work.

2.2 UTILITY CLEARANCE AND WELL LOCATIONS

The Utility Protection Commission (UPC) was contacted prior to drilling activities and issued utility clearance ticket number 08194-120-066. On August 25, 2014, Master Locators was on site to locate utilities at the proposed drilling locations. Existing drawings and Ground Penetrating Radar (GPR) were used to detect potential utility interferences. GPR is generally capable of detecting most underground utilities, (including non-metallic concrete, fiberglass, and plastic pipes) that cannot be located with magnetic utility locating methods. The GPR survey was used at the well locations to determine whether underground utilities were present. GPR results indicated there were no underground utilities at both drilling locations. Master Locators field service reports are provided in Appendix B.

2.3 WELL INSTALLATIONS

Upon completing utility clearance, well drilling activities began. The monitoring and PR wells were installed using a combination of three drilling methods: hollow stem auger (HSA), rotary drilling, and rock coring. Monitoring well PN-24B in B-Zone was installed within the Right of Way of Veterans Drive on its eastern side, and on the west bank of Gill Creek approximately 70 ft north of Buffalo Avenue. Well, PR-14, a Passive Relief (PR) well, was installed in the vicinity of current passive relief wells PR7, PR8, PR9, and PR10. Figures 2-1 and 2-2 show the locations of the newly installed wells and existing wells at the Site.

2.3.1 B-Zone Monitoring Well Installation

At monitoring well PN-24B a 4.25 inch (in.), internal diameter by 8 in. outer diameter, HSA was advanced in the overburden until refusal on bedrock at a depth of approximately 15 feet (ft) below ground surface (bgs) (see boring log Appendix C).

Upon encountering the bedrock, the HSA was removed from the borehole and a nominal 6 in. diameter – temporary steel casing was placed in the borehole for rotary drilling. The temporary casing was set by hammering it into the bottom of the borehole, providing a seal to allow cutting returns from rotary drilling. The borehole was advanced to about 2 ft below the bottom of the temporary casing into competent rock using a 5 7/8-inch roller bit. Rotary drilling with a roller bit was performed using potable water without drilling mud or other additives.

Upon completion of roller bit drilling, drilling water was circulated through the roller bit to remove cuttings from the borehole. The roller bit and temporary casing were removed from the borehole and a 4 in. diameter carbon steel casing inserted to the bottom of the borehole.

The annular space between the casing and borehole wall was tremie grouted with cement-bentonite grout to within 5 feet below ground surface. The grout mixture consisting of approximately 6 gallons of potable water for every 94 pounds of Type I Portland cement, with 3 to 8 percent by weight bentonite powder was used. The remaining grout was poured into annular space to ground surface. The grout was allowed to cure overnight (at least 12 hours). Calcium chloride was added to the grout mixture to expedite the curing process.

Following curing of the grout, the bedrock below the steel casing was cored using an NX diamond bit and core barrel (approximately 4 inch diameter) and potable water. The bedrock core hole was advanced to a depth of approximately 20 feet bgs, penetrating the full extent of the B-zone. After completion of bedrock coring, the rock core was logged to identify B-zone fracture zone. Core recovery was good (98%). Photograph 2.1 shows the full core, and Photograph 2.2 shows a close-up of the B-Zone fracture.

Drilling water was then circulated through the core barrel to remove cuttings from the borehole. The core barrel was removed from the borehole and the depth to the bottom of the borehole measured. The open borehole constitutes the B-zone monitoring well. No well screen was installed in the open cored borehole. The drill cuttings and the rock core were logged in accordance with the Unified Soil Classification System. The boring log and well completion diagram for PN-24B are included in Appendix C.

2.3.2 Passive Relief Well Installation

PR-14 borehole was drilled in the same manner as monitoring well PN-24B, but well installation was different. A 4-inch diameter, 5 ft of steel casing and 5 ft of continuous slot (0.010 inch openings) stainless steel screen were installed in the overburden. A filter pack consisting of clean silica sand was placed in the borehole between the annular space and the well screen/casing to approximately 2 ft above the well screen. A K-packer was installed at the

bottom of the screen for sealing the sand pack. A 1 foot thick bentonite seal was placed above the sand pack and the remainder of the annulus above the bentonite seal was grouted with a cement/bentonite mix.

Below the K-packer the borehole was advanced in the bedrock by coring approximately 10 ft below the 4 in steel casing to the B-zone fracture zone. Coring was performed similar to monitoring well PN-24B as described above. The rock core was logged, and the B-zone fracture zone identified. The borehole was completed as an open borehole in the fractured bed. No well screen was installed in the bedrock. The drill cuttings and the core were logged in accordance with the Unified Soil Classification System. The boring log and well completion diagram for PR-14 are included in Appendix C. Measured core recovery was excellent (99%). Photograph 2.1 shows the full core, and Photograph 2.3 shows a close-up of the B-Zone fracture.

2.4 WELL HEAD COMPLETION

The wells were completed at the surface as flush mount, each in a traffic rated box with a bolted cover. Each well has a locking cap and the protective traffic rated box grouted in a 2 foot diameter by 8 inch concrete pad.

2.5 WELL DEVELOPMENT

The newly installed wells were developed by pumping. The wells were pumped until the purge water was relatively clear and free of suspended solids. During well development, approximately 200 gallons were pumped out of well PN 24B and about 300 gallons from well PR-14 as indicated on boring logs and in the field notes (Appendix D).

2.6 WELL SURVEY

On September 22, 2014, the newly installed wells were surveyed for location and elevation. The survey was performed by a professional staff from McIntosh & McIntosh, licensed to work in the State of New York. The locations were surveyed to North American Datum 1983 (NAD83) New York State Plane Coordinates and the elevations were surveyed relative to the North American Vertical Datum 1988 (NAVD88). In addition to the two new wells, existing monitoring wells that are monitored quarterly were also surveyed for location and elevation. Table 2-1 presents a summary of the new survey data including well construction details. Survey data including well location coordinates, elevations, and map provided by the Surveyor, McIntosh & McIntosh, Inc., are provided in Appendix E.

3.0 WELL LOGS

Based on the boring logs from locations PN-24B and PR-14, the overburden consists of primarily black, silty clay intermixed with varying amounts of silt and sand with some gravel and weathered rock fragments. The thickness of the overburden is variable as expected. The boring log for well PN-24B indicates an overburden thickness of approximately 8 ft and at well PR-14, approximately 13 ft. The thickness of the partially weathered rock is approximately 1 ft at PR-14 and 2 ft at PN-24B. The fracture zone was encountered at approximately 16 ft bgs in both wells PN-24B and PR-14. Boring logs and well construction data are included in Appendix C.

PHOTOGRAPHS

Photograph 2.1: PN-24B and PR-14 Rock Cores

Photograph 2.2: PN-24B B-Zone Fracture

Photograph 2.3: PR-14 B-Zone Fracture

TABLES

Table 2.1: Well Construction Summary

Well	Installation Date	Consultant/Driller	Well Type	Survey Date	Surveyor	Easting (ft NAD83)	Northing (ft NAD83)	Top of Riser Elevation (ft NAVD88)	Ground Elevation (ft NAVD88)	Depth to Bedrock (ft BGS)	Top of Bedrock Elevation (ft NAVD88)	Bottom of A-Zone (ft NAVD88)	Top of Screen (ft BGS)	Bottom of Screen (ft BGS)	Zone Monitored	Total Depth of Well (ft BGS)
BH-1	1978	Harza	1.25" SS Well Point	9/22/2014	McIntosh&McIntosh	1030134.911	1123476.861	573.78	570.17	10.1	560.07	557.07	12.1	16.1	B	16.1
OBA-1A	6/22/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1029007.926	1123529.300	570.67	570.83	5.5	565.33	562.33	2.5	8.5	A	8.5
OBA-1B	6/23/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029020.639	1123528.533	570.35	570.85	5	565.85	562.85	10.0	25.0	B	25
OBA-1C	6/27/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029031.906	1123527.914	570.41	570.93	5	565.93	562.93	25.0	38.5	C	38.5
OBA-2A	8/22/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1029899.740	1123526.793	572.54	570.12	5.8	564.32	561.32	3.8	8.8	A	8.8
OBA-2B	8/24/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029909.629	1123525.983	572.63	570.12	5.8	564.32	561.32	11.0	25.0	B	25
OBA-2C	8/30/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029888.107	1123527.395	572.43	569.93	5.7	564.23	561.23	25.0	50.0	C/CD (1)	50
OBA-3A	6/30/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030511.647	1123445.004	572.07	569.66	14.3	555.36	552.36	11.4	17.4	A	17.4
OBA-3B	7/7/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030495.224	1123446.783	571.66	569.48	14	555.48	552.48	19.0	33.5	B (1)	33.5
OBA-3C	7/11/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030481.079	1123448.893	572.67	569.51	14	555.51	552.51	33.0	58.0	C/CD (1)	58
OBA-4A	7/14/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030215.506	1123224.109	572.42	569.74	8.4	561.34	558.34	5.5	11.5	A	11.5
OBA-4B	7/20/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030216.915	1123235.483	573.03	569.91	9	560.91	557.91	13.9	21.5	B	21.5
OBA-4C	7/24/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030219.999	1123247.101	573.05	569.97	8.5	561.47	558.47	22.0	30.5	C	30.5
OBA-5A	8/7/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1029866.800	1122919.805	571.72	569.12	8.4	560.72	557.72	4.5	11.3	A	11.3
OBA-5B	8/8/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029857.175	1122920.921	572.29	569.27	8.3	560.97	557.97	12.2	23.5	B	23.5
OBA-5C	8/10/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029874.927	1122918.455	572.01	569.4	8.3	561.10	558.10	23.0	53.0	CD	53
OBA-6A	8/15/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1029688.031	1123109.021	570.17	570.56	6.55	564.01	561.01	3.6	9.6	A	9.55
OBA-6B	8/15/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029693.442	1123108.592	570.31	570.51	6.4	564.11	561.11	11.5	24.0	B	24
OBA-6C	8/18/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029698.464	1123108.736	570.35	570.58	6	564.58	561.58	24.0	49.5	C/CD (1)	49.5
OBA-7A	6/7/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1029204.361	1123317.347	573.39	571.21	5.5	565.71	562.71	2.3	8.3	A	8.3
OBA-7B	6/13/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029214.867	1123316.986	573.97	571.13	8.5	562.63	559.63	10.4	24.8	B	24.8
OBA-7C	6/20/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029186.065	1123318.138	574.3	571.6	4	567.60	564.60	25.0	40.0	C	40
OBA-8A	7/26/1989	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1028246.984	1123176.548	572.49	570.86	8.27	562.59	559.59	5.3	11.3	A	11.3
OBA-8B	7/28/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1028255.439	1123169.718	572.64	570.7	7.5	563.20	560.20	12.4	25.0	B	25
OBA-8C	8/4/1989	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1028238.422	1123182.618	573.14	570.9	7.5	563.40	560.40	24.9	52.0	CD	52
OBA-9A	11/2/1992	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030081.229	1122911.108	569.24	568.01	7	561.01	558.01	3.8	10.0	A	10
OBA-10A	11/4/1992	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030152.060	1122875.766	568.39	568.85	13.7 (2)	555.15	552.15	10.4	16.4	A/B	16.4
OBA-11A	11/30/1993	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1028063.907	1123644.172	572.83	570.56	8.8	561.76	558.76	6.2	12.0	A	12
OBA-11B	12/2/1993	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1028039.036	1123642.462	572.87	570.57	8.5	562.07	559.07	13.5	24.5	B	24.5
OBA-11C	12/6/1993	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1028052.917	1123643.555	572.94	570.47	8.3	562.17	559.17	22.5	47.8	CD	47.8
OBA-14A	4/25/1994	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030570.360	1123240.863	570.67	568.84	13.4	555.44	552.44	9.0	14.5	A	14.5
OBA-14B	4/25/1994	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030571.552	1123258.978	570.76	568.79	13.6	555.19	552.19	17.3	24.2	B	24.2
OBA-14C	4/27/1994	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030571.479	1123249.707	570.15	568.74	13.7	555.04	552.04	25.1	41.7	C	41.7
OBA-15A	4/13/1994	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030283.200	1123463.219	572.59	570.96	16.9	554.06	551.06	14.0	20.2	A	20.2
OBA-15B	4/20/1994	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030271.831	1123381.514	573.13	570.8	17.5	553.30	550.30	22.5	32.1	C	32.1
OBA-16A	4/5/1994	WCC	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030012.405	1123384.633	573.26	570.62	7.2	563.42	560.42	3.2	9.2	A	9.2
OBA-16B	4/20/1994	WCC	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030012.436	1123379.173	572.99	570.77	7.2	563.57	560.57	11.6	21.8	B	21.8
OBA-18A		CRA		9/22/2014	McIntosh&McIntosh	1028159.960	1123648.701	573.47	570.58	8.4	562.18	559.18	5.3	11.3	A	11.3
OBA-19A		CRA		9/22/2014	McIntosh&McIntosh	1028012.119	1123417.600	573.86	571.18	10.1	561.08	558.08	7.0	12.8	A	12.8
OBA-21AB	12/8/1995	CRA	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1029923.620	1122924.344	571.99	569.86	8	561.86	558.86	4.0	24.0	A/B	24
OBA-23A	8/4/1997	LAW	4" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029784.056	1123426.716	570.19	570.44	6.5	563.94	560.94	6.1	9.5	A	9.5
OBA-23B	8/1/1997	CRA	4" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029783.380	1123420.174	570.04	570.36	6.5	563.86	560.86	12.0	20.0	B	20
OBA-24A	6/6/1999	CRA	2" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030193.919	1122920.985	568.95	569.23	8.47	560.76	557.76	8.3	11.3	A	11.3
OBA-24B	6/6/1999	CRA	4" Open Rockhole	9/22/2014	McIntosh&McIntosh	1030193.752	1122926.747	568.76	569.2	8.1	561.10	558.10	13.7	22.9	B	22.9
OBA-25A	6/11/1999	CRA	2" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030353.218	1122914.541	569.02	569.53	8.46	561.07	558.07	6.5	11.5	A	11.5
OBA-25B	6/12/1999	CRA	4" Open Rockhole	9/22/2014	McIntosh&McIntosh	1030355.127	1122925.612	568.93	569.52	8.35	561.17	558.17	13.5	22.0	B	22
OBA-26A	6/10/1999	CRA	2" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030300.495	1123067.542	569.55	569.98	9.7	560.28	557.28	9.3	14.3	A	14.3
OBA-26B	6/10/1999	CRA	4" Open Rockhole	9/22/2014	McIntosh&McIntosh	1030308.530	1123065.809	569.65	569.99	9.5	560.49	557.49	15.0	22.0	B	22
PN-1A	8/13/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029731.113	1123321.065	570.51	570.71	7.5	563.21	560.21	5.3	10.1	A	10.1
PN-1B	8/13/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029731.399	1123321.145	570.32	570.71	7.5	563.21	560.21	16.8	21.6	B	21.6
PN-2A	8/13/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029936.340	1123415.206	570.64	570.91	6.5	564.41	561.41	4.6	9.4	A	
PN-2B	8/13/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029936.147	1123415.046	570.44	570.91	6.5	564.41	561.41	17.2	22.0	B	
PN-3A	8/12/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030076.921	1123384.842	571.8	572.12	9	563.12	560.12	6.3	11.1	A	11.1
PN-3B	8/12/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030077.185	1123384.773	571.73	572.12	9	563.12	560.12	20.5	25.3	B	25.3
PN-4A	8/14/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030128.939	1123319.103	568.35	568.94	7	561.94	558.94	4.7	9.5	A	9.5
PN-4B	8/14/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030128.595	1123319.014	568.46	568.94	7	561.94	558.94	15.9	20.7	B	20.7
PN-5A	8/15/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030117.421	1123234.877	568.55	568.95	7	561.95	558.95	5.2	10.0	A	10

Table 2.1: Well Construction Summary

Well	Installation Date	Consultant/Driller	Well Type	Survey Date	Surveyor	Easting (ft NAD83)	Northing (ft NAD83)	Top of Riser Elevation (ft NAVD88)	Ground Elevation (ft NAVD88)	Depth to Bedrock (ft BGS)	Top of Bedrock Elevation (ft NAVD88)	Bottom of A-Zone (ft NAVD88)	Top of Screen (ft BGS)	Bottom of Screen (ft BGS)	Zone Monitored	Total Depth of Well (ft BGS)
PN-5B	8/15/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030117.329	1123234.668	568.58	568.95	7	561.95	558.95	19.2	24.0	B	24
PN-6A	8/18/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030083.711	1123114.450	568.43	569.06	7	562.06	559.06	5.2	10.0	A	10
PN-6B	8/18/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030083.978	1123114.269	568.56	569.06	7	562.06	559.06	19.2	24.0	B	24
PN-7A	8/19/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030071.173	1123026.174	568.23	568.52	7	561.52	558.52	5.4	10.2	A	10.2
PN-7B	8/19/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030071.556	1123026.225	568.45	568.52	7	561.52	558.52	16.8	21.6	B	21.6
PN-8A	8/20/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030063.908	1122937.310	568.28	568.53	8	560.53	557.53	5.4	10.2	A	10.2
PN-8B	8/20/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030063.746	1122937.233	567.85	568.53	8	560.53	557.53	16.7	21.5	B	21.5
PN-9A	10/10/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1030076.879	1123453.160	570.74	570.97	9	561.97	558.97	5.5	10.5	A	11
PN-9B	5/14/1999	CRA	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030076.118	1123446.374	570.68	571.15	9.1	562.05	559.05	16.0	26.0	B	26
PN-10A	9/9/2002	LAW/Nothnagle	2" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1029797.687	1123455.560	570.11	570.55	6.2	564.35	561.35	3.9	8.9	A	9.5
PN-10B	5/17/1999	CRA	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1029858.358	1123450.472	571.15	571.54	7.1	564.44	561.44	12.5	24.1	B	24.1
PN-11A	9/9/2002	LAW/Nothnagle	2" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030082.315	1122918.871	567.49	567.78	7	560.78	557.78	4.5	9.5	A	10
PN-11B	10/6/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1030080.606	1122926.736	567.78	568.12	6.5	561.62	558.62	11	21	B	21
PN-12A	10/10/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029944.651	1123006.402	570.07	570.35	8.5	561.85	558.85	4	9	A	9.5
PN-12B	9/28/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029944.147	1123000.072	570.00	570.30	9	561.30	558.30	13	23	B	23
PN-13A	10/11/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029912.048	1123083.921	573.25	573.48	10.5	562.98	559.98	8.5	13.5	A	14
PN-13B	10/5/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029921.246	1123081.687	573.24	573.46	10.5	562.96	559.96	17	24	B	24
PN-14A	10/11/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029889.722	1123135.185	573.30	573.62	10	563.62	560.62	6.5	11.5	A	12
PN-14B	10/5/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029897.420	1123134.210	573.30	573.59	11	562.59	559.59	15	24	B	24
PN-15A	10/10/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029993.198	1123199.055	570.69	570.94	8.5	562.44	559.44	6.1	11.1	A	11.6
PN-15B	10/5/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029988.330	1123202.517	570.70	571.02	8.5	562.52	559.52	13	22	B	22
PN-16A	10/7/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029986.537	1123320.843	570.44	570.67	7.5	563.17	560.17	3.5	8.5	A	9
PN-16B	10/4/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029987.568	1123327.323	570.36	570.66	8	562.66	559.66	11	21	B	21
PN-17A	10/6/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029870.530	1123297.910	570.55	570.82	7.5	563.32	560.32	3.95	9	A	9.45
PN-17B	10/5/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029863.605	1123298.977	570.54	570.96	7.5	563.46	560.46	11	21	B	21
PN-18A	10/7/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029932.223	1123348.515	570.23	570.55	6	564.55	561.55	3.5	8.5	A	9
PN-18B	10/4/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029924.254	1123348.781	570.50	570.67	6	564.67	561.67	11	21	B	21
PN-19A	10/7/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1029843.386	1123361.145	570.74	571.00	6	565.00	562.00	2.5	7.5	A	8
PN-19B	10/4/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029843.822	1123367.890	570.64	570.95	6	564.95	561.95	10	20	B	20
PN-20A	10/10/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1030125.105	1123471.298	570.07	570.35	9	561.35	558.35	6	11	A	11.5
PN-20B	10/4/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1030132.637	1123469.258	569.70	569.98	10	559.98	556.98	14	24	B	24
PN-21A	10/6/2005	MACTEC/Nothnagle	2" SS Screen/PVC Riser	9/22/2014	McIntosh&McIntosh	1030002.499	1122954.623	569.48	569.77	8	561.77	558.77	4.65	9.7	A	10.15
PN-21B	10/6/2005	MACTEC/Nothnagle	3" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1030010.297	1122953.206	569.39	569.69	8	561.69	558.69	12	22	B	22
PN-22B	5/14/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029978.852	1122952.437	569.08	569.62	8.5	561.12	558.12	12	20	B	20
PN-23B	5/14/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029970.940	1122929.150	568.90	569.43	8.5	560.93	557.93	12	20	B	20
PN-24B	8/26/2014	AMEC/Nothnagle	4" Open Rockhole/CS Riser	9/22/2014	McIntosh&McIntosh	1030149.173	1123632.496	570.87	571.12	12.5	558.62	555.62	15	20	B	20
PR-1	8/7/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029777.334	1123268.050	572.29	570.7	6	564.70	561.70	8.1	21.5	A/B	24.6
PR-1-PZ	8/7/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029778.018	1123267.791	571.15	570.7	6	564.70	561.70	15.0	24.5		24.8
PR-2	8/6/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029875.839	1123414.208	572.21	571.17	7	564.17	561.17	8.1	21.5	A/B	24.6
PR-2-PZ	8/6/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029876.190	1123414.258	572.17	571.17	7	564.17	561.17	14.8	25.6	A/B	24.6
PR-3	8/11/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030072.475	1123406.484	572.39	571.15	10.5	560.65	557.65	9.0	22.4	A/B	25.5
PR-3-PZ	8/11/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030072.202	1123406.091	571.69	571.15	10.5	560.65	557.65	15.2	25.0	A/B	25
PR-5	8/13/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030081.529	1123066.757	570.18	568.47	7	561.47	558.47	8.8	22.2	A/B	25.3
PR-5-PZ	8/13/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030082.201	1123066.359	569.23	568.47	7	561.47	558.47	15.3	25.1	A/B	25.1
PR-6	9/4/2002	LAW/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030109.827	1123206.840	568.28	568.85	6.5	562.35	559.35	2.5	16.5	A/B	19
PR-7	9/4/2002	LAW/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030092.001	1123146.421	568.57	569.06	7.5	561.56	558.56	3.7	17.7	A/B	20
PR-8	9/6/2002	LAW/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030086.595	1123091.988	567.97	568.51	6.6	561.91	558.91	2.6	16.6	A/B	19
PR-9	9/6/2002	LAW/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030076.661	1123042.538	568.39	568.66	9.5	559.16	556.16	4.9	18.9	A/B	21.25
PR-10	9/6/2002	LAW/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030071.610	1123005.340	568.16	568.38	7	561.38	558.38	3.0	17.0	A/B	19.5
PR-11	9/6/2002	LAW/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030064.752	1122958.349	567.53	567.91	6.6	561.31	558.31	2.6	16.6	A/B	19
PR-12	9/9/2002	LAW/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030073.052	1122921.679	569.28	568.37	7	561.37	558.37	4.7	18.7	A/B	21
PR-13	6/18/2003	MACTEC/Nothnagle	4" PVC Screen/Riser	9/22/2014	McIntosh&McIntosh	1030115.219	1123239.865	568.69	569.15	7	562.15	559.15	4.2	18.0	A/B	20
PR-14	8/27/2014	AMEC/Nothnagle	4" Open Rockhole/SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030087.576	1123135.108	568.6	569.09	7.5	561.59	558.59	4.7	18.7	A/B	18.7
RW-1	8/5/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029797.363	1123358.529	573.22	570.43	6.5	563.93	560.93	7.3	20.8	A/B	23.8
RW-1-PZ	8/5/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029797.213	1123358.895	572.33	570.43	6.5	563.93	560.93	13.6	23.4	A/B	23.4
RW-2	8/7/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029978.805	1123432.557	572.01	571.03	9	562.03	559.03	8.7	22.1	A/B	25.2

Table 2.1: Well Construction Summary

Well	Installation Date	Consultant/Driller	Well Type	Survey Date	Surveyor	Easting (ft NAD83)	Northing (ft NAD83)	Top of Riser Elevation (ft NAVD88)	Ground Elevation (ft NAVD88)	Depth to Bedrock (ft BGS)	Top of Bedrock Elevation (ft NAVD88)	Bottom of A-Zone (ft NAVD88)	Top of Screen (ft BGS)	Bottom of Screen (ft BGS)	Zone Monitored	Total Depth of Well (ft BGS)
RW-2-PZ	8/7/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029979.067	1123432.839	571.76	571.03	9	562.03	559.03	14.9	24.8	A/B	24.8
RW-3	8/5/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030129.502	1123375.270	569.4	568.69	9	559.69	556.69	6.5	19.9	A/B	23
RW-3-PZ	8/5/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030129.952	1123375.110	569.37	568.69	9	559.69	556.69	13.2	23.0	A/B	23
RW-4	8/8/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030099.207	1123177.595	569.27	568.55	8.5	560.05	557.05	10.4	23.8	A/B	26.8
RW-4-PZ	8/8/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030099.502	1123177.833	569.33	568.55	8.5	560.05	557.05	17.0	26.8	A/B	26.8
PR-4	8/6/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030118.159	1123277.563	569.66	569.08	9.5	559.58	556.58	7.3	20.7	A/B	23.8
PR-4-PZ	8/6/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030117.528	1123277.295	569.65	569.08	9.5	559.58	556.58	13.9	23.7	A/B	23.7
RW-5	8/8/1997	LAW/Maxim	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030063.727	1122983.708	569.28	568.31	8.5	559.81	556.81	7.6	21.0	A/B	24.1
RW-5-PZ	8/8/1997	LAW/Maxim	1.25" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030063.639	1122983.176	569.24	568.31	8.5	559.81	556.81	14.8	24.6	A/B	24.6
OBA-9AR	1/8/2007	MACTEC/Nothnagle	6" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030078.609	1122909.236	570.22	568.08	7.8	560.28	557.28	4.55	13.55	A	13.55
OBA-9AR-PZ	1/8/2007	MACTEC/Nothnagle	1" SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1030078.701	1122909.562	569.98	568.08	7.8	560.28	557.28	4.55	13.55	A	13.55
ORC-1	5/10/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1030025.911	1122901.097	568.44	568.81	8.7	560.11	557.11	12	19.7	B	19.7
ORC-2	5/14/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1030002.310	1122917.173	568.63	569.22	8.1	561.12	558.12	12	20	B	20
ORC-3	5/11/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029955.155	1122909.005	569.11	569.5	8.3	561.20	558.20	12	20	B	20
ORC-4	5/11/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029926.933	1122911.890	568.97	569.52	8.5	561.02	558.02	12	20	B	20
ORC-5	5/11/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029895.653	1122915.083	569	569.4	8.5	560.90	557.90	12	20	B	20
ORC-6	5/14/2007	MACTEC/Nothnagle	3.75" Open Rockhole/4" CS Riser	9/22/2014	McIntosh&McIntosh	1029933.243	1122941.787	569.02	569.55	8.2	561.35	558.35	12	20	B	20
SRW-1	6/12/2001	LAW/Nothnagle	8" Open Rockhole/SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029849.839	1123161.720	572.09	572.62	10	562.62	559.62	7.1	25.0	A/B	25
SRW-2	6/8/2001	LAW/Nothnagle	8" Open Rockhole/SS Screen/Riser	9/22/2014	McIntosh&McIntosh	1029819.743	1123074.121	572.57	573.06	11.8	561.26	558.26	9.9	28.0	A/B	28

Notes:

(1)	No major waterbearing fractures encountered during drilling of the monitored interval.
(2)	OBA-10A was most likely installed in a sewer line trench excavated into rock. Top of rock elevation is inconsistent with bedrock elevation in surrounding area.
BGS	below ground surface
CS	carbon steel
ft	feet
NAD83	North American Datum of 1983 - New York State Plane Coordinate System - West Zone
NAVD88	North Armerican Vertical Datum of 1988
PVC	polyvinyl chloride
SS	stainless steel

Prepared By: T. Englund 10/15/2014
Checked By: R. Yardley 10/16/2014

FIGURES

Buffalo Avenue
Buffalo Avenue
Adams Avenue
Olin Plant 1
Dupoint Niagara Plant
Olin Plant 2
Dupoint Niagara Plant
Gill Creek
Gill Creek Stilling Well
OBA-11B
OBA-11A
OBA-18A
OBA-11C
OBA-19A
OPW-1
OBA-8C
OBA-8A
OBA-8B
OBA-1B
OBA-1C
OBA-1A
OBA-7A
OBA-7C
OBA-7B
OBA-6B
OBA-6A
OBA-6C
OBA-2A
OBA-2C
OBA-2B
PN-24B
OBA-15A
OBA-3C
OBA-3B
OBA-3A
OBA-15B
OBA-4C
OBA-4B
OBA-4A
OBA-14B
OBA-14C
OBA-14A
OBA-26A
OBA-24B
OBA-24A
OBA-10A
OBA-25B
OBA-25A

Legend

- Gill Creek Stilling Well
- Monitoring Well
- Olin Production Well
- Passive Relief Well
- Recovery Well
- Gill Creek
- Approximate Olin Boundary
- New Well Installed in August 2014

0 200 400 Feet

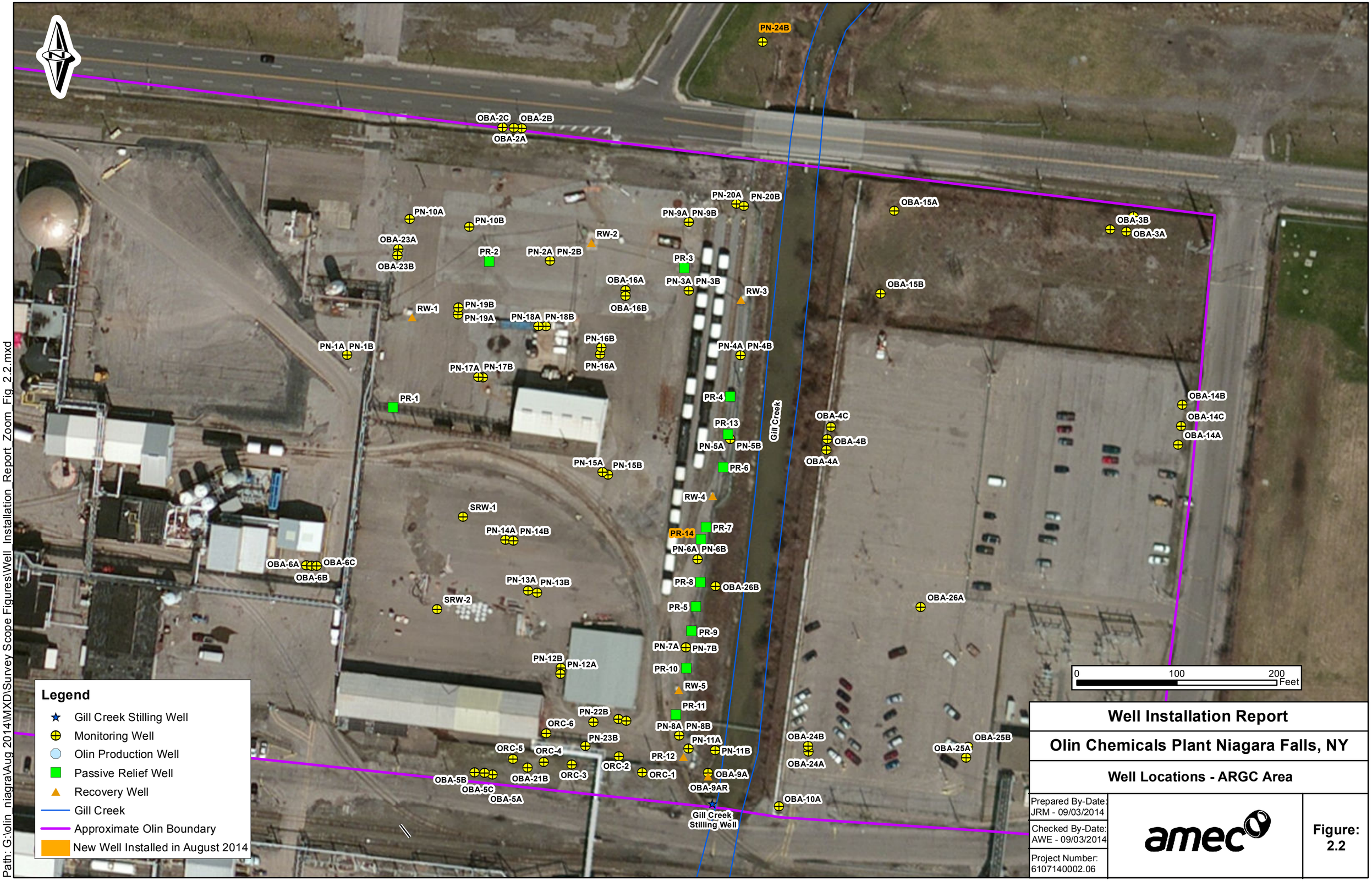
Well Installation Report

Olin Chemicals Plant Niagara Falls, NY

Well Locations

Prepared By-Date: JRM - 09/03/2014	amec	Figure: 2.1
Checked By-Date: AWE - 09/03/2014		
Project Number: 6107140002.06		

Path: G:\olin_niagra\Aug 2014\MXD\Survey Scope Figures\Well_Installation_Report_Fig_1.mxd



Path: G:\olin_niagra\Aug 2014\MXD\Survey Scope Figures\Well_Installation_Report_Zoom_Fig_2.2.mxd

Well Installation Report

Olin Chemicals Plant Niagara Falls, NY

Well Locations - ARGC Area

Prepared By-Date: JRM - 09/03/2014	Figure: 2.2
Checked By-Date: AWE - 09/03/2014	
Project Number: 6107140002.06	

amec

APPENDIX A

STATE OF NEW YORK

DEPARTMENT OF TRANSPORTATION

HIGHWAY WORK PERMIT

PERM 42 (09/09)

State of New York
Department of Transportation

Highway Work Permit

Permit No.: **20140545078**

Date Issued: **08/22/2014**

Project ID No.:

Expiration Date: 02/22/2015

***Permittee 1:**
NOTHNAGLE DRILLING, INC.
1821 SCOTTSVILLE-MUMFORD RD.
SCOTTSVILLE, NY 14546
Emergency Contact: STEVE DILAURA
Emergency Number: 585-370-4905

Under the provisions of the Highway Law or Vehicle & Traffic Law, permission is hereby granted to the permittee to:

INSTALLATION OF (1) - 4" MONITORING WELL ON WEST BANK OF GILL CREEK, APPROX. 70' NORTH OF THE CENTERLINE OF BUFFALO AVENUE (RTE. 384) IN THE CITY OF NIAGARA FALLS AS PER ATTACHED PLAN. MPT AS PER MUTCD. SEE ATTACHED MPT SHEETS. SEE ATTACHED CIRCLED CONSTRUCTION RESTRICTION #'S: 6,7,11,23,45,54

THE PERMITTEE IS RESPONSIBLE FOR TEMPORARY TRAFFIC CONTROL IN ACCORDANCE WITH THE NATIONAL MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES AND THE NYS SUPPLEMENT. ANYONE WORKING WITHIN THE HIGHWAY RIGHT-OF-WAY SHALL WEAR HIGH-VISIBILITY APPAREL MEETING THE ANSI 107-2004 CLASS II STANDARDS AND A HARD HAT.

County	Municipality	State Hwy	State Route	Beg Ref	End Ref
NIAGARA	NIAGARA FALLS	-	384	384 54023043	-

as set forth and represented in the attached application at the particular location or areas, or over the routes as stated therein, if required; and pursuant to the conditions and regulations general or special, and methods of performing work, if any; all of which are set forth in the application and form of this permit. See additional conditions on PAGE 2.
THIS PERMIT IS ISSUED BASED ON ALL LOCAL, STATE, AND FEDERAL REQUIREMENTS BEING SATISFIED.

Dated at: **Buffalo** **Date Signed:** **08/22/2014** **Commissioner of Transportation** **By:** **Thomas Messana**

IMPORTANT:

THIS PERMIT, WITH APPLICATION AND DRAWING (OR COPIES THEREOF) ATTACHED, SHALL BE PLACED IN THE HANDS OF THE CONTRACTOR BEFORE ANY WORK BEGINS. THE HIGHWAY WORK PERMIT SHALL BE AVAILABLE AT THE SITE DURING CONSTRUCTION.

BEFORE WORK IS STARTED AND UPON ITS COMPLETION, THE PERMITTEE ABSOLUTELY MUST NOTIFY:

Dave Mallow, Ass't Resident Engineer 716-438-2396

"UPON COMPLETION OF WORK", SECOND TO LAST PAGE, MUST BE COMPLETED, SIGNED BY THE PERMITTEE, AND DELIVERED TO THE RESIDENT ENGINEER.

→ Line 8-25 on phone

→ left message 9-28 ~ 8:00

APPENDIX B

MASTER LOCATOR FIELD SERVICE NOTES

FIELD SERVICE REPORT

*Formal invoice to follow

master locators
675 Concord Road Glen Mills, PA
1-800-495-4248
www.masterlocators.com

Company: AMEC Project: 2 Borings

Customer Contact: Anthony England ML Job #: GU-081787-14N4 Address: ONIA 2400 Buffalo Ave Niagra Falls NY

Lead Technician: Rich Byrne Assts:

Services Performed: (Circle all that apply) (GPR Survey) (EM Scan) Leak Locate VPI Air / Hydro Excavation Fault Locate Concrete Scan Survey & Mapping Site Training Other:

Date:	# :	Description of Services:	STD Hours	OT Hours	Begin	Onsite	Offsite	End
8/25		GPR Survey	4 / 8		7:00	7:30	12:00	6:30
			4 / 8					
			4 / 8					
			4 / 8					
			4 / 8					

Full Scope of Work:

Utilities/Features Designated: (circle all that apply)

GAS WATER ELECTRIC FIBER OPTIC COMM STORM SEWER REBAR UST UNKNOWN (NONE)

Other:

Additional Resources: *(traffic control, rentals, supplies, etc...)*

Results and Notes: *IN Area 2 could Not use Split Box in area.
*HCL lines did not have a tracer on them & could Not see with GPR

Client Communication:

Deliverables Requested: (MARK OUT) PMU ENGINEERING REPORT ***Deliverables Provided Onsite:*** ***YES / NO***

CAD UPDATE SKETCH OTHER:

Survey Methodologies					Other:
Known Utilities:		**Unknown Utilities:**		(Grid Spacing)	
Utilities within Scope of Work:	X	Passive Scans:	X	1/3	
Utilities outside Scope of Work:	X	Split Box Scans:	X	1/3	
Building Feeds:	X	GPR Scans:	X	1/3	

Contacts on Site: Client PO #: Project Complete: (YES) / NO

Name: Jeff Moore Company: AMEC Phone: 404-219-0438 Signature: Jeff Moore

Name: Company: Phone: Signature:

MASTER LOCATORS FIELD SKETCH

Customer: AMEC

Job Number: GU-081787-14NY

Date: 8/25/14

Project/Site Location: 2400 Buffalo Ave Niagara Falls NY

Technician: Rich Byrne

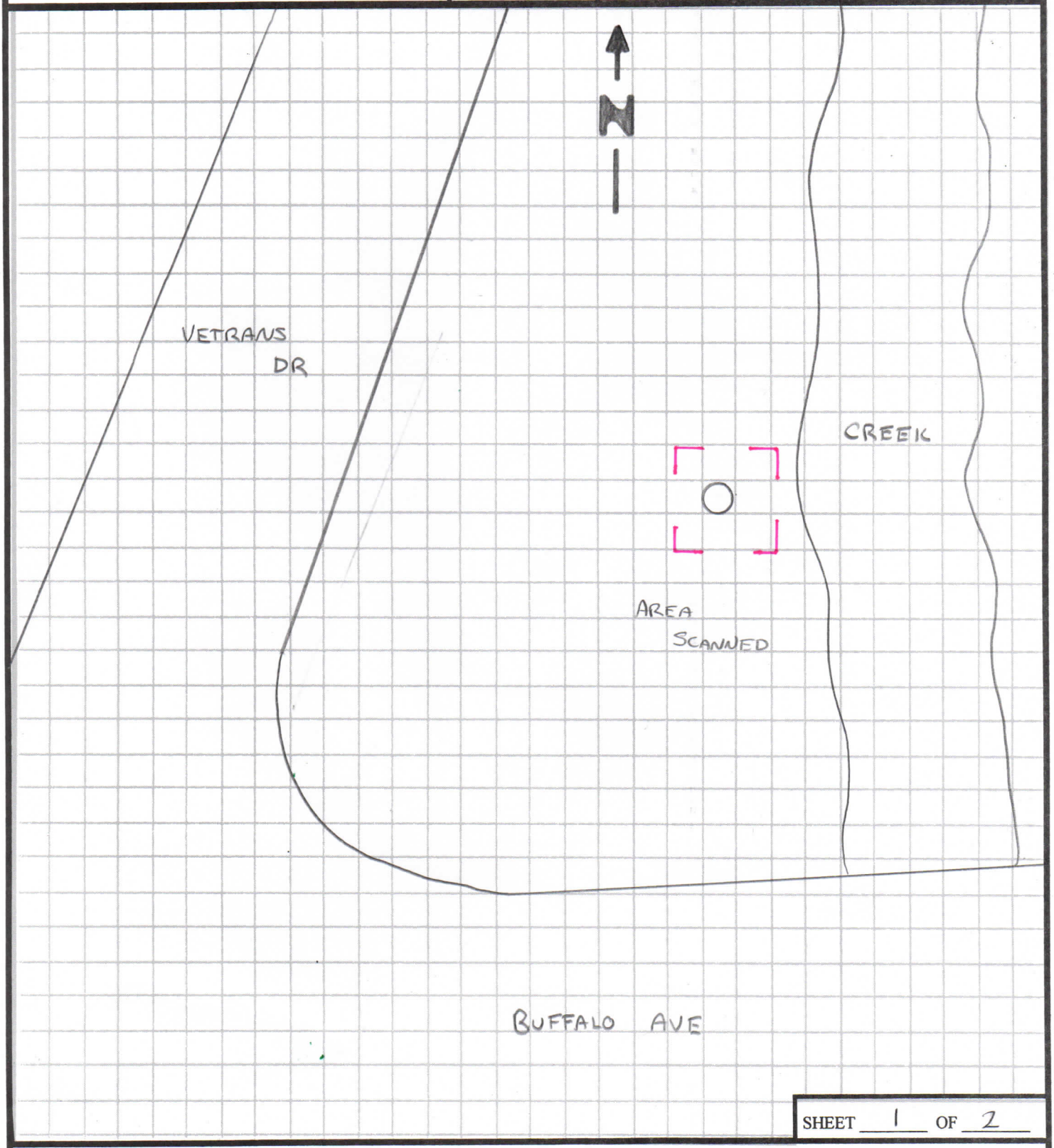
COLOR CODES:

RED - electric unknown
YELLOW - gas
ORANGE - comm., FO
BLUE - water
GREEN - storm, sewer
PINK - temporary

SYMBOLS:

CB - catch basin
CO - clean-out
FH - fire hydrant
JB - junction box
MH - manhole
PB - pull box
PIV - post indicator valve
SL - site light
VB - valve box
WV - water valve

master locators
THE FIRST STEP TO A SMARTER JOBSITE
675 Concord Rd., Glen Mills, PA 19342
610-358-0172 610-358-0175 (FAX)



SHEET 1 OF 2

MASTER LOCATORS FIELD SKETCH

Customer: AMEC

Job Number: GU-081787-14 NY

Date: 8/25/14

Project/Site Location: 2400 Buffalo Ave Niagara Falls NY

Technician: Rich Byrne

COLOR CODES:

RED - electric unknown
YELLOW - gas
ORANGE - comm., FO
BLUE - water
GREEN - storm, sewer
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SYMBOLS:

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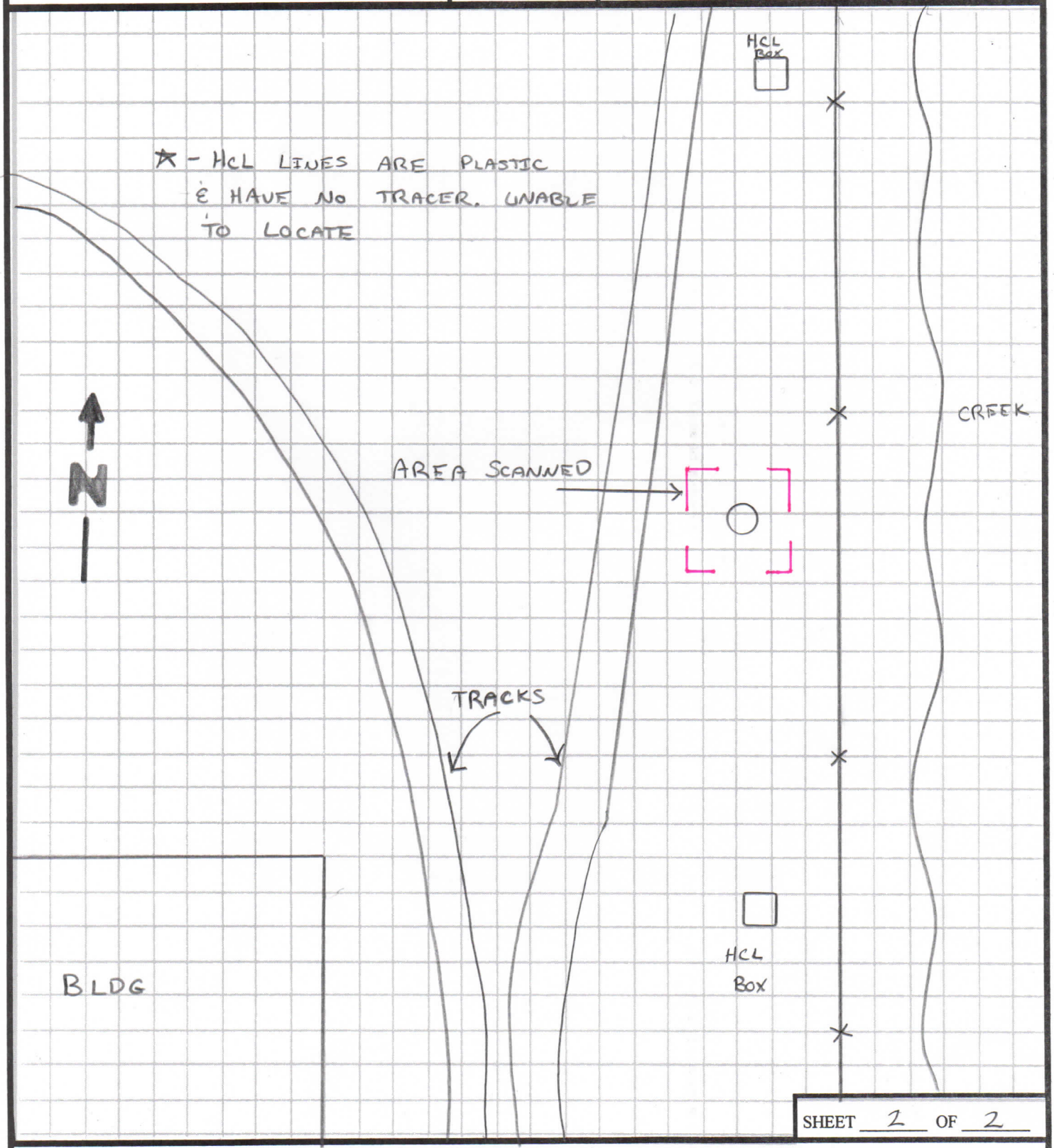


SHEET 2 OF 2

NOTE: All information contained herein is for reference only. Master Locators, Inc. is not responsible for the accuracy of its content.

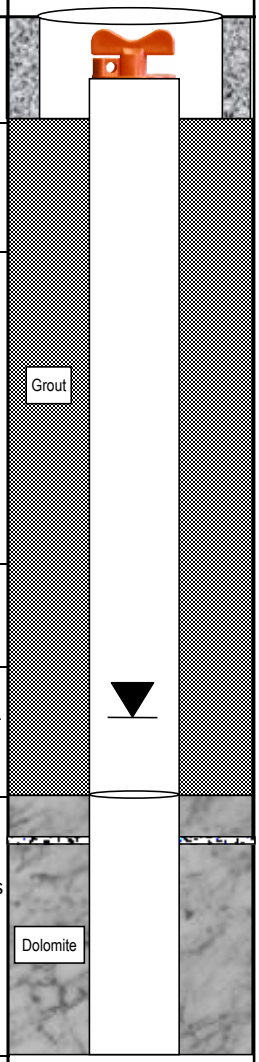
APPENDIX C

BORING LOGS AND WELL COMPLETION DIAGRAMS

amec / Olin — Well construction		**PN-24B** (BORING ID.)
PROJECT: Plant 2		PAGE NO. 1 OF 1
CLIENT: OLIN - Niagara Falls, NY		PROJ. NO. 6107140017
DRILLING CONTRACTOR: Nothnagle Drilling		DATE START: 8/25/14
TOP OF CASING ELEVATION: NA		DATE FINISH: 8/26/14
GROUND ELEVATION: ft. DATUM:		DRILLER: Steve Loranty
DRILLING METHOD: CME 85, 4-1/4 I.D. HSA, 5-7/8 Roller Bit, NX Core, 3-7/8 Roller Bit		FIELD REP: Jeff Moore
SAMPLING METHOD: 10-foot NX Core Barrel		
CORING METHOD: NX Core		

DEPTH FT.	SAMPLE / RUN No.	SAMPLE RECOVERY %	CORE RQD %	LITHOLOGY	IDENTIFICATION & REMARKS
1–2				Fill	Fill, silt, dark brown with rock, gravel, and concrete chunks.
3–4				CL	Lean Clay with some gravel, black, moist, fine grained.
5–10				CL/CH	Silty Clay, dark gray to black, fine grained, moist to wet, plasticity increases with depth.
11–12				PWR	Weathered rock and silty clay, dark gray to black, sticky with harder rock fragments. Auger Refusal at 12.5'.
13–15				Dolomite	Dolomite reamed from 12.5' to 15' with a 5-7/8" roller bit. 4-inch carbon steel casing set to 15' and grouted in place.
16–20	1	98%	80%	Dolomite	Dolomite, dark gray, medium bedded, well indurated, HCL effervescence when powdered, irregular vesicular vuggy voids 17.5' to 20', few thin stylolites wavy and swirled, few coral colony fossils especially toward bottom. 100% fluid loss in B-zone fracture at 15.8'. Rock core spinout at 15.8' due to open B-zone fracture.
21–27					▼ Stabilized water level measured at 13.5' BGS on 8-26-14 Lost appx. 200 gallons of potable drilling fluid while drilling. Well was developed by pumping 200 gallons at a constant rate of 1.75 gpm with a water level of 13.68'.

Flush Mount Manhole Completion with Concrete Pad



NX bedrock borehole reamed to 4-inch diameter from 15' to 20'.

prepared by: JAM - 9/3/14
checked by: JMQ - 9/3/14

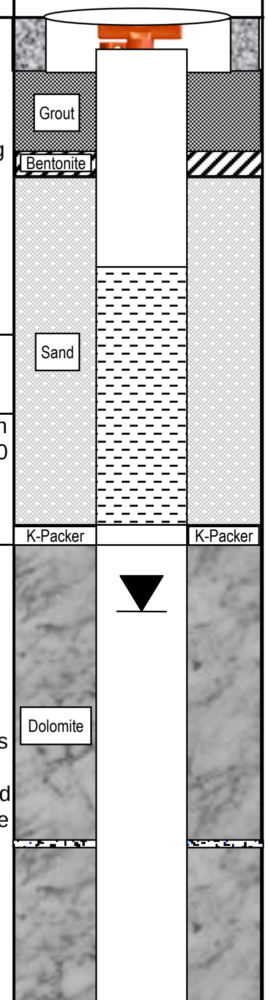
amec | Olin **Well construction**

PR-14
(BORING ID.)

PROJECT: Plant 2
PAGE NO. 1 OF 1
CLIENT: OLIN - Niagara Falls, NY
PROJ. NO. 6107140017
DRILLING CONTRACTOR: Nothnagle Drilling
DATE START: 8/26/14
TOP OF CASING ELEVATION: NA
DATE FINISH: 8/27/14
GROUND ELEVATION: ft. DATUM:
DRILLER: Steve Loranty
DRILLING METHOD: CME 85, 4-1/4 I.D. HSA, 5-7/8 Roller Bit, NX Core, 3-7/8 Roller Bit
FIELD REP: Jeff Moore
SAMPLING METHOD: 10-foot NX Core Barrel
CORING METHOD: NX Core

Flush Mount Manhole Completion with Concrete Pad

DEPTH FT.	SAMPLE / RUN No.	SAMPLE RECOVERY %	CORE RQD %	LITHOLOGY	IDENTIFICATION & REMARKS
1–6				Fill	Fill, gravel, rock, asphalt, and silty sand, black to 2' becoming silt with gravel, pebbles, wood fragments, and sand, black, moist to wet.
7				CL / PWR	Silty clay, some sand, black with weathered rock fragments.
8–10				Dolomite	Dolomite reamed from 7.5' to 10' with a 5-7/8" roller bit. 6-inch K-packer set from 9.7' to 10' on bottom of 4-inch diameter #10 slotted screen from 4.7' to 9.7'. Riser from 0.5' to 4.7'. Filter sand placed from 3' to 9.7'. Bentonite powder on top of sand from 2.5' to 3', then grout from 1' to 2.5'.
11–19	1	99%	17%	Dolomite	Dolomite, dark gray, medium bedded, well indurated, HCL effervescence when powdered, irregular vesicular vuggy voids 10.5' to 11.4', 11.7' to 11.8', 12.3' to 12.7', and 14.9', few thin stylolites wavy and swirled, few coral colony fossils. 100% fluid loss in B-zone fracture at 15.7'. Rock core spinout at 15.7' due to open B-zone fracture.
20–27					▼ Stabilized water level measured at 11.35' BGS on 8-27-14 Lost appx. 525 gallons of potable drilling fluid while drilling. Well was developed by pumping out 300 gallons then injecting 500 gallons of clean potable at 50 gpm with a water level rise of 0.08'.



NX bedrock borehole reamed to 4-inch diameter from 10'to18.7'.

AMEC E&I
prepared by: JAM - 9/3/14
checked by: JMQ - 9/3/14

APPENDIX D

FIELD NOTES

Location Niagara Falls, NY Date 8-25-14

Project / Client OLIN 6107140002

Mon. Sunny 65°-85° Well Installation Jeff Moore

6:50 - Arrive @ Site - Sean Warner to be here w/ Master Locators to take Olin Safety w/ John Gabryelski @ 7:30. - Actually met Rich Byrne w/ master locators. Steve & Mark Lorentz w/ Nothnagle on Site @ 9:00 - Safety training finished. 9:30 - Set up etc & take Rich for Utility locate. 10:00 - Rich finished locating B-Zone well location on East Side of Veterans Dr. - Escort Rich inside to clear ~~RR~~ #m PR location between PN 6 & PR-7. 11:30 Finished utility locate - Rich drawing up paperwork - Steve & Mark drilling. 12:00 - 4-inch Steel casing set to 15' BGS - top rock @ 12.5' - grout in place. 1:30 Casing grouted in place - clean up, take Soil cham to Building 73 & dispose of wastewater. 2:00 Sign off on permit & everyone offsite.

Jeffrey Moore

Location Niagara Falls, NY Date 8-26-14

Project / Client OLIN 6107140002

Tue. Sunny 65°-85° Well Installation Jeff Moore Scale

6:45 - Arrive @ Site - Get Safe Work permit for today. 7:10 - Steve & Mark on Site - Safe Work permit in place. Drillers to get outside for rock coring, then set up for NX coring. 9:20 - Finished Coring & reaming B-Zone well from 15-20' - work on surface completion & develop w/ mayno pump. 10:00 - Static water level = 13.5' - Static while pumping is 13.68' @ 1.75 gpm 10:15 - Still pumping 1.75 gpm @ 13.68' BGS. This well will be PN-24B & the passive relief well PR-14. 11:15 - Pumped 200 gal from PN-24B - end development - Do surface completion. 11:40 - Finished @ PN-24B. Set up on PR-14. 12:10 Auger refusal @ 7.5'. Get screen & casing sections ready, then set up to wash rotary into rock. 2:00 - PR-14 Screen & Riser Set (See Log) will have to let grout set up before coring. 2:30 - Cleaned up site & filled tanks with water - Sign off on permit & head offsite.

Jeffrey Moore

Location Niagara Falls, NY Date 8-27-14

Project / Client OLIN 6107140002

Wed. Sunny-Cloudy 65°-85° Well Installation Jeff Moore

6:40 - Arrive @ Site - Get Safe Work permit for today. 7:00 Safe work permit in place. 7:10 Steve & Mark on site - Set up to core & ream PR-14 from 10'. 9:00 - Finished Coring & reaming PR-14 - total depth 19.7' BGS (See Log) Develop w/ moyno pump. 9:25 - Checked depth to water in PR-7 - 5.5' BTOC - will try to Surge & clean at later. Pulled the sample tubing from PR-7 & it was covered in Iron bacteria. Will use a 4-inch Surge block to Surge PR-7. 9:45 - Pumped 300 gal from PR-14 - Set up to Surge PR-7. 10:05 - Surged & pumped 30 gal from PR-14 - water is Red Brown w/ Iron. 10:10 - water level stabilized 11.1' BTOC after pumping & Surging. 10:35 GW in PR-6 is @ 10.6' BTOC. 10:40 GW in PR-8 is @ 7.5' BTOC. Will Surge & pump these next. 10:50 - Surging PR-8 - water level in PR-6 looks OK and can not access, it with rail cars in the way.

11:35 - Pumped 120 gal from PR-8 & water is clear - water is @ 10.55' BTOC now. 11:45 - GW is @ 7.25' BTOC in PR-9 - Surge & develop. 12:00 - GW is @ 4.60' BTOC in PR-11. 12:25 - Pumped 125 gal from PR-9. GW is @ 10.9' BTOC now. Empty tanks & set up on PR-11. Lots of Calcium buildup. 1:20 - Could only pump 40 gal from PR-11. This well has calcium buildup & probably needs acid treatment. Water level is @ 10.15 BTOC. 1:30 - GW is @ 9.6' BTOC in PR-1. Surge & pump - very dark brown water. Retrieved

Location _____ Date _____

Project / Client _____

_____ Scale

a section of sampling tubing that someone had lost down the well. 2:00 Pumped 50 gal from PR-1 & clear, but visual inspection inside 6-inch stainless steel casing shows calcium buildup. GW is @ 19.3' & coming in slowly. Probably needs acid (HCl) 2:15 - Tony had mentioned performing the Lugeon test w/ packers, transducers etc. to pressurize the B-Zone fracture in PR-14. This well acts like all other B zone wells in that once the fracture is hit - all water is lost to the fracture system - While drilling we lost 500 gallons as fast as the moyno pump would run and we pumped out 300 gal as fast as it could pump. In order to make sure the fracture is clear we will inject another 500 gal. as fast as possible. 2:20 - water level in PR-1 is @ 16.3' and still recharging very slowly. 2:35 - GW in PR-14 is @ 11.35' BTOC - prior to injection of 500 gal potable 2:40 - Start injection. End @ 2:50:00 - water level = 11.27' BTOC. So less than 0.1' of water level rise @ 50 gpm 3:05 - Steve & Mark headed off site. 3:10 GW in PR-1 is @ 13.15'. Sign off on Safe work & excavation permits then head off site.

Jeff Moore

APPENDIX E

DATA FROM McINTOSH & McINTOSH

Project: Olin Niagara Falls Plant
Niagara Falls, New York
September 2014

WELL	WELL TYPE	EASTING	NORTHING	TOP RISER	GROUND	CASING
OBA-1A	4"PVC	1029007.926	1123529.300	570.67	570.83	
OBA-1B	4"STL	1029020.639	1123528.533	570.35	570.85	
OBA-1C	4"STL	1029031.906	1123527.914	570.41	570.93	
OBA-2A	4"PVC	1029899.740	1123526.793	572.54	570.12	573.11
OBA-2B	4"STL	1029909.629	1123525.983	572.63	570.12	
OBA-2C	4"STL	1029888.107	1123527.395	572.43	569.93	
OBA-3A	4"PVC	1030511.647	1123445.004	572.07	569.66	572.18
OBA-3B	4"STL	1030495.224	1123446.783	571.66	569.48	
OBA-3C	4"STL	1030481.079	1123448.893	572.67	569.51	
OBA-4A	4"PVC	1030215.506	1123224.109	572.42	569.74	572.62
OBA-4B	4"STL	1030216.915	1123235.483	573.03	569.91	
OBA-4C	4"STL	1030219.999	1123247.101	573.05	569.97	
OBA-5A	4"PVC	1029866.800	1122919.805	571.72	569.12	571.86
OBA-5B	4"STL	1029857.175	1122920.921	572.29	569.27	
OBA-5C	4"STL	1029874.927	1122918.455	572.01	569.40	
OBA-6A	4"ST.STL	1029688.031	1123109.021	570.17	570.56	
OBA-6B	4"ST.STL	1029693.442	1123108.592	570.31	570.51	
OBA-6C	4"ST.STL	1029698.464	1123108.736	570.35	570.58	
OBA-7A	4"PVC	1029204.361	1123317.347	573.39	571.21	574.03
OBA-7B	4"STL	1029214.867	1123316.986	573.97	571.13	
OBA-7C	4"STL	1029186.065	1123318.138	574.30	571.60	
OBA-8A	4"PVC	1028246.984	1123176.548	572.49	570.86	572.68
OBA-8B	4"STL	1028255.439	1123169.718	572.64	570.70	
OBA-8C	4"STL	1028238.422	1123182.618	573.14	570.90	
OBA-9A	4"PVC	1030081.229	1122911.108	569.24	568.01	569.98
OBA-9AR	6"ST.STL	1030078.609	1122909.236	570.22	568.08	
OBA-9AR-PZ	1-1/4"ST.STL	1030078.701	1122909.562	569.98	568.08	
OBA-10A	4"PVC	1030152.060	1122875.766	568.39	568.85	
OBA-11A	4"PVC	1028063.907	1123644.172	572.83	570.56	573.13
OBA-11B	4"STL	1028039.036	1123642.462	572.87	570.57	573.52
OBA-11C	4"STL	1028052.917	1123643.555	572.94	570.47	573.52
OBA-14A	4"PVC	1030570.360	1123240.863	570.67	568.84	571.18
OBA-14B	4"STL	1030571.552	1123258.978	570.76	568.79	571.52
OBA-14C	4"STL	1030571.479	1123249.707	570.15	568.74	571.09
OBA-15A	4"PVC	1030283.200	1123463.219	572.59	570.96	573.12
OBA-15B	4"STL	1030271.831	1123381.514	573.13	570.80	573.68
OBA-16A	4"PVC	1030012.405	1123384.633	573.26	570.62	573.67
OBA-16B	4"STL	1030012.436	1123379.173	572.99	570.77	573.49
OBA-18A	4"PVC	1028159.960	1123648.701	573.47	570.58	573.85
OBA-19A	4"PVC	1028012.119	1123417.600	573.86	571.18	574.32
OBA-21AB	4"PVC	1029923.620	1122924.344	571.99	569.86	572.53
OBA-23A	4"ST.STL	1029784.056	1123426.716	570.19	570.44	

Project: Olin Niagara Falls Plant
Niagara Falls, New York
September 2014

OBA-23B	4"STL	1029783.380	1123420.174	570.04	570.36	
OBA-24A	2"PVC	1030193.919	1122920.985	568.95	569.23	
OBA-24B	4"STL	1030193.752	1122926.747	568.76	569.20	
OBA-25A	2"PVC	1030353.218	1122914.541	569.02	569.53	
OBA-25B	4"STL	1030355.127	1122925.612	568.93	569.52	
OBA-26A	4"STL	1030300.495	1123067.542	569.55	569.98	
OBA-26B	2"PVC	1030308.530	1123065.809	569.65	569.99	
RW-1	6"ST.STL	1029797.363	1123358.529	573.22	570.43	
RW-1-PZ	1-1/4"ST.STL	1029797.213	1123358.895	572.33	570.43	
RW-2	6"STL	1029978.805	1123432.557	572.01	571.03	
RW-2-PZ	1-1/4"ST.STL	1029979.067	1123432.839	571.76	571.03	
RW-3	6"ST.STL	1030129.502	1123375.270	569.40	568.69	
RW-3-PZ	1-1/4"ST.STL	1030129.952	1123375.110	569.37	568.69	
RW-4	6"STL	1030099.207	1123177.595	569.27	568.55	
RW-4-PZ	1-1/4"ST.STL	1030099.502	1123177.833	569.33	568.55	
RW-5	6"ST.STL	1030063.727	1122983.708	569.28	568.31	
RW-5-PZ	1-1/4"ST.STL	1030063.639	1122983.176	569.24	568.31	
PR-1	6"ST.STL	1029777.334	1123268.050	572.29	570.70	
PR-1-PZ	1-1/4"ST.STL	1029778.018	1123267.791	571.15	570.70	
PR-2	6"ST.STL	1029875.839	1123414.208	572.21	571.17	
PR-2-PZ	1-1/4"ST.STL	1029876.190	1123414.258	572.17	571.17	
PR-3	6"ST.STL	1030072.475	1123406.484	572.39	571.15	
PR-3-PZ	1-1/4"ST.STL	1030072.202	1123406.091	571.69	571.15	
PR-4	6"ST.STL	1030118.159	1123277.563	569.66	569.08	
PR-4-PZ	1-1/4"ST.STL	1030117.528	1123277.295	569.65	569.08	
PR-5	6"ST.STL	1030081.529	1123066.757	570.18	568.47	
PR-5-PZ	1-1/4"ST.STL	1030082.201	1123066.359	569.23	568.47	
PR-6	4"PVC	1030109.827	1123206.840	568.28	568.85	
PR-7	4"PVC	1030092.001	1123146.421	568.57	569.06	
PR-8	4"PVC	1030086.595	1123091.988	567.97	568.51	
PR-9	4"PVC	1030076.661	1123042.538	568.39	568.66	
PR-10	4"PVC	1030071.610	1123005.340	568.16	568.38	
PR-11	4"PVC	1030064.752	1122958.349	567.53	567.91	
PR-12	4"PVC	1030073.052	1122921.679	569.28	568.37	
PR-13	4"PVC	1030115.219	1123239.865	568.69	569.15	
PR-14	4"ST.STL	1030087.576	1123135.108	568.60	569.09	
PN-1A	1-1/4"ST.STL	1029731.113	1123321.065	570.51	570.71	
PN-1B	1-1/4"ST.STL	1029731.399	1123321.145	570.32	570.71	
PN-2A	1-1/4"ST.STL	1029936.340	1123415.206	570.64	570.91	
PN-2B	1-1/4"ST.STL	1029936.147	1123415.046	570.44	570.91	
PN-3A	1-1/4"ST.STL	1030076.921	1123384.842	571.80	572.12	

Project: Olin Niagara Falls Plant
Niagara Falls, New York
September 2014

PN-3B	1-1/4"ST.STL	1030077.185	1123384.773	571.73	572.12	
PN-4A	1-1/4"ST.STL	1030128.939	1123319.103	568.35	568.94	
PN-4B	1-1/4"ST.STL	1030128.595	1123319.014	568.46	568.94	
PN-5A	1-1/4"ST.STL	1030117.421	1123234.877	568.55	568.95	
PN-5B	1-1/4"ST.STL	1030117.329	1123234.668	568.58	568.95	
PN-6A	1-1/4"ST.STL	1030083.711	1123114.450	568.43	569.06	
PN-6B	1-1/4"ST.STL	1030083.978	1123114.269	568.56	569.06	
PN-7A	1-1/4"ST.STL	1030071.173	1123026.174	568.23	568.52	
PN-7B	1-1/4"ST.STL	1030071.556	1123026.225	568.45	568.52	
PN-8A	1-1/4"ST.STL	1030063.908	1122937.310	568.28	568.53	
PN-8B	1-1/4"ST.STL	1030063.746	1122937.233	567.85	568.53	
PN-9B	4"STL	1030076.118	1123446.374	570.68	571.15	
PN-9A	2"PVC	1030076.879	1123453.160	570.74	570.97	
PN-10A	2"PVC	1029797.687	1123455.560	570.11	570.55	
PN-10B	6"STL	1029858.358	1123450.472	571.15	571.54	
PN-11A	2"PVC	1030082.315	1122918.871	567.49	567.78	
PN-11B	4"STL	1030080.606	1122926.736	567.78	568.12	
PN-12A	2"STL	1029944.651	1123006.402	570.07	570.35	
PN-12B	4"STL	1029944.147	1123000.072	570.00	570.30	
PN-13A	2"PVC	1029912.048	1123083.921	573.25	573.48	
PN-13B	4"STL	1029921.246	1123081.687	573.24	573.46	
PN-14B	4"STL	1029897.420	1123134.210	573.30	573.59	
PN-14A	2"PVC	1029889.722	1123135.185	573.30	573.62	
PN-15A	2"PVC	1029993.198	1123199.055	570.69	570.94	
PN-15B	4"STL	1029988.330	1123202.517	570.70	571.02	
PN16-A	2"PVC	1029986.537	1123320.843	570.44	570.67	
PN16-B	4"STL	1029987.568	1123327.323	570.36	570.66	
PN-17A	2"PVC	1029870.530	1123297.910	570.55	570.82	
PN-17B	4"STL	1029863.605	1123298.977	570.54	570.96	
PN-18A	2"PVC	1029932.223	1123348.515	570.23	570.55	
PN-18B	4"STL	1029924.254	1123348.781	570.50	570.67	
PN-19A	2"PVC	1029843.386	1123361.145	570.74	571.00	
PN-19B	4"STL	1029843.822	1123367.890	570.64	570.95	
PN-20A	2"PVC	1030125.105	1123471.298	570.07	570.35	
PN-20B	4"STL	1030132.637	1123469.258	569.70	569.98	
PN-21A	2"PVC	1030002.499	1122954.623	569.48	569.77	
PN-21B	4"STL	1030010.297	1122953.206	569.39	569.69	
PN-22B	4"STL	1029978.852	1122952.437	569.08	569.62	
PN-23B	4"STL	1029970.940	1122929.150	568.90	569.43	
PN-24B	4"STL	1030149.173	1123632.496	570.87	571.12	
ORC-1	4"STL	1030025.911	1122901.097	568.44	568.81	
ORC-2	4"STL	1030002.310	1122917.173	568.63	569.22	
ORC-3	4"STL	1029955.155	1122909.005	569.11	569.50	

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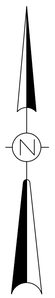
September 2014

ORC-4	4"STL	1029926.933	1122911.890	568.97	569.52	
ORC-5	4"STL	1029895.653	1122915.083	569.00	569.40	
ORC-6	4"STL	1029933.243	1122941.787	569.02	569.55	
SRW-1	8"ST.STL	1029849.839	1123161.720	572.09	572.62	
SRW-2	8"ST.STL	1029819.743	1123074.121	572.57	573.06	
BH-1	2"STL	1030134.911	1123476.861	573.78	570.17	
MW-22B	4"STL	1028879.335	1123760.702	569.84	570.24	
MW-22C	4"STL	1028913.617	1123764.406	569.90	570.40	
MW-22D	4"STL	1028942.953	1123758.668	569.98	570.55	
Horizontal Datum: New York State Plane Coordinate System,West Zone (3103/FIPS 3103) feet						
	NAD83/2011					
NGS Reference Stations:		Lockport CORS ARP (PID DI0596)				
		Hamburg CORS ARP (PID DI0458)				
		Youngstown 5 CORS ARP (PID DK4191)				
Vertical Datum: NAVD88 - Feet						
NGS Reference Stations:		Y-411 First Order (PID OG0352)				
		J-20 First Order (PID OG0193)				



MW22-B
MW22-C
MW22-D
OBA-11C
OBA-11B
OBA-11A
OBA-18A
OBA-1B
OBA-1A
OBA-1C
OBA-19A
OBA-7A
OBA-7C
OBA-7B
OBA-8C
OBA-8A
OBA-8B
PN-24B
OBA-2C
OBA-2B
OBA-2A
PN-10A
PN-10B
PN-20A
BH-1
PN-20B
PN-9A
PN-9B
OBA-15A
OBA-3C
OBA-3B
OBA-3A
OBA-24A
OBA-23B
RW-2
RW-2-PZ
PN-2A
PR-2
PR-2-PZ
PN-2B
PR-3
PR-3-PZ
OBA-16A
OBA-16B
PN-3A
PN-3B
RW-3
RW-3-PZ
OBA-15B
RW-1-PZ
RW-16
PN-19B
PN-19A
PN-18B
PN-18A
PN-1A
PN-1B
PN-16A
PN-16B
PN-4B
PN-4A
PN-17B
PN-17A
PR-4-2
PR-4
PR-1
PR-1-PZ
OBA-14B
OBA-14C
OBA-14A
PR-13
PN-5A
PN-5B
OBA-4C
OBA-4B
OBA-4A
PR-6
PN-15B
PN-15A
RW-4
RW-4-PZ
SRW-1
PR-7
PR-14
PN-14A
PN-14B
OBA-6B
OBA-6AL
OBA-6C
PN-6A
PN-6B
PR-8
PN-13A
PN-13B
SRW-2
PR-5
PR-5-PZ
OBA-26A
OBA-26B
PR-9
PN-7A
PN-7B
PN-12A
PN-12B
PR-10
RW-5
RW-5-PZ
PN-22B
PN-21A
PN-21B
PR-11
PN-8A
PN-8B
ORC-6
OBA-5C
OBA-21AB
PR-12
PR-11B
PN-11A
OBA-24B
OBA-24A
OBA-25B
OBA-25A
OBA-5B
OBA-5A
ORC-5
ORC-4
ORC-3
ORC-2
OBA-9AR-PZ
OBA-9AR
OBA-9A
ORC-1
OBA-10A

GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)
1 inch = 80 ft.

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REVISION	

NOTE: UNAUTHORIZED ALTERATION OR ADDITION TO THIS MAP IS A VIOLATION OF SECTION 7209, PROVISION 2 OF THE NEW YORK STATE EDUCATION LAW.

MAP OF OLIN WELL LOCATIONS

LOCATION CITY OF NIAGARA FALLS, NIAGARA COUNTY, NEW YORK

JOB No. 5377-E	SCALE: 1"= 80	DATE: SEPTEMBER 25, 2014	DRAWN JEM III
			COMP.
			CAD FILE 53772014.DWG
			CHECKED JEM III