December 10, 2014

Ms. Charlotte B. Theobald
Environmental Engineer I
NYS Department of Environmental Conservation
Region 8, Division of Environmental Remediation
6274 East Avon-Lima Road
Avon, New York 14414

Re: Addendum #1 to Supplemental IRM Work Plan
Andrews Street Site
300, 304-308 and 320 Andrews Street, and 25 Evans Street
Rochester, New York
ERP Site No. E828144

Dear Ms. Theobald:

On behalf of the City of Rochester (City) Division of Environmental Quality (DEQ), Day Environmental, Inc. (DAY) is providing this letter to serve as an Addendum #1 to the New York State Department of Environmental Conservation (NYSDEC) approved Supplemental Interim Remedial Measure (IRM) Work Plan dated June 2014. The Site is shown on the enclosed Project Locus Map as Figure 1.

The objective of this Addendum #1 is to complete a polishing-phase of in-situ chemical oxidation (ISCO) as specified in Section 2.6 of the NYSDEC-approved June 2014 Supplemental IRM Work Plan.

1.0 BACKGROUND

In accordance with Section 2.4 of the June 2014 Supplemental IRM Work Plan, ISCO was completed at the Site that involved the subsurface injection/placement of approximately 35,640 pounds of potassium permanganate ($KMnO_4$). The majority of the permanganate was injected at a grid of 30 overlapping injection points (designated IP-01 through IP-26, IP-32, IP-40, IP-42 and IP-45). Smaller quantities of $KMnO_4$ were placed and/or injected at injection borings IB-1 through IB-3, backfill wells BW-01 through BW-04, and remediation pits RP-01 through RP-05. The above locations are shown on the enclosed Figure 2. The above ISCO-related work was completed between July 17, 2014 and October 30, 2014.

As part of the process monitoring included in Section 2.4.4 of the June 2014 Supplemental IRM Work Plan, each injection interval at each injection point was documented in terms of the percent of target quantity of $KMnO_4$ actually injected. This work showed that some zones of the treatment area, including the northern portion of the treatment area near monitoring well MW-01, received less than 25% the target quantity of $KMnO_4$ due to inability to inject at these zones because of excessive surfacing of $KMnO_4$ injectate at or near these locations during the moderate to high pressure injection work being performed. This data was input into DAY's global information

system (GIS) database for the Site, and ArcGIS Spatial Analyst software was used to create a three dimensional (3D) model of the data. The 3D model assisted in identifying zones that did not receive target quantities of $KMnO_4$. Based on these process monitoring results, the areas near monitoring well MW-01 and injections points IP-02, IP-06, IP-08 and IP-19 were identified as locations that could benefit from an additional polishing-phase of ISCO (refer to the enclosed Figure 2).

During excavation of RP-02, apparent PCE odors and elevated PID readings ranging up to 270 parts per million (ppm) were detected on excavated soils from approximately 11.0 to 12.0 feet below the ground surface. During excavation of RP-05, elevated PID readings up to 57.0 ppm were detected on excavated soils from approximately 14.5 to 16.5 feet below the ground surface. Evidence of permanganate (e.g., purple stained or brown oxidized soils) was encountered near the bottom of the RP-02 and RP-05 excavations at depths of approximately 12.0 and 16.5 feet below the ground surface, respectively. A two-inch diameter PVC injection well designated as IW-1 (with 10 feet of 10-slot screen and bottom cap, attached to 10 feet of riser that extended above the ground surface) was installed in RP-05 during backfilling. The bottom of IW-1 was set approximately 16.5 feet below the ground surface. Field evidence of PCE (e.g., elevated PID readings and/or odors) was not detected during excavation of RP-01, RP-03 or RP-04. Based on this ISCO-related work, the areas of RP-02 and RP-05 were identified as locations that could benefit from an additional polishing-phase of ISCO (refer to enclosed Figure 2).

In accordance with Section 2.4.5, five performance monitoring events were completed between September 24, 2014 and November 12, 2014. The performance monitoring was completed using wells within and immediately outside the treatment area. The performance monitoring at these wells included:

1. Visual observations for color of groundwater (i.e., pink and purple indicate presence of $KMnO_4$);
2. Water quality measurements of groundwater samples including oxidation reduction potential (ORP), dissolved oxygen (DO), temperature, pH, turbidity and chloride, and
3. Analytical laboratory testing of a round of groundwater samples for volatile organic compounds (VOCs) that were collected on November 12, 2014.

This work showed that groundwater alternated between clear and purple at well MW-01 and backfill wells BW-02 and BW-04 (refer to the enclosed Figure 2). In addition, PCE concentrations detected in the November 12, 2014 groundwater samples collected from these three locations were above the NYSDEC Technical and Operational Guidance Series (TOGS) 1.1.1 groundwater standard for PCE, and showed the least reduction of PCE for those wells located in, or immediately adjacent to, the IRM-01 and IRM-02 areas. Based on the performance monitoring, the MW-01, BW-02 and BW-04 areas were identified as locations that could benefit from an additional polishing-phase of ISCO.

Note: NYSDEC-approved imported Crusher Run #2 (CR2) stone has been placed on the Site so that a two-foot thick clean cover system exists across the Site. Some areas of the Site did not require placement of CR2 since adequate pre-existing clean material at least two feet thick was present. Other areas of the Site required placement of up to two feet thick of the imported CR2 to meet cover

system requirements. The depths presented herein correspond to ground surface after to installation of the new imported CR2.

2.0 PROPOSED ADDENDUM #1 WORK

In accordance with Section 2.6 of the June 2014 NYSDEC-approved Supplemental IRM Work Plan, the scope of work outlined herein is proposed for a polishing-phase of ISCO to supplement the main ISCO treatment that has been completed at the Site.

Nine overburden injection wells will be installed at the Site. DAY will retain Nothnagle Drilling, Inc. (Nothnagle) to install these injection wells. Their proposed locations are shown on the enclosed Figure 2. As shown, IW-2A/IW-2B, IW-3A/IW-3B and IW-4A/IW-4B are paired wells with each pair being installed within approximately three feet of each other and screened at different depths. The well designations, the anticipated associated boring depths, and the anticipated depth intervals for well screens are provided below.

- IW-2A – 19' deep (install screen from 14' to 19')
- IW-2B – 27' deep (install screen from 17' to 27')
- IW-3A – 19' deep (install screen from 14' to 19')
- IW-3B – 27' deep (install screen from 17' to 27')
- IW-4A – 19' deep (install screen from 14' to 19')
- IW-4B – 27' deep (install screen from 17' to 27')
- IW-5 – 23' deep (install screen from 13' to 23')
- IW-6 – 12' deep (install screen from 7' to 12')
- IW-7 – 21' deep (install screen from 15' to 20')

For each location noted above, 4.25-inch inside diameter (ID) hollow stem augers (HSAs) will be advanced from the ground surface to the depths noted. For each location, up to two split spoon samples may be collected (as directed by DAY or the City) ahead of the HSAs in general conformance with the American Society for Testing and Materials (ASTM) 1586. The following field screening may be completed on drill cuttings, and any split spoon samples, that are derived from each of the injection well borings in context to the depths of the augers and/or split spoon samples:

- Observations pertaining to color (e.g., natural, oxidized, purple indicative of $KMnO_4$)
- Observations on moisture content (e.g., damp, moist, saturated).
- Measured PID reading on ambient air above soil cuttings and/or split spoon samples.

Following the completion of drilling, a Schedule 40 polyvinyl chloride (PVC) injection well will be constructed in each of the nine borings. As shown above, five of the injection wells will consist of pre-cleaned approximate five-foot long No. 10 slot screens with bottom caps that are attached to solid riser casings that extend from the top of the screened section to above the ground surface. The other four injection wells will consist of a pre-cleaned approximate ten-foot long No. 10 slot screens with bottom caps that are attached to solid riser casings equipped with solid slip caps or J-plugs that extend from

the top of the screened section to above the ground surface. The annulus around each well screen will be filled with a washed and graded silica sand pack that will be placed one half foot above the top of the screened interval. A minimum two-foot thick bentonite seal will be placed above each well's sand pack and hydrated with potable water. Following hydration of the bentonite, a cement/bentonite grout consisting of approximately 96% Portland type 1 (or similar) cement, approximately 4% granular bentonite mixture, and water will be tremied into the annulus of each well approximately to grade. Once the grout has set (generally one day after installation), each new injection well will be developed by removing up to 10 well casing volumes of water that will be placed in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums.

Drilling equipment will arrive on-site in clean condition. A temporary decontamination pad will be constructed using wood and plastic sheeting. Soil cuttings will be placed in an approximate 20-foot by 20-foot solid waste staging area consisting of three layers of 6-millimeter polyethylene plastic sheeting as a bottom liner, with two layers of 6-millimeter polyethylene plastic sheeting used as a cover that is secured in-place with sand bags or other acceptable method.

It is proposed that 5% $KMnO_4$ solution be injected at injection wells IW-1, IW-2A, IW-2B, IW-3A, IW-3B, IW-4A, IW-4B, IW-5, IW-6, and IW-7, and backfill wells BW-02 and BW-04. Injection well IW-1 has a ten-foot well screen, and backfill wells BW-02 and BW-04 have five-foot well screens. It is anticipated that the 5% solution would be injected at pressures of 10 pounds per square inch (psi) or less. Assuming a 5-foot radius of influence of the injectate within the screen interval of each of the ten injection wells and two backfill wells, it is estimated that approximately 6,675.87 cubic feet of saturated soil and groundwater are targeted for treatment during the polishing-phase ISCO. Treatment dimensions and site data were input into the Carus calculator (refer to enclosed Carus Estimation Spreadsheet), and the output shows that 1,244 pounds of $KMnO_4$ mixed with water to create 2,982 gallons of 5% $KMnO_4$ solution are estimated for the proposed polishing-phase ISCO.

DAY will retain TREC Environmental to perform the polishing-phase ISCO injection work. A representative of the City and/or DAY will document the work as it progresses. Static water level measurements will be made at key monitoring well locations. It is anticipated that a total of between 1,200 and 1,320 pounds of $KMnO_4$ will be procured and mixed with appropriate amounts of water to create 5% $KMnO_4$ solution that is injected at the twelve locations during this polishing-phase ISCO. Based on the previous process monitoring data, and performance monitoring data and observations, and since permanganate has a specific gravity greater than 1.0, wells that are treating shallower zones will generally receive twice the volume of 5% KMnO4 solution as wells that are treating deeper zones to the extent possible. As an example, assuming a total of 2,982 gallons 5% $KMnO_4$ solution is purchased, it is anticipated that the following volumes would be targeted for each well:

- IW-1 – inject 298.2 gallons of 5% $KMnO_4$ solution
- IW-2A – inject 298.2 gallons of 5% $KMnO_4$ solution
- IW-2B – inject 149.1 gallons of 5% $KMnO_4$ solution
- IW-3A – inject 298.2 gallons of 5% $KMnO_4$ solution
- IW-3B – inject 149.1 gallons of 5% $KMnO_4$ solution

- IW-4A – inject 298.2 gallons of 5% $KMnO_4$ solution
- IW-4B – inject 149.1 gallons of 5% $KMnO_4$ solution
- IW-5 – inject 298.2 gallons of 5% $KMnO_4$ solution
- IW-6 – inject 298.2 gallons of 5% $KMnO_4$ solution
- IW-7 – inject 149.1 gallons of 5% $KMnO_4$ solution
- BW-02 – inject 298.2 gallons of 5% $KMnO_4$ solution
- BW-04 – inject 298.2 gallons of 5% $KMnO_4$ solution

Adjustments to the above preliminary distribution assumptions may be made to account for actual field conditions that are encountered, and actual quantities of $KMnO_4$ used.

Although not anticipated given the low injection pressures proposed, the Site and the NYSDOT Inner Loop public right-of-way north of the Site will be observed for any evidence of $KMnO_4$ liquid surfacing (e.g., purple groundwater daylighting from the ground, monitoring wells, etc.). Any surfacing will be addressed using the protocols identified in the NYSDEC-approved June 2014 Supplemental IRM Work Plan. It is anticipated that the $KMnO_4$ will be delivered to the Site in partial shipments to minimize the quantity of material on-site.

As the injection work progresses, groundwater may be pumped from well MW-01 to assist in distribution of the 5% $KMnO_4$ solution being injected at nearby injection wells, and also to assist in minimizing the potential for $KMnO_4$ migrating off-site to the north. If deemed appropriate, one or more well packers may be installed at MW-01 to assist in pumping groundwater from select depth intervals. Water may also be pumped from other wells (e.g., MW-20) to assist in distribution of the 5% $KMnO_4$ solution in those areas. Any water removed from wells will be added to the container (e.g., tote) storing the 5% $KMnO_4$ solution so that it is fully treated prior to being subsequently re-injected (i.e., re-circulated) into the groundwater zone at the Site.

Drilling and injection equipment will be decontaminated prior to leaving the Site, and the decontamination water will be placed in NYSDOT-approved 55-gallon drums. Decontamination waters, and well development waters, will be mixed with permanganate and used in the polishing-phase injection work. Some of this water may also be injected at temporary injection well IB-3 using a gravity feed system to minimize $KMnO_4$ daylighting at this location since this well was not finished with a sand pack or overlying cement/bentonite grout (refer to enclosed Figure 2). Decontamination sediments, decontamination pad materials, used disposable personal protective equipment (PPE), and used field materials (e.g., tubing) will be placed in the soil staging area. The solid project-derived wastes will be characterized and disposed off-site in accordance with applicable regulations.

Applicable provisions set forth in the NYSDEC-approved June 2014 Supplemental IRM Work Plan, including the Health and Safety Plan (HASP) and Quality Assurance Project Plan (QAPP), will be implemented during fieldwork associated with this Addendum #1. This includes implementation of the air monitoring outlined in the Community Air Monitoring Plan (CAMP) during drilling activities. Performance monitoring will continue as scheduled in the June 2014 Supplemental IRM Work Plan. Based on the findings of the performance monitoring data and

observations, additional rounds of polishing-phase ISCO injections of $KMnO_4$ may be performed under this Addendum to the June 2014 Supplemental IRM Work Plan, and the NYSDEC would be notified of any additional polishing-phase injections..

Where applicable, individuals involved with implementation of the fieldwork in Addendum #1 of the Supplemental IRM Work Plan will be 29 CFR 1910.120 HAZWOPER trained, and current HAZWOPER certifications for these individuals will be made available upon request.

This Addendum #1 to the June 2014 Supplemental IRM Work Plan is being provided for regulatory review and approval. The drilling activities associated with this Addendum #1 are scheduled to commence on Monday January 5, 2015. In order to continue to meet project schedule goals, an expedited review and approval of Addendum #1 would be greatly appreciated. Within one week of regulatory approval, and prior to implementation of the work described herein, a copy of the Addendum #1 to the Supplemental IRM Work Plan will be placed in the document repository.

If there are any questions, please contact this office.

Very truly yours,
Day Environmental, Inc.

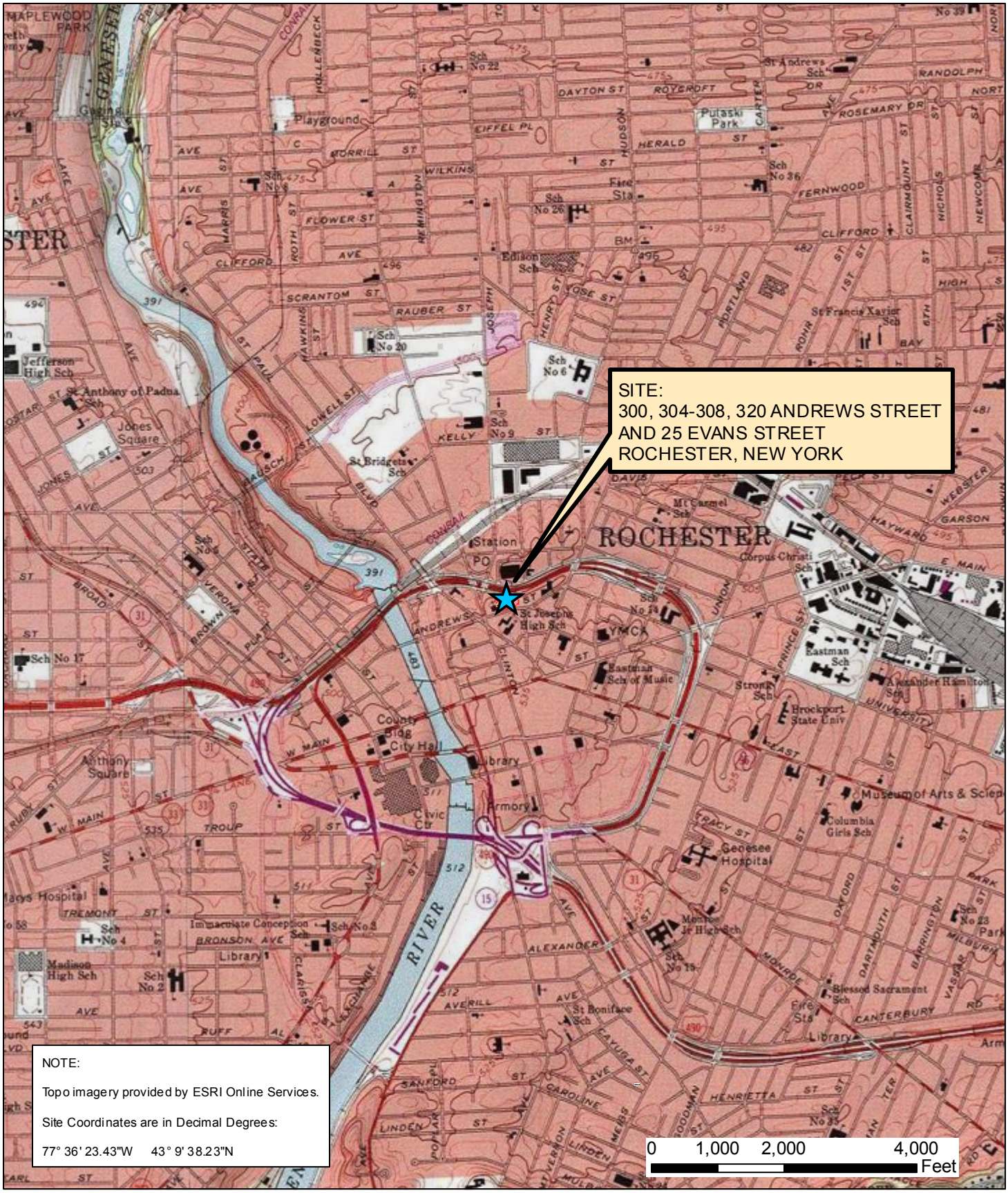
Nathan E. Simon
Task Leader (NYSDEC P.E. License #087172)

Jeffrey A. Danzinger
Project Manager

Enclosures – Figure 1, Figure 2, and Carus Estimation Spreadsheet

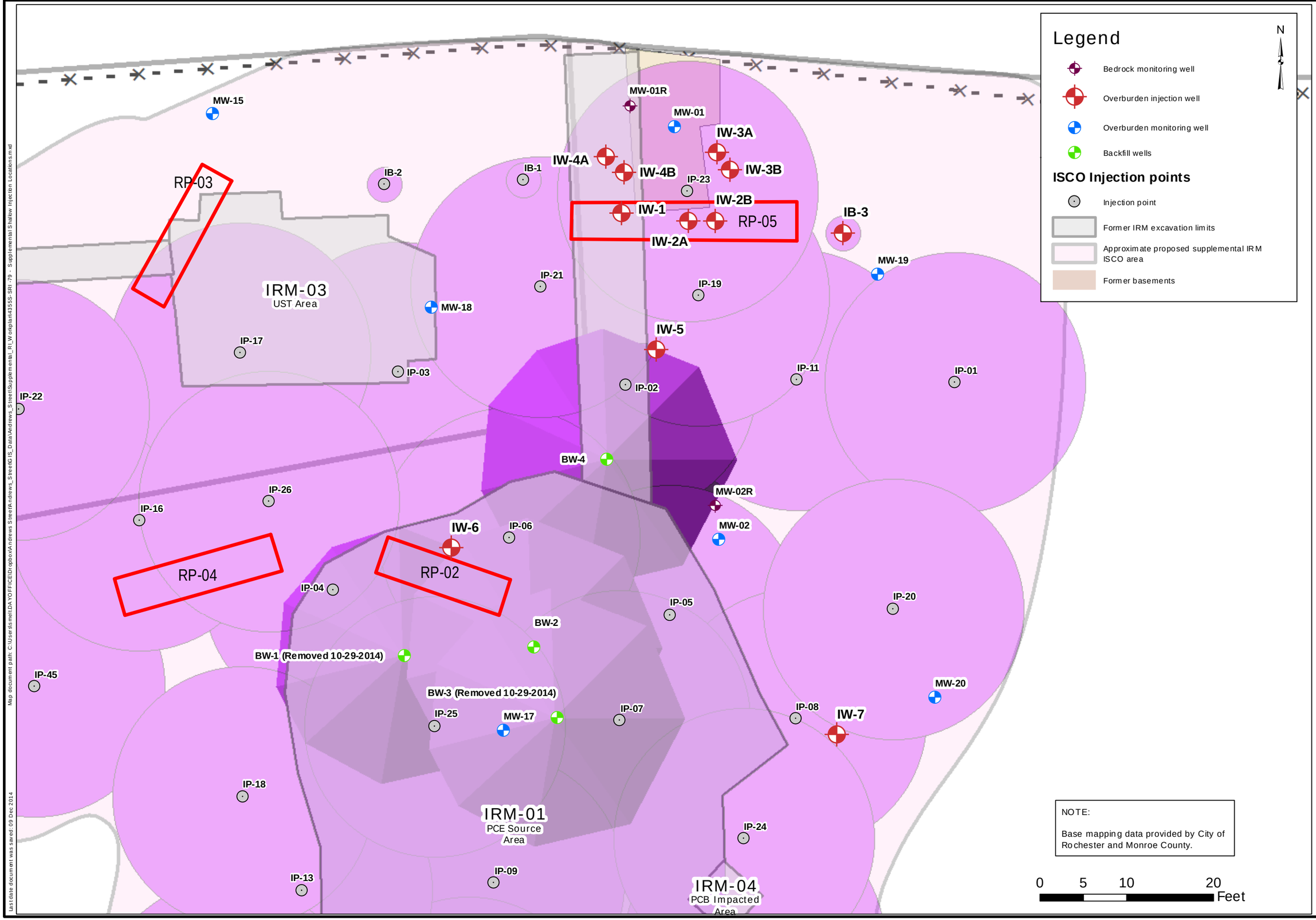
cc: Joseph Biondolillo, City of Rochester DEQ – electronic copy

JD7507 / 4355S-10



Document Path: E:\GIS\GIS Mapping\Andrews_Street\4355S-10Rocity - Andrews Street\Supplemental_RI_Workplan\4355S-SR1-1 - Locus Map.mxd

Date: 10-01-2012	day **DAY ENVIRONMENTAL, INC.** Environmental Consultants Rochester, New York 14606 New York, New York 10016-0701	Project Title: 300, 304-308, 320 ANDREWS STREET AND 25 EVANS STREET ROCHESTER, NEW YORK (NYSDEC SITE NO.: E828144) ENVIRONMENTAL RESTORATION PROJECT	Project No.: 4355S-10
Drawn By: CPS		Drawing Title: Project Locus Map	FIGURE 1
Scale: AS NOTED			



Map document path: C:\Users\ssmelt\DAYOFFICE\Dropbox\Andrews Street\Andrews_StreetIS_Data\Andrews_StreetSupplemental_RI_Workplan\4355S-RI -79 - Supplemental Shallow Injection Locations.mxd

Last date document was saved: 09 Dec 2014

DESIGNED BY	DATE
JAD	12-2014
DRAWN BY	DATE DRAWN
CPS	12-2014
SCALE	DATE ISSUED
AS NOTED	12-9-2014

day
DAY ENVIRONMENTAL, INC.
Environmental Consultants
Rochester, New York 14606
New York, New York 10170

Project Title
300, 304-308, 320 ANDREWS STREET
AND 25 EVANS STREET
ROCHESTER, NEW YORK
ENVIRONMENTAL RESTORATION PROJECT NYSDEC SITE NO: E828144

Drawing Title
Additional #1 Polishing Phase

Project No.
4355S-10

FIGURE 2

Andrews Street Site
(Polishing Phase ISCO at Injection Wells and Backfill Wells)
12/9/2014
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RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into box with blue font

Site Name: Andrews Street Site, Rochester, NY
Date:

	Estimates	Units
Treatment Area Volume		
Length	30.707	ft
Width	30.707	ft
Area	942.9198	sq ft
Thickness	7.08	ft
Total Volume	247	cu yd
Soil Characteristics/Analysis		
Porosity	20	%
Total Plume Pore Volume	9988	gal
Avg Contaminant Conc	80	ppm
Mass of Contaminant	6.67	lb
PNOD	3.5	g/kg
Effective PNOD	40	%
Effective PNOD Calculated	1.4	
PNOD Oxidant Demand	1028.084	lb
Avg Stoichiometric Demand	1.3	lb/lb
Contaminant Oxidant Demand	8.67	lb
Theoretical Oxidant Demand	1036.75	lb
Confidence Factor	1.2	
Calculated Oxidant Demand	1244.104	
Injection Volumes for RemOx S		
RemOx S Injection Concentration	5.0%	%
Total Volume of Injection Fluid	2,982	gal
Pore Volume Replaced	0.30	%

Amount of RemOx S ISCO Reagent Estimated — **1,244 pounds**

Injection Volumes for RemOx L		
RemOx L Injection Concentration	10.0%	%
Calculated Specific Gravity	1.091623	g/ml
Total Volume of Injection Fluid	1,226	gal
Pore Volume Replaced	0.12	%

Amount of RemOx L ISCO Reagent Estimated — **2,793 pounds**
244 gallons