

January 8, 2025

VIA ELECTRONIC MAIL

Ms. Maeve Wurtz, Remedial Project Manager
Western New York Remediation Section
New York Remediation Branch
Superfund and Emergency Management Division
U.S. Environmental Protection Agency, Region II
290 Broadway, 20th Floor
New York, New York 10007-1866

Re: Remedy Optimization Work Plan
Alcas Cutlery Corporation Site, Olean Well Field OU2 and OU3
Consent Decree No. II-CERCLA-10202, DJ# 90-11-3

Dear Ms. Wurtz:

As requested in your email dated August 14, 2024, and responses to comments provided on December 19, 2024, and January 2, 2025, the following revised work plan discusses the proposed strategies for optimizing remedy implementation for Operable Unit 2 (OU2) and Operable Unit 3 (OU3) within the Alcas Source Area (Site).

1.0 Introduction

1.1 Operable Unit 2

The Remedial Action Work Plan (RAWP) for OU2, as prepared by Civil & Environmental Consultants of New York, Inc (CECNY), details the implementation process for the selected remedy, as identified in the Record of Decision (ROD), and the design basis, presented in the July 2020 revised Final Design (OU2 Remedial Design [RD] 100% Submittal) Olean Well Field Superfund Site, Operable Unit 2 report, as prepared by CDM Smith Inc. (CDM). The U.S. Environmental Protection Agency (U.S. EPA) Region II, in consultation with the New York State Department of Environmental Conservation (NYSDEC), approved the revised OU2 RD 100% Submittal on July 14, 2020. The RAWP for OU2 was approved June 8, 2022. Implementation of the RAWP is discussed in the Remedy Implementation and Performance Monitoring Report for OU2 submitted on July 1, 2024, as prepared by CECNY.

In accordance with the OU2 remedial design for volatile organic compound (VOC)-impacted saturated soil and groundwater, remedy implementation consisted of recirculating alkaline-activated sodium persulfate oxidant through the treatment area. As discussed in Section 3.2.1 of the OU2 RD 100% Submittal, the targeted treatment area is the upper water-bearing zone (UWBZ) in the Alcas Source Area, which is located above a glacial till layer generally encountered between 20 and 25 feet below ground surface (ft bgs). Depth to water in the UWBZ is typically between 8 and 10 ft bgs. Groundwater was extracted from one horizontal extraction well (HRW-2) and five

vertical recovery wells, amended with the oxidant, and reinjected into two pairs of horizontal injection wells (HRW-1/HRW-4R and HRW-3/HRW-5) (Figure 1). The performance monitoring well network is shown on Figure 2. During implementation, observed extracted groundwater production rates were substantially lower than the designed production rate. Lower production rates were attributed to the geologically driven, laterally discontinuous sequences of sediments in the upper water-bearing zone and the remedy-driven generation of a calcium carbonate precipitate, resulting in the fouling of well screens.

In August 2023, the horizontal wells were rehabilitated. Following completion of the well rehabilitation, extraction and injection wells were systematically tested on individual and combinations of horizontal well screen segments to optimize future remedy implementation activities. Extraction testing on HRW-2 yielded an extraction rate of 3.04 gallons per minute (gpm), which is below the designed extraction rate of 20 gpm, as specified in the OU2 100% RD Submittal. An injection test yielded a combined 5.4 gpm injection rate for HRW-2. The flow rate for the extraction tests at HRW-2 are a combination flow from six of the seven screened intervals, with individual flow rates ranging from 0.1 to 0.5 gpm. Of the seven horizontal well screens, four are believed to be screened fully or partially across less permeable lenses producing under 1 gpm. There was no flow from channel 3 (HRW-2 Yellow). Additional discussion on the well rehabilitation is provided in the OU2 July 1, 2024, Remedy Implementation and Performance Monitoring Report.

While the proposed recirculation approach is based on existing Site data and supported by the remedy design groundwater modeling, the injection strategy will need to adapt to observed performance monitoring data to more efficiently degrade VOCs to meet the Remedial Action Objectives (RAOs). As noted in the OU2 100% RD Submittal, following each recirculation event, the performance monitoring data was to be evaluated, and if necessary, optimization of the recirculation approach will be implemented during the next event. Optimization steps including an evaluation of alternative activation methods are consistent with the September 2014 Operable Unit Three Record of Decision for the Olean Well Field Superfund Site related to the Alcas Source Area and Amendment to the Operable Unit Two Record of Decision for the Olean Well Field Superfund Site related to the Alcas Source Area which states:

Site-specific, bench-scale tests with alkaline-activated sodium persulfate were found to be successful, and this treatment chemical was assumed, for cost-estimating purposes; however, other ISCO treatment methods could also be employed as part of this remedial alternative.

Potential optimization steps included in the OU2 100% RD Submittal were as follows:

- Reversal of injection/extraction locations;
- Changing locations within the horizontal well system where extraction and injection occur (i.e. extracting from one end of a horizontal well string while injecting into the other end);
- Changing the planned duration of recirculation to better distribute oxidant;

- Targeting recirculation in specific portions of the treatment area which are exhibiting poor degradation performance;
- Changing the oxidant concentration; and
- Completing targeted oxidant injections without recirculation to address areas with higher dissolved phase concentrations.

As noted above, potential optimization steps include reversal of injection/extraction locations; therefore, the vertical remediation wells may be utilized for both extraction and injection. The OU2 100% RD Submittal stated that the horizontal wells (HRW-1 through 5) were to be used for both injection and extraction and the vertical wells (RW-1 through 5) were to be used for extraction. However, the OU2 100% RD also proposed an adaptive approach which included “reversal of injection/extraction locations (i.e. extracting groundwater from HRW-1 and HRW-3, and injecting amended groundwater at HRW-2 and RW-1 through 5).” This adaptive approach is designed to improve amendment delivery if performance monitoring data indicate areas of poor delivery or poor VOC degradation.

As also discussed in the OU2 100% RD Submittal, the in-situ chemical oxidation effectiveness is controlled by the ability to distribute the injected oxidant into the heterogeneous subsurface, which includes the variable presence of low-permeability soils in the vicinity of the source area. Additional optimization steps include adding remediation well infrastructure outside the building footprint (e.g. vertical wells) to intersect the discontinuous sequences of sediments in the upper water-bearing zone. The proposed vertical wells should give greater ability to address these discontinuous units – essentially “piercing” the low permeability soils to access more of the UWBZ. Furthermore, these proposed locations target the edges of the treatment area where mass reductions were not as great as in the center of the treatment area.

Arconic anticipates that it will be necessary to complete multiple oxidant injection and recirculation events; however, the intent is not to frequently reverse injection and extraction during an event. The oxidant requires volume at injection locations to achieve distribution in the formation. Frequently reversing injection and extraction during an event would be expected to achieve only localized reductions in mass at the injection site. At this time, it is uncertain how frequently they would be reversed, if at all. Following each recirculation event, the performance monitoring data will be evaluated and, if necessary, optimization of the approach will be implemented during the next event.

Proposed strategies for optimizing remedy implementation at OU2 are an objective of this work plan.

1.2 Operable Unit 3

The RAWP for OU3 for groundwater contamination within the Alcas Source Area and updated supporting documents detail the selected remedy, as identified in the ROD, and the design basis, presented in the September 2018 revised Final Design (OU3 RD 100% Submittal) Olean Well Field Superfund Site, Operable Unit 3 report, as prepared by CDM. The U.S. EPA Region II, in

consultation with the NYSDEC, approved the revised OU3 RD 100% Submittal on September 25, 2018. The RAWP for OU3 was approved on June 8, 2022. Implementation of the RAWP for OU3 is discussed in the Remedy Implementation and Performance Monitoring Report for OU3 submitted on April 9, 2024, as prepared by CECNY.

In accordance with the OU3 remedial design, remedy implementation consisted of enhanced anaerobic bioremediation (EAB). In June 2023, the electron donor (custom formulated LactOil ® XR as manufactured by JRW Bioremediation, LLC) was injected within the southern, or downgradient, half of the targeted treatment area (the Southern Treatment Area). The donor was a combination of soluble aqueous donors and slow-release donors designed to extend the longevity of the amendment while also taking advantage of better distribution and reduced lag time before onset of microbial activity.

The amendment was injected using direct-push techniques throughout the target vertical intervals at 21 locations (IP-1 through IP-21) shown on Figure 3. Following the injections, six temporary piezometers (TW-1 through TW-6) were installed within the Southern Treatment Area. As specified in the OU3 100% RD, 5 liters of a commercially available actively dechlorinating culture (KB-1® Plus as manufactured by SiREM) was injected into each of the temporary piezometers. The results of the three-month performance monitoring event were included in the Remedy Implementation and Performance Monitoring Report for OU3.

Remedy implementation in the Northern Treatment Area was completed in July and August 2024. The amendment was injected as described above at 22 locations (IP-21 through IP-42) shown on Figure 3. Bioaugmentation of the Northern Treatment Area is anticipated following completion of the work described in Section 2.2 of this document. A detailed discussion of the remedy implementation in the Northern Treatment Area will be included in an upcoming Remedy Implementation Report to be prepared by CECNY.

The results of the six-, nine-, and twelve-month performance monitoring data were provided in the monthly progress reports submitted on May 16, August 1, and September 26, 2024, respectively, and will be discussed in an upcoming Performance Monitoring Report prepared by CECNY. Geochemical indicators from these sampling events (e.g. dissolved oxygen, oxidation reduction potential, ferrous iron, and sulfate) suggest reduction may not be occurring at the design rate. During the nine-month performance monitoring sampling event, supplemental microorganism and functional genes data was collected which showed lower than expected microbial populations. Performance monitoring analytical results suggest the bioaugmentation strategy may need to be adapted to more efficiently degrade VOCs to meet the RAOs. To support optimizing the strategy, proposed optimization steps include the following:

- Installation of a bioaugmentation network for baseline and performance microbial monitoring and the delivery of bioaugmentation culture within the OU3 treatment areas; and
- Collection of additional geochemical and microbial parameters from the established performance monitoring well network to evaluate potential microbial degraders.

Proposed strategies for optimizing remedy implementation at OU3 are an objective of this work plan.

2.0 Project Tasks

2.1 Operable Unit 2

2.1.1 Task 1 – Vertical Well Installation

To more effectively distribute the oxidant throughout the OU2 treatment area, five (5) vertical remediation wells (VW-1 through VW-5) are proposed for installation at the locations on Figure 1. As discussed in the October 2023, Alcas Facility Monthly Progress Report dated December 11, 2023, new vertical remediation wells were proposed to improve the efficiency of the oxidant injection and groundwater recirculation process. The locations of the five proposed vertical remediation wells were selected based on the following:

- Distribution across the targeted treatment area;
- Accessibility around the exterior of the Main Building; and
- Distance between the proposed injection wells and existing extraction wells during future recirculation events.

Cross sections for the Alcas Source Area were submitted with the November 10, 2008, Updated Site Evaluation and Conceptual Model Report as prepared by ENI Engineering, LLC. Figure 5-1, TCE in the Upper Water Bearing Zone & Lines of Cross Section, and Figure 5-4, TCE Concentrations Along Cross-Section A-A', are included in Attachment A. The proposed locations and well construction details for the vertical remediation wells, and the positions of the horizontal wells, have been projected to these figures.

The vertical remediation wells will be installed using 6 ¼" hollow stem auger or roto-sonic drilling methods. During installation of the wells, soil will be logged continuously for field screening and to document in the boring log. Borings will be logged using the Unified Soil Classification System describing lithology, mineralization, color, texture, and other relevant features.

The vertical remediation wells will be installed in accordance with industry standards and procedures specified in the approved OU2 RAWP. Each well will be constructed of 4-inch diameter, Schedule 40 polyvinyl chloride (PVC) to a depth of approximately twenty-five (25) ft bgs. Each well will have a fifteen (15)-foot long machine-slotted Schedule 40 PVC screen (0.01-inch) installed at the design target depth of ten (10) to twenty-five (25) ft bgs. The actual screen interval depths will be determined in the field based on lithologic observations during drilling to ensure the bottom of the well screen interval is at the top of the glacial till layer. The sand pack surrounding the screen will be 20/40 silica sand to at least 1 foot above the top of the screen. A two to three foot bentonite seal will be placed on top of the sand pack. The remaining annulus will be grouted using 95% (by weight) cement and 5% bentonite powder, placed using a tremie pipe. The wells will be protected at the surface with flush-mounted protective covers. The proposed

well construction diagram (Figure 5 of the OU2 100% RD Submittal) is included as Attachment B.

After construction, the wells will be developed by surging and pumping according to U.S. EPA SESD Guidance: *Design and Installation of Monitoring Wells* (SESDGUID-101-R1, January 29, 2013), until the water is free of visible sediment and pH, temperature, turbidity, and specific conductivity have stabilized. Investigation-derived waste (IDW) in the form of drill cuttings and development water generated under this task will be managed according to the procedures discussed in Section 4.0.

The newly installed wells will be surveyed for location and top of casing elevation by a New York-licensed Professional Land Surveyor. Newly collected location data will be incorporated into the ArcGIS database containing the previously surveyed well infrastructure.

It is anticipated that the proposed vertical remediation wells will be utilized in the next scheduled recirculation event. Actual extraction and injection rates will be field-determined for each location based on a combination of factors including but not limited to formation-driven sequences and efforts to target elevated remnant impacts following the first recirculation event. Future injections will be performed following procedures outlined in the approved OU2 RAWP and/or modifications approved by U.S. EPA as a result of information gained from ROWP implementation.

2.1.2 Task 2 –Bulk Sample Collection

Evonik Industries AG (Evonik), the oxidant manufacturer, will be contracted to perform remedy optimization testing for the selected remedy (in-situ chemical oxidation via alkaline activated persulfate). To support the remedy optimization testing, CEC NY will collect the following bulk soil and groundwater samples:

- Impacted soil: CEC NY will collect approximately nine (9) kilograms (kg) of impacted soil during installation of the vertical wells. The soil will be collected from horizons with photoionization detector (PID) readings greater than fifty (50) parts per million (ppm).
- Impacted groundwater: Groundwater samples will be collected from RU-4 and RU-22B. Prior to collecting the required sample volume, each well will be purged according to the procedures established in the approved Field Sampling Plan for Operable Units 2 and 3 (OU2/OU3 FSP) included as Appendix B of both the OU2 RAWP and OU3 RAWP. If persulfate is quantified in field testing above ten (10) ppm, alternate well RU-22A will be sampled. Fourteen (14) liters of groundwater will be collected.
- Unimpacted soil: A direct push soil boring will be advanced at the location shown on Figure 2. The soil will be logged as described in Section 2.1.1. Approximately two (2) kg soil will be collected from approximately twelve (12) to twenty (20) ft bgs. The soil will be screened with a PID. If VOCs are field screened above ten (10) ppm, an alternate location will be used.

- Unimpacted groundwater: Four (4) liters of groundwater will be collected from upgradient wells RU-17A or RU-17B (Figure 2). Prior to collecting the required sample volume, each well will be purged according to the procedures established in the OU2/OU3 FSP.

IDW in the form of drill cuttings and purge water generated under this task will be managed according to the procedures discussed in Section 4.0.

2.1.3 Task 3 – Remedy Optimization Testing

During the OU2 remedy implementation in October and November 2022, flow rates from horizontal wells were observed to be significantly less than flow rates anticipated in the OU2 100% RD as prepared by CDM Smith. Furthermore, contractor field personnel observed a white precipitate in the bag filter processing extracted groundwater. Samples of the precipitate were sent to CDM Smith for analysis, who determined that the precipitate was composed of calcium carbonate. The precipitation was believed to form as a result of the elevated pH from the alkaline activation of the persulfate. The formation of the calcium carbonate precipitate is discussed in the OU2 July 1, 2024, *Remedy Implementation and Performance Monitoring Report* as prepared by CECNY. Evonik will conduct remedy optimization testing to evaluate the potential for various persulfate activation methods, including the currently selected alkaline activation, to generate the calcium carbonate precipitate observed during the remedy implementation, and, if necessary, recommend optimal methods based on Site conditions. The remedy optimization testing will be conducted in two phases:

- (1) Precipitation Formation Testing: The first step of the remedy optimization testing will be to recreate the conditions that resulted in the precipitate formation at the Site. This will both confirm that the samples that were received by the laboratory are representative of the formation and allow Evonik to assess if modest modifications may assist in mitigating the observed precipitate formation. This will include quantification of VOCs and cations/anions that potentially contributed to the precipitate formation. In addition, a base buffering capacity test will be performed. The base buffering capacity test quantifies the amount of 25% sodium hydroxide required to maintain a slurry at pH 10.5 for up to seven days for remedy implementation effectiveness. The mass of 25% sodium hydroxide required will be reported after both two and seven days. During this test, the reactors will be observed for precipitate formation. Three (3) kilograms of impacted soil and four (4) liters of impacted groundwater collected as described in Task 2 will be utilized to evaluate precipitate formation.
- (2) Alternative Activation Testing: Additional testing on alternative persulfate activation methods will be performed to potentially optimize the activation of the selected oxidant. The Site has the potential to have elevated cations that precipitate as metal hydroxides between a pH 10 and 12. If this is correct, then alternative activation methods may be more efficient in remedy implementation.

As part of the activation testing, a soil oxidant demand test will be performed to evaluate the consumption of persulfate due to the reaction with non-targeted demanding species (such as naturally occurring organics or reduced metals). The soil oxidant demand test will utilize two (2) kg unimpacted soil and four (4) liters unimpacted groundwater collected under Task 2.

Following the soil oxidant demand test, an activation optimization analysis monitoring the efficacy of two potential alternative activation methods, Klozur® One and an iron chelate activated persulfate, will be conducted using impacted soil and groundwater from OU2. In addition, the current activation method, alkaline activation, will be evaluated alongside the alternatives for comparison purposes. Samples will be collected at seven (7) and twenty eight (28) days to evaluate the efficacy of the activation methods. Approximately six (6) kg of impacted soil and ten (10) liters of impacted groundwater collected as described in Task 2 will be utilized to test the activation method.

The results of the optimization testing are anticipated to be available approximately ninety (90) days after receipt of the bulk soil and groundwater samples.

2.2 Operable Unit 3

2.2.1 Task 5 –Bioaugmentation Network Installation

Fifteen (15) permanent bioaugmentation network points (IP-1 through IP-15) will be installed for the delivery of bioaugmentation culture within the OU3 treatment areas and to allow for as-needed assessments of the microbial population (e.g. DHC CENSUS and functional gene) following bioaugmentation. Arconic is not proposing any additional water quality monitoring points for OU2 or OU3 nor is proposing to use the OU3 bioaugmentation network for water quality monitoring or the injection of amendment. The proposed locations of the bioaugmentation network points are shown on Figure 3. Locations of the bioaugmentation network points have been selected to spatially distribute the bioaugmentation culture across the OU3 Northern Treatment Area. Further, these locations are within the area of elevated constituent concentrations in groundwater (see Figure 3 of the OU3 100% RD Submittal).

The bioaugmentation network points will be installed according to the procedures for temporary piezometers outlined in Section 3.2.4 of the OU3 100% RD (i.e. 1-inch diameter PVC riser with approximately 20 feet of factory-slotted screen), with the exception that the bioaugmentation network points will be made into permanent points with protective flush mount steel covers. The newly installed network points will be surveyed for location and top of casing elevation by a New York-licensed Professional Land Surveyor. IDW in the form of drill cuttings generated under this task will be managed according to the procedures discussed in Section 4.0.

2.2.2 Task 6- Remedy Optimization Investigation

As discussed in the OU3 April 9, 2024, *Remedy Implementation and Performance Monitoring Report* as prepared by CECNY, performance monitoring locations RU-9 and RU-19 exhibited temporal increases in sulfate following the injections in the Southern Treatment Area. Sulfate concentrations also increased at RU-10, RU-16, RU-19, RU-20, and RU-21 in subsequent performance monitoring events. Low sulfate concentrations are desirable but not required for anaerobic dechlorination to occur. Elevated sulfate concentrations can be a competing alternate electron acceptor for microbial respiration and potentially inhibit anaerobic dechlorination. In conjunction with low chemical oxygen demand, elevated sulfate can indicate that additional donor may be required. RU-28 was selected to evaluate if similar trends are occurring following the injections in the Northern Treatment Area. Additional discussion of groundwater trends in OU3 will be included in the forthcoming Performance Monitoring Report. To evaluate potential competing microbial degraders, groundwater samples from OU3 will be analyzed for geochemical parameters. Groundwater samples will be collected from performance monitoring wells RU-9, RU-10, RU-16, RU-19, RU-20, RU-21, and RU-28 as part of a supplemental remedy optimization sampling event.

Prior to collecting the required sample volume, each well will be purged according to the procedures established in the OU2/OU3 FSP. Additional geochemical parameters will be collected for assessing potential geochemical processes that have the potential to give context to remedy implementation optimization. Table 1 presents the groundwater analyte list for this task.

Table 1: OU3 Remedy Optimization Well Analyte List

Matrix	8260C	RSK175	410.4	300.0	353.2	VFAs	6010	4500 S	4500 SiO2C	365.1	2540C	Field Screening	QuantArray-Chlor
RU-9	X	X	X	X	X	X	X	X	X	X	X	X	X
RU-10	X	X	X	X	--	X	X	X	--	--	--	X	--
RU-16	X	X	X	X	--	X	X	X	--	--	--	X	--
RU-19	X	X	X	X	X	X	X	X	X	X	X	X	X
RU-20	X	X	X	X	--	X	X	X	--	--	--	X	--
RU-21	X	X	X	X	X	X	X	X	X	X	X	X	X
RU-28	X	X	X	X	X	X	X	X	X	X	X	X	X

Notes:

8260C = Volatile Organic Compounds - Target Compound List

410.4 = Chemical Oxygen Demand

353.2 = Nitrate/Nitrite

6010 = Dissolved metals, including Arsenic, Barium, Calcium, Chromium, Iron, Magnesium, Manganese, Potassium, and Sodium

4500 S = Total Sulfide

365.1 = Orthophosphate

Field Screening = Dissolved Oxygen, Specific Conductance, pH, Temperature, Oxidation Reduction Potential, Turbidity, Ferrous Iron, Alkalinity, Soluble Sulfide

QuantArray-Chlor = Quantitative polymerase chain reaction analysis for key microorganisms and functional genes.

RSK175 = Dissolved Gases (Methane, Ethane, Ethene)

300.0 = Sulfate, Chloride, Fluoride

VFAs = Volatile Fatty Acids (Acetate, Propionate, Butyrate)

4500 SiO2C = Dissolved Silica

2540C = Total Dissolved Solids

Procedures for field analysis of sulfide, which was not included in the OU2/OU3 FSP, are included as Attachment C. In addition, Microbial Insights, Inc. updated their procedures for collection of microorganism and functional genes samples since the OU2/OU3 FSP was finalized. The updated procedures for microorganism and functional genes samples are included as Attachment D.

The results of the remedy optimization testing are expected to be available approximately 60 days after the collection of the soil and groundwater samples. IDW in the form purge water generated under this task will be managed according to the procedures discussed in Section 4.0.

3.0 Sample Collection

Soil samples collected for OU2 optimization testing (Task 2) will be collected in 8 or 32 ounce jars. As directed by Evonik, the jars will be filled with little to no headspace. Groundwater samples will be collected in 1 liter plastic sample containers. The bottles will be filled to limit the potential for headspace. Soil and groundwater sample containers will be packed on ice and sealed with tape and shipped via a carrier or courier service on the day they are collected if possible. Exceptions to this procedure will be for samples collected after the courier service has picked up the last shipment for the day or if the sampler cannot make the last drop-off time for a mail carrier service. In such cases, the sampler will follow the procedures outlined in the OU2/OU3 FSP: additional ice will be placed in the coolers, and the coolers will be kept in a designated secure area under chain-of-custody procedures until they are shipped or couriered to the laboratory.

Samples for the OU3 remedy optimization will be collected in laboratory supplied jars and shipped to a New York-certified laboratory following the procedures in the OU2/OU3 FSP.

4.0 Investigation-Derived Waste

Soil (drill cuttings) and groundwater (development and purge water) IDW generated during the tasks discussed above will be managed as discussed in the Transportation and Offsite Disposal Plan (TODP) included as Appendix E to both the OU2 and OU3 RAWPs.

5.0 Schedule

Remedy optimization activities for OU2 and OU3 are designed to be completed consecutively. The groundwater sampling for geochemical parameters in OU3 (Task 6) is anticipated to take place on October 28 – 31, 2024. The installation of the OU2 vertical remediation wells, OU3 bioaugmentation network points, and associated soil and groundwater sampling is scheduled to start on January 13, 2025.

Remedy optimization testing by Evonik will require approximately 90 days to complete from the date the bulk soil and groundwater samples are received. The results of the remedy optimization testing will be provided in a letter report along with recommendations for optimization of the OU2 activation method approximately 90 days after receipt of the report from Evonik. The letter report will also include a summary of the vertical remediation well installation.

Ms. Maeve Wurtz, Remedial Project Manager
U.S. Environmental Protection Agency, Region II
Page 11
January 8, 2025

The installation of the bioaugmentation network points will be included in the Remedy Implementation Report for the Northern Treatment Area in OU3. The results of the remedy optimization testing will be provided in a letter report with recommendations and a revised schedule for bioaugmentation of the Northern Treatment Area.

Should you have any questions or concerns, please feel free to contact Robert Prezbindowski or myself.

Sincerely,

A handwritten signature in blue ink, appearing to read "M. Worden", with a stylized flourish at the end.

Michael W. Worden, P.G., Senior Project Manager
Civil & Environmental Consultants, Inc.

for

Robert A. Prezbindowski
Arconic Corporation

Cc: Steve Moeller – NYDEC (email)
Stanley Radon – NYDEC (email)
Andrea Caprio (Skalski) – NYDEC (email)
Michele Dolan – NYDOH (email)
Wendy Kuehner – NYDOH (email)
Pietro Mannino – U.S. EPA, Region II (email)
Michael Scorca – U.S. EPA, Region II (email)
Sharon Kivowitz – U.S. EPA, Region II (email)
Chief, Environmental Enforcement Section – U.S. Department of Justice (email)
Bob Ring – Cattaraugus County Health Department (email)

FIGURES



ALCAS FACILITY
(OU2)

HRW-3/HRW-5

HRW-2

HRW-1/HRW-4/HRW-4R

VW-1

VW-2

RW-1

RW-2

RW-3

RW-4

RW-5

INJ-1

VW-5

VW-4

18M

PARCEL B
(OU3)

LEGEND

- RECOVERY WELLS
- PUBLIC WATER WELL
- PROPOSED VERTICAL REMEDIATION WELL
- EXISTING VERTICAL REMEDIATION WELL
- REMEDiation WELL SAMPLING POINT
- HRW BORING PATH
- HORIZONTAL REMEDIATION WELL
- OPERABLE UNIT BOUNDARY 2
- PARCEL B (OU3)

SCALE IN FEET

0 80 160



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ALCAS SOURCE AREA
OPERABLE UNIT 2
OLEAN, NEW YORK

PROPOSED VERTICAL WELLS

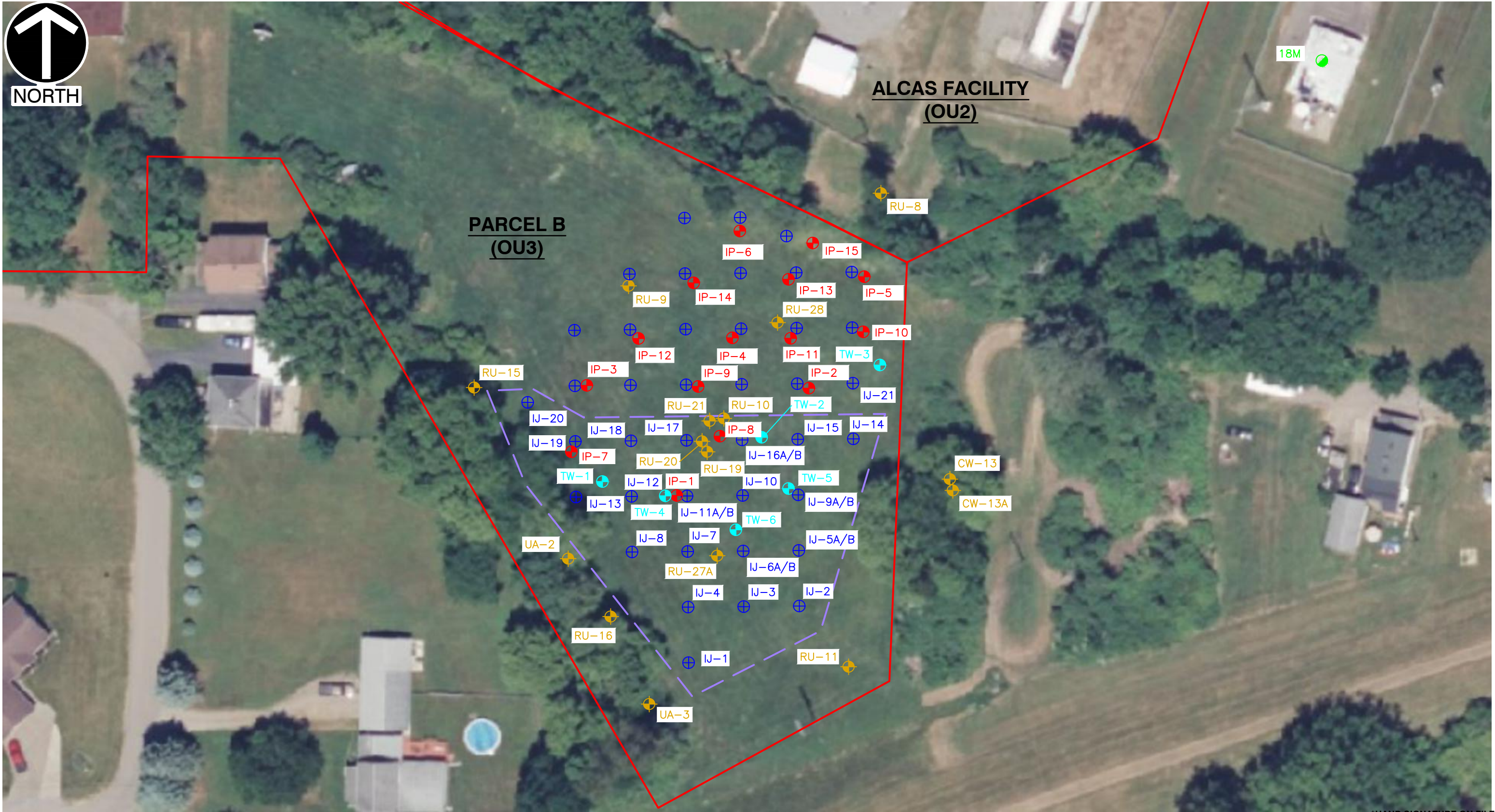
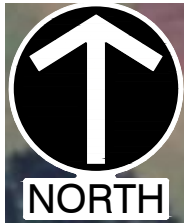
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DATE:	11/22/2024	SCALE:	1"=80'	PROJECT NO:	300-082	1

*Hand Signature on file



IMAGERY SOURCE: ESRI WORLD IMAGERY / ARCGIS MAP SERVICE: HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_IMAGERY. LAST ACCESSED: 10/16/2024	Civil & Environmental Consultants of New York, Inc. 2704 Cherokee Farm Way Suite 101 Knoxville, TN 37920 Ph: 865.977.9997 · 844.828.7979 www.cecinc.com	ALCAS SOURCE AREA OLEAN, NEW YORK	SAMPLE LOCATIONS	
			FIGURE NO: 2	
	DRAWN BY: JS	CHECKED BY: MW	APPROVED BY: TLM	PROJECT NO: 300-082
DATE: October 16, 2024		SCALE: 1" = 100'		

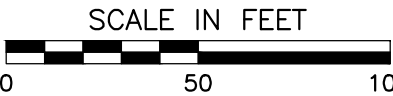
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LEGEND

- | | | | |
|--|-------------------------|--|----------------------------------|
| | OPERABLE UNIT BOUNDARY | | PUBLIC WATER WELL |
| | SOUTHERN TREATMENT AREA | | INJECTION LOCATION |
| | MONITORING WELL | | PROPOSED BIOAUGMENTATION NETWORK |
| | TEMPORARY PIEZOMETER | | |



REFERENCE

AERIAL PHOTOGRAPHY TAKEN FROM GOOGLE EARTH PRO, DATED OCTOBER 4, 2022.



Civil & Environmental
Consultants of New York, Inc.

2704 Cherokee Farm Way
Suite 101
Knoxville, TN 37920
Ph: 865.977.9997
www.cecinc.com

ALCAS SOURCE AREA
OPERABLE UNIT 3
OLEAN, NEW YORK

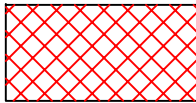
PROPOSED BIOAUGMENTATION NETWORK

DRAWN BY:	DWD	CHECKED BY:	LDC	APPROVED BY:	MWW*	FIGURE NO.:
DATE:	11/22/2024	DWG SCALE:	1"=50'	PROJECT NO:	300-082.0051	3

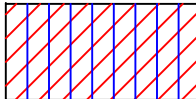
ATTACHMENT A

A-1

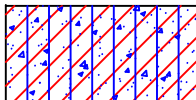
1. PAVEMENT, CONCRETE,
&/OR FILL



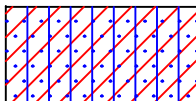
2. SILTY CLAY



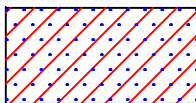
3. SILTY CLAY W/GRAVEL



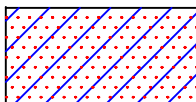
4. SILTY, SANDY CLAY



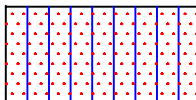
5. SANDY CLAY



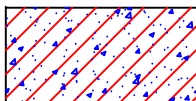
6. CLAYEY SAND



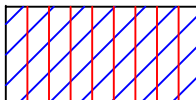
7. SILTY SAND



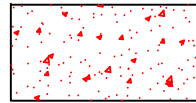
8. CLAY W/GRAVEL



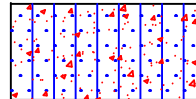
9. CLAYEY SILT



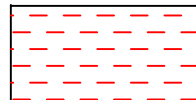
10. GRAVEL



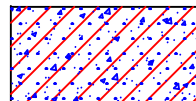
11. GRAVEL W/SAND
& SILT



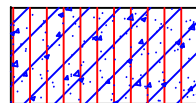
12. SHALE



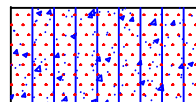
13. SANDY CLAY W/
GRAVEL



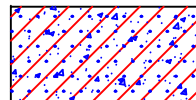
14. CLAYEY SILT W/
GRAVEL



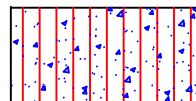
15. SAND W/GRAVEL
& SILT



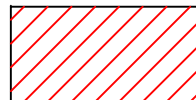
16. CLAY W/GRAVEL
& SAND



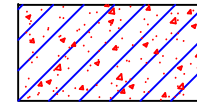
17. SILT W/GRAVEL



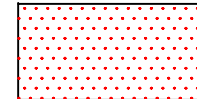
18. CLAY



19. GRAVEL W/CLAY



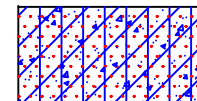
20. SAND



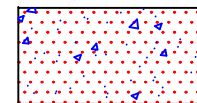
21. SILT



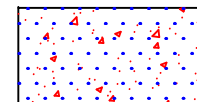
22. SILTY CLAYEY SAND
W/GRAVEL



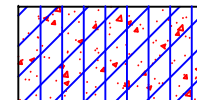
23. SAND W/GRAVEL



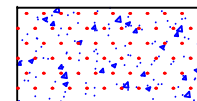
24. GRAVEL W/SAND



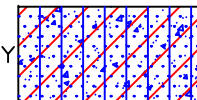
25. SILTY CLAYEY GRAVEL



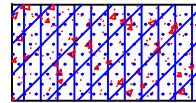
26. GRAVELLY SAND



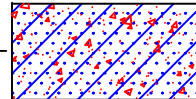
27. SILTY SANDY GRAVELLY
CLAY



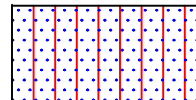
28. SILTY CLAYEY SANDY
GRAVEL



29. CLAYEY SANDY GRAVEL



30. SANDY SILT



NOT TO SCALE

NOTE:
RED INDICATES PREDOMINANT LITHOLOGY.
BLUE INDICATES SECONDARY LITHOLOGY.

ENVIRONEERING, INC.

FIGURE 3
STRATIGRAPHIC COLUMN
DESCRIPTIONS

ALCAS FACILITY
OLEAN, NEW YORK

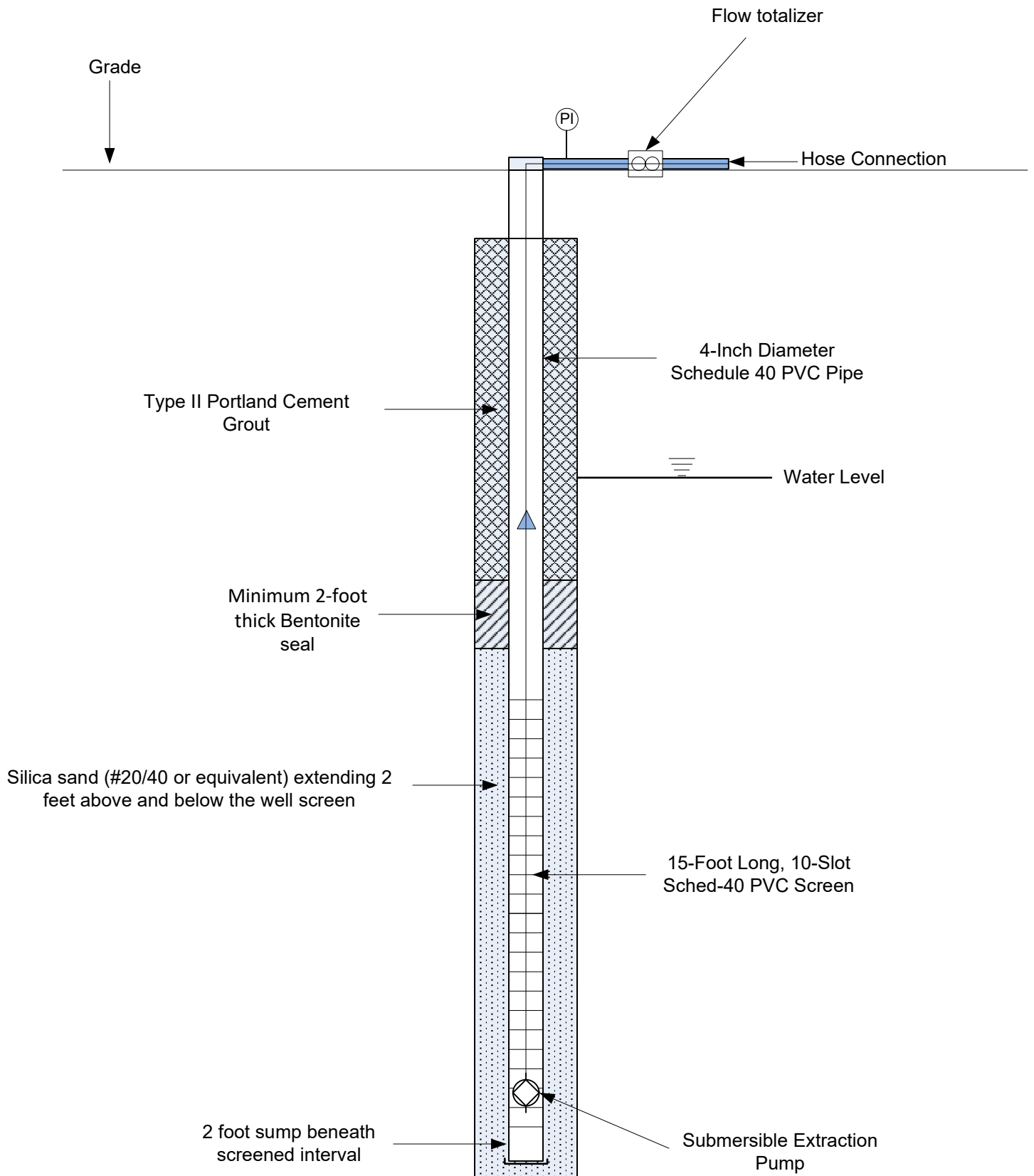
DRAWN BY:

DATE:

PROJ. NO.

137-46

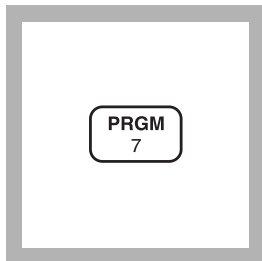
ATTACHMENT B



ATTACHMENT C

SULFIDE (0 to 0.70 mg/L S²⁻)

For water, wastewater and seawater

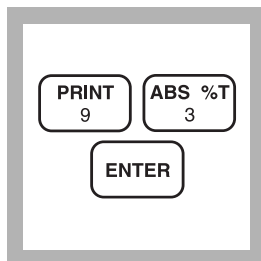
Methylene Blue Method* USEPA accepted for reporting wastewater analysis**

1. Enter the stored program number for sulfide (S).

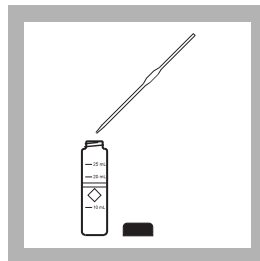
Press: **PRGM**

The display will show:

PRGM ?



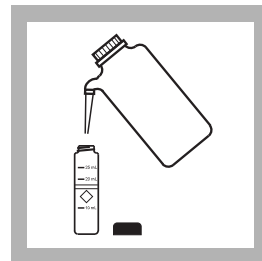
2. Press: **93 ENTER**
The display will show **mg/L, S** and the **ZERO** icon.



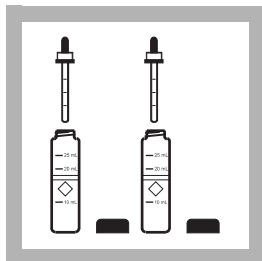
3. Pipet 25 mL of sample into a clean sample cell. This will be the prepared sample.

Note: Samples must be analyzed immediately and cannot be preserved for later analysis. Use a pipet to avoid agitation.

Note: For field testing, a 25-mL graduated cylinder may be used.

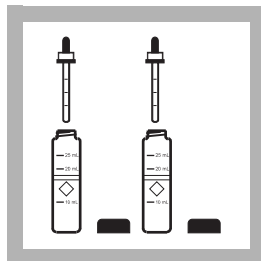


4. Fill a second sample cell with 25 mL of deionized water (the blank).



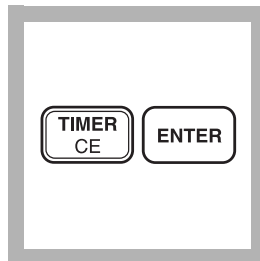
5. Add 1.0 mL of Sulfide 1 Reagent to each cell. Swirl to mix.

Note: Use the calibrated 1-mL dropper.

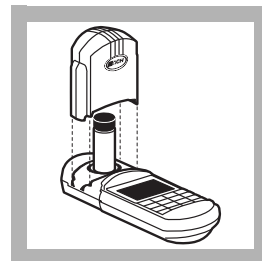


6. Add 1.0 mL of Sulfide 2 Reagent to each cell. Immediately swirl to mix.

Note: A pink color will develop, then the solution will turn blue if sulfide is present.



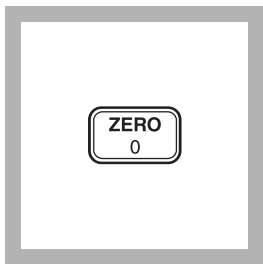
7. Press:
TIMER ENTER
A 5-minute reaction period will begin.



8. Place the blank into the cell holder. Tightly cover the sample cell with the instrument cap.

* Adapted from *Standard Methods for the Examination of Water and Wastewater*.

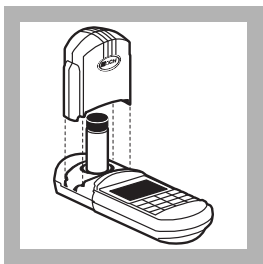
** Procedure is equivalent to USEPA method 376.2 or Standard Method 4500-S²⁻ D for wastewater.



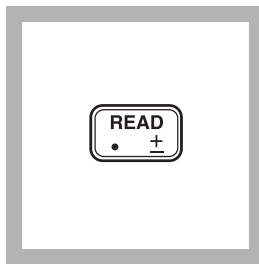
9. Press: ZERO

The cursor will move to the right, then the display will show:

0.00 mg/L S



10. After the timer beeps, place the prepared sample into the cell holder. Tightly cover the sample cell with the instrument cap.



11. Press: READ

The cursor will move to the right, then the result in mg/L sulfide will be displayed.

***Note:** Some sulfide loss may occur if dilution is necessary.*

***Note:** Standard Adjust may be performed using a prepared standard (see Standard Adjust in Section 1).*

Sampling and Storage

Collect samples in clean plastic or glass bottles. Fill completely and cap tightly. Avoid excessive agitation or prolonged exposure to air. Analyze samples immediately.

Accuracy Check

Sulfide standards are unstable and must be user prepared. See Standard Methods, 4500S⁻ for preparation and standardization directions.

Method Performance

Precision

In a single laboratory, using standard solutions of 0.73 mg/L sulfide and two representative lots of reagent with the instrument, a single operator obtained a standard deviation of ± 0.02 mg/L sulfide.

Estimated Detection Limit (EDL)

The EDL for program 93 is 0.01 mg/L S²⁻. For more information on derivation and use of Hach's estimated detection limit, see Section 1.

SULFIDE, continued

Interferences

Interfering Substance	Interference Levels and Treatments
Strong reducing substances (sulfite, thiosulfate and hydrosulfite)	Interfere by reducing the blue color or preventing its development.
Sulfide, high levels	High concentrations of sulfide may inhibit full color development and require sample dilution. Some sulfide loss may occur when the sample is diluted.
Turbidity	For turbid samples, prepare a sulfide-free blank as follows. Use it in place of the deionized water blank in the procedure. 1. Measure 25 mL of sample into a 50-mL erlenmeyer flask. 2. Add Bromine Water dropwise with constant swirling until a permanent yellow color just appears. 3. Add Phenol Solution dropwise until the yellow color just disappears. Use this solution in Step 4 in place of deionized water.

Soluble Sulfides

Determine soluble sulfides by centrifuging the sample in completely filled, capped tubes and analyzing the supernatant. Insoluble sulfides are then estimated by subtracting the soluble sulfide concentration from the total sulfide result.

Summary of Method

Hydrogen sulfide and acid-soluble metal sulfides react with N, N-dimethyl-p-phenylenediamine oxalate to form methylene blue. The intensity of the blue color is proportional to the sulfide concentration. High sulfide levels in oil field waters may be determined after dilution.

Pollution Prevention and Waste Management

Sulfide 2 Reagent contains potassium dichromate. The final solution will contain hexavalent chromium (D007) at a concentration regulated as a hazardous waste by Federal RCRA. See *Section 3* for more information on proper disposal of these materials.

SULFIDE, continued

REQUIRED REAGENTS

	Cat. No.
Sulfide Reagent Set (100 tests).....	22445-00
Includes: (2) 1816-42, (2) 1817-42	

Description	Quantity Required		Units	Cat. No.
	Per Test			
Sulfide 1 Reagent.....	2 mL.....	100 mL	MDB.....	1816-32
Sulfide 2 Reagent.....	2 mL.....	100 mL	MDB.....	1817-32
Water, deionized.....	25 mL.....	4 L		272-56

REQUIRED APPARATUS

Cylinder, graduated, 25 mL	1	each.....	508-40
Pipet, volumetric, Class A, 25.00 mL.....	1	each.....	14515-40
Pipet Filler, safety bulb	1	each.....	14651-00
Sample Cell, 10-20-25 mL, w/ cap	2.....	6/pkg.....	24019-06

OPTIONAL REAGENTS

Description	Units	Cat. No.
Bromine Water, 30 g/L.....	29 mL.....	2211-20
Phenol Solution, 30 g/L	29 mL.....	2112-20
Sodium Sulfide, hydrate	114 g.....	785-14

OPTIONAL APPARATUS

Bottle, Wash, 250 mL	each.....	620-31
Dropper, for 1 oz. bottle.....	each.....	2258-00
Flask, erlenmeyer, 50 mL	each.....	505-41
<i>Standard Methods for the Examination of Water and Wastewater</i>	each.....	22708-00

For Technical Assistance, Price and Ordering

In the U.S.A.—Call 800-227-4224

Outside the U.S.A.—Contact the Hach office or distributor serving you.

ATTACHMENT D

SAMPLING INSTRUCTIONS

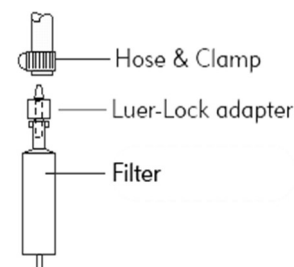
1. Purge the well.
2. Prepare the pump (Peristaltic preferred, Grundfos, or air bladder) as normal. Use the clamp provided to ensure a leak-proof connection.
3. Remove the filter from the Falcon tube.
4. Attach the inlet of the filter with a 1/4" - 5/16" inner diameter (I.D.) tubing using the clamp to secure.
5. Place the filter within a receiving container so that the amount of water filtered can be measured accurately.
6. The amount of water filtered will vary depending upon the turbidity of the water. We recommend filtering 1-2 L.
7. Record the volume of water that passed through the filter, and then submit the filter for analysis. The water may then be discarded. Please cap the filter on both ends. The thinner end should be closed with the red rubber cap and the thicker end should be closed with the clear luer plug.

Note: If the filter clogs before 1L has been filtered, record how much water was passed through the first filter, and then collect an additional filter, also recording the volume of water that went through the second filter. In this case, both filters are then submitted for testing. For each location there should be **no more than 2 filters** used and there is no need to filter more than 2L of water.

Hold time for this analysis is 24-48 hours.

To Submit Sample:

1. Place the filter in the Falcon tube provided.
2. Affix the label to the Falcon tube and note the amount of water that passed through the filter, the well location, sampling date, and the analyses requested.



SHIPPING INSTRUCTIONS

Packaging Samples:

1. Samples should be shipped in a cooler with ice or blue ice for next day delivery. If regular ice is used, the ice should be double bagged.
2. A chain of custody form must be included with each shipment of samples. Access our chain of custody at www.microbe.com

Shipment for Weekday Delivery:

Samples for weekday delivery should be shipped to:

Sample Custodian
Microbial Insights, Inc.
10515 Research Drive
Knoxville, TN 37932
(865) 573-8188

Shipment for Saturday Delivery:

Coolers to be delivered on Saturday **must be shipped via FedEx** to our **FedEx Drop Location** (FedEx will not accept shipments from any other carriers). To ensure proper handling the following steps must be taken:

1. FedEx shipping label should be marked under (6) Special Handling, check Hold Saturday.
2. The cooler must be taped with FedEx SATURDAY tape.
3. The shipping label must be filled out with the Drop Location address below. Our laboratory name must be on the address label.
4. You **MUST notify by email** customerservice@microbe.com with the tracking number of the package on Friday (prior to 4pm Eastern Time) to arrange for Saturday pickup. Please make sure you write "Saturday Delivery" in the subject line of the message. **Without proper labeling and the tracking number, there is no guarantee that the samples will be collected.**

Samples for **Saturday delivery** should be shipped to:

Microbial Insights, Inc.
FedEx Drop Location
10601 Murdock Drive
Knoxville, TN 37932
(865) 573-8188