April 30, 2021

Mr. Todd Caffoe, P.E.
Project Manager
Division of Environmental Remediation
New York State Department of Environmental Conservation
6274 East Avon-Lima Road
Avon, NY 14414

Subject: Draft Remedial Action Work Plan – Horizontal Extraction Well HW-1 Installation, Arch Chemicals, Inc., Site No. 828018a

Dear Mr. Caffoe:

On behalf of Arch Chemicals, Inc., a wholly owned subsidiary of Lonza, MACTEC Engineering & Geology (PC) is pleased to provide this Draft Remedial Action Work Plan for your review for the Arch Chemicals, Inc. site in Rochester, New York.

Sincerely,

MACTEC E & G (PC)

Nelson Breton
Project Manager

encl.
cc : Melissa Doroski, NYSDOH – Albany
Gayle Taylor, Lonza
Warner Golden, Lonza
Joe Flores, Lonza
Francien Trubia, Lonza
Hank Andolsek, MACTEC
Alex Howe, MACTEC

MACTEC E & G PC.
511 Congress Street
Portland, ME 04101

Arch Chemicals, Inc.

Rochester, New York (Site #828018a)

Remedial Action Work Plan

April 2021

DRAFT

REMEDIAL ACTION WORK PLAN
HORIZONTAL EXTRACTION WELL HW-1 INSTALLATION
ARCH CHEMICALS, INC.
SITE NO. 828018a

ARCH CHEMICALS
ROCHESTER PLANT SITE
ROCHESTER, NEW YORK

ARCH CHEMICALS, INC.
(A WHOLLY-OWNED SUBSIDIARY OF LONZA)

APRIL 2021

DRAFT

REMEDIAL ACTION WORK PLAN HORIZONTAL EXTRACTION WELL HW-1 INSTALLATION

ARCH CHEMICALS, INC.
SITE NO. 828018a

Prepared by:

MACTEC E & G (PC), Inc.
Portland, Maine

for:

ARCH CHEMICALS, INC.
(A Wholly-Owned Subsidiary of Lonza)

APRIL 2021

3617207488

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Project Geologist

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

Arch	Arch Chemicals, Inc.
bgs	below ground surface
cm/sec	centimeter(s) per second
FS	Feasibility Study
gpm	gallon(s) per minute
NYSDEC	New York State Department of Environmental Conservation
RAO	Remedial Action Objective
RI	Remedial Investigation
Site	Arch Chemicals, Inc. manufacturing facility in Rochester, NY
SVOC	semi volatile organic compound
VOC	volatile organic compound

1.0 INTRODUCTION

MACTEC E & G (PC) has prepared this Remedial Action Work Plan (RAWP) on behalf of Arch Chemicals, Inc. (Arch – division of Lonza) for the manufacturing facility located in Rochester, New York (the Site). This RAWP details activities related to installation of a single horizontal groundwater extraction well (HW-1) intended to improve mass removal of contaminated groundwater and control migration of contaminated groundwater off-site .

Arch submitted a final Feasibility Study (FS) in 2019 (MACTEC, 2019) to develop and evaluate remedial alternatives intended to protect human health and the environment. This FS addresses both potential human health and environmental exposures to contaminated media and source removal and containment of groundwater. More specifically, remedial action objectives were identified to prevent:

1) Ingestion of groundwater with contaminant levels exceeding drinking water standards,

2) contact with, or inhalation of volatile organic compounds, from contaminated groundwater, and

3) discharge of contaminants to surface water.

Soil remedial and soil vapor remedial action objectives were identified to mitigate impact to public health for soil vapor exposure and to prevent:

1) Ingestion/direct contact with contaminated soil and

2) inhalation of or exposure from contaminants volatilizing from

   contaminants in soil, and

3) migration of contaminants that would result in groundwater or surface water contamination.

Ongoing remedial actions at the Site (groundwater extraction, treatment, and discharge to publicly owned treatment works) in addition to groundwater use limitations and monitoring were identified to be protective of human health and provide a remediation strategy for affected media (groundwater).

Technologies were screened and evaluated in the FS to assess their effectiveness in removing or treating contaminated on-site groundwater in the contaminant source areas and provide protection to off-site receptors. Three alternatives were evaluated and Alternative 2, installation of up to two horizontal groundwater extraction wells, was chosen as the preferred alternative.

This RAWP details activities related to installation of a single horizontal groundwater extraction well (HW-1) for the selected remedial alternative that is intended to improve mass removal of contaminated groundwater and control migration of contaminated groundwater

off-site.

1.2 Site Background

The Site includes a chemical manufacturing plant located at 100 McKee Road, Rochester, Monroe County, New York (**Figure 1**). The plant property occupies approximately 19.5 acres (see **Figure 2**).

The Site has been the subject of various environmental investigations and remediation since the 1980s. A prior Consent Order was executed in August 1993, between Olin Corporation (the former owner) for the implementation of Remedial Investigation (RI) and FS. Arch implemented a portion of the previously recommended remedial alternative in the 2000 FS for the Site after Arch entered into a new Consent Order with the New York State Department of Environmental Conservation (NYSDEC) to implement the requirements of the NYSDEC's Record of Decision in August 2003. The recommended remedial alternative included groundwater extraction and treatment to maintain hydraulic control of groundwater at the property boundary. Groundwater extraction system operations, maintenance, and upgrades have occurred as needed from August 2000 to the present. Extracted groundwater is conveyed by pipeline to a treatment system prior to discharge to the Monroe County Pure Waters Publicly Owned Treatment Works. The recommended remedial alternative also included a provision for installing and operating a downgradient extraction well near the Dolomite Products quarry on Buffalo Road; however, subsequent monitoring and an updated risk evaluation have demonstrated that potential exposure risks at the quarry are below levels of concern. The NYSDEC has indicated that installation of the downgradient extraction well is no longer required (MACTEC, 2005).

In 2019 the NYSDEC issued the Record of Decision for the Site selecting installation of horizontal groundwater extraction wells beneath the site as the preferred alternative (NYSDEC, 2019). The 2019 FS, the supporting document for the record of decision, evaluated the installation of up to two horizontal groundwater extraction wells to improve groundwater capture at the western property boundary and to increase contaminant mass removal rates. The use of horizontal extraction wells as part of an expanded network of groundwater extraction wells is intended to accelerate the removal and treatment of remaining groundwater contamination.

2.0 SITE PHYSICAL SETTING

The physical characteristics especially relevant to remediation of the contamination source area are presented in this section.

2.1 Geology

Glacially deposited sands and silty sands constitute local surface geology. Local fill, interpreted as recompacted glacial sediments, covers the sand and silty sands. This plan refers to the undisturbed sediment and fill as overburden. Overburden thickness ranges

from approximately 10 to 20 feet.

Lockport Dolomite bedrock underlies the overburden. The bedrock surface elevation ranges from approximately 520 to 530 feet above mean sea level. A fractured upper bedrock zone ranges in thickness from 11 to 40 feet (or 27 to 54 feet below ground surface [bgs]). Fractures within the upper zone appear to be primarily near-horizontal. Below the upper zone, the bedrock becomes less fractured and more competent.

2.2 Hydrogeology

Groundwater flow occurs primarily in the saturated portions of the overburden and the uppermost 10 feet of bedrock. No significant barrier to flow between the overburden and the upper bedrock has been identified. However, the degree of hydraulic communication between the overburden and bedrock units varies locally due in large part to heterogeneities in the shallow bedrock.

The groundwater table in the overburden is generally less than 10 feet bgs throughout the property. Overburden groundwater exists beneath the site but is absent in areas west and southwest of the site in the direction of the Erie Barge Canal. The presence of a drainage area along the railroad right-of-way just east of the Arch site serves as a significant recharge area for groundwater that results in a mound along the eastern property boundary. This is the primary feature that controls overburden and bedrock groundwater flow at the Site. Other factors that influence flow include bedrock surface topography, the location of the canal, the nature and distribution of water-bearing fractures, and flow direction in bedrock.

Historical piezometric contours indicate that overburden groundwater flows primarily west and south from the plant toward the Erie Barge Canal and Buffalo Road. An easterly and southeasterly flow component is also present along the east and the southeast corner of the site. Groundwater in shallow and deeper bedrock flows primarily west and south toward the Dolomite Products Quarry in the Town of Gates. Groundwater discharges into the quarry along vertical bedrock seepage faces. The driving force for groundwater appears to be ongoing dewatering in the quarry.

Historical overburden piezometric contours suggest a southerly horizontal component of flow near the southern boundary of the plant. However, when compared to shallow bedrock piezometric contours, the data also indicate a strong downward vertical gradient beneath the plant, suggesting a downward flow path for overburden groundwater.

Hydraulic conductivity estimates calculated from the Phase I RI for the water bearing zones range as follows:

- Overburden: 1.9×10^{-5} to 7.7×10^{-3} centimeters per second (cm/sec)
- Shallow bedrock: 4.0×10^{-5} to 1.17×10^{-2} cm/sec
- Deeper bedrock: 1×10^{-6} to 2.4×10^{-4} cm/sec.

While the overburden and shallow bedrock ranges are similar, experience with pumping well operations at this site over the past 25 to 30 years indicates that the transmissivity of the shallow bedrock is noticeably greater than the saturated overburden zone.

3.0 NATURE AND EXTENT OF CONTAMINATION

This section summarizes information in the FS on the nature and extent of on-site groundwater contamination.

On-site Groundwater

Semi volatile organic compounds (SVOCs) (mainly chloropyridines), volatile organic compounds (VOCs), and inorganic analytes were detected in overburden and bedrock groundwater beneath the Site. Chloropyridines were the most frequently detected organic chemicals in both overburden and bedrock groundwater. The distribution of chloropyridines is believed to represent the greatest extent of site-derived constituents in the groundwater. Further references in this plan on the extent of SVOCs will simply refer to the extent of the chloropyridines.

Figures 3 and 4 show the extent of primary VOCs and chloropyridines in groundwater for the May 2018 sampling event (Arch, 2018).

In general, maximum chloropyridine and VOC concentrations are near the main plant building in both overburden and shallow bedrock wells. Elevated concentrations for these constituents also occur along the west side of the site due in part to extraction well pumping intended to limit off-site migration. Historically, total chloropyridine concentrations are lower in deeper bedrock wells on or near the Arch facility than in adjacent shallow bedrock wells.

4.0 REMEDIAL ACTION OBJECTIVES

This subsection identifies the extent of contaminated media to which the Remedial Action Objectives (RAOs) addressed by the installation of the well will apply. Due to lower VOC concentrations off site (See Figure 3), the extraction HW-1 will be installed to focus on the areas on site having the highest chloropyridine concentrations (e.g., in the Well B-17 Area and other nearby wells on site). This area is generally inside the 10,000 microgram per liter concentration contour line as measured in Spring 2018 and shown on Figure 4.

The vertical extent of groundwater contamination for both VOCs and chloropyridines extends throughout saturated zone in overburden and into bedrock. The placement of the horizontal extraction well is intended to target the first five to ten feet of underlying bedrock. The significant fracturing of this upper zone of weathered bedrock is expected to be more transmissive than the overburden and deeper bedrock.

5.0 SCOPE OF WORK

The following section describes the scope of work for completion of the horizontal

groundwater extraction well capable of achieving the RAOs for the contaminated groundwater.

5.1 Preconstruction meeting and Site Preparation

A preconstruction meeting will be held during the drill mobilization phase with Arch representatives to review the scope of work for well installation activites. This will include a safety review of utility clearances.

Prior to the start of horizontal drilling onsite monitoring wells PW10, BR-2, BR-2A, C-2, and C-2A will be abandoned in place. These wells are in close proximity to the proposed horizontal well and could be conduits for drilling mud loss during drilling. The locations of existing onsite wells relative to the proposed horizontal well location are presented on **Figure 2**.

5.2 Drilling Mobilization and Drilling

The drilling rig and primary support equipment for this project will consist of two key units: the directional drill and a mud recycling and supply system.

The well proposed is of double-ended configuration. The drill will be set up at the entry end of the well, using a small entry pit for access. The biopolymer mud system will be situated nearby, with watertight roll-off boxes for the waste cuttings and/or slurry that flows from the recycler positioned beneath the cuttings discharge chute. This setup will be used for drilling the pilot bore and installing the well materials.

Based on information provided by MACTEC's subcontractor, Ellingson DTD, an American Augers DD10 or similar track-mounted drill rig will be used. The DD10 is a rig with 100,000 pounds of thrust/pullback and 14,000 foot-pounds of torque.

Navigation will be performed with a wireline steering tool. A wireline steering tool transmits navigation information from the drilling assembly back to the surface via a wireline strung through the drill string. The wireline data streams directly to the steering technician's and the drill operator's workstations, where steering corrections can be performed.

The drill rig is supplied with drilling mud from a mud recycling system to reduce the amount of drilling fluid that must be disposed. The mud recycler will have the capacity to reuse drilling mud and remove drill cuttings, mixes, and also conditions the drill mud for reuse. The mud recycler system is set up to minimize crew contact with the recycled drilling mud and can be cleaned after the project has been completed.

At completion of the project the drilling area will be restored to a condition as near to pre-work conditions as possible. Restoration will include grading and filling in pit excavations and installing a temporary steel access vault for use in accessing the well for pumping tests.

5.3 Horizontal Groundwater Extraction Well Installation

Figure 5 shows the proposed path for the horizontal groundwater extraction well with approximate zone for the well screen placement. The horizontal well would extract groundwater from beneath the Arch facility and directly target the suspected chloropyridine source area. The well would be oriented approximately east-west to improve contaminant mass removal by targeting areas of higher chloropyridine concentrations generally found in the rear of the main operating facility building near monitoring well B-17 and In the vicinity of other wells nearby also with historically elevated chloropyridine and VOC concentrations.

The 600-foot length well will consist of a 6-inch diameter with 0.02 inch-slotted stainless-steel screen that is 300 to 400 feet in length with blank risers on either end. The well screen will be installed approximately 3 to 5 feet below the top of bedrock. The depth to bedrock along the proposed borehole ranges from approximately 12 to 19 feet bgs as shown on **Figure 5**. The target depth for the well screen will range from approximately 15 to 24 feet bgs, based on location. The drilling will commence from the west side of facility with the exit point east of the facility. This approach may be altered but is assumed for planning purposes. The entry and exit locations were selected based on the well screen target zone, depth of foundations, and space needed for drill rig set up, well riser and screen assembly, and long-term maintenance. For planning purposes, it's assumed that the stainless-steel well screen and casing will be pulled through the exit point from east-to-west.

5.4 Well Development

After the well has been installed, the well will be developed via flushing, jetting and pumping to remove drilling mud and fine sediment from the surrounding well bore. The flushing process clears out the bulk of the residual mud and cuttings, and clears the return water significantly. Clean city water will be used to flush approximately 1-2 volumes of the bore (not the casing volume) within the screened interval. After the initial flush of water, a pH-adjusting and fluid-breaking solution is jetted into the well. The fluid-breaking chemical is a catalyst that speeds the breakdown of the chemical bonds in the long-chain polymers comprising the drilling fluid. Jetting using clean water is then conducted to remove soil or mud that may be stuck in the screen. Following jetting, the well will be pumped using a submersible pump.

Development will continue for approximately 8 hours and will terminate when the water clarity, as measured with a nephelometer, does not improve when measured repeatedly at 30-minute intervals. The water and solids removed from the well will be containerized in on-site frac tanks for chemical testing and eventual treatment though the facility treatment system. Arch will communicate with Monroe County Pure Waters to determine for added requirements before groundwater is treated and discharged. Solids collected in the frac tanks will be characterized, drummed, and shipped off-site to the appropriate disposal facility. Wood will coordinate with subcontractors to clear solids from frac tanks or totes as needed.

5.5 Pumping Tests

Following well development, multiple pumping tests will be conducted on the horizontal well to:

- test hydraulic performance of horizontal extraction well;
- determine capture zone;
- assess effectiveness of contaminant removal; and
- evaluate pump types/setup.

One week prior to conducting the tests, a synoptic round of water level measurements will be collected while the vertical extraction wells are pumping. The wells to be included are a combination of shallow and bedrock wells and are shown on Figure 2 and listed on Table 1. At that time, transducers equipped with data loggers will be deployed in ten of the wells (see Figure 2/Table 1). The data loggers will be set up to record in linear mode with measurements collected every hour. The flow rate of the vertical extraction wells will be recorded at the time of well gauging. The vertical extraction wells will be shut off at least five days prior to the start of the horizontal well testing. One day prior to conducting the tests, a synoptic round of water level measurements will be collected.

Variable Rate Test. The testing will commence with a variable rate (step) test using a submersible pump to determine the optimum rate for conducting the longer-term constant rate pumping test and to evaluate whether use of a suction-type pump is viable for groundwater extraction. The target rates are 30, 40, 50, 60 gallons per minute (gpm). The step test will proceed in the following manner:

1) Prior to the start of the test, conduct a synoptic round of water level measurements and set the data loggers to record in linear mode recording measurements every 2 minutes.
2) Using a submersible pump, begin conducting the first variable rate test (30 gpm). Each rate will be pumped for 90 minutes. It is anticipated that if each rate is successfully pumped for 90 minute 16,200 gallons of water will be extracted and discharged to the 20,000-gallon frac tank. Monitoring flow will be performed with an in-line flow meter.
3) Manually measure depth to water (DTW) in the wells with data loggers deployed on a 15-minute basis to monitor drawdown to ensure that cavitation of the pump in the horizontal extraction well does not occur.
4) If after 90 minutes of pumping at 30 gpm cavitation does not occur, increase the rate to 40 gpm and begin the next 90-minute cycle of water level gauging.
5) Repeat the cycle until the end of the test (i.e., 60 gpm) or until cavitation is imminent given the approximate screen depth of the horizontal well.
6) End test. Test water discharged to frac tank and process water through Arch Chemical's treatment system.
7) Download data loggers and evaluate the flow vs drawdown data and determine the optimum rate for the constant rate test.
8) Determine whether the maximum drawdown observed exceeded the lifting capacity of a suction pump.

9) Continue monitoring with transducers but reduce recording interval to once per hour for evaluation of antecedent trend prior to long-term test.

Constant Rate Test Part 1. The constant rate pumping test will commence no sooner than one week following completion of the step test. The rate for the constant rate test will be 80% of the maximum rate that can be pumped without dewatering/cavitating the horizontal well screen. In the event the facility's treatment system cannot process as much water that can be pumped from the well, the flow rate for the test will be limited to the through put of the treatment system. The constant rate test will proceed in the following manner:

1) Complete manual round of WL measurements prior to commencement of test. Re-program data loggers to record on shorter (15-minute) time format.
2) Begin test at target flow rate. Depending on the clarity of water at the end of the step test, water may be discharged to a settling tank prior to discharging to a frac tank. Bag filters may also be necessary prior to discharging to Arch Chemical's treatment facility. Extracted water will be discharged to Arch Chemical's treatment system at the rate it is extracted from the horizontal well.
3) Monitor flow and DTW in select wells on 30-minute intervals, plotting graphs of time vs drawdown as data is collected. After 4 hours of operation, reduce manual WL measurements to 60 minutes
4) Continue test while monitoring for dewatering that could result in pump cavitation. Adjust (reduce) rate as needed.
5) After twelve hours of pumping, reduced manual measurements intervals to 120 minutes.
6) Replace bag filters as needed. Reduce flow as needed (due to potential fracture dewatering).
7) Continue test for 96 hours unless plot of DTW vs time data suggests that aquifer is not approaching equilibrium. If plots suggest aquifer is not approaching equilibrium, continue test for an additional 24 hours.
8) Shut off test and permit data loggers to continue running.
9) Make sure all data is plotted on time-series graphs, determine whether water levels at end of test are suitable for use of a suction type pump.

Constant Rate Test Part 2. If the previous drawdown data indicate that use of a suction-type pump (e.g., centrifugal or peristaltic pump) is feasible for extracting groundwater at the targeted rates, a second short-term test will be conducted using a centrifugal pump. The use of an industrial peristaltic pump is preferred for an extraction pump because the extracted water does not have contact with the pump thus minimizing operation and maintenance activities typically associated with submersible pumps used at the site. Unlike the submersible pump which has a small area of intake directly across from the pump's impellors, a perforated suction hose will be used with the centrifugal pump allowing an intake area to be as long as the well screen. The constant rate test using the centrifugal pump will proceed in the following manner:

1) Complete manual round of WL measurements prior to commencement of test. Re-start the data loggers for the new test and continue recording data on a 15-minute time interval.

2) Install perforated "stinger" in the well the full length of the well screen (e.g., HDPE tubing with ½" hole drilled throughout). Attach stinger to centrifugal pump.
3) Begin test at target flow rate. Discharge water to the frac tank prior to discharging to Arch Chemical's treatment facility.
4) Monitor flow and measure water levels in wells with data loggers at 30-minute intervals, plotting graphs of time vs drawdown as data is collected. After 4 hours of operation, reduce manual WL measurements to 60 minutes
5) Continue test while monitoring for dewatering that could result in pump cavitation. Adjust (reduce) rate as needed.
6) After twelve hours of pumping, reduced manual measurements intervals to 120 minutes.
7) Continue test for 24 hours.
8) Shut off test and permit data loggers to continue running 24 hours.
9) Plot data (drawdown vs time) and compare to first 24 hours of submersible pump pumping test.
10) Evaluate data and determine which pump is more effective at capture for the same flow rate.

Once testing is complete, the vertical extraction wells will be turned back on.

6.0 TEMPORARY CONTROLS AND IDW MANAGEMENT

Drilling equipment will be placed on containment pads consisting of plastic sheeting with berms, and secondary containment berms and wattles/silt fences will be installed to limit mud and/or rain from flowing off drill pad.

All investigation derived waste (IDW) will be characterized and managed by Arch for onsite treatment or offsite disposal. Water generated from development and the pumping tests will be processed through the Arch Chemical's treatment system. Soils generated during drill mobilization and vault construction will be containerized in roll offs or drums, characterized and disposed of accordingly.

7.0 VIBRATION MONITORING

Continuous vibration monitoring will be conducted on sensitive structures to assess drilling-related vibrations to the extent feasible. A minimum of three seismographs will be utilized on each structure to monitor vibration levels during drilling. The seismographs will be installed in locations approved by Arch and in consultation with MACTEC. Following installation daily monitoring will be performed. During all phases of the project the seismographs will be monitored each hour of the day by a field technician onsite. At the beginning of the project baseline data will be evaluated in order to determine appropriate threshold levels to set for project-related disturbances. Daily reports will be completed to include the following information:

- Location, duration, number, and depth of intrusion

- Weather conditions
- Strip charts of peak particle velocity and vibration-frequency
- Results of the vibration monitoring

8.0 HEALTH AND SAFETY AND AIR MONITORING

Workers entering the Site will be trained in accordance with 29 CFR 1910.120 Occupational Safety and Health Standards, Hazardous Waste Operations and Emergency Response requirements. A project-specific health and safety plan will be developed for the work and will document the successful completion of the required trainings and medical clearance for each worker.

In addition to air monitoring that will be conducted following the project-specific health and safety plan, community air monitoring will also be completed. Monitoring will be conducted during drilling and well development activities for fugitive dust and VOCs. This monitoring will be conducted as required by the New York State Department of Health and follow Appendix 1A of DER-10 (NYSDEC, 2010). The community air monitoring plan is provided in Appendix A.

9.0 REFERENCES

Arch Chemicals, Inc., 2018. Surface Water and Groundwater Monitoring Program Spring 2018 Monitoring Report. Prepared by Wood Environment & Infrastructure Solutions, Inc., for Arch Chemicals, Inc. August 2018.

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New York State Department of Environmental Conservation (NYSDEC), 2010. DER-10, Technical Guidance for Site Investigation and Remediation. May 2010.

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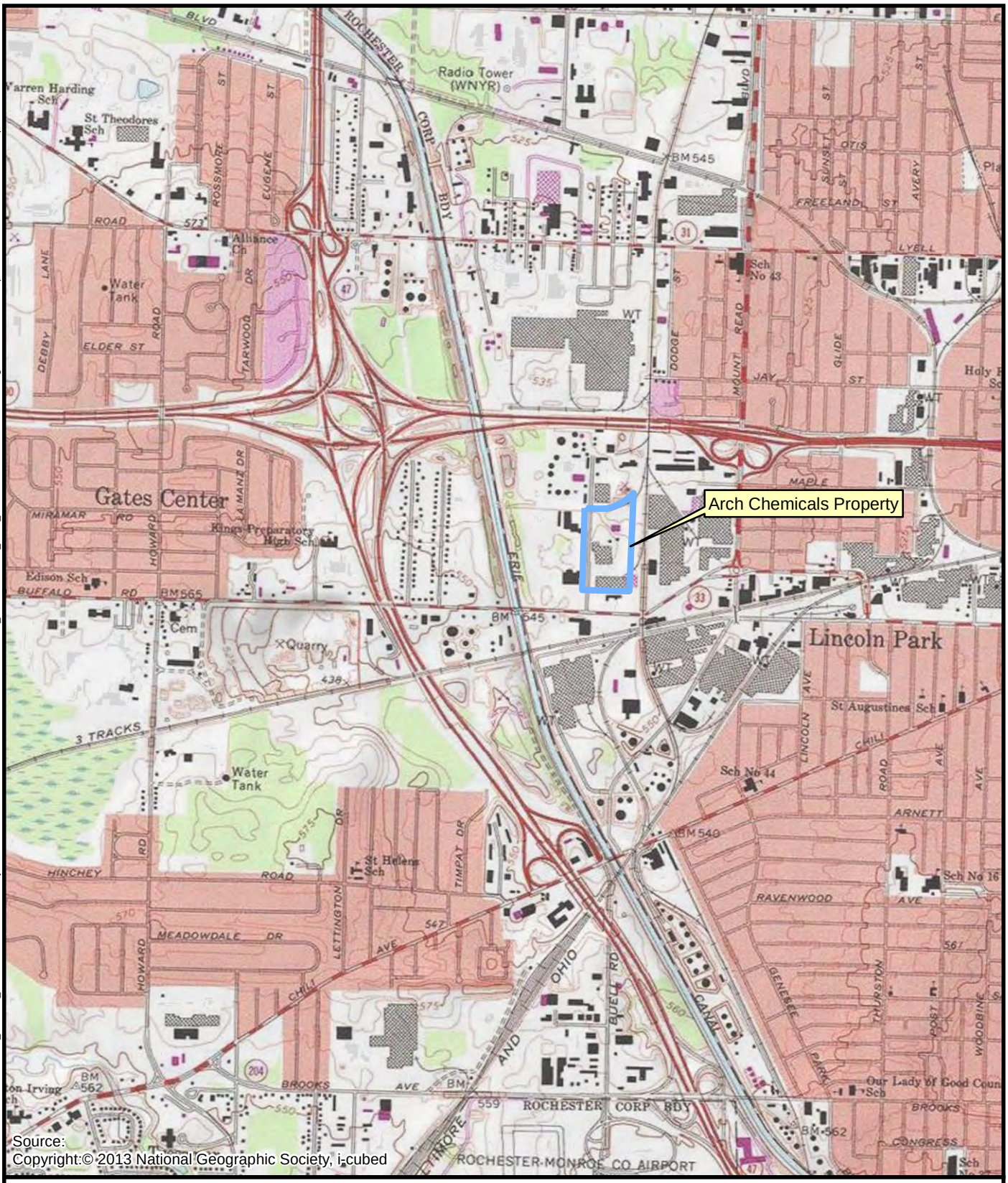
FIGURES



Legend

Arch Property Boundary

0 1,000 2,000 Feet

N

MACTEC

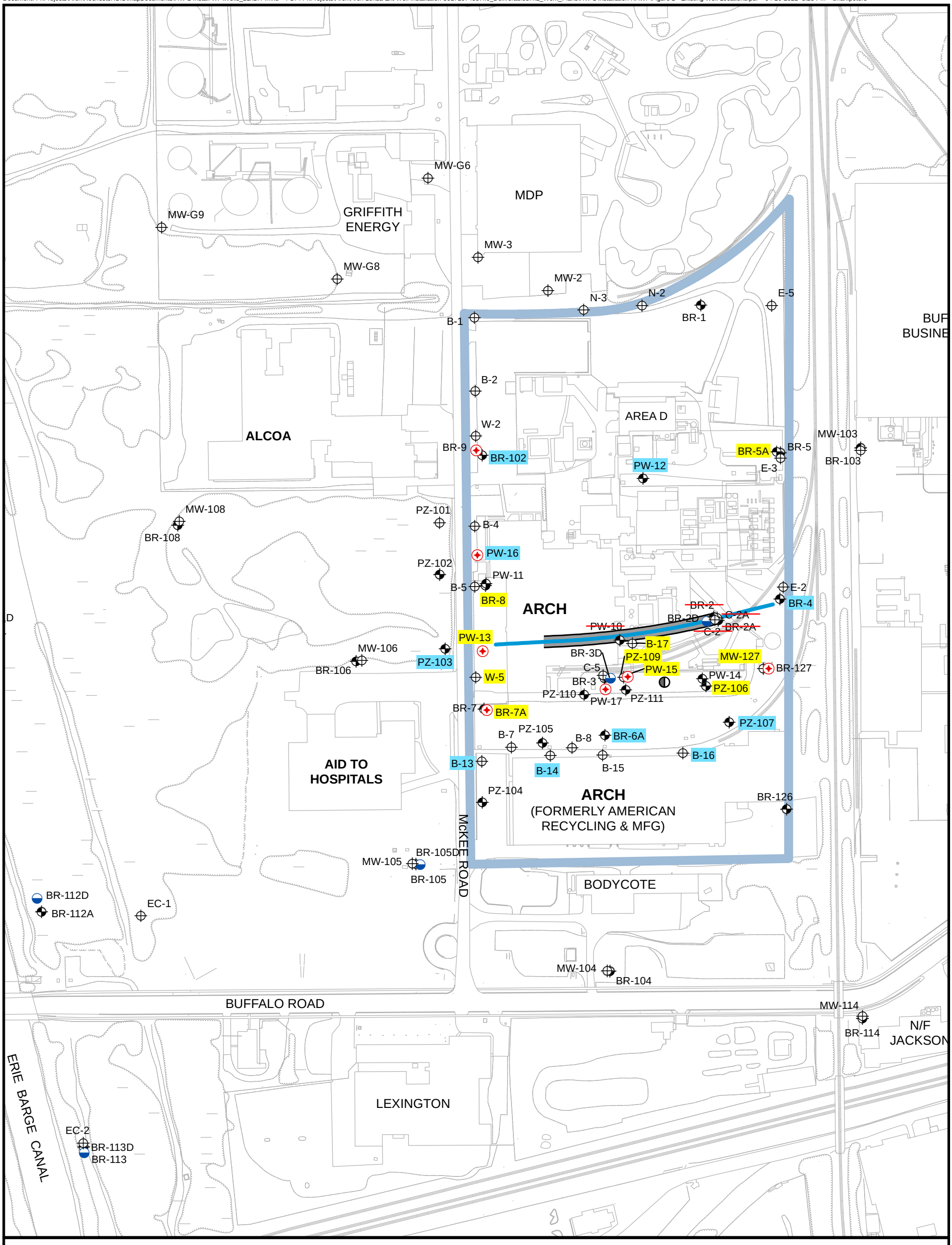
Prepared/Date: BRP 04-20-21 | Checked/Date: NMB 04-20-21

Figure 1
Site Location

Arch Chemicals
Rochester, New York

Document: P:\Projects\Arch\Rochester\GIS\MapDocuments\HW-1 Install WP\Site_Location_8.5x11P.mxd PDF: P:\Projects\Arch\Arch Lonza-Ext Well Installation-36172074881\4.0_Deliverables\4.2_Work_Plans\HW-1 Installation RAWP\Figure 1 - Site Location.pdf 04-20-2021 8:39 AM brian.peters

Document: P:\Projects\Arch\Rochester\GIS\MapDocuments\HW-1 Install WP\Wells_11x17P.mxd PDF: P:\Projects\Arch\Arch Lonza-Ext Well Installation-3617207488\4.0_Deliverables\4.2_Work_Plans\HW-1 Installation RAWP\Figure 2 - Existing Well Locations.pdf 04-20-2021 3:23 PM brian.peters



Note: Red line strike-through of label indicates well abandoned April 2021.

0 100 200 Feet

N

Legend

- Carbon Treatment Sample Location
- Active Pumping Well
- Overburden Monitoring Well
- Bedrock Monitoring Well
- Deep Bedrock Monitoring Well
- BR-5A — Well with transducer for pumping tests
- BR-6A — Well to be measured periodically using water level meter for pumping tests
- Proposed HDD Borehole and Well
- Approximate Well Screen Placement
- Property Owned by Lonza

Figure 2
Existing Well Locations

Arch Chemicals
Rochester, NY

MACTEC

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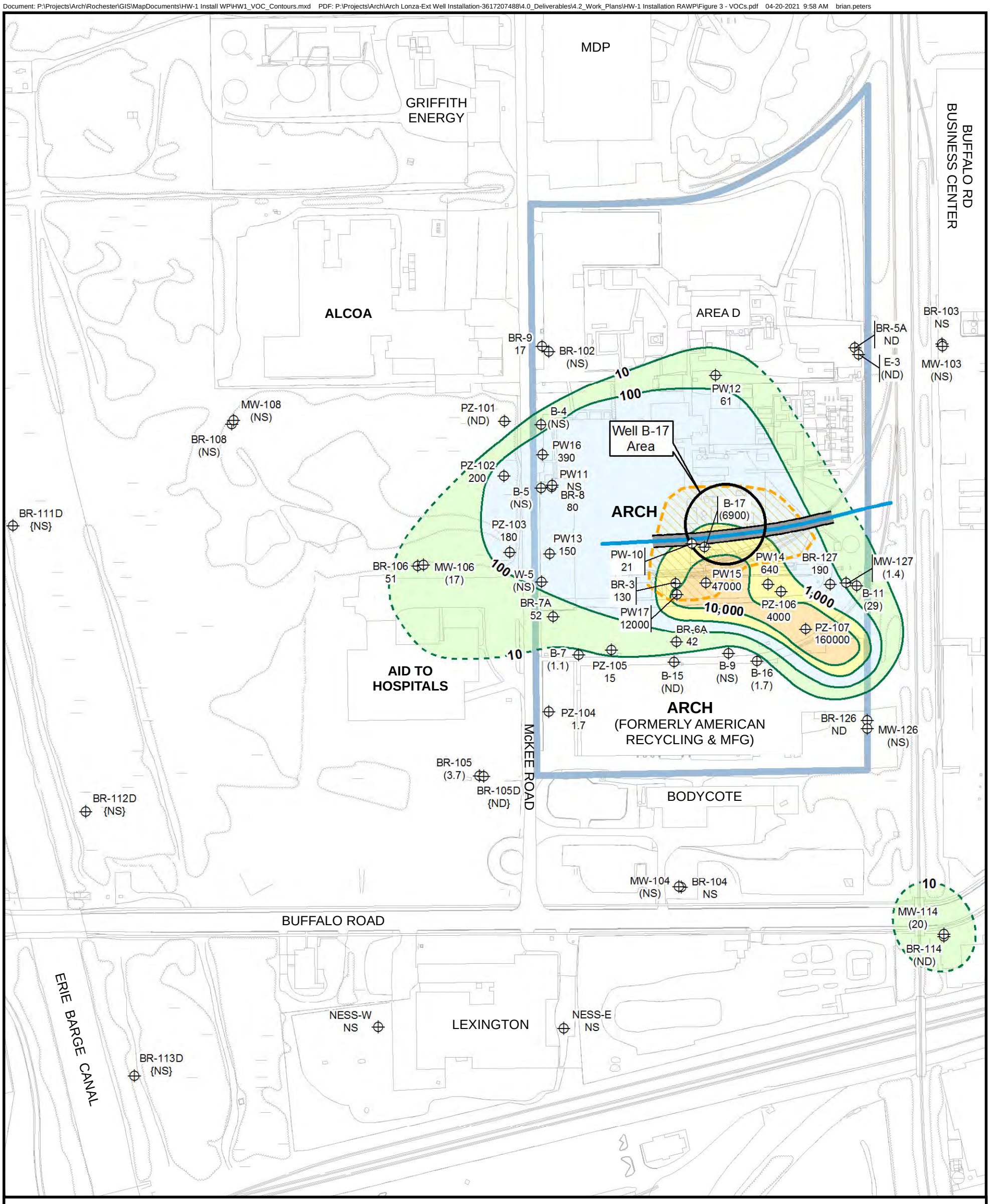


Legend

- B-17 (6900) — Monitoring Location with Concentration
- 100 — VOC Concentration Contour
- Outline of Arch Property Boundary
- {1000} Deep Bedrock Well
- (1000) Overburden Well
- 1000 Bedrock Well
- NS Not Sampled
- ND Not Detected
- Planned HW-1 Well Location
- Approximate Well Screen Placement
- Approximate Source Area

0 100 200 Feet

N

MACTEC

NOTES:

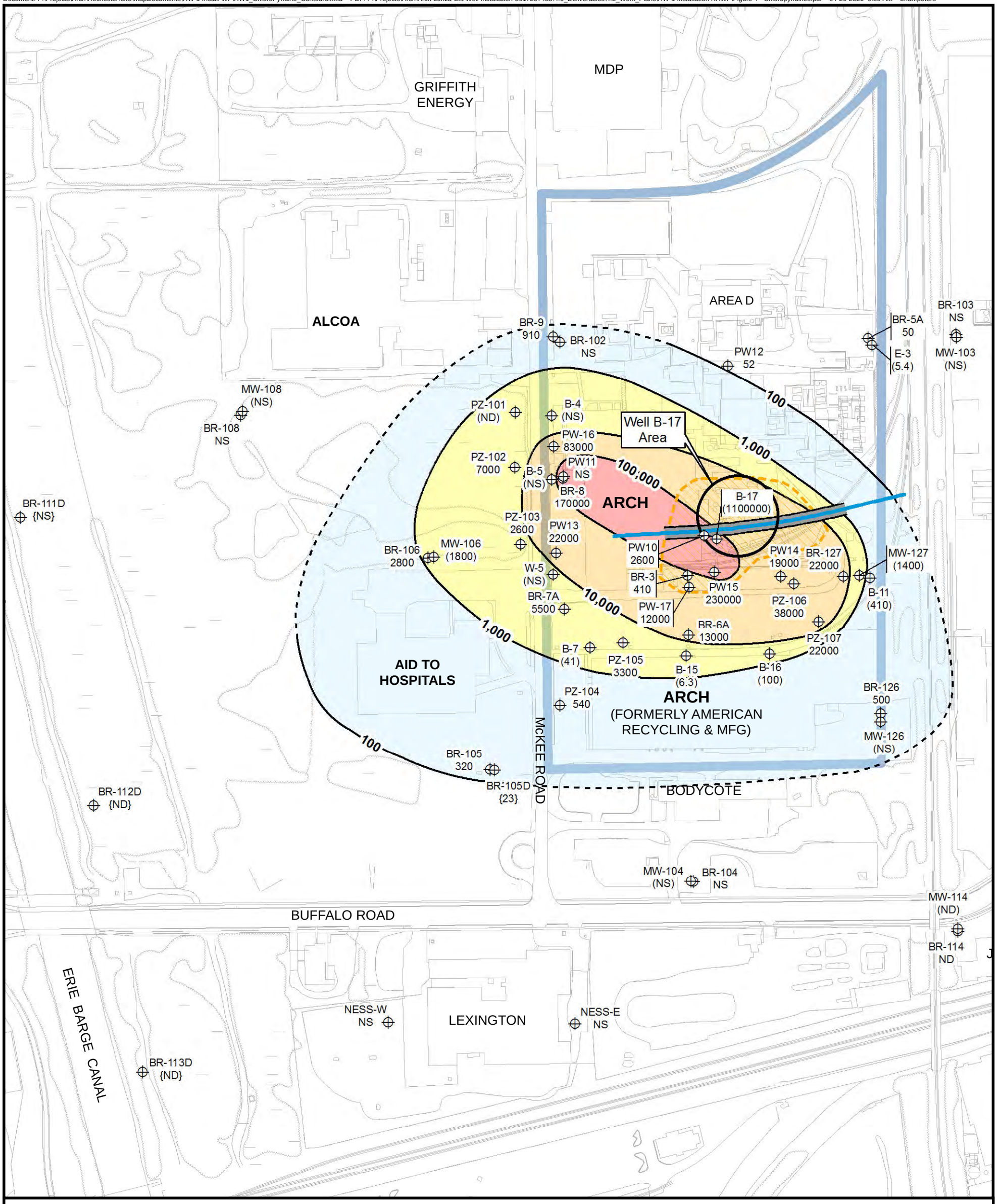
1. Samples Collected May 9-16, 2018
2. Original Select VOCs consist of Carbon tetrachloride, Methylene chloride Chloroform, TCE, PCE, and Chlorobenzene.
3. Concentration contours represented for Bedrock Wells and selected Overburden and Deep Bedrock Wells.
4. Dashed concentration contours represent inferences from historical analytical results.
5. Concentrations are in µg/L

Prepared/Date: BRP 04-20-21	Checked/Date: NMB 04-20-21

Figure 3
Spring 2018
Selected Volatile Organic Compound Concentration Contours

Arch Chemicals
Rochester, NY

Document: P:\Projects\Arch\Rochester\GIS\MapDocuments\HW-1 Install WP\HW1_ChloroPyridine_Contours.mxd PDF: P:\Projects\Arch\Arch Lonza-Ext Well Installation-3617207488\4.0_Deliverables\4.2_Work_Plans\HW-1 Installation RAWP\Figure 4 - Chloropyridines.pdf 04-20-2021 9:59 AM brian.peters



Legend

MW-106 (22000) — Monitoring Location with Concentration

Outline of Arch Property Boundary

100 — Chloropyridine Concentration Contour

Planned HW-1 Well Location

Approximate Well Screen Placement

Approximate Source Area

{1000} Deep Bedrock Well
(1000) Overburden Well
1000 Bedrock Well
NS Not Sampled
ND Not Detected

0 100 200 Feet

N

MACTEC

NOTES:

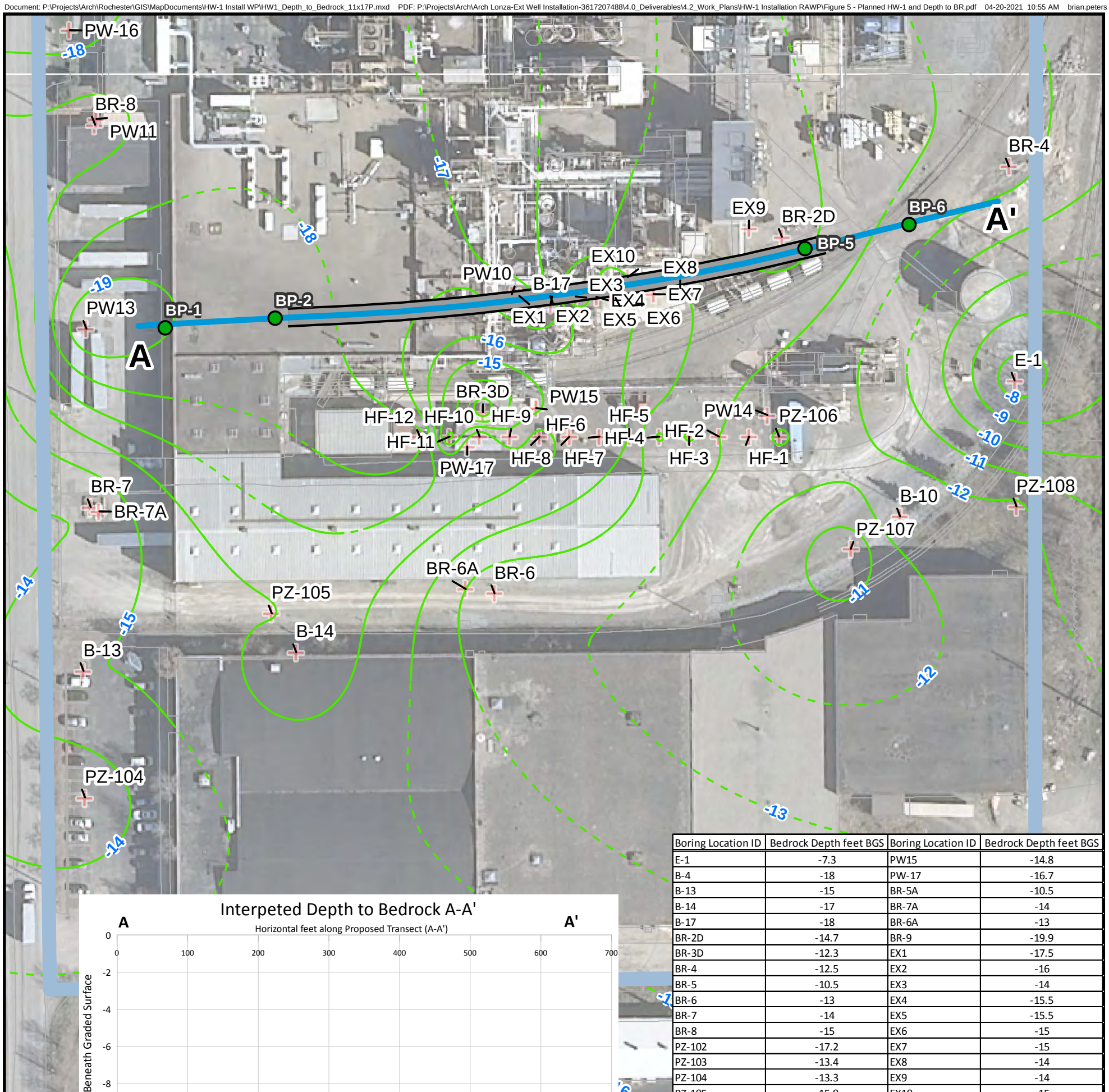
1. Samples Collected May 9-16, 2018
2. Selected chloropyridines consist of 2,6-dichloropyridine, 2-chloropyridine, 3-chloropyridine, 4-chloropyridine, and P-fluoroaniline.
3. Concentration contours represented for Bedrock Wells and selected Overburden and Deep Bedrock Wells.
4. Dashed concentration contours represent inferences from historical analytical results.
5. Concentrations are in µg/L.

Prepared/Date: BRP 04-20-21	Checked/Date: NMB 04-20-21

Figure 4
Spring 2018
Selected Chloropyridine Concentration Contours

Arch Chemicals
Rochester, NY

Document: P:\Projects\Arch\Rochester\GIS\MapDocuments\HW-1 Install WP\HW1_Depth_to_Bedrock_11x17P.mxd PDF: P:\Projects\Arch\Arch Lonza-Ext Well Installation-3617207488\4.0_Deliverables\4.2_Work_Plans\HW-1 Installation RAWP\Figure 5 - Planned HW-1 and Depth to BR.pdf 04-20-2021 10:55 AM brian.peters



Boring Location ID	Bedrock Depth feet BGS	Boring Location ID	Bedrock Depth feet BGS
E-1	-7.3	PW15	-14.8
B-4	-18	PW-17	-16.7
B-13	-15	BR-5A	-10.5
B-14	-17	BR-7A	-14
B-17	-18	BR-6A	-13
BR-2D	-14.7	BR-9	-19.9
BR-3D	-12.3	EX1	-17.5
BR-4	-12.5	EX2	-16
BR-5	-10.5	EX3	-14
BR-6	-13	EX4	-15.5
BR-7	-14	EX5	-15.5
BR-8	-15	EX6	-15
PZ-102	-17.2	EX7	-15
PZ-103	-13.4	EX8	-14
PZ-104	-13.3	EX9	-14
PZ-105	-15.9	EX10	-15
PZ-106	-13.2	HF-1	-12.5
PZ-107	-10.2	HF-2	-13
PZ-101	-20.4	HF-3	-14.2
PW12	-15.5	HF-4	-12.8
BR-102	-19.9	HF-5	-15
BR-103	-10.8	HF-6	-16
BR-104	-18.8	HF-7	-15.6
BR-105	-15	HF-8	-16.4
BR-106	-13.2	HF-9	-15.4
BR-108	-12.5	HF-10	-17
BR-105D	-15.4	HF-11	-13.7
PW10	-16.5	HF-12	-18.7
PW11	-16.5	B-10	-13
PW13	-20	PZ-108	-12.2
PW14	-12.5	BR-107	-16.8
PW-16	-18.5		

Legend

- Borings with Known Depth to Bedrock Values
- Interpreted Depth to Bedrock (ftbgs)
- Inferred Depth to Bedrock (ftbgs)
- Outline of Arch Property Boundary
- Planned HW-1 Well Location
- Approximate Well Screen Placement
- Completed Bedrock Probe Location (April 2021)

0 25 50 75 Feet

N

NOTES: Depth to Bedrock contoured using linear Kriging interpolation. Total number of boring locations in model reduced to minimize effects of clustering.

MACTEC

Prepared/Date: BRP 04-20-21	Checked/Date: NMB 04-20-21

Figure 5
Planned HW-1 Well Location and Intepreted Depth to Bedrock Surface (feet bgs)

Arch Chemicals
Rochester, NY

TABLES

Arch Rochester
Well List for Synoptic Water Levels

Extraction Well HW-1 Pumping Test

Well	Use	Casing Type	Zone	Screen/Zone Top (Ft bgs)	Screen/Zone Bottom (Ft bgs)	Ground Elevation (ft msl)	Casing Elevation (ft msl)	Measuring Point Elevation
B-17	T & WL	Flush	Overburden	11.6	16	538.8	539.05	538.74
BR-5A	T & WL	Stick up	Bedrock	12.5	32	534.9	536.39	536.35
BR-7A*	T & WL	Stick up	Bedrock	19	62.5	537.0	539.22	539.12
BR-8	T & WL	Stick up	Bedrock	18	38	537.5	540.17	539.72
MW-127	T & WL	Stick up	Overburden	5	9	534.8	537.17	536.87
PW13*	T & WL	Flush	Bedrock	22	50	537.9	537.96	536.13
PW15*	T & WL	Stick up	Bedrock	17.2	50.1	536.8	538.32	538.32
PZ-106	T & WL	Stick up	Bedrock	20	29.4	535.0	537.50	537.24
PZ-109	T & WL	Stick up	Overburden	6.8	14.8	536.9	538.79	538.59
W-5	T & WL	Vault	Overburden	4.9	14.9	536.3	538.53	538.53
B-13	WL	Flush	Overburden	4.7	14.7	537.1	537.07	537.07
B-14	WL	Flush	Overburden	7	17	538.0	537.95	537.95
B-16	WL	Flush	Overburden	3.5	13.5	536.2	536.21	536.21
BR-102	WL	Stick up	Bedrock	22	54	540.2	540.21	539.43
BR-4	WL	Stick up	Bedrock	17.5	50	537.2	539.14	539.03
BR-6A	WL	Stick up	Bedrock	18	57	538.2	540.94	540.90
PW12	WL	Stick up	Bedrock	18	44.5	538.2	537.49	537.49
PW16*	WL	Stick up	Bedrock	21	60	541.0	539.32	539.32
PZ-103	WL	Stick up	Bedrock	20	29.3	537.8	540.36	540.20
PZ-107	WL	Stick up	Bedrock	16	25.6	536.4	538.64	538.39

Note:
T & WL = Transducer with synoptic water level
WL = Synoptic water level
ft bgs = feet below ground surface
ft msl = ft above mean sea level
* = current pumping well

APPENDIX A
COMMUNITY AIR MONITORING PLAN

COMMUNITY AIR MONITORING PLAN

A Community Air Monitoring Plan (CAMP) will be implemented during intrusive activities. The purpose of the CAMP is to provide a measure of protection for the downwind community from potential airborne contaminant releases resulting from proposed investigation activities. Site-specific procedures described below for fugitive dust and Volatile Organic Carbon (VOC) monitoring are consistent with the New York State Department of Health (NYSDOH) generic CAMP as outlined in Appendix 1A of DER-10 (NYSDEC, 2010).

Particulate Air Monitoring.

Particulate monitoring will be conducted continuously during ground intrusive activities (e.g., installation of soil borings and/or monitoring wells and well abandonment). Dust/particulate monitoring will be conducted near upwind and downwind perimeters of the work area or where dust generating operations are obvious. Dust monitoring may be suspended during periods of precipitation and snow cover.

Particulate air monitoring will be conducted with a DataRAM-4 or similar device. This instrument is equipped with an audible alarm (indication of action level exceedance) and is capable of measuring particulate matter less than 10 micrometers in size (PM-10). It will continually record emissions (calculating 15-minute running average concentrations) generated during field activities. The upwind and downwind dust monitoring devices will be checked periodically throughout each day of intrusive activities to assess emissions and the need for corrective action.

Weather conditions, including prevailing wind direction, will be observed and recorded each day of site activities. Fugitive dust migration will be visually assessed during all work activities. As work and weather conditions change throughout the day, the locations of the dust monitoring devices may need to be adjusted accordingly.

Particulate monitoring response and action levels include:

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area. Dust

suppression techniques are outlined in DER-10 Appendix 1B and include wetting equipment and work surfaces using atomizing sprays to minimize dry particulates. Care should be taken to prevent overly wet conditions, which can prove hazardous to personnel within the exclusion zone and public outside of the exclusion zone.

- If after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 µg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work can resume if dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for State (DEC and NYSDOH) and County health personnel to review.

VOC Air Monitoring.

VOC air monitoring will be conducted in conjunction with the dust monitoring program. VOC monitoring will be conducted for ground intrusive (continuous monitoring) and non-intrusive activities (periodic monitoring).

VOCs will be continuously monitored and recorded at the downwind perimeter of the immediate work area. Upwind concentrations will be measured before field activities commence and periodically throughout the day to establish background conditions. The downwind VOC monitoring device will also be checked periodically throughout the day to assess emissions and the need for corrective action.

VOC air monitoring will be conducted using a RAE Systems MiniRAE 2000 VOC instrument (or a similar PID device) which provides real-time recordable air monitoring data and provides 15-minute running average concentrations, to be compared to VOC monitoring response and action levels (see below). The equipment will be calibrated at least daily.

VOC monitoring response and action levels include:

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5ppm over background, work activities can resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. Work activities can resume provided the total organic vapor level 200 feet downwind of the work area or half the

distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be suspended.

All 15-minute readings will be recorded and be available for State (DEC and NYSDOH) personnel to review. Any instantaneous readings used for decision purposes will be recorded.

As work and weather conditions change throughout the day, the locations where the VOC monitoring devices are set up may be adjusted accordingly.