Work Plan for the Phase II Groundwater Investigation at the RMIES Main Extrusion Plant Site (Site), Ashtabula, Ohio.

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1.0 PURPOSE AND SCOPE

The purpose of this document is to specify the scope of work required for Phase II of the site wide groundwater investigation, including technical requirements of completing field activities at the RMI Extrusion Plant site. Requirements specified in this document are applicable to Sharp and Associates, Inc. (SHARP) employees and sub-contractors.

2.0 TASK 1. WELL EVALUATION/REPAIRS

RMIES will locate and uncover MW-309, MW-310, MW-311, and MW-500. SHARP will conduct a visual inspection of the monitoring wells to determine whether they are physically damaged. If the wells are damaged, abandon the wells. If the wells are intact, sample these wells for the full suite of VOCs, Techniciam-99, uranium, barium and lead. Sampling of these wells will be conducted by RMIES. SHARP will provide guidance during the sampling of these wells. Additionally, MW-500 is damaged and will be abandoned (see Task 2 below).

SHARP's field geologist will supervise the replacement of the monitoring well protective casings (MW-315, MW-401, MW-402, MW-403, MW-404, and MW-405). Field crews will use caution to ensure that the wells are not damaged or compromised during removal of the existing protective casing. The repair shall be documented and inspected by the SHARP field geologist.

SHARP will supervise the modifications to MW-106, MW-800, MW-801, MW-802, MW-803, and MW-804 wellheads to drain standing water. The effort will consist of drilling a minimum two 3/8-inch holes in the annulus between the protective covers and the wellheads. Field crews will use caution to ensure that the wells are not damaged or compromised during the repairs. The repair shall be documented and inspected by the SHARP field geologist.

3.0 TASK 2. PLUG AND ABANDON DAMAGED WELLS

The following wells will be abandoned during the field work; MW-100, MW-103, MW-104, MW-202, MW-204, MW-205, MW-206, MW-207, MW-301, MW-313, MW-500, MW-511, and MW-512. The protective casings will be removed and the well casing will be over drilled with 4 ¼ HSAs to the depth of the bottom of the screened interval. The stainless steel screen and well casing will be removed and the borehole will be grouted with Portland cement. The well screen and riser pipe will be cut into two to three foot sections and placed in 55-gallon drums. Cuttings generated during the abandonment will be drummed separately from riser pipe and well screens. The locations of the wells to be abandoned are shown on Figure 1. The total depth and screen intervals of the thirteen wells to be abandoned are included in Table 1.

4.0 TASK 3. INSTALL NEW MONITORING WELLS

Fifteen monitoring wells will be installed as part of this investigation. The wells will be installed in the order of the potentially least contaminated to the potentially most contaminated. The order that the wells will be installed is as follows: MW-907, MW-908, MW-906, MW-914, MW-912, MW-904, MW-911, MW-910, MW-913, MW-909, MW-905, MW-903, MW-902, MW-901, and MW-900. The locations of the new wells are shown on Figure 1. Table 2 summarizes the anticipated well completion intervals.

Thirteen monitoring wells will be installed in the glacial till unit. These wells will be constructed in borings installed using 4 ¼-inch inside diameter hollow stem augers (HSA) and continuously sampled using 2-inch split spoons. The riser pipe will be 2-inch inside diameter flush threaded stainless steel. Well screens will be 0.020-inch wire wrapped stainless steel. The maximum length of the well screens will be 5-feet. Two of the glacial till wells (MW-912 and MW-914) will be installed below the escarpment in the Fields Brook floodplain. It is anticipated that bedrock will be encountered approximately 11-feet below existing grade. The length of the screen will be adjusted so that the top of the plug is a minimum of 4-feet below existing ground surface. Because of the added flexibility in adjusting screen length in the fields, PVC may be used in place of stainless steel for these two wells as agreed to between the RMIES and SHARP representatives. The estimated depth of the new till wells is 18-feet below existing ground surface. The screen interval will be installed from 18 to 13-feet below ground surface. Filter pack will consist of #4 silica sand placed from the base of the boring to one-foot above the top of the screen. Compressed bentonite pellets will be placed on top of the filter pack to 3.5 feet below ground surface (frost line). Wherever possible, the new wells will be completed with five-inch diameter above grade protective casings. The protective casings will be set in quick setting concrete placed in a Sono Tube.™ Wells located in areas subject to traffic will be completed with a flush mount protective cover.

The final depths will be determined in the field based on lithology encountered during sampling. If fill materials are encountered at depths greater than five feet, the filter pack and screen depth will be increased so the top of the filter pack is a minimum of two feet below the base of the fill.

4.1 Interface Well

MW-902 will be installed in the glacial till/bedrock interface. This well will be constructed in a boring installed using 4 ¼-inch I.D. HSAs. The boring will be continuously sampled to the top of bedrock. Following the confirmation of the top of bedrock through split spoon samples, the hollow stem augers will be advanced 2.5-feet into bedrock.

The riser pipe will be 2-inch inside diameter flush threaded stainless steel. The well screen will be 0.020-inch wire wrapped stainless steel. The estimated depth of the new interface well is 32.5-feet below existing ground surface. The screen interval will be installed from 27.5 to 32.5-feet below ground surface. Filter pack will consist of #4 silica sand placed from the base of the boring to one-foot above the top of the screen. A minimum of two feet of compressed bentonite pellets will be placed on top of the filter pack and hydrated if necessary. The remaining annular space will be filled with high solids bentonite grout placed with a tremmie pipe as the augers are removed. The interface well will be completed with five-inch diameter above grade protective casings. The protective casing will be set in concrete placed in a Sono Tube.™

4.2 Bedrock Well

MW-900 will be installed in the bedrock unit. This well will be constructed in a boring installed using a combination 4 ¼-inch I.D. HSAs and air rotary drilling methods. HSAs will be advanced until auger refusal is encountered within bedrock. Following refusal, the boring will be completed using a 4-inch tri-cone air rotary bit.

The bottom of the five-foot screen interval will be twelve-feet below the top of bedrock (estimated at 30-feet). Filter pack will consist of #4 silica sand placed from the base of the boring to one-foot above the top of the screen. A minimum of two feet of compressed bentonite pellets will be placed on top of the filter pack and hydrated if necessary. The remaining annular space will be filled with high solids bentonite grout placed with a tremmie pipe as the augers are removed. The bedrock well will be completed with five-inch diameter above grade protective casings. The protective casing will be set in concrete placed in a Sono Tube.™

4.3 Split Spoon Sampling

Split spoon samples will be collected every 2-feet as the borings are advanced. The augers will be advanced to the top of the predetermined sample interval and the center plug will be removed. A clean decontaminated split spoon will be lowered to the top of the sample interval and driven by repeatedly dropping a 140-pound hammer a distance of 30-inches. Blow counts per each 6-inch interval will be recorded as spoons are driven (ASTM D-1586). As split spoons are extracted from the borehole, RMIES health physics will screen the drill rods and spoon for residual radiological contamination. The SHARP geologist will record information on lithology including soil density, color, type, texture, and any visible signs of potential contamination on a field log. The field soil descriptions will follow Unified Soil Classification System (USCS).

4.4 Split Spoon Decontamination

Split spoons must be decontaminated between samples. Spoons will be washed in potable water with a phosphate free detergent (e.g., Alconox) followed by a double rinse with potable water and de-ionized water. Split spoon decontamination will be the responsibility of the driller under the direction of the SHARP field geologist and the RMIES health physics technician.

4.5 Shelby Tube Collection

Nine Shelby Tubes will be collected during the well installation fieldwork. The Shelby Tubes will be collected following ASTM D-1587 from well borings MW-910, MW-911, and MW-912. The depth intervals are summarized below.

Well I.D.	Depth Interval
MW-910	0-2, 5-7, 8-10
MW-911	0-2, 5-7, 8-10
MW-912	0-2, 5-7, 8-10

A near surface soil sample will be collected in close proximity to the boring locations and screened for radiological contamination by a RMIES health physics technician. A surface soil sample will be screened for radiological contamination by a RMIES health physics technician. The Shelby Tube will be collected from the 0 to 2 foot interval if the near surface soil screening results are acceptable. Split spoon samples will be collected immediately above and below the Shelby Tube sample intervals (5 to 7 feet and 8 to 10 feet) and screened for radiological contamination by a RMIES health physics technician. If radiological contamination is above background levels at the proposed locations, alternate boring locations will be selected in the field based on the results of field screening.

4.6 Decontamination

Following the installation of each well, the augers and drill rods will be transported to the decontamination pad and cleaned using a high-pressure steam cleaner. The driller will be responsible for removing soil cuttings prior to steam cleaning. RMIES will be responsible for steam cleaning the augers and drill rods.

4.7 Anticipated Waste Generation

Waste generated during the well installation and abandonment includes soil cuttings, stainless steel screens and riser pipe, sampling equipment decontamination water, and drilling equipment decontamination water. Solid waste including paper and plastic (well packaging materials) will also be generated during the well installation process. The estimated volume generated is up to 2 drums of soil cutting per well.

If possible, unnecessary packaging materials will be removed prior to entering the restricted area. Solid waste that enters the restricted area will be placed in 55-gallon drums staged at the wellhead. RMIES will provide the drums and be responsible for transporting the drums from the wellhead to the appropriate storage area. SHARP will label the drums following RMIES/RCRA procedures.

Soil cuttings generated during boring installation will be placed in 55-gallon drums and labeled following RMIES/RCRA procedures. Liquid waste generated at the well (split spoon decontamination water) will be placed in drums at the wellhead. RMIES will be responsible for transporting the drums to the onsite water treatment facility for disposal. Water generated during equipment decontamination (augers, drill rods, tools, etc.) will be contained in the existing on-site decontamination pad.

4.8 Drill Rig Decontamination

At the completion of the project, the drill rig and augers will be thoroughly decontaminated with the high-pressure steam cleaner. RMIES operations will be responsible for conducting the decontamination. The drill rig will then be inspected by RMIES health physics. Equipment will not be permitted to leave the site until it has been inspected and released by RMIES.

5.0 TASK 4. SIDE-BY-SIDE SAMPLING TEST

The side-by-side sampling test will consist of collecting a sample with a bailer and a sample using low-flow techniques from the same well at the same time. Filtered and unfiltered samples will be collected using both techniques and analyzed for metals. The side-by side test will be performed on the following wells: MW-101, MW-200, MW-204, MW-310, MW-311, and MW-402. RMIES will conduct the sampling with oversight from SHARP. RMIES will be responsible for generating the procedures for the side-by-side sampling test and providing the necessary equipment.

6.0 TASK 5. SURVEYING AND PREMOBILIZATION PLANS

A meeting will be held at the site prior to mobilizing the drill crew. The well locations will be physically staked at that time based on drill rig accessibility. In addition, existing site utilities will be identified during the pre-mobilization meeting.

Following the final completion of the new wells, RMIES will contract to have the entire well network surveyed for northing, easting and elevation.

7.0 TASK 6. SEEP MAPPING AND SAMPLING

A SHARP field geologist will map the silt seams along the escarpment and estimate flows from the seams to further define the Site hydrogeology. The locations of the seeps will be staked or flagged and surveyed for northing, easting and elevation. The schedule for the seep mapping work is dependent on weather conditions. Efforts will be made to conduct this work shortly after a rain event. A topographic map will be generated from the survey data that depicts the seep locations and estimated flow at the time of the survey.

8.0 TASK 7. HYDRAULIC TESTING

A rising and falling head test will be conducted on the fifteen wells following their development. RMIES will be responsible for developing the wells. The rising and falling head test will be accomplished by dropping a solid slug of known volume into each well. The water level will be monitored using an In-Situ Troll© data logger. The data logger will be set to record levels on a logarithmic time scale. When the water level has recovered to 95% of the pre-slug level change, the slug will be rapidly removed and the level will be recorded until it has recovered to within 95% of the initial water level. The transducer and slug will be decontaminated between wells. Water levels vs. time will be plotted and evaluated for transmissivity with either the Hvorslev (1951) or Bouwer and Rice (1989).

The nine Shelby Tubes collected during the well installation will be laboratory tested for permeability following ASTM method D-5084. RMIES will contract for the laboratory services. The shallowest samples will be oriented in the vertical position and tested for vertical hydraulic conductivity, the balance oriented in the horizontal.

9.0 TASK 8. COLLECTION AND ANALYSIS OF GROUND WATER DATA

RMIES will sample all the wells in the network wells plus new wells and compile field data into spreadsheets.

Review all groundwater data, including data used to monitor the CAMU area remediation (including field parameter results).

Collect field parameter information on low-flow sampled wells and in-situ for wells within and outside of the CAMU to help characterize the groundwater conditions of each well and the factors that may affect contaminant transport (RMIES).

Review Laboratory Data Quality Objectives to ensure that the laboratory detection limits are below the target cleanup standards.

10.0 TASK 9. EVALUATION OF UTILITY CONDUIT PATHWAYS USING DIRECT PUSH SAMPLING

Previous Geoprobe® investigations have identified elevated concentrations of uranium in borings located in close proximity to buried utilities. It is suspected that these elevated concentrations are the result of utility backfill material providing a preferential path for the vertical and horizontal transport of site related contaminants. The purpose of this scope of work is to investigate the backfill material associated with the 18-inch sewer line located between manhole 1 (MH-1) and manhole 11 (MH-11).

10.1 Boring Locations

Four series of transecting borings will be installed along the sewer line. The distance between MH-1 and MH-11 is approximately 500-feet. The first transect in the series will be located approximately 50-feet east of MH-11. Each subsequent transect will be located 100-feet east of the previous location with the final transect approximately 50-feet west of MH-1. The transect will consist of six sets of soil borings advanced to one foot below the invert elevation of the sewer line (estimated to be 18-feet below existing grade). The sets will consist of one boring installed with the Geoprobe® Macro-Core Piston Rod Sampler® (MC) soil sampling system and one boring installed with the Geoprobe® Membrane Interface Probe (MIP). The sewer line will be surveyed and staked at the location of each transect. The transects will consist of a set of borings offset from the center of the sewer 2 feet, 8-feet and 12-feet north and 2-feet, 8-feet, and 12-feet south. A conceptual cross-section of the utility trench transects is shown on Figure 2.

10.2 Boring Installation Methods

The MIP will be the first in each set to be installed. Following the installation of the MIP boring, the MC boring will be installed. Soil samples collected from the MC borings will be logged in a field book using the Unified Soil Classification System. One EnCore® soil sample will be collected from each MC boring at the depth interval from which the highest concentration of total VOCs was detected in the associated MIP boring.

10.3 Membrane Interface Probe Borings

The MIP borings will be advanced to a minimum of two feet below the invert elevation of the sewer. The estimated depth of the sewer is 16 to 18 feet below existing grade. As the MIP is advanced, probe speed, total VOCs, soil conductivity, and probe temperature will be continuously recorded.

10.4 Macro-Core® Borings

The MC borings will be advanced to a minimum of two feet below the invert elevation of the sewer (estimated 20-feet). Soil samples will be continuously collected in four-foot drive intervals. An acetate liner will be inserted in the MC sample tube. The sample tube will be advanced to the top of the designated sample interval and the piston rod point will be extracted from the cutting shoe. The sample tube will then be advanced four feet and a soil sample will be collected in the acetate liner. The sample tube will be retrieved from the borehole and the liner, containing the soil sample, will be extracted sample tube. The SHARP geologist will record lithologic data, including soil density, color, type, texture, and any visible signs of potential contamination on a field log. Also included on the field log will be the depth of the interface between the trench backfill material and native undisturbed soil.

10.5 Soil Sample Collection

One EnCore soil sample will be collected from each MC boring. The sample will be collected from the unsaturated zone in which the highest levels of total VOCs were detected in the corresponding MIP boring. If VOCs are not detected in the MIP boring, the soil sample will be collected from the sample interval immediately above the water table. The EnCore sample will be analyzed for VOCs using GC/MS.

10.6 Direct Push Equipment Decontamination

The driller will be responsible for equipment decontamination. As the sample barrel and rods are removed from the boring, the driller will be responsible for wiping them down to remove any loose or wet soil. After the liner and sample have been extracted, the inside and outside sample tube and drive shoe will be thoroughly scrubbed with potable water and phosphate free detergent and rinsed with potable water. A final rinse will be performed using de-ionized water.

11.0 EQUIPMENT LIST

The following equipment is required to conduct the proposed scope of work described in Tasks 1, 2, 3, and 7.

1. Drill Rig
2. Hollow Stem Augers (~100-feet)
3. Drill Rods (~100-feet)
4. Core Barrel and Steel (~60-feet)
5. Rotary Bit
6. Hoses (~50-feet)
7. Split Spoons
8. Shovels
9. Tool Box
10. Air Compressor
11. Skid Steer
12. Hammer Drill and Bits
13. Generator
14. Grout Mixer
15. Tremmie pipe (~60-feet)
16. Troll Data Logger
17. Laptop Computer
18. Slug
19. Nylon Cord (500-feet)
20. Decontamination Equipment (5-Gallon Buckets, Alconox, Brushes)
21. Propane Torch

12.0 MATERIALS LIST

The following materials will be required to conduct the proposed scope of work described in Tasks 1,2,3, and 7.

	Item	Units
1.	Stainless Steel Well Casing and Screen	280-feet
2.	PVC Well Casing and Screen	30-feet
3.	Bentonite Chips	8 x 5-gallon buckets
4.	Silica Sand	10 x 50 pound bags
5.	Bentonite Grout	15 x 50 pound bags
6.	Sono Tubes	21 (12" x 3.5')
7.	Concrete	90 x 50 pound bags
8.	Portland Cement	20 x 94 pound bags
9.	Protective Casings	21
10.	Well Caps	15
11.	Shelby Tubes	9
12.	Wax	5 pounds