FOCUSED REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORK PLAN D.C. ROLLFORMS/INGERSOLL-RAND SITE SITE CODE 907019 JAMESTOWN, NEW YORK

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Prepared for

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1.0 INTRODUCTION

1.1 PURPOSE

Geraghty & Miller, Inc. has been retained by the Ingersoll-Rand Company to prepare this work plan for conducting a focused Remedial Investigation/Feasibility Study (RI/FS) at the D.C. Rollforms/Ingersoll-Rand Site (site) located in Jamestown, New York. The site is currently listed by the New York State Department of Environmental Conservation (NYSDEC) on the Registry of Inactive Hazardous Waste Sites (Site No. 907019). The site has been listed with a classification code of 2.

Previous investigations at the site have generally characterized subsurface conditions at the site, as well as the history of site use and impacted areas. However, additional investigative work is required to evaluate appropriate remedial measures for the site. The additional work will utilize a phased approach designed to collect the appropriate data necessary to achieve site closure in an expedited time frame. The results of an initial investigative phase already performed will be used to focus the scope of any subsequent closure activities.

This work plan describes the approach and field activities to be performed, quality assurance and quality control (QA/QC) procedures, health and safety requirements, and community participation plan for the RI/FS. The work plan is consistent with the interim final "Guidance for Conducting Remedial Investigation and Feasibility Studies Under CERCLA" developed by the United States Environmental Protection Agency (USEPA 1988) and NYSDEC technical and administrative guidance documents.

1.2 ORGANIZATION OF WORK PLAN

The work plan is organized into the following sections: Section 2 provides information concerning the site description, geology and hydrogeology and site history; Section 3 provides an overview of the existing data for the site and identified data gaps; Section 4 provides the scope of work for the RI; Section 5 contains the project organization and assigned responsibilities; Section 6.0 contains the proposed schedule of activities; and Section 7 contains a listing of references used in preparation of the work plan.

2.0 SITE BACKGROUND AND PHYSICAL SETTING

2.1 SITE DESCRIPTION

A description of the site location and conditions is provided in the following sections.

2.1.1 Site Location

The site is located at 583 Allen Street in Jamestown, Chautauqua County, New York (Figure 1). Based on Chautauqua County tax maps, the site consists of two parcels encompassing approximately 3.2 acres (Empire Soils Investigations, 1990a). Figure 2 is a site map developed from existing mapped information and shows the current physical layout of the site. One existing building located on the northern portion of the site is currently occupied by the D.C. Rollforms Corporation. The site is bordered along the north and northwestern perimeter by the Chadakoin River, which flows in a generally easterly direction. Allen Street is directly east of the site, with property owned by the Jamestown Urban Renewal Agency and the Weber Knapp Corporation abutting the site to the south. A site survey will be performed to confirm the property boundaries relative to the adjacent property owners Jamestown Urban Renewal Agency and Weber Knapp as part of the study.

The site is also the former location of the Proto Tool Company, formerly a unit of Ingersoll-Rand Company. Figure 3 shows the former Proto Tool Company building layout at the site. The Proto Tool plant was a permitted hazardous waste treatment, storage and disposal facility (TSDF) which was closed in 1985 and subsequently demolished in 1986 as part of a closure plan for the facility. Additional information concerning the historical use of the site by Proto Tool is discussed further in Section 2.2.1.

2.1.2 Regional Geology and Hydrogeology

The site is located within the Appalachian Uplands physiographic province of New York and the Allegheny River basin. Three main stream valleys dominate the region - the Chadakoin River which drains Chautauqua Lake, the Cassadaga Creek, and the Conewango Creek. From the site location, the Chadakoin River flows in a northeasterly direction for approximately three miles to where it joins Cassadaga Creek. Flow within the Chadakoin River is controlled by a dam located beneath the Washington Street bridge in Jamestown. The bridge is operated by the Jamestown Board of Public Utilities for the purpose of regulating the water level of Chautauqua Lake. Flow varies anywhere from 15 cubic feet per second (cfs) to over 600 cfs.

Surficial geologic mapping of the unconsolidated deposits in the area shows the site to be underlain by till (Cadwell 1988). Till in the Jamestown area is predominantly clayey as most of its constituents are derived from the local shale bedrock (Crain 1966). Till is mapped to the east and west of the site and is mapped as being in contact with alluvium associated with the Chadakoin River along the northern boundary of the site. Bedrock outcrops occur to the south of the site just east of Allen Street. Bedrock in the area is mapped as shales, siltstones and sandstones of the Conneaut Group (Rickard and Fisher 1970).

Valley-fill sand and gravel deposits within the Chadakoin River, Cassadaga Creek and Conewango Creek valleys comprise the Jamestown aquifer, an aquifer system which supplies water to the City of Jamestown (Crain 1966, Anderson et. al. 1982, Waller and Finch 1982, Miller 1988). The sand and gravel aquifer material is overlain by lacustrine silt and clay or till producing confined conditions over a large portion of the aquifer. The aquifer has been designated as a primary aquifer by the NYSDEC. Municipal well fields which supply water to the City of Jamestown and area villages are located to the northeast of the site, the closest of which is approximately 2.5 miles northeast of the site (NYSDOH 1982).

The site is located along the southern perimeter of the area mapped as part of the Jamestown aquifer. As described above, the site is mapped as underlain by till. Existing data for the site indicate that the hydrogeologic conditions at the site form a relatively shallow, local flow system which is separate from the more regional sand and gravel aquifer that supplies water to the municipal wells.

2.1.3 Site Hydrogeology

Based on data from previous investigations, subsurface geologic conditions at the site consist mainly of two overburden units - a surficial layer of fill material and an underlying, dense till (Empire Soils Investigations, 1991a). In the western half of the site, toward the Chadakoin River, native deposits of either sand, silt, clay or sand and gravel (generally less than 4 feet in thickness) occur between the fill and underlying till. A summary of the geologic conditions encountered during previous subsurface investigations is included on Figure 4. The fill material generally ranges from 1 to 13.5 feet in thickness across the site and includes the following materials: silt, sand, gravel, clay, cinders, brick, concrete, and slag.

The identification of till at the site is consistent with existing surficial geologic mapping data for the site and region. The till appears to occur beneath the entire site based on review of existing soil boring logs (Empire Soils Investigations, 1991). The till is described as gray or brown in color, hard or stiff, and generally consists of a clayey silt matrix with variable amounts of sand and gravel. Blow counts within the till generally exceeded 20 blows per six inches of penetration by a 2-inch diameter split-spoon sampler with a 140 lb. hammer suggesting a dense, low-permeability deposit. Surficial mapping of the area (Cadwell 1988) shows the till extends to the south of the site covering the upland areas. In addition, not shown on the available mapping is the presence of bedrock outcrops located just south of Allen Street.

Till at the site is likely underlain by shale bedrock based on refusal at boring ESI-6A, bedrock outcrops observed south of Allen Street and published mapping (Crain 1966; Richard and Fisher 1970). Based on the existing mapped data (Crain 1966, Cadwell 1988, Waller and Finch 1982), these geologic conditions at the site location are separate from the geologic conditions northeast of the site which form the Jamestown aquifer.

The direction of groundwater flow at the site, as determined from existing mapped information, is to the northwest towards the Chadakoin River (Figure 5). The depth of groundwater, determined from available data on water-level measurements in monitoring wells and visual observations of moisture content in samples from soil borings and test pits, is approximately 3 to 5 feet below land surface (bls). Only one synoptic round of water level measurements were completed at the site which occurred in April 1991.

The Chadakoin River flows in an easterly direction along the northern and western boundary of the site. The reach of the Chadakoin River adjacent to the site occupies an approximately fifty foot wide channel and has incised steeply sloped banks on either side of the river. The Chadakoin River is classified by the NYSDEC as a class C surface water with C standards.

As discussed in Section 2.1.2, streamflow in the Chadakoin River is controlled by a dam at Washington Street operated by the City of Jamestown Board of Public Utilities for the purposes of regulating the water level of Chautauqua Lake. As a result, streamflow can vary from 15 cubic feet per second (cfs) to over 600 cfs in response to operation of the dam. Streamflow is recorded downstream from the dam at the Dow Street bridge in Falconer, New York.

2.2 SITE HISTORY

2.2.1 Site Use

The site is the former location of the Proto Tool Company, a manufacturer of hand tools (see Figure 3). Original manufacturing operations at the site were begun by the J.P. Danielson Company in approximately 1910. In 1948, interests in the J.P. Danielson were sold to Pendleton Tool Industries, Inc. (Empire Soils Investigations 1991). Sometime in the 1950's, Pendleton Tool Industries acquired the parcel of land currently occupied by the D.C. Rollforms facility. This parcel of land was reportedly the location of the Alliance Furniture Company. In February 1964, Ingersoll-Rand purchased assets of Pendleton Tool Industries, Inc., which included operations at 583 Allen Street in Jamestown, New York. Subsequently, the name was changed to Ingersoll-Rand in 1976. Ingersoll-Rand Company maintained ownership of the property until 1985 when it was sold to the Jamestown Urban Renewal

Agency. In 1987 the property was sold to Dowcraft Corporation, the current owner.

The Proto Tool facility consisted of a series of buildings constructed over time beginning in 1910. The manufacturing operations associated with each of the buildings has been obtained through previous interviews of former employees (Empire Soils Investigations 1991) and are summarized on Figure 3. Under ownership by Ingersoll-Rand Company, the facility manufactured hand tool products at the site, including pipe wrenches, adjustable wrenches, pliers, slip-joint pliers, clamps, hammers, ratchets and pullers. Manufacture of these products involved some or all of the following processes or operations: forging, machining (including milling, drilling, broaching and grinding), heat treat oil quench, sandblasting, polishing, punch press operations, plastisol dipping of handles, black oxidizing ("Parco"), painting, paint stripping, vapor degreasing, electroplating and wastewater treatment.

The facility was also a RCRA permitted treatment and storage facility (ID No. NYD002123727) due to storage of hazardous wastes generated from the manufacturing process used to produce hand tools. Four hazardous wastes were generated on a regular basis and reported to the NYSDEC (Ingersoll-Rand 1985). These wastes were: F006 - sludges from the treatment of electroplating wastes (metal hydroxide sludge), F001 - waste trichloroethylene from vapor degreasing, F005 - waste toluene used to mix with paints, and F003, F005 - waste paint containing solvents. In addition, two solid waste management units (SWMUs) were located at the facility - the wastewater treatment plant and a hazardous waste storage area (PRC Environmental Management 1988). The wastewater treatment plant was located in Building 24 and the hazardous waste storage area was located in an asphalt-paved courtyard outside the wastewater treatment plant (Ingersoll-Rand 1986). These locations are included on Figure 3.

Information on the types and quantities of wastes generated at the facility during the entire span of manufacturing operations is not available. However, the following wastestreams are presumed to have been generated during Ingersoll-Rand's involvement at the site:

Forging - This process involved heating a billet to the plastic temperature range and recontouring it in a die via a drop forge hammer. The parting line flash was removed using a trim press. This flash was non-hazardous and was disposed of off-site. No other wastes were generated in this process.

Machining - Steel chips, shavings, turnings and flash were generated from these operations. These wastes were sold as scrap metal to a local scrap dealer. Water soluble coolants used in the process and waste oils from the machines were drummed and shipped off-site for reclamation. All of these wastes were classified as non-hazardous.

Heat treat - Parts were processed through heat treat operations to normalize grain structure for machining/cold strike or for hardening to develop ultimate physical properties of the forged components. Oil was used as the quench media to achieve the required metallurgical properties. Spent quench oils and accumulated bottom sludges from the operation were disposed of as hazardous (characteristic for cyanide or as a listed F012 waste). These wastes were manifested for disposal at a secure landfill.

Black oxidizing ("Parco") - This process applied a blackened, corrosion resistant finish to a hand tool. The process consisted of stages to clean, etch, conversion coat, apply the corrosion resistant coating and oil the exterior surface of a finished tool. The baths were captive. The rinses after the cleaning and etching stages were overflowed to the wastewater treatment system for pH adjustment, clarification and discharge to the Chadakoin River under an SPDES permit. Periodic cleaning of the bottom of the process tanks would generate a sludge that was disposed of as non-hazardous after passing EP toxicity testing; this waste was disposed off-site.

Sandblasting - This process was used to descale parts in process or to deburr or otherwise radius sharp edges of parts. The waste generated was a dry dust composed chiefly of sand and metal fines. This waste was non-hazardous and was disposed of off-site.

Polishing - This process imparted a polished finish to a hand tool using gritted belts or buffing wheels. The dust generated was captured at the work surface and piped to a cyclone dust collector, where the dust was separated and drummed. The dust and spent belts and buffing wheels were non-hazardous and disposed of off-site.

Punch Press Operations - This was a stamping operation using progressive dies that results in metal parts bent to final shape. Other than excessive flash that was trimmed after stamping, no other waste was generated in the process. The flash was sold as scrap metal to a local scrap dealer.

Vapor degreasing - This process involved the cleaning of metal parts after machining using trichloroethylene. This degreasing unit was also used to strip defective plastisol from finished tool handles. Spent trichloroethylene from the process was hazardous and was sent for reclamation at a local solvent recovery operation. Bottom sludges were drummed for disposal as a hazardous waste at a secure landfill.

Plastisol - This process applied a cushion grip to the handles of certain hand tools for insulation purposes. The process consists of a tank of liquid poly vinyl chloride (PVC) and a downstream heat source. Parts were conveyorized through the dip tank where the PVC coats out on the handle and then through an oven where the PVC is cured to rubbery consistency. The process is captive and there were no wastes generated.

Painting - The paint process consisted of a large dip tank containing a preformulated liquid paint mixture. Parts were racked and conveyorized through the paint tank and then air dried. Waste paint, paint thinner and cleanup solvents (non-chlorinated) were periodically drummed for disposal. These wastes were disposed of as hazardous because of their flammability. These wastes were shipped offsite for reclamation and/or incineration. The process itself was captive in that no waste byproduct of the process was generated.

Metal stripping/paint stripping - This process utilized an acid bath to remove coatings from rejected parts. Dragout from the bath was removed in a series of water rinses. The overflow from these rinses was routed to the sanitary system for disposal through the POTW. Sludges from tank cleaning were disposed of as hazardous at a secure landfill.

Electroplating/Wastewater Treatment - The electroplating process consisted of stages of cleaning, etching, nickel plating and chrome plating to apply a decorative nickel-chrome finish to steel hand tools. An automatic conveyor line moved the parts through the process. Each process stage was separated by a water rinse stage. Overflows from the rinses following the nickel and chrome plating baths were discharged to wastewater treatment where the metals were separated as metal hydroxide sludge and dewatered. The resulting listed hazardous waste (F006) was disposed of at a secure landfill. The separated waters from the waste treatment process were discharged to the Chadakoin River under and SPDES permit (No. NY000341). The caustic and acid rinsewater overflows were discharged to the local POTW. Prior to 1972, process water from various buildings at the facility were discharged directly to the Chadakoin River through seven separate outfalls beneath the facility (Figure 3). These pipes still exist along the bank of the Chadakoin River. The pipes vary in diameter and material type (concrete, iron, PVC).

Beginning in 1984, Ingersoll-Rand Company initiated closure of the Proto Tool facility (Ingersoll-Rand 1984, 1985, 1986; Mesch Engineering, 1984; Bay West, Inc. 1986). Closure activities included the identification of wastes for subsequent off-site disposal, closure of hazardous waste management units including the wastewater treatment facility, electroplating baths, and vapor degreaser tank, pumping of liquid from machine pits, tanks and sumps for disposal, decontamination of tanks, and removal of an underground gasoline storage tank (located adjacent to Building 21).

During the course of the closure activities, petroleum-impacted soils were encountered while attempting to remove underground storage tanks (USTs) in the former courtyard area (Figure 3). The incident was reported to the NYSDEC and was assigned a spill number (Spill No. 853304). Analytical testing of the stockpiled soils excavated from around the tanks was performed and the soils were backfilled around the tanks. The tanks were abandoned in place by filling with sand.

In 1986, the Proto Tool facility was demolished. Based on a corrective action prior to loss of interim status (CAPLIS) inspection of the site performed in August 1988, it was recommended that no further action be taken at the former facility (PRC Environmental Management 1988). Subsequently, the NYSDEC made the determination that there had been no release of hazardous waste into the environment that prohibited clean closure of the facility and terminated the interim status to operate a hazardous waste facility at the site (NYSDEC 1988).

The site is currently owned by the Dowcraft Corporation. The D.C. Rollforms plant occupies the former Proto Tool buildings 12 and 21 located on the northeast parcel. The adjacent vacant parcel is a grassy field with occasional fragments of concrete block. A gravel parking lot is located directly adjacent to the southern side of the D.C. Rollforms plant (Figure 2). D.C. Rollforms is a metal fabricating facility. Reportedly, lubricant chemicals are used at the facility and a garage area is used for storage of spent oil/water (Empire Soils Investigations 1991).

2.2.2 Previous Investigations

Previous investigations at the site include Phase I and Phase II Environmental Site Assessments (ESAs), and a supplemental environmental investigation. These investigations were performed in 1990 and 1991 by Empire Soils Investigations for Dowcraft Corporation (Empire Soils Investigations 1990a, 1990b, 1991b). An environmental investigation report was prepared in 1991 (Empire Soils Investigations 1991a) which summarized the results of the Phase I and Phase II ESAs and the supplemental environmental investigation, and included information obtained from employee interviews and public records regarding site use and manufacturing operations at the former Proto Tool Company.

During the Phase I ESA, a groundwater seep was observed on the bank of the Chadakoin River (see Figure 4) (Empire Soils Investigations 1990a). The seep had an orange-brown staining and discolored water associated with it. Directly below the seep, an oil type sheen was observed dissipating across the water. These observations prompted a Phase II ESA at the site.

The Phase II ESA included the excavation of 7 test pits and installation of three monitoring wells (ESI-1, 2, and 3). Composited soil samples were collected from selected test pits and one round of groundwater samples was collected from the monitoring wells. The supplemental environmental investigation consisted of the installation and sampling of four additional monitoring wells (ESI-4, 5, 6, and 7) and one test pit adjacent to the former test pit TP-4 location. The area of subsurface investigation during both investigations was limited to the vacant parcel at the site and did not include the parcel of land currently occupied by the D.C. Rollforms facility.

The analytical results of soil and groundwater samples collected during the Phase II ESA are provided in Tables 2 through 5. Figure 4 shows the distribution of subsurface geologic conditions encountered at the site along with the soil analytical data. Figure 6 shows the distribution of analytical results for groundwater samples collected from the monitoring wells.

As summarized on Figure 4, soil samples collected from test pits and soil borings showed the presence of petroleum sheens, oil, and/or petroleum-like odors at several locations on the site. Findings within the Phase II report also indicated that water was observed discharging from one of the outfalls producing an oily sheen in the water surface. Review of the soil sample descriptions in test pit and soil boring logs indicates that the visually impacted soils were predominantly within the fill materials and native sandy deposits. Analytical results of soil samples collected from test pits (Table 2) indicated detectable concentrations of metals including chromium (6.12 milligrams per kilogram [mg/kg] to 33.5 mg/kg), copper (67.5 mg/kg to 1,370 mg/kg), lead (56 mg/kg to 129 mg/kg), nickel (37 mg/kg to 904 mg/kg), zinc (83.7 mg/kg to 444 mg/kg), total cyanide (< 0.91 mg/kg to 15.4 mg/kg), and oil and grease (0.21% to 7.11%). Target compound list (TCL) volatile organic compounds (VOCs) were not detected in any of the soil samples.

Analysis of an additional soil sample collected from test pit TP-4 detected PCBs at 3 mg/kg and total petroleum hydrocarbons (TPH) (identified as fuel oil) at 3,100 mg/kg. Toxicity characteristic leaching procedure (TCLP) testing of the soil sample indicated that VOCs, semi-volatile organic compounds (SVOCs) and metals were all at concentrations below regulatory levels for classification as a hazardous waste.

Groundwater samples were collected from the seven monitoring wells on two separate occasions. On November 14, 1990, groundwater samples were collected from wells ESI-1, ESI-2 and ESI-3 and analyzed for TCL VOCs, USEPA Priority Pollutant metals, pH, total cyanide, and oil and grease. On January 2, 1991, groundwater samples were collected from wells ESI-4, 5, 6, and 7 and submitted for analysis of TCL VOCs and TPH. The analytical results are summarized in Tables 4 and 5 and are presented in Figure 6.

TCL VOCs detected in groundwater included vinyl chloride (<1 micrograms per liter [ug/L] to 5,900 ug/L), 1,2-dichloroethane (1 ug/L to 1,100 ug/L) and trichloroethene (<0.5 ug/L to 52 ug/L). Highest VOC concentrations were detected at well ESI-1; however, quantification of other VOCs at this location, as well as at well ESI-2, 3, and 4, were limited due to elevated detection limits. Samples collected from well ESI-4 also detected the presence of lube oil, and detected kerosene at 1,100 ug/L. Lower (less than 5 ug/L) concentrations of benzene, ethyl benzene, toluene and xylene (BTEX) were detected at well ESI-5.

Samples for metals, cyanide, and oil and grease analysis were collected only from wells ESI-1, 2, and 3. Oil and grease concentrations ranged from 18 to 64 milligrams per liter (mg/L). In comparison to the New York Class GA groundwater standards for metals, only arsenic and lead were slightly above the standard of 25 ug/L for both parameters. Cyanide was not detected above the detection limit.

2.2.3 Regulatory Status

The site is currently listed as a New York state Class 2 inactive hazardous waste site (Site code 907019).

3.0 IDENTIFICATION OF ADDITIONAL DATA NEEDS

The previous investigations have summarized the history of manufacturing operations at the site and have identified areas of impacted soil and groundwater through visual observations and analytical testing of soil and groundwater samples. This section identifies the issues which require additional data collection.

The purpose of the focused RI, as set forth in this work plan, is to collect the necessary data to support an analysis of remedial alternatives in a focused FS (FFS). Therefore, the additional data needs and the proposed RI field activities have been developed in a manner consistent to achieve closure in an expedited time frame. Sampling and analysis of impacted media at the site have been limited to testing of those parameters that were identified during previous investigations; may be present based on data from previous site use; determine water quality at potential source areas; identify impacts, if any, to the till underlying the site; and provide background groundwater and soil quality data. Sampling and analysis of media not previously sampled at the site (Chadakoin River surface water and sediment) will be investigated in a phased approach as part of evaluating impacts. In addition, aerobic/anaerobic groundwater conditions at the site will be evaluated through the collection of data on biogeochemical parameters. Collection of this data during this stage of the RI will provide an indication of the degree in-situ biodegradation and potentially may be required for final remedial design alternatives.

Review of the data from the previous investigations has identified the following environmental issues at the site requiring additional data:

- Surface soil sampling - surface soil sampling was not performed during previous investigations. Additional data is needed to determine the presence of VOCs, SVOCs, metals and PCBs in surface soils.

- Impact to Chadakoin River - Surface water and sediment samples have not been collected to evaluate impacts, if any, from a reported oily seep and discharge from outfall pipes along the bank of the river. The relationship between groundwater flow from the site and streamflow has also not been evaluated.

- Background soil and groundwater quality - Data on background concentrations of constituents detected on-site has not been collected.

- Limited groundwater characterization - Additional groundwater samples are needed to further define the distribution of groundwater impacts. Analytical data is needed for VOCs, SVOCs, metals and TPH.

In addition, the possibility exists that in-ground tanks associated with the former Proto Tool were closed in-place. These tanks were reportedly located at areas (g) and (h) shown on Figure 3. The potential for the existence of these tanks at the site will be investigated utilizing a phased approach. The presence of the tanks will first be investigated by conducting an electromagnetometer survey (EM) over the suspected location of the tasks. Groundwater samples will then be collected at downgradient locations to determine impacts to groundwater.

The following scope of work has been developed to address the above issues. Once the additional data is gathered, the remedial strategy will be modified or further developed, as necessary.

4.0 SCOPE OF WORK

This section presents the scope of work which will be performed to meet the goals and collect the additional data discussed in the previous section. The scope of work activities will be conducted in a phased approach to allow modification to the scope of work based on data gathered during a previous phase.

In accordance with OSHA and NYSDEC requirements, a site specific Health & Safety Plan (HASP) has been developed for the field activities in accordance with 29CFR1910 and 1526, with emphasis on 29 CFR 1910.20 which covers hazardous waste operations.

As required by the NYSDEC, the necessary elements of a Sampling and Analysis Plan (SAP) have been prepared and are attached as separate documents. The SAP consists of a Quality Assurance Project Plan (QAPP) and Field Sampling Plan (FSP). The QAPP describes the project objectives and organization, and the QA/QC protocols that will be used to achieve the data quality objectives for the RI. The FSP defines the sampling methods that will be used during the project. The FSP will be modified as necessary to accommodate field conditions or changes in the scope of work. A Citizen Participation Plan (CPP) has also been prepared using the NYSDEC document entitled "New York State Inactive Hazardous Waste Site Citizen Participation Plan".

4.1 HISTORICAL REVIEW

The previous environmental site assessment reports for the site have included reference to historical documents (e.g., tax maps, former building plans for the site) that are on-file with the Chautauqua County Department of Planning and Development, the City of Jamestown Assessor's Office, and Dowcraft Corporation. A summary of interviews held with former Proto Tool Company employees is also provided. This information will be reviewed as described below.

4.1.1 Review of Employee Interviews and Historical Documents

Geraghty & Miller has reviewed the summaries of the employee interviews, and other historical documents, as described in the environmental investigation report prepared by Empire Soils Investigations. If available, these documents and transcripts of the employee interviews will be reviewed both prior to initiation of field activities and following receipt of laboratory analytical results for the purposes of locating possible source areas not previously identified. If necessary, former employees will be contacted for additional information regarding historical site use.

4.1.2 Review of Aerial Photographs

Research will be conducted to identify and review available historical aerial photographs of the site, including those aerial photographs identified as being on file with the Chautauqua County Department of Planning and Development. The aerial photographs will be reviewed to look for visible indications of past disposal areas at the site.

4.2 GEOPROBE™ INVESTIGATION

Existing data for the site has confirmed the presence of VOCs in groundwater. The data, however, is limited with respect to the lateral extent of groundwater impacted by VOCs, as well as metals, SVOCs, and TPHs (SVOCs were not included in the analytical parameters tested for during the previous investigations). The present database also does not include background soil quality data for metals.

Using the Geoprobe™ method, groundwater samples will be collected at 15 locations (Figure 7). Prior to beginning the Geoprobe™ program, an EM survey will be conducted around potential below grade tanks at areas (g) and (h) (see Figure 3). The EM survey will consist of oriented transect lines over the suspected area spaced 5 feet apart. The survey will be conducted using a Geonics EM-31DL. Prior to starting the survey, the instrument will be calibrated to a reading of 0.0 microOhms per cubic centimeter (uOhms/cc) in an area of background subsurface conditions free of apparent buried metal objects or surface interference such as parked cars. Using the instrument in this manner, 0.0 uOhms/cc serves as a zero point with a reading greater than 0.0 uOhms/cc recorded as positive values (reading minus 0.0) and readings less than 0.0 uOhms/cc recorded as negative values. Variation in readings due to changes in subsurface soil texture across the site will also be noted. The EM-31DL will give a negative reading (less than 0.0 uOhms/cc) when oriented perpendicular to buried metal objects.

At each Geoprobe™ location, an initial pilot soil boring will be drilled through the fill and/or native sandy deposits and into the underlying till. Samples from the borehole will be collected at continuous 2-foot intervals. The samples will be described and logged in the field by a hydrogeologist. Representative soil samples from each samples interval will be retained and a headspace analysis will be performed in the field using a photoionization detector (PID). Upon completion of the pilot boring, the borehole will be grouted to the surface with a cement-bentonite grout. A second, adjacent boring will then be drilled to a depth within the saturated fill or native sandy deposits for the collection of a groundwater sample. Each groundwater sample will be submitted for analysis of TCL VOCs, TCL SVOCs, TAL Metals and TPH. Geoprobe™ sampling methods and groundwater sampling protocols are provided in the FSP; QA/QC sample collection (duplicates, field blanks) are provided in the QAPP. The samples will be analyzed in accordance with the NYSDEC ASP dated December 1991.

At six of the Geoprobe™ locations, a groundwater sample will also be collected from the underlying till. Groundwater samples for analysis of TCL VOCs will be collected from GP-1, GP-2, GP-3, GP-4, GP-5, and GP-6.

At Geoprobe™ location GP-13, one soil sample will be collected and submitted for analysis of metals to determine background concentrations.

4.3 SURFACE SOIL SAMPLING PROGRAM

Surface soil samples will be collected from throughout the site at the locations shown on Figure 7. In addition to collecting samples for TCL VOCs, TCL SVOCs, and TAL metals at each location, samples will also be collected and submitted for analysis of polychlorinated biphenyls (PCBs).

Sampling methods for the collection of surface soil samples are described in the FSP. The proposed program will be performed upon completion of the Geoprobe™ investigation.

4.4 INSTALLATION OF MONITORING WELLS

The location and need for any additional long-term monitoring wells at the site will be evaluated following completion of the Geoprobe™ investigation and review of the groundwater analytical results. The need to install additional monitoring wells will be determined mainly by the location and concentration of compounds detected in groundwater, and the need to further define hydrogeologic conditions in those areas given the distribution of existing monitoring wells at the site.

The proposed locations of any additional monitoring wells will be submitted to NYSDEC for approval. This submittal will include a site map showing the proposed location, a summary of the estimated screened interval, well construction details, and any modifications to the proposed drilling and sampling methods in the FSP.

4.5 ASSESSMENT OF GROUNDWATER/SURFACE WATER INTERACTION

As discussed in Section 2.1.2 and Section 2.1.3, streamflow within the Chadakoin River varies significantly in response to operation of a dam located beneath the Washington Street bridge in Jamestown. The dam is operated for the purposes of controlling the water level of Chautauqua Lake. As a result of this fluctuation in river stage, groundwater levels and the direction of groundwater flow at the site are likely to be affected. In addition, during the ESAs performed at the site, groundwater seeps and discharges from the outfalls along the bank of the Chadakoin River were observed. The relative elevation of the area of the reported river bank seep (which is assumed to be coincident with a fill material/till contact), in comparison to the fluctuating river stages is unknown. This is also true for the relative elevation of the outfall pipes compared to the stage of the river at various streamflows.

The proposed assessment of the groundwater/surface water interaction will utilize water-level elevation data to be collected from the existing monitoring wells, water-level elevation data to be collected from any newly installed monitoring wells, recorded streamflow data for the Chadakoin River and the surveyed elevation of the Chadakoin River adjacent to the site. The main objective will be to attempt to obtain synoptic water levels in the site monitoring wells and adjacent Chadakoin River during three different streamflow events:

Low-flow - Generally 40 cfs to 60 cfs but low enough flow that river stage is below any identified seep, outfall pipes or fill material/till contact exposed in the bank of the river.

Moderate-flow - River stage is roughly at same elevation of any identified seep, outfall pipes or fill material/till contact.

High-flow - River stage is clearly above any identified seep, outfall pipes or fill material/till contact.

Due to the depth of the river channel (> 10 feet) and fluctuation of the river stage, the elevation of the Chadakoin River will be surveyed directly during each of the above scenarios via a temporary staff gauge as opposed to attempting to install a permanent staff gauge in the river. The elevation of the river during each flow event will be surveyed at a point directly adjacent to well ESI-1. Water-level measurement protocols are contained in the FSP.

The resulting water-level data will be used to construct groundwater contour maps to evaluate variations in the horizontal direction of groundwater flow under the various streamflow scenarios. In addition, visual observations of the river bank will be recorded noting the presence of any seeps or discharges from the outfall pipes. Upon completion of the assessment of groundwater/surface water interaction and review of analytical results collected during the Geoprobe™ investigation, locations will be selected for collection of surface water and sediment samples in the Chadakoin River. These locations will be submitted to the NYSDEC for approval.

4.6 GROUNDWATER SAMPLING

One round of groundwater samples will be collected from the existing monitoring wells, and any designated newly installed wells. Groundwater sampling will not be performed any sooner than two weeks after the installation and development of any new monitoring wells. Analytical parameters for groundwater samples will be the same as those groundwater samples collected during the Geoprobe™ investigation. The groundwater sampling protocol is provided in the FSP and the QA/QC procedures are contained in the QAPP.

During the groundwater sampling, in-situ measurement of selected biogeochemical parameters will be performed. Using a down-well probe and meters, the following parameters will be measured: dissolved oxygen, Eh, pH, specific conductance and temperature. The biogeochemical parameters will provide a general indication of aerobic/anaerobic conditions present in the subsurface.

4.7 SURFACE WATER AND SEDIMENT SAMPLING

The purpose of the surface water and sediment sampling is to determine potential impacts to the Chadakoin River. The proposed sample locations will be submitted to NYSDEC following review of the analytical results for groundwater samples collected during the Geoprobe™ investigation and after the assessment of the groundwater/surface water interaction. It is likely that a minimum of two sampling locations will be selected, one location adjacent to the site and one location upstream of the site.

Surface water and sediment samples will be collected during low-flow stage of the Chadakoin River. Analytical parameters for the surface water and sediment samples are TCL VOCs, TCL SVOCs, TAL metals, and PCBs. The samples will be analyzed in accordance with the NYSDEC ASP dated December 1991. Sediment samples will be collected at the same locations as the surface water samples. The sediment samples will be collected after the surface water samples to prevent sediments from becoming disturbed and suspended in the surface water. Sediment samples will be collected from the 0 to 1 foot depth with a hand-operated core sampler or equivalent. The surface water and sediment sampling protocol is provided in the FSP. QA/QC procedures are contained in the QAPP.

4.8 HYDRAULIC CONDUCTIVITY TESTING

In-situ hydraulic conductivity tests will be performed in each existing monitoring well and any new monitoring wells. The slug tests will involve the "instantaneous" lowering of the water-level in the well. This will be accomplished by introducing a solid slug into the water column to displace water in the well. After the water-level has equilibrated, the slug is suddenly removed, causing the water-level to drop. During the test, water-level changes over time will be measured and recorded. The resulting data will then be analyzed using AQTESOLV, a Geraghty & Miller software program, to determine hydraulic conductivity in the vicinity of the well.

4.9 EVALUATION OF INTERIM REMEDIAL MEASURES AND TREATABILITY STUDIES

An evaluation of the need for interim remedial measures (IRM) and treatability studies will be performed following review of all soil and groundwater data collected during the Geoprobe™ investigation, surface soil sampling program, groundwater sampling, and surface water and sediment sampling.

At this time, the data will be reviewed to evaluate the need to implement an IRM, or to collect additional data to further characterize site conditions for the IRM. Similarly, if during the course of the RI, a potentially applicable preliminary treatment technology is identified, supplemental data needs for treatability studies will be evaluated.

4.10 SURVEY

The vertical elevations of each existing and newly installed monitoring well will be surveyed relative to the National Geodetic Vertical Datum to an accuracy of 0.01 feet by a New York State licensed surveyor. Surveying of the wells will be to the top of the riser casings which will be marked to indicate a measuring point where the well elevations are established. The elevation of the Chadakoin River will be surveyed to an accuracy of 0.01 feet during each round of synoptic water levels.

4.11 DATA VALIDATION

Analytical data generated during the field investigation will be accompanied by a NYSDEC ASP deliverables package. The data package will be validated by a Geraghty & Miller chemist according to the procedures specified in Section 10.0 of the QAPP.

4.12 FISH AND WILDLIFE IMPACT ANALYSIS

Geraghty & Miller will conduct a fish and wildlife impact analysis (FWIA) for the site according to the 1994 guidance prepared by the NYSDEC Division of Fish and Wildlife. Five principal steps are included in the FWIA. These include: (1) Site Description, (2) Contaminant-Specific Impact Assessment, (3) Ecological Effects of Remedial Alternatives, (4) Fish and Wildlife Requirements for Implementation of Remedial Actions, and (5) Monitoring Program. Steps 3 through 5 provide specific guidance for implementation of remedial measures to mitigate environmental impacts and are not addressed in this work plan. If remedial measures are determined to be necessary, a separate work plan will be prepared. Therefore, this work plan focuses on the first two steps which will describe the environmental setting, fish and wildlife resources, and the impacts, if any, that the site has had on these resources.

Step I: Site Description

Tasks to be completed during Step I include reviewing analytical data, maps and aerial photos, environmental investigation reports, and other pertinent site data. The local field offices of the United States Fish and Wildlife Service (USFWS) and the Significant Habitat Unit of the NYSDEC will be contacted for information on regulated wetlands, threatened and endangered species, and critical habitats within a two-mile radius of the site. These agencies also will be asked to provide information on any previous environmental investigations near the site. This information will be used to plan the field investigation.

A field investigation will be conducted by an ecologist to characterize the fish and wildlife resources and covertypes associated with the site and surrounding area. During the field investigation, general covertype and surface drainage maps within 0.5 miles of the site perimeter will be prepared. Any evidence of stress on plant or animal species will be recorded. A description of aquatic resources near the site will include information pertaining to chemical characteristics (general water chemistry, dissolved oxygen), physical characteristics (temperature, depth, flow rate, streambed morphology, etc.), and aquatic vegetation. Terrestrial covertypes will be characterized according to the vegetative species, distribution, and abundance. All fish and wildlife species observed will be recorded according to location relative to the site and covertype.

Following the field investigation and review of other pertinent information, a qualitative evaluation of the value of the fish and wildlife resources within 0.5 miles of the site will be made. This evaluation will consider the general land use and the ability of the area to support fish and wildlife and the potential use of these resources by humans. Potential impacts to any fish and wildlife resources downstream of the site will be assessed. Uses may include fishing, hunting, wildlife observation, or other recreational or economic activities.

The final task of Step I is to identify applicable fish and wildlife regulatory standards or criteria. These include state and federal water quality criteria, sediment criteria, and/or other site-specific criteria. Analytical data collected during the site investigations will be compared to the applicable criteria as a screening assessment of potential impacts during Step II.

Step II: Contaminant-Specific Impact Assessment

Once the fish and wildlife resources have been characterized and the analytical data reviewed and summarized, a contaminant-specific impact analysis (CSIA) will be conducted. The CSIA depends on a number of factors including the constituent concentrations, media impacted, fate and transport of the constituents in the environmental media, fish and wildlife species present, habitat types, exposure pathways, and toxicity of the constituents.

The CSIA will follow the 3-step process (Pathway Analysis, Criteria-Specific Analysis, and Analysis of Toxic Effects) as outlined in the FWIA guidance (NYSDEC, 1994). Each step is more complex than the previous and a decision is made at the conclusion of each step to stop or continue. Each of these steps are described below.

Pathway Analysis

In order for impacts to occur there must be a pathway of exposure and a receptor. In this case, the receptor could be any fish or wildlife resource. If no significant fish and wildlife resources are present due to factors unrelated to chemical releases from the site, minimal impact would be expected even if constituent concentrations exceed regulatory standards or criteria. Also, if constituents have not migrated, and are not expected to migrate in the future, to a potential fish and wildlife resource, minimal impacts would be expected. The CSIA only would proceed to the next step if exposure pathways and receptors were present.

Criteria-Specific Analysis

A criteria-specific analysis is conducted by estimating constituent exposure point concentrations and comparing to available regulatory standards, criteria, or guidance values. Exposure point concentrations will be calculated as the lesser of the maximum or 95 percent upper confidence limit on the mean concentration for each medium. For constituents which do not have applicable published criteria, a literature search of appropriate data bases will be conducted to identify toxicity data which may be used to derive a numerical criteria for the impacted media. Criteria will be developed according to methods used to develop the applicable regulatory standards.

If constituent levels are below the regulatory standards or criteria, it is reasonably assumed that environmental impacts will be minimal. If regulatory standards or criteria are exceeded, the CSIA will include a Toxic Effect Analysis.

Toxic Effects Analysis

Toxic effects to fish and wildlife resources may be conducted for individual organisms, populations, communities, and/or ecosystems. Generally ecological risk assessments focus on impacts to populations rather than individuals. Evaluation of potential impacts at the community or ecosystem level is highly complex; therefore, specific guidance for conducting quantitative evaluations has not yet been developed. If needed, the site-specific toxic effects analysis will include a quantitative assessment of potential impacts to selected indicator species' populations. Indicator species will be selected to represent fish and wildlife resources which have the greatest potential for exposure and/or expected to be sensitive to the particular constituents.

Potential acute and chronic toxic effects to indicator species populations are evaluated by estimating exposure levels from various media and comparing to appropriate ecological toxicity values derived from the literature. An ecological hazard index may be calculated by dividing the estimated exposure by the toxicity value. If the value is greater than 1, this suggests that exposure exceeds acceptable levels and that there is a potential for an environmental impact.

Depending on the results of the steps mentioned above, further toxicity assessment may be needed. This could include plant and animal tissue analysis, toxicity bioassays, comparisons of population density and diversity between impacted and control areas, etc. It is not anticipated that this level of evaluation will be necessary to determine whether remedial measures are required for the site, and if so, appropriate remedial measures. If a more detailed level of assessment is indicated, the specific strategy and methods will be negotiated with the NYSDEC.

4.13 HUMAN HEALTH RISK ASSESSMENT

Once the data from the sampling activities has been validated, a baseline risk assessment (BRA) will be performed. The scope of work for the BRA is provided in Appendix A.

4.14 REMEDIAL INVESTIGATION REPORT

The draft focused RI report will be prepared upon completion of the scope of work. The results of the focused remedial investigation will be submitted to NYSDEC for review and approval. The report will contain the validated analytical results, presented in tables and figures, along with supporting documentation. Geologic logs and as-built construction diagrams will be developed for each Geoprobe™ boring and monitoring well. Water-level elevation data will be tabulated and water-table maps developed so an assessment can be made on the horizontal direction of groundwater flow, and groundwater/surface water interaction. The report will also include descriptions of the investigation methodologies; regional and site specific geology and hydrogeology; identification of applicable or relevant and appropriate requirements; an evaluation of the nature and extent of contamination and a discussion of the fate and transport mechanisms. Comments made by the NYSDEC on the draft report will be addressed prior to submission of the final RI report.

4.15 FOCUSED FEASIBILITY STUDY

A FFS for the site will be performed to evaluate potential remedial technologies and develop remedial alternatives. It is anticipated that the FFS will focus on minimizing impacts, if any, to the Chadakoin River. A detailed scope of work will be submitted at the completion of the RI. A draft outline for the FFS report is provided as Appendix B.

5.0 PROJECT ORGANIZATION & RESPONSIBILITIES

The project team is presented in Figure 8. The responsibilities of the key personnel are defined in the QAPP.

6.0 SCHEDULE

The proposed project schedule is shown on Figure 9. These estimates assume that the field work is performed during acceptable weather seasons. Quarterly project progress reports will be prepared with the commencement of the RI and submitted until the FS is completed.

7.0 REFERENCES

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Waller, M.W. and A.J. Fisher. 1982. Atlas of Eleven Selected Aquifers in New York. United States Geological Survey Water Resources Investigations Open File Report 82-553.

Table 1. Summary of Existing Well Construction Details, D.C. Rollforms/Ingersoll-Rand Site, Jamestown, New York.

Number Designation	Well Diameter	Slot Size	Material Type	Screen Depth Interval *
ESI-1	2"	0.010"	PVC	4-14
ESI-2	2"	0.010"	PVC	4-14
ESI-3	2"	0.010"	PVC	4-14
ESI-4	2"	0.020"	PVC	4.5-14.5
ESI-5	2"	0.020"	PVC	4-14
ESI-6	2"	0.020"	PVC	8-18
ESI-7	2"	0.020"	PVC	5-15

* Feet below land surface.

Table 2. Analytical Results for Test Pit Soil Samples, Phase II Environmental Site Assessment, D.C. Rollforms/Ingersoll-Rand Site, Jamestown, New York.

	Concentration					
Parameter	TP-2	TP-3	TP-4	TP-5	TP-6	TP-7
Antimony	65.2	74.8	182	34.6	92.7	80.7
Arsenic	<22.3	<25.0	74.5	<29.0	32.6	<31.6
Beryllium	<1.11	<1.25	1.66	<1.45	<1.16	<1.58
Cadmium	12.4	6.12	33.5	2.32	20.4	11.1
Chromium	82.8	38.4	231	16.7	104	38.7
Copper	228	383	1370	67.5	476	91.6
Lead	129	70	114	56	117	77.3
Mercury	<0.11	<0.13	0.55	<0.16	<0.12	<0.17
Nickel	169	168	730	39.0	904	136
Selenium	<11.1	<12.5	<15.4	<14.5	<11.6	<15.8
Silver	22.3	<2.5	5.54	<2.90	<2.33	<3.16
Thallium	<22.3	<25.0	<30.8	<29.0	<23.3	<31.6
Zinc	124	218	444	83.7	244	142
pH	7.03	6.61	5.95	7.29	6.83	7.06
Total Cyanide	0.93	<0.91	1.65	15.4	2.24	4.02
Oil & Grease (%)	0.21	1.92	7.11	0.76	1.35	5.05
TCL Volatiles	ND	ND	ND	ND	ND	ND

ND - None detected.
Units in milligrams per kilogram (mg/kg)

Table 3. Summary of Additional Testing of Soil Sample from Test Pit 4, Environmental Investigation, D.C. Rollforms/Ingersoll-Rand Site, Jamestown, New York.

Parameter	Result	Regulatory Level
Corrosivity as pH	7.57	2< or > 12.5
Ignitability	>160° F	>140° F
TCLP Volatile Organics (ug/L)		
Chlrorform	< 25	6,000
1,2-Dichloroethane	< 25	500
Carbon Tetrachloride	< 25	500
Trichloroethene	< 25	500
Benzene	< 25	500
Tetrachloroethene	< 25	700
Chlorobenzene	< 25	100,000
1,4, Dichlorobenzene	< 50	7,500
2-Butanone	< 50	200,000
Vinyl Chloride	< 25	200
1,1-Dichloroethene	< 25	700
TCLP Semi-Volatiles (ug/L)		
Cresol (Total)	< 50	200,000
1,4-Dichlorobenzene	< 50	7,500
2,4-Dinitrotoluene	< 50	130
Hexachlorobenzene	< 50	130
Hexachlorobetadiene	< 50	500
Hexachloroethane	< 50	3,000
Nitrobenzene	< 50	2,000
Pentachlorophenol	< 250	100,000
2,4,5-Trichlorophenol	< 250	400,000
2,4,6-Trichlorophenol	< 50	200
Pyridine	< 50	500
TCLP Metals (ug/L)		
Arsenic	< 0.18	5.0
Barium	1.61	100
Cadmium	0.033	1.0
Chromium	< 0.05	5.0
Lead	< 0.23	5.0
Mercury	< 0.0002	0.2
Selenium	< 0.30	1.0
Silver	< 0.05	5.0
PCBs (ug/g)		
PCB-1016	< 1.0	10 *
PCB-1221	< 1.0	10 *
PCB-1232	< 1.0	10 *
PCB-1242	< 1.0	10 *
PCB-1248	< 1.0	10 *
PCB-1254	3.0	10 *
PCB-1260	< 1.0	10 *

* PCB Concentration for non-restricted access area.

ND Not detected.

NS No standard.

Table 3. Summary of Additional Testing of Soil Sample from Test Pit 4, Environmental Investigation, D.C. Rollforms/Ingersoll-Rand Site, Jamestown, New York.

Parameter	Result	Regulatory Level
Total Petroleum Hydrocarbons		
Gasoline	ND	NS
Kerosene	< 200 ug/g	NS
Fuel Oil	3,100 ug/g	NS
Lube Oil	ND	NS

* PCB Concentration for non-restricted access area.

ND Not detected.

NS No standard.

Table 4. Metals, Cyanide, and Oil and Grease Results for Groundwater Samples from Wells ESI-1, ESI-2, and ESI-3, Phase II Environmental Site Assessment, D.C. Rollforms/Ingersoll-Rand Site, Jamestown, New York.

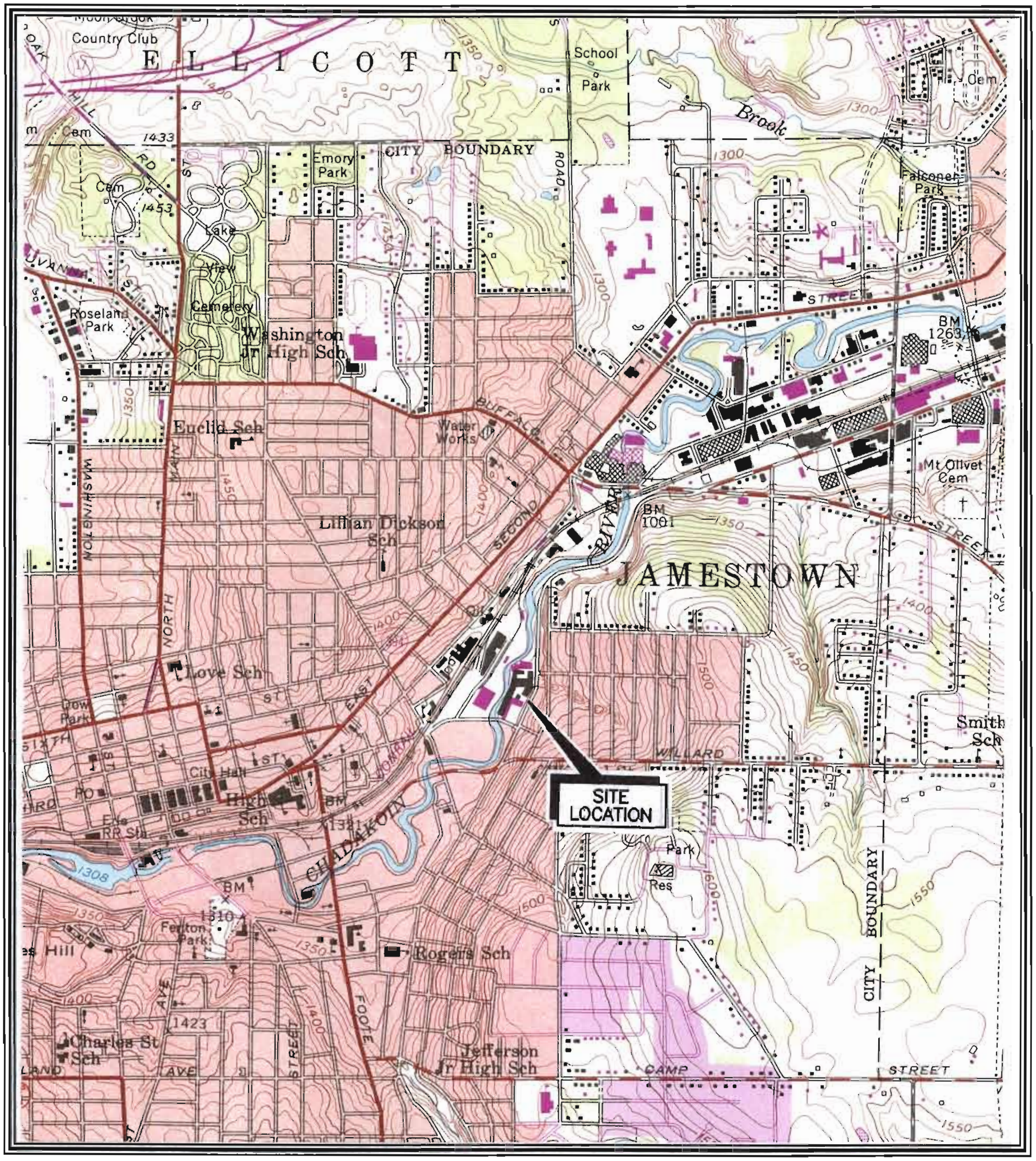
Parameter	Concentration ESI-1	Concentration ESI-2	Concentration ESI-3
Antimony	< 0.05	< 0.05	< 0.05
Arsenic	< 0.01	0.06	< 0.01
Beryllium	< 0.005	< 0.005	< 0.005
Cadmium	< 0.005	< 0.005	< 0.005
Chromium	0.02	0.05	0.02
Copper	0.02	0.07	0.02
Lead	< 0.005	0.03	< 0.005
Mercury	< 0.0002	< 0.0002	< 0.0002
Nickel	0.09	< 0.04	< 0.04
Selenium	< 0.005	< 0.005	< 0.005
Silver	< 0.01	0.01	< 0.01
Thallium	< 0.01	< 0.01	< 0.01
Zinc	0.04	0.13	< 0.02
Cyanide	< 0.002	< 0.02	< 0.02
Oil and Grease	18	64	20

All units in milligrams per liter (mg/L).
Samples collected on November 14, 1990.

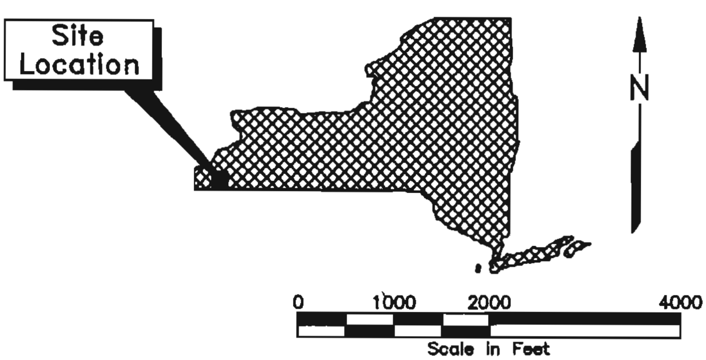
Table 5. Summary of Volatile Organic Compounds and Petroleum Hydrocarbons Detected in Groundwater Samples, Phase II Environmental Site Assessment and Environmental Investigation, D.C. Rollforms/Ingersoll-Rand Site, Jamestown, New York.

	Concentration						
Parameter	ESI-1	ESI-2	ESI-3	ESI-4	ESI-5	ESI-6	ESI-7
Vinyl Chloride	5,900	180	< 50	32	< 1	8.5	3.2
1,2-Dichloroethene (Total)	1,000	< 50	< 25	1,100	1	83	68
Trichloroethene	< 500	< 50	< 25	< 2.5	< 0.5	52	8.9
Benzene	< 500	< 50	< 25	< 10	1.9	< 0.5	< 0.5
Toluene	< 500	< 50	< 25	< 10	1.4	< 0.5	< 0.5
Ethyl Benzene	< 500	< 50	< 25	< 10	0.62	< 0.5	< 0.5
Xylene	< 500	< 50	< 25	< 20	4.2	< 0.1	< 2.0
Lube Oil	NA	NA	NA	Present	ND	ND	ND
Kerosene	NA	NA	NA	1,100	< 100	< 100	< 100

All units in micrograms per liter (ug/L).
Samples from ESI-1, ESI-2 and ESI-3 collected on November 14, 1990.
Samples from ESI-4, ESI-5, ESI-6 and ESI-7 collected on January 2, 1991.
NA Not analyzed.
ND Not detected.



Reference: U.S. Geological Survey, 7.5 Minute Quadrangle, Jamestown, New York, Edited 1954.



SITE LOCATION

D.C. ROLLFORMS/INGERSOLL-RAND SITE
Jamestown, New York

DRAWN: TAD/G248A	DATE:	FIGURE 1
APP'D:	APRIL 1996	

GERAGHTY & MILLER, INC.
Environmental Services

Figure 8. Project Team

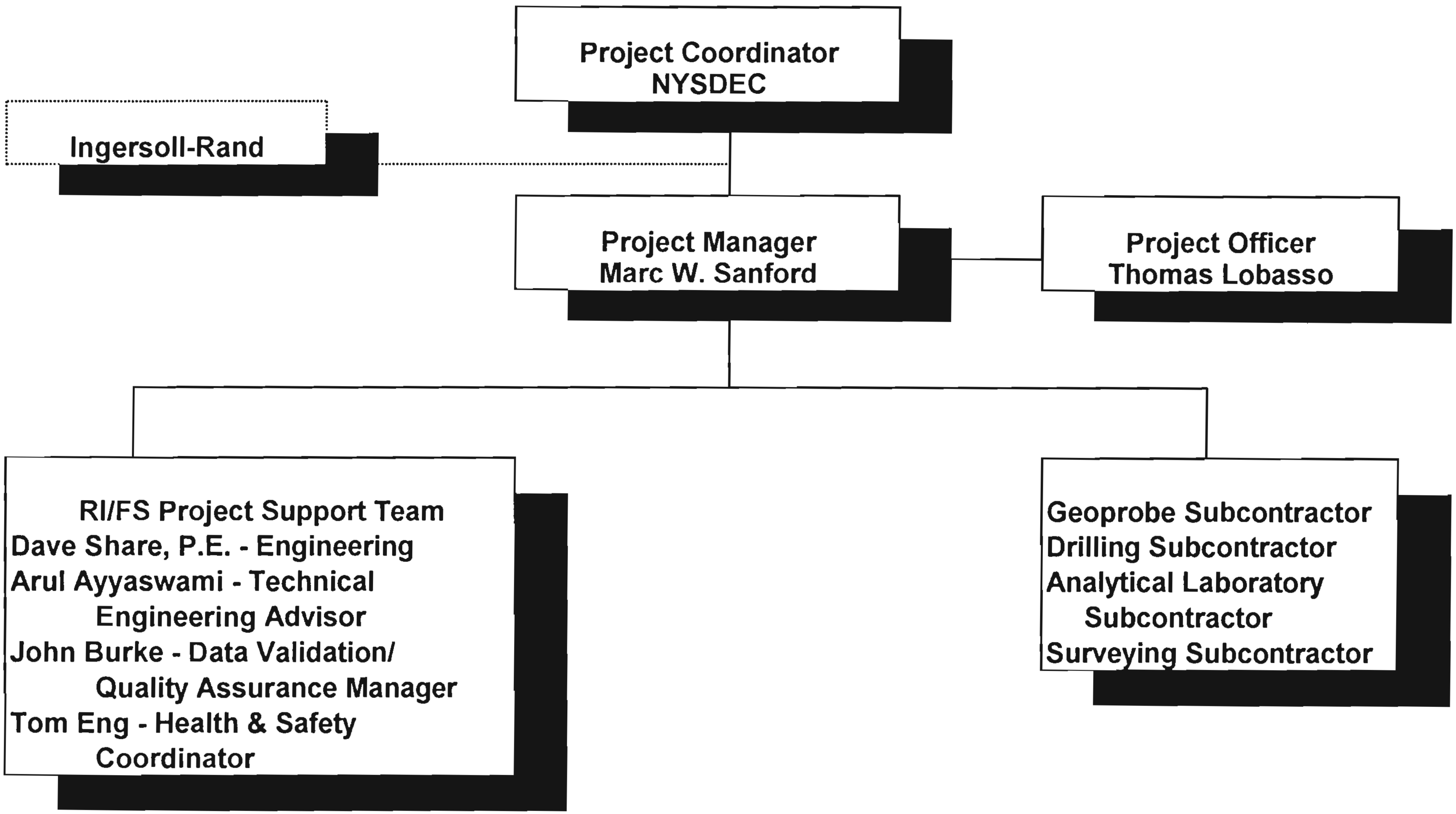
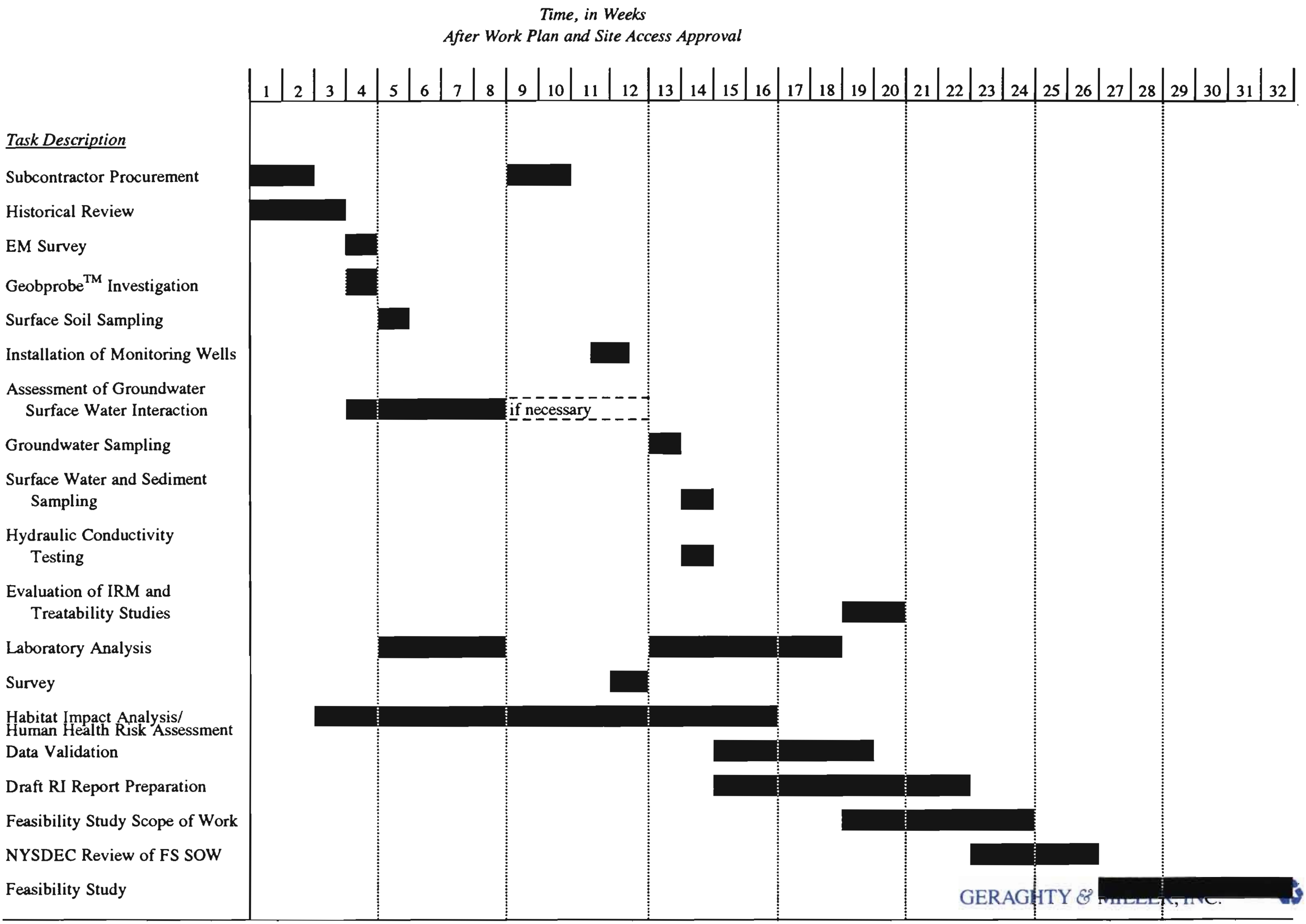


Figure 9. Proposed Schedule for the Focused Remedial Investigation and Feasibility Study at the D.C. Rollforms/Ingersoll-Rand Site, Jamestown, New York.



FOCUSED REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORK PLAN

APPENDIX A

HUMAN HEALTH RISK ASSESSMENT WORK PLAN

HUMAN HEALTH RISK ASSESSMENT WORK PLAN
FOCUSED REMEDIAL INVESTIGATION AND FEASIBILITY STUDY
D.C. ROLLFORMS/INGERSOLL-RAND SITE

1.0 INTRODUCTION

The objective of the baseline risk assessment (BRA) is to identify all reasonable current and future exposure pathways and focus remedial efforts where the greatest benefits in terms of risk reduction and project efficiency can be achieved. Geraghty & Miller will utilize a phased approach to the BRA, moving from a screening level assessment to a more site-specific approach. For example, a screening approach using regulatory standards or criteria may be all that is necessary to eliminate some constituents of concern (COCs) or exposure pathways. However, failing to pass the screening criteria does not necessarily mean that remediation is required. In these cases, a more site-specific approach may demonstrate that no further action is needed or that limited remediation will address the concerns.

2.0 SCOPE OF WORK

The BRA will be prepared according to the latest USEPA and NYSDEC guidance. The following sections discuss the primary tasks for completing the BRA.

2.1 PREPARATION OF CONCEPTUAL SITE EXPOSURE MODEL

A preliminary conceptual site exposure model will be prepared based on readily available site information. The purpose of this model is to identify all the relevant current and future exposure pathways and assumptions. It is recommended that the conceptual exposure model be provided to the NYSDEC for review. Submittal of the conceptual site exposure model affords the opportunity to address agency concerns and obtain approval of the BRA strategy early in the process. By obtaining pre-approval of the conceptual site exposure model, subsequent comments on the BRA are kept to a minimum.

2.2 RISK ASSESSMENT

The basic approach, methods, and assumptions that will be used to evaluate potential risks to human health are reviewed below. Potential human health and environmental risks associated with current and reasonably anticipated future land use will be considered. The risk assessment will be based on the assumption that no remedial (corrective) action will take place at the site; therefore, the site will be evaluated as it currently exists to define baseline conditions. Risks associated with potential exposures will be quantified using site-specific information and reasonable default exposure assumptions. The following subtasks will be required to complete the BRA: site characterization, data review and evaluation, toxicity assessment, exposure assessment, and risk characterization. An ecological assessment also is required and is addressed in a separate section.

2.2.1 Site Characterization

Information gathered from existing reports, site visits conducted by Geraghty & Miller personnel, and local sources will be used to provide a thorough description of the site setting, site use history, geology, hydrogeology, climate, and surrounding land use. This information is critical for developing defensible exposure scenarios.

2.2.2 Data Review and Evaluation

A database will be developed for the environmental data generated from previous investigations and the RI. The data will be reduced and analyzed for use in the risk assessment according to the guidelines provided by USEPA (1989) guidance, as described below:

- Data will be sorted by medium. Surface soil (the top 12 inches) and subsurface soil will be considered as separate media.

- Constituents reported as not detected will be recorded at one-half of the sample quantitation limit (SQL) rather than using zero or eliminating the data point. In instances where one-half of the SQL exceeds the maximum detected concentration, (i.e., as in an unusually high SQL), the maximum detected concentration will be used.

- The reduced data will be presented in summary tables and will identify the frequency of detection, the range of SQLs for non-detects in the dataset, the range of detected values, the arithmetic mean, the one-tailed 95 percent upper confidence level (UCL) on the arithmetic mean, and the exposure point concentration (EPC) to be used in subsequent risk calculations.

COCs will be selected to focus the exposure evaluation on the constituents posing the greatest potential risks to human health and the environment. The term "constituent of concern" does not indicate that significant risk is attributable to the constituent. The term is used to describe those constituents on which the risk assessment will focus. Factors such as detection frequency (constituents detected in less than 5 percent of the samples may be eliminated), comparison to background concentrations, toxicity, and chemical and physical properties related to environmental mobility and persistence (potential for future exposures) will be considered.

2.2.3 Toxicity Assessment

This section presents and discusses the toxicity values used to quantify risks and provides a brief summary of the potential toxic effects for the COCs. Toxicity values are an expression of the dose-response relationship for the constituent and include cancer slope factors (CSFs) and unit risks (URs) for evaluating carcinogenic effects and reference doses (RfDs) and reference concentrations (RfCs) for evaluating non-carcinogenic effects. Toxicity values will be obtained from the Integrated Risk Information System (IRIS, 1996), the Health Effects Assessment Summary Tables (USEPA, 1995), or the National Center for Environmental Assessment. Toxicity values will be presented in tables which conform to agency guidelines.

2.2.4 Exposure Assessment

This section will present the conceptual site exposure model, describe the exposure setting, provide the rationale and documentation for exposure assumptions and pathways, and intake calculations. The potential for exposure to constituents detected in environmental media will be evaluated using the available site-specific information. The site characterization information will be reviewed. This includes information previously presented on the physical nature of the site, including historical uses, surface features, public access, security, surrounding land use, and geology and hydrogeology beneath the site. This information will be used in the risk assessment to qualitatively evaluate fate and transport of constituents and justify the likely receptor populations.

An exposure pathway is defined by four elements: (1) a source or mechanism of constituent release to the environment; (2) an environmental transport medium for the released constituent; (3) a point of potential contact with the contaminated medium (the exposure point); and (4) a receptor exposure route at the exposure point.

An exposure pathway is considered complete only if all four elements are present. Without exposure, there is no risk; therefore, the exposure assessment is one of the key elements of a risk assessment.

The purpose of the exposure assessment is to identify the reasonable maximum exposure (RME) for each potential receptor. The RME is defined by the USEPA (1989) as the maximum exposure that is reasonably expected to occur at a site. Typically, this involves estimating upperbound constituent concentrations at the expected exposure points, contact rates, exposure frequencies, and exposure durations. Determining the RME requires the use of site-specific data, professional judgment, and USEPA default exposure assumptions. In addition to the RME, Geraghty & Miller will include provide "average case" risk estimates for comparison to the RME.

Based on the available information, current exposure pathways include site trespassers and site workers exposed to on-site surface soil and off-site exposure to surface water and sediment. There are no known water supply wells near the site which could be impacted by the site. Therefore, groundwater discharge to surface water or seeps are the only exposure points for groundwater. Future site use is expected to remain industrial; however, future exposure pathways will consider construction worker exposure to surface and subsurface soil. Future worker or trespasser exposure will be the same as current exposure, assuming that constituent concentrations remain the same.

2.2.5 Risk Characterization

Two general criteria are used to describe risk for non-carcinogenic and carcinogenic health effects: the hazard quotient (HQ) for non-carcinogenic effects and the excess lifetime cancer risk

(ELCR) for carcinogens. HQs and ELCRs, calculated for all COCs for each receptor and exposure pathway will be presented and summarized in this section of the BRA.

The HQ is the ratio of the estimated exposure dose and the RfD or RfC. If the HQ exceeds 1, there may be concern for potential non-carcinogenic effects. However, the HQ does not provide the probability of an adverse effect as does the ELCR. HQs may be summed to derive the hazard index (HI). Current regulatory methodology (USEPA, 1989) advises summing HIs across exposure routes for all media to derive a "Total Site HI." However, if the HI exceeds 1, constituents may be grouped according to critical toxic effects, and HIs may be calculated separately for each effect.

The ELCR is an estimate of the probability of developing cancer and is an indication of the increased risk that may result from exposure to affected media. Current regulatory methodology assumes that ELCRs can be summed across routes and media of exposure and COCs to derive a "Total Site Risk" (USEPA, 1989). ELCRs in the target range of 10^{-4} to 10^{-6} generally do not require remediation (USEPA, 1991). The NYSDEC generally considers and ELCR of 10^{-6} acceptable for Class A and B carcinogens and an ELCR of 10^{-5} acceptable for Class C carcinogens (NYSDEC, 1992). Risk-based concentrations (RBCs) will be calculated for COCs which exceed target risk levels by multiplying the ratio of the EPC and the calculated risk by the target risk level. A discussion of uncertainties inherent in the risk assessment process and their impact on the risk assessment results will be included in the report. Risk estimates based on central tendency assumptions will be presented, and, if appropriate, probabilistic risk assessment techniques will be used to quantify the certainty and estimate a range of reasonable risks for the site.

3.0 REFERENCES

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U.S. Environmental Protection Agency (USEPA), 1991. Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions. Office of Solid Waste and Emergency Response, Washington, DC. August 18.

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DRAFT FOCUSED FEASIBILITY STUDY REPORT OUTLINE

EXECUTIVE SUMMARY

1. INTRODUCTION

- 1.1 Purpose and Organization of Report
- 1.2 Site Background and History
- 1.3 Previous Investigations
- 1.4 Results of the Remedial Investigation
- 1.5 Nature and Extent of Contamination

2. IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

- 2.1 Introduction
- 2.2 Remedial Action Objective
- 2.3 General Response Actions
- 2.4 Screening of Remedial Technology Types and Process Options
  - 2.4.1 Identification and Screening of Technologies
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3. DEVELOPMENT AND SCREENING OF ALTERNATIVES

- 3.1 Alternative 1
  - 3.1.1 Description
  - 3.1.2 Evaluation
- 3.2 *(Repeat as necessary for number of alternatives)*

4. DETAILED ANALYSIS OF ALTERNATIVES

- 4.1 Evaluation Criteria
- 4.2 Individual Analysis of Alternatives
  - 4.2.1 Alternative 1
    - 4.2.1.1 Overall Protection
    - 4.2.1.2 Compliance with ARARs
    - 4.2.1.3 Long-Term Effectiveness and Permanence
    - 4.2.1.4 Reduction of Mobility, Toxicity or Volume Through Treatment
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    - 4.2.1.6 Implementability