FINAL REPORT

Boiler Room Focused Feasibility Study
Administrative Order on Consent
R4-0539-88-02

Amphenol Corporation
Sidney, New York

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ENGINEERS, INC.

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1. Introduction

On November 1, 1989, Amphenol Corporation entered into an Administrative Order on Consent (AOC) (File No. R4-0539-88-02) with the New York State Department of Environmental Conservation (NYSDEC). The goal of the AOC was to develop and implement an on-site remedial investigation (RI) program at the Amphenol Corporation facility in Sidney, New York. The objective of the RI program was to identify potential contaminant source areas and, if present, "abate and mitigate the source, in a cost-effective manner and to the extent practicable." To meet the goals and objectives of the AOC the RI program was conducted in phases allowing for the development of a comprehensive site database. These investigative phases together with a Supplemental RI, undertaken from 1984 to 1996, are summarized in the RI Summary Report (O'Brien & Gere, 1996). This report presents the Focused Feasibility Study (FFS) conducted for the site. The Feasibility Study is focused on those alternatives which Amphenol and NYSDEC mutually agreed are most appropriate to evaluate.

1.1. Site background

Amphenol Corporation operates an electrical connector and component manufacturing facility in Sidney, New York. A site location map is presented as Figure 1. Waste oils and organic solvents have been generated and used since the facility commenced operations in the 1930s. The waste oils and organic solvents have been handled and stored at various undocumented locations over the course of the facility operational history.

1.2. Previous investigations

In November 1984, a waste oil underground storage tank (UST), located adjacent to the facility Boiler Room, was removed. During removal, oil was identified in the surrounding soils prompting subsurface soil and ground water investigations. The location of the Boiler Room is illustrated on Figure 2, the site map.

Between January 1985 and February 1995, five phases of remedial investigations were performed at the Amphenol facility in the vicinity of, or related to, the Boiler Room Area. In 1996, a Supplemental RI was also completed for the Boiler Room Area.

The first phase of investigations focused on assessing the presence of free-phase oil on the shallow ground water table, evaluating ground water quality, and evaluating the extent of migration of dissolved petroleum related constituents. The Phase I investigation concluded that there was no free phase oil present; however; dissolved petroleum constituents including benzene, toluene, ethylbenzene and xylene were detected in shallow ground water in the vicinity of the Boiler Room. During this investigation, chlorinated volatile organic compounds (VOCs) were also detected in ground water. The VOCs did not appear to be related to the former waste oil tank. Subsequent phases of investigation focused on further defining the extent and source of the chlorinated VOCs.

The results of the subsequent phases of investigation indicated that VOCs in ground water were detected in the vicinity of the Boiler Room, West Well House and the North Area Well House. VOCs were primarily found to be present in the shallow ground water. These investigations are summarized in the Summary RI Report (O'Brien & Gere, 1996).

1.3. Site conditions

1.3.1 Geology

The Amphenol facility is located in the upper eastern Susquehanna River drainage basin within a valley initially formed by the main trunk of the Susquehanna River. The valley was enlarged by glacial action and subsequently backfilled through deglaciation processes. Deglaciation involved glaciofluvial and glaciolacustrine processes that formed a complex depositional environment that resulted in the highly heterogeneous stratigraphic environment that exists today (Fleisher, 1986).

The subsurface geology in the vicinity of the Amphenol facility consists of overburden deposits with a thickness of approximately 100 ft overlying red shale bedrock. The overburden deposits thicken both in a northerly (in excess of 120 ft at WW-5) and easterly direction (in excess of 106 ft at BR-21 (Stearns & Wheler, 1985).

Surficial fill materials, consisting of varying amounts of sand, silt, angular gravel, and brick pieces, were encountered from grade to depths of approximately 8 ft. Underlying the fill materials is a light olive gray to moderate yellowish brown, heavily oxidized, clayey very fine sand and silt unit (clayey silt). Peat material was also encountered within this unit. The clayey silt has a thickness from 4 to 6 ft and extends to depths ranging between approximately 6 and 12 ft below land surface (bls).

A dark greenish gray to dark reddish brown, very fine grain sand and silt matrix till, with varying amounts of fine to medium grain sand, fine to medium grain rounded gravel, and clay was observed below the clayey silt. The till was encountered at depths ranging from approximately 6 to 12 ft bls and ranging in thickness between approximately 4 and 14 ft.

Underlying the till unit is a dark greenish gray to grayish brown, well sorted sand and gravel deposit. The sand and gravel deposit was encountered at depths ranging from approximately 14 ft to deeper than 20 ft bls. Beneath the gravel unit lies a silty fine sand lacustrine unit which may extend to a depth of approximately 100 ft bls. Geological cross-sections illustrating the above described geologic units are presented in Figures 3 and 4.

1.3.2. Hydrology

An unconfined ground water aquifer exists within the overburden deposits at the Amphenol Facility. This overburden aquifer can be divided into two zones here designated as the shallow overburden aquifer zone and the deep overburden aquifer zone. The zones are separated by the relatively thick silty lacustrine unit in the vicinity of the Amphenol facility. The deep zone is used as a source of municipal water by the Village of Sidney downgradient from the Amphenol facility.

Shallow Overburden Aquifer Zone

The shallow overburden aquifer zone is heterogenous and consists of the saturated portions of fill materials, clayey silt overbank deposits, till, and well sorted, sand and gravel units. The units appear to extend north of the facility to monitoring wells BR-13, BR-14, and BR-19, and exhibit lateral variations. The saturated thickness of the shallow zone materials in the vicinity of the north property boundary range from approximately 2 ft at monitoring well BR-7 to 26 ft at monitoring well WP-1.

Ground water flow direction is to the north towards the Susquehanna River. The hydraulic conductivity values in the shallow zone range from 14 to 18 ft/day in the vicinity of the Boiler Room to 43 ft/day at BR-13

(Environmental Resources Management, 1991). The average shallow zone hydraulic gradient is 0.0006 ft/ft. However, gradients increase locally in the vicinity of building foundations (0.001 ft/ft) near the Boiler Room and the pumping wells (0.003 ft/ft).

Deep overburden aquifer zone

The deep aquifer zone in the vicinity of the facility is comprised of the silty fine sand lacustrine unit that extends from 18 ft below land surface at BR-20 to 106 ft below land surface at BR-21.

The hydraulic conductivity value of the deep aquifer zone, as evaluated at well BR-12 (near the Boiler Room), is 1.6 ft/day (Environmental Resources Management, 1991). In the vicinity of the Amphenol facility an average downward vertical hydraulic gradient of 0.007 ft/ft exists between the shallow and deep zones. Downgradient, towards the Susquehanna River a downward hydraulic gradient of 0.0005 ft/ft exists between the two aquifer zones. Downward vertical gradients increase to approximately 0.07 ft/ft in the vicinity of pumping wells.

The deep zone is a component of the unconfined overburden aquifer and as such is hydraulically connected with the shallow aquifer zone. However, in the vicinity of the Amphenol facility the fine grain nature of the deep aquifer zone materials results in increasingly poor hydraulic connection with depth.

1.3.3. Ground water quality

The presence of detectable concentrations of VOCs in the shallow ground water in the vicinity of the Amphenol facility is pervasive across the site, as shown on Figure 6. Areas of higher total VOC concentrations are observed in predominantly three areas:

1. Adjacent to the Boiler Room in well BR-6 (620 ppb).

2. Near a former solvent tank storage area at the western portion of the facility in GP-12 (1,670 ppb).

3. At the center of the facility at GP-7 (358, 000 ppb).

Some dark brown discrete beads with solvent odors were noted in the subsurface materials in the vicinity of GP-7 which is the likely cause for the high trichlorethene (TCE) concentration in this vicinity.

VOCs detected in ground water included TCE, 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), 1,2-dichloroethene (1,2-DCE), 1,1-dichloroethane (1,1-DCA), and vinyl chloride (VC). The presence of some of these chlorinated VOCs, such as 1,1-DCE, 1,2-DCA and VC, is an indication that natural degradation is taking place in site ground water.

The presence of VOCs in the shallow ground water is attributed to historic facilities operations involving the handling and storage practices of solvents. The distribution of VOCs in the shallow ground water is likely the result of preferential migration pathways due to a combination of heterogeneous geology and the presence of a dense network of active and inactive on-site underground utilities.

The vertical distribution of VOCs in the vicinity of GP-7 exhibited a decreasing trend with depth ranging from 2,810 ppb in GP-17 (27- 29 ft) to 12 ppb in GP-18 (81- 83 ft). However, total VOC concentrations increased in GP-18 (91- 93 ft) and (101-103 ft) to 136 ppb and 266 ppb, respectively (See Figure 4). The deep aquifer VOC concentrations in GP-18 were verified in BR-21 (350 ppb).

Ground water monitoring of on-site and off-site wells indicate that VOCs, primarily residing in the shallow aquifer zone have migrated to the north of the facility towards the Susquehanna River. The limits of the plume are defined by WW-4 and STB-4 to the west and BR-13 and STB-3 to the east (See Figure 6). Total VOC concentrations of 268 ppb were detected in the shallow aquifer zone at STB-5 in the spring of 1995. At this point, the plume apparently descends and concentrations decrease.

A total VOC concentration of 190 ppb was observed in STB-5 in the deep aquifer zone approximately 250 ft from village supply well #2. However, the concentration of total VOCs decreased to 2 ppb in STB-7 and non-detect in STB-8, located 65 ft and 125 ft away from the supply well, respectively. This plume behavior suggests that dilution and/or equilibrium effects are decreasing the concentration of VOCs in the vicinity of the village supply well.

The distribution of deep aquifer VOC concentrations suggests that the west and north facility process wells are exerting hydraulic control of the deep aquifer plume in the vicinity of the facility. This observation is evidenced by the absence of VOCs in the deep portions of the downgradient aquifer as indicated from data collected from STB-2, STB-3, STB-4, and BR-18 which are located between the facility and the supply well.

1.4. Removal actions

Following the investigations performed between 1984 and 1986, the former above ground solvent storage tanks located in the vicinity of the West Parking Lot were identified as the source of VOCs in shallow ground water in this area. The tanks were removed and the area around them was remediated during plant construction activities in 1984. Samples collected subsequent to the removal showed the levels of VOCs in the shallow ground water had "significantly abated" since remediation of the source area, and that the West Parking lot was not a continuing source of VOCs (O'Brien & Gere, 1996).

1.5. Interim remedial measures

During the month of April 1996, a pre-design study was performed for an Interim Remedial Measure (IRM) at the Boiler Room Area. The objective of the pre-design study was to provide supplemental data necessary to evaluate the feasibility and design of a focused contaminant mass reduction ground water recovery and treatment system. The pre-design study consisted of the following:

- the installation of a shallow ground water recovery well;
- the design and construction of a ground water treatment system;
- well yield testing and;
- treatment system performance and effectiveness testing.

In 1998, two additional recovery wells were added to the IRM.

1.5.1. Recovery wells and recovery system

Three 8-inch test recovery wells, designated as PRW-3, PRW-4, and PRW-5, were installed between piezometer GP-7 and monitoring well BR-20. The wells were constructed with two 5-ft screen sections separated by a 2-ft carbon steel blank section. With this configuration, the wells could recover ground water from both the sand and gravel and upper fine sand and silt portions of the overburden aquifer where the highest levels of VOCs were detected.

The recovery system consists of a submersible centrifugal well pump, capable of pumping up to 55 gallons per minute (gpm), installed in each well with buried discharge piping provided from each well to the Amphenol

Plant, which houses the treatment system. A bag filter, flow meter, in-line mixer, sample tap, check valve and throttling valve were included in the piping design from the wells to the treatment system.

1.5.2. Treatment System

The treatment system consists of a low profile tray air stripper to remove VOCs from the ground water. This system makes use of the moderate to high volatility of VOCs by promoting vaporization. The following information was used in the design of the air stripper:

Constituent	Design Influent Concentration (ppb)	Design Effluent Concentration (ppb)
1,1,1-trichloroethane	110	<1
t-1,2-dichloroethene	2,200	<1
tetrachloroethene	100	<1
trichloroethene	720	<1

The air stripper was designed to handle a minimum water temperature of 50 F, and a maximum flowrate of 135 gpm.

Treated ground water is pumped from the air stripper to an existing storm sewer which also collects roof drainage, in accordance with Amphenol's existing State Pollutant Discharge Elimination System (SPDES) permit discharge requirements. The treatment building is equipped with a sump and curb system to control runoff in the event of a leak in the system. A conceptual process schematic for the remediation system is provided as Figure 5.

1.5.3. Treatment System Performance

Following implementation of the treatment system, it is anticipated that the flow rate will range from 60 to 120 gpm, depending on seasonal ground water recharge conditions. The influent concentrations are generally less than 2 ppm of total VOCs. Effluent concentrations of treated ground water have been generally less than the detection limit.

2. Identification and screening technologies

2.1. Introduction

The objective of this phase of the FFS is to identify and screen remedial technologies for the site. The identification and screening of alternatives process includes the development of remedial action objectives; development of general response actions; identification of volumes or areas of media; identification and screening of remedial technologies and process options; and evaluation of process options.

2.2. Remedial action objectives

USEPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (USEPA, 1988) specifies that preliminary remediation goals be based on readily available risk information and applicable or relevant and appropriate requirements (ARARS). The NYSDEC Technical and Administrative Guidance Memorandum (TAGM) on Selection of Remedial Actions at Inactive Hazardous Waste Sites (NYSDEC, 1990) specifies consideration of applicable or relevant and appropriate New York State Standards, Criteria and Guidelines (SCGs). In accordance with the AOC, which states that the FS "shall be performed in a manner that is consistent with CERCLA, as amended, the current NCP and the USEPA draft guidance document entitled, "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA," dated October, 1988" (NYSDEC, 1989). Therefore to be consistent with the AOC, ARARs, which are essentially the same as SCGs, will be referred to in this FFS. Remedial objectives reflect risk-based issues resulting from site-specific baseline risk assessment or ARARS.

A comparison of site ground water data to the NYSDEC Class GA ground water standards indicates that several VOCs, including TCE, 1,1,1-TCA, PCE, DCE, DCA, VC, benzene and ethylbenzene have been detected in site ground water at concentrations greater than the NYSDEC Class GA standards for these compounds. These standards have been identified as potential chemical-specific ARARS for the site. Based on the comparison of detected concentrations in ground water at the site, the following remedial action objectives have been developed:

- Prevent ingestion of site ground water containing VOC concentrations in excess of NYSDEC Class GA ground water standards.
- Achieve mass reduction of VOCs in site ground water.

2.3. General response actions

General response actions are media-specific actions which may be combined into alternatives to satisfy the remedial action objectives. General response actions identified for the site include: institutional controls, monitoring, containment, collection, treatment, and discharge.

2.4. Identification of volumes or areas of media

Site conditions, the nature and extent of contamination, and preliminary remediation goals were taken into consideration to develop the volumes or areas of media to be addressed by the general response actions. Chlorinated VOCs including TCE, TCA, PCE, 1,2-DCE, 1-1-DCE, 1,1-DCA, and VC have been detected in ground water in the vicinity of the Amphenol facility. Additionally, benzene and ethylbenzene have been detected in ground water at the site. The extent of the ground water VOC plume is illustrated in Figure 6.

As described in Section 1.4, areas of higher total VOC concentrations are observed in predominantly three areas, with VOCs being pervasive across the back portion of the facility. A review of analytical data for ground water in these areas shows that the maximum concentrations are associated with ground water in the vicinity of GP-7. As such, this area has been identified as a hot spot, and is the subject of this FFS.

2.5. Identification and screening of remedial technologies and process options

This step requires identification of potentially applicable remedial technology types and process options for each general response action. Process options are screened on the basis of technical implementability. The technical implementability of each identified process option is evaluated with respect to site contaminant information, site physical characteristics, and areas and volumes of affected media. Technologies and process options identified for the ground water are described and screened for technical implementability as presented in Table 1. As identified in Table 1, installation of both the interceptor trench and the iron reactive wall would be very difficult due to the presence of underground utilities. Given this difficulty, the iron reactive wall was not retained for further analysis. The interceptor trench was retained for further analysis to provide an evaluation of an alternate ground water collection method. Descriptions of process options which remained after the screening phase follow.

Deed restrictions. Deed restrictions incorporated into a property deed could include ground water use restrictions prohibiting the installation of a potable water well or use of the untreated site ground water as a potable water supply. Deed restrictions for this site would be implemented until such a time when ground water VOC concentrations would no longer pose a threat to human receptors.

Ground water monitoring. Ground water monitoring would involve periodic sampling and analysis of ground water at the site. Ground water monitoring would provide a means of detecting changes in VOC concentrations in the ground water.

Ground water extraction wells. Contaminated ground water could be collected by pumping from extraction wells installed in the overburden material. The collected ground water would require further management. Currently, three extraction wells have been installed at the site to remove ground water from the hot spot area in the vicinity of GP-7. As described in Section 1.5.1, the extraction wells are 8-inch wells, and are designated as PRW-3, PRW-4, and PRW-5. Ground water outside of the GP-7 hot spot area is expected to be addressed through natural attenuation. As discussed in Section 1.3, it is evident that natural degradation of TCE is currently occurring within the aquifer.

Downgradient interceptor trench. An interceptor trench is a ground water collection technique. Typically, a trench is excavated with conventional construction equipment to the necessary depth. A perforated pipe is placed in the bottom of the trench; the trench is then backfilled with more permeable materials (*e.g.*, gravel) to allow collection of ground water through the pipe to a storage area such as a collection tank.

Air stripping. Air stripping involves the contact of ground water with air in a countercurrent tray column, or bulk reactor to transfer volatile contaminants from the ground water to the air. Air stripping would address VOCs in the ground water. Currently a low-profile air stripper is operational at the site. The air stripper is designed for a maximum of 125 gpm. No air permit or air emissions control equipment are required, in concurrence with NYSDEC.

Off-site discharge. Treated ground water would be discharged directly to a storm drain. Treated ground water is currently discharged to a storm drain and has been demonstrated to meet the effluent requirements as specified in the SPDES permit currently held by Amphenol.

2.6. Evaluation of process options

Process options remaining after the initial screening are further evaluated for effectiveness, implementability, and cost. The effectiveness criterion includes the evaluation of:

- potential effectiveness of the process options in meeting remediation goals and handling the estimated volumes or areas of media;
- potential effects on human health and the environment during construction and implementation; and
- experience and reliability of the process options for site contaminants and conditions.

The technical and institutional aspects of the process options are assessed for the implementability criterion. The capital and operation and maintenance (O&M) costs of each process option are evaluated as to whether they are high, medium, or low relative to the other process options of the same technology type. A summary of these evaluations for each medium is presented in Table 2. Based on the evaluation, each process option was retained.

3. Development of alternatives

3.1. Development of alternatives

General response actions and representative process options are combined to form alternatives that address the remedial objectives. The alternatives are developed for each affected medium at the site. The no action alternative is included in the range of alternatives in accordance with USEPA guidelines (USEPA, 1988) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (*Federal Register*, 1990). A summary of the remedial alternatives and their elements is presented in Table 3. A description of each alternative follows:

3.1.1. Alternative 1 - No action

Alternative 1 is the no action alternative. The no action alternative is required by the NCP and serves as a benchmark for the evaluation of action alternatives. This alternative provides for an assessment of the environmental conditions if no active remedial actions are implemented.

This alternative would include ground water use restrictions, ground water monitoring, and five-year reviews. Use restrictions would include deed restrictions. Deed restrictions would provide for ground water use restrictions by including language in the Site property deed which would specifically prohibit the installation of potable water supply wells on-site while ground water concentrations exceed NYSDEC Class GA Standards. Ground water would be monitored for chlorinated VOCs.

Five-year reviews are conducted when impacted materials are to remain on-site. The purpose of the five-year review is to evaluate whether adequate protection of human health and the environment is maintained. Five-year reviews are required by the NCP (*Federal Register*, 1990) and apply to Superfund sites where the selected alternatives include provisions for untreated waste material to remain on the site at concentrations above acceptable levels.

3.1.2. Alternative 2 - No further action

Alternative 2 involves continuation of the current IRM as the long-term remedy for ground water at the site. As described in Section 1.5, the current IRM includes a ground water extraction system, treatment of the extracted ground water using an air stripper, and discharge of treated ground water to a storm drain.

The extraction system consists of three extraction wells equipped with submersible pumps. The extracted ground water is piped to an air stripper for treatment of chlorinated VOCs. The treated ground water is then discharged to a storm drain, in accordance with the existing SPDES permit. Alternative 2 would also include treated effluent and ground water monitoring for chlorinated VOCs.

3.1.3. Alternative 3 - Ground water extraction and treatment

Alternative 3 consists of a ground water extraction system, treatment of extracted ground water using an air stripper, and discharge of treated ground water to storm drain.

The extraction system would consist of an interceptor trench used to collect ground water, coupled with a pumping system. Ground water would be directed to an air stripper for treatment of chlorinated VOCs. The treated ground water would then be discharged to a storm drain, in accordance with an existing SPDES permit. Alternative 3 would also include treated effluent and ground water monitoring for chlorinated VOCs.

4. Detailed evaluation of alternatives

4.1. Introduction

The following section provides a detailed evaluation of the alternatives developed for the site. The alternatives are first evaluated individually and then compared to each other. The detailed evaluation is summarized in Table 4.

The objective of the detailed analysis of alternatives was to analyze and present sufficient information to allow the alternatives to be compared and a remedy selected. The analysis consisted of a comparison to nine evaluation criteria that encompass statutory requirements and overall feasibility and acceptability. The nine evaluation criteria are:

- Overall protection of human health and the environment
- Compliance with ARARS
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- Support agency acceptance, and
- Community acceptance.

The preamble to the NCP (*Federal Register*, 1990) indicates that, during remedy selection, these nine criteria should be categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The two threshold criteria, overall protection of human health and the environment and compliance with ARARS, must be satisfied in order for an alternative to be eligible for selection. Long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost are primary balancing criteria which are used to balance the trade-offs between alternatives. The modifying criteria are support agency and community acceptance, which are formally considered after public comment is received on the Proposed Remedial Action Plan (PRAP).

4.2. Individual analysis of alternatives

In the individual analysis of alternatives, each of the remedial alternatives was evaluated with respect to the nine Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) criteria. A summary of the individual analysis of alternatives is presented in Table 4.

4.2.1. Overall protection of human health and the environment

The analysis of each alternative to this criterion provides an evaluation of whether the alternative achieves and maintains adequate protection and a description of how site risks are eliminated, reduced, or controlled through treatment, engineering, or institutional controls. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

4.2.2. Compliance with ARARS

Section 121(d) of CERCLA, as amended by Superfund Amendment Reauthorization Act (SARA), requires that remedial actions comply with ARARs or standards under Federal and State environmental law. The requirement to attain State ARARS applies to requirements promulgated under State environmental or facility siting laws which are either more stringent than Federal requirements, or address a chemical, location or action that Federal ARARS do not. NYSDEC evaluates compliance with applicable or relevant and appropriate standards, criteria, and guidelines (SCGs) (NYSDEC, 1990). As discussed in Section 2.2, the FFS will be consistent with CERCLA guidance, and ARARs, rather than SCGs, will be included in analyses for this FFS.

SARA does allow selection of remedies which do not attain all ARARS, provided one or more of six waiver conditions are met and protection of human health and the environment remains assured. The six waiver conditions are:

1. Fund balancing (need for protection versus funds available--only applicable to federally funded projects);
2. Compliance is technically impractical;
3. Alternative is only an interim action;
4. Compliance would result in greater risk;
5. Previous inconsistency in application of State standards; or
6. Alternate method or approach achieves equivalent standards.

Alternatives are developed and refined throughout the CERCLA process so that they would meet the respective ARARS or that there is a good rationale for waiving an ARAR. There are three types of ARARS: chemical-, location-, and action-specific ARARS.

Chemical-specific ARARS are usually health- or risk-based numerical values or methodologies which, when applied to sit-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to the ambient environment.

Chemical-specific ARARS for the site include the NYSDEC Class GA standards for ground water. Historically, ground water sample analytical results collected at the site have shown that ground water concentrations of benzene, TCE, 1,2-DCE, PCE, and VC have consistently been above the NYSDEC Class GA standards for ground water. Additionally, 1,1-DCE, 1,2-DCA, TCA and ethylbenzene have also been detected above the NYSDEC Class GA standards for ground water, though less frequently.

Location-specific ARARS set restrictions on activities based on the characteristics of the Site or immediate environs. Location-specific ARARS and to be considered material (TBCs) were not identified for the site.

Action-specific ARARS set controls or restrictions on particular types of actions related to management of hazardous substances, pollutants, or contaminants. Potential action-specific ARARS identified for the site are associated with air emissions, treatment residues, and water discharge associated with Alternatives 2 and 3. In addition to potential action-specific ARARS, a potential action-specific TBC was identified for activities resulting in air emissions.

The potential chemical-specific, and action-specific ARARS and TBCs identified for the site are summarized in Table 5. Evaluation of compliance with ARARS for each remedial alternative is summarized in Table 4.

4.2.3. Reduction of mobility, toxicity, and volume through treatment

The evaluation of reduction of toxicity, mobility and volume through treatment addresses the expected performance of treatment technologies in each alternative. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

4.2.4. Long-term effectiveness and permanence

This criterion assesses the magnitude of residual risk remaining from untreated material or treatment residuals at the site. Additionally, the adequacy and reliability of controls used to manage untreated material or treatment residuals is also evaluated. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

4.2.5. Short-term effectiveness

The evaluation of short-term effectiveness addresses the protection of workers and the community during construction and implementation of each alternative, and the environmental effects resulting from implementation of each alternative. Additionally, the time required to achieve remedial objectives is also evaluated under this criterion. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

4.2.6. Implementability

The analysis of implementability involves an assessment of the ability to construct and operate the technologies, the reliability of the technologies, the ease of undertaking additional remedial action, the ability to monitor the effectiveness of each remedy, the ability to obtain necessary approvals from other agencies. Additionally, the availability of services, capacities, equipment, materials, and specialists necessary for implementation of the alternative is also assessed. The individual analysis of each remedial alternative with respect to this criterion is presented in Table 4.

4.2.7. Cost

For the cost analysis, cost estimates are presented for each alternative based on vendor information and quotations, cost estimating guides, and experience. Cost estimates are prepared for the purpose of alternative comparison and are based on information currently known about the study area. Cost estimates include capital costs, annual operation and maintenance costs, and a present worth cost. The present worth cost for these alternatives was calculated for the expected duration of the remedy at a 7% discount rate. The individual cost estimates for the remedial alternatives are included in Tables 6 through 8.

4.2.8. Support agency acceptance

Support agency acceptance indicates whether, based on its review of the RI and FS reports and the PRAP, the support agency concurs with the preferred remedy at the present time. Support agency acceptance will be addressed in the Record of Decision (ROD) following the public comment period.

4.2.9. Community acceptance

Community acceptance refers to the public's general response to the alternatives described in the RI and FS reports and the PRAP. Community acceptance will be addressed in the ROD following the public comment period.

4.3. Comparative analysis of alternatives

In the comparative analysis of alternatives, the performance of each alternative relative to the others was evaluated for each criterion.

4.3.1. Overall protection of human health and the environment

Though Alternative 1 provides protection of human health through deed restrictions on ground water use at the site and natural attenuation, both Alternatives 2 and 3 provide a greater degree of protection through active reduction of contaminant mass in ground water.

Alternatives 2 and 3 also provide better protection to the environment through reduction in contaminant mass in the ground water, while Alternative 1 relies solely on natural attenuation. Alternatives 2 and 3 would also actively address contaminant migration to downgradient ground water resources.

4.3.2. Compliance with ARARS

The NYSDEC Class GA standards for ground water were identified as potential ARARS for site ground water. Alternatives 2 and 3 provide active remediation of ground water, directly addressing contaminant concentrations in the ground water. Alternative 1 relies on natural attenuation to remediate ground water.

Potential action-specific ARARS and TBCs are associated with Alternatives 2 and 3. Both these alternatives would be implemented such that potential action-specific ARARS and TBCs associated with air emissions, treatment residues, and ground water discharges would be met.

4.3.3. Reduction of mobility, toxicity, and volume through treatment
Alternative 1 would not provide for a reduction in mobility, toxicity, or volume through treatment, as it is the no action alternative, however, some reduction in toxicity is anticipated through natural attenuation. Both Alternatives 2 and 3 will achieve a reduction in toxicity of recovered ground water through use of an air stripper to remove VOCs. Air stripping is considered an irreversible treatment for VOCs in ground water.

4.3.4. Long-term effectiveness and permanence
Alternatives 1, 2, and 3 provide adequate controls on ground water use. The risks posed by constituents in ground water would not be actively addressed in Alternative 1, though some reduction in VOC concentration is anticipated through natural attenuation. Both Alternatives 2 and 3 would actively address risks posed by constituents in ground water through collection and treatment of ground water.

4.3.5. Short-term effectiveness
Implementation of Alternatives 1 and 2 is not anticipated to result in risks to the surrounding community, and no protection is required for onsite workers. Risks to surrounding community and construction workers associated with interceptor trench construction for Alternative 3 would be minimized through dust control and proper health and safety practices.

4.3.6. Implementability
Alternative 2 is currently implemented at the site. Alternative 1 is readily implementable. Installation of the interceptor trench included in Alternative 3 would be difficult due to buried utilities in the area. Specialized equipment and construction methods required for Alternative 3 is readily available.

Deed restrictions associated with Alternatives 1, 2, and 3 are reliable methods of restricting ground water use. Air stripping is a reliable technology for removal of VOCs from ground water. Necessary capacity for discharge of treated ground water exists. Additional remedies can be easily implemented as necessary with these three alternatives.

Ground water monitoring, a component of each alternative, is a reliable method of evaluating ground water quality. Some coordination is expected to be necessary for implementation of the deed restrictions, included in each alternative.

4.3.7. Cost

The estimated cost for each alternative is presented in Tables 6 through 8.

Alternative 1. The estimated total present worth cost for Alternative 1 is $231,699. This includes an estimated capital cost of $5,000 and an estimated annual operation and maintenance cost of $16,530. A cost of $10,000 was also included for five-year reviews. The present worth cost was generated for 30 years using a discount rate of 7 %.

Alternative 2. The estimated total present worth cost for Alternative 2 is $499,735. This includes an estimated capital cost of $5,000 and an estimated annual operation and maintenance cost of $38,130. A cost of $10,000 was also included for five-year reviews. The present worth cost was generated for 30 years using a discount rate of 7 %.

Alternative 3. The estimated total present worth cost for Alternative 3 is $997,160. This includes an estimated capital cost of $502,425 and an estimated annual operation and maintenance cost of $38,130. A cost of $10,000 was also included for five-year reviews. The present worth cost was generated for 30 years using a discount rate of 7 %.

4.3.8. Support agency acceptance

Support agency acceptance will be addressed in the ROD following the public comment period.

4.3.9. Community acceptance

Community acceptance will be addressed in the ROD following the public comment period.

4.4. Summary of the detailed analysis of alternatives

Alternative 2 best addresses the full range of evaluation criteria, since this alternative involves active restoration of the affected ground water. Alternative 2 is favored due to the fact that it has been successfully implemented at the site as an IRM. Alternative 3 would achieve a similar degree of remediation as Alternative 2; however, implementation would be difficult due to buried utilities in the area and would involve additional capital expenses of approximately $497,425.

5. Conclusions

Ground water quality at the site has been evaluated and the evaluation indicates that there are ground water concentrations of VOCs in excess of the NYSDEC Class GA standards, identified as potential ARARS for the site. Given this finding, two remedial action objectives were developed for consideration at the site. These remedial action objectives were prevention of ingestion of site ground water, and reduction in contaminant mass in site ground water.

With these remedial objectives in mind, general response actions and associated remedial technologies and process options were evaluated. Three remedial alternatives were identified. These alternatives included a no action alternative and two active ground water recovery and treatment alternatives. A detailed evaluation of alternatives was performed using nine criteria established by USEPA and NYSDEC.

The most favorable alternative to emerge from the detailed evaluation of alternatives was Alternative 2. Alternative 2 was most favorable because it has been successfully implemented at the site as an IRM. Additionally, Alternative 3, also expected to achieve a similar degree of remediation, is considered to be less implementable because of the difficulties associated with the installation of an interceptor trench.

Alternative 2 consists of three extraction wells, ground water pumping system, and an air stripper. The air stripper is designed to remove VOCs from the ground water such that the treated effluent meets the effluent limits of the facility SPDES permit. The details of the treatment system are described in Section 1.5.

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Table 1. *Screening of technologies and process options - ground water.*

General response action	Remedial technology	Process option	Description	Screening comments
No further action	None	Not applicable	No action.	Required for consideration by NCP.
Institutional controls	Use restrictions	Deed restrictions	Restriction written into affected property's deed restricting use of ground water as a potable supply.	Potentially applicable.
Monitoring	Monitoring	Ground water monitoring	Periodic sampling and analysis of overburden and bedrock ground water.	Currently applied as part of the IRM.
Containment	Horizontal barriers	Slurry wall	Vertical containment wall to restrict horizontal migration of ground water from or through the contaminated zone.	Not applicable. No appropriate low permeability formation is available into which a slurry wall can be keyed at depths less than 100 ft.
		Grout curtain	Pressure injection of grout into soil to form a barrier surrounding impacted ground water.	Not applicable. No appropriate low permeability formation is available into which a slurry wall can be keyed at depths less than 100 ft.
Collection	Extraction	Ground water extraction wells	Installation of extraction wells to pump and collect contaminated ground water.	Currently applied as part of the IRM.
		Downgradient interceptor trench	Installation of a trench to intercept and collect ground water flowing from the contaminated zone.	Potentially applicable. Implementation would be difficult due to existing utilities.

Table 1. *Screening of technologies and process options - ground water.*

General response action	Remedial technology	Process option	Description	Screening comments
Treatment	*Ex situ* Physical treatment	Air Stripping	Contact of air with contaminated ground water in a countercurrent column or bulk reactor to transfer VOCs from water to air.	Currently applied as part of the IRM.
	In situ chemical treatment	Iron reactive wall barrier	Subsurface trench containing iron based reactive material used for treating chlorinated VOCs. Ground water is channeled to the wall using vertical barriers.	Potentially applicable. Implementation would be difficult due to existing utilities.
Discharge	Surface water	On-site storm drain	Discharge of treated water to storm drain. Amphenol has an existing SPDES permit for this discharge.	Currently implemeted as part of the IRM.

Table 2. *Evaluation of process options - ground water.*

General response action	Remedial technology	Process option	Effectiveness	Implementability	Cost
No action	None	Not applicable	Relies solely on natural attenuation.	Readily implementable	No capital No operation and maintenance
Institutional controls	Use restrictions	Deed restrictions	Effectiveness depends on continued implementation. Does not reduce contamination or prevent migration.	Readily implementable	Low capital. No operation and maintenance
Monitoring	Monitoring	Ground water monitoring	Effective means of evaluating changes in VOC concentrations in ground water.	Implemented	Low capital. Low operation and maintenance.
Collection	Extraction	Ground water extraction wells	Effective means of collecting ground water.	Implemented	No additional capital. Medium operation and maintenance.
		Downgradient interceptor trench	Effective means of collecting ground water.	Implementable	High capital. Medium operation and maintenance.
Treatment	*Ex situ* Physical treatment	Air Stripping	Effective means of treating VOCs in ground water. Off-gas treatment may be required.	Implemented	No additional capital. Medium operation and maintenance.
Discharge	Surface water	On-site storm drain	Effective means of discharging treated ground water.	Implemented	No capital. Low operation and maintenance.

Notes:

Table 3. *Remedial alternatives*

General response actions	Remedial Technology	Process Option	Alternatives		
			1	2	3
No action	None	None	X		
Institutional controls	Ground water use restriction	Deed restriction	X	X	X
Monitoring	Monitoring	Ground water monitoring	X	X	X
Collection	Extraction	Ground water extraction wells		X	
		Ground water interceptor trench			X
Treatment	*Ex situ* physical treatment	Air stripping		X	X
Discharge	Surface water	storm drain		X	X

Table 4. *Detailed evaluation of alternatives.*

Criterion	Alternative -1 - No Action Deed Restrictions Monitoring	Alternative -2 - Deed Restrictions Monitoring Extraction well Ground water treatment Discharge to POTW	Alternative - 3 - Deed restrictions Monitoring Interceptor trench Ground water treatment Discharge to POTW
Overall protection of human health and the environment			
Overall protection of human health	Relies on deed restrictions for protection of human health through limitation of ground water use as a potable water source.	Relies on both deed restrictions and contaminant mass reduction for protection of human health.	Relies on both deed restrictions and contaminant mass reduction for protection of human health.
Overall protection of the environment	Relies on natural attenuation to protect downgradient ground water from further contamination.	Relies on natural attenuation and active contaminant mass reduction to protect downgradient ground water resources from further contamination.	Relies on natural attenuation and active contaminant mass reduction to protect downgradient ground water resources from further contamination.
Compliance with applicable, relevant and appropriate requirements and to be considered material (ARARs and TBCs are listed in Table 5)			
Compliance with chemical-specific ARARs	Relies on natural attenuation to address excursions of ground water standards which are identified as chemical-specific ARARs.	Relies on both natural attenuation and contaminant mass reduction to address excursions of ground water standards which are identified as chemical-specific ARARs.	Relies on both natural attenuation and contaminant mass reduction to address excursions of ground water standards which are identified as chemical-specific ARARs.
Compliance with chemical-specific TBCs	No chemical-specific TBCs are identified for the site.	No chemical-specific TBCs are identified for the site.	No chemical-specific TBCs are identified for the site.
Compliance with location-specific ARARs	No location-specific ARARs are identified for the site.	No location-specific ARARs are identified for the site.	No location-specific ARARs are identified for the site.
Compliance with location-specific TBCs.	No location-specific TBCs are identified for the site.	No location-specific TBCs are identified for the site.	No location-specific TBCs are identified for the site.

Table 4. *Detailed evaluation of alternatives.*

Criterion	Alternative -1 - No Action Deed Restrictions Monitoring	Alternative -2 - Deed Restrictions Monitoring Extraction well Ground water treatment Discharge to POTW	Alternative - 3 - Deed restrictions Monitoring Interceptor trench Ground water treatment Discharge to POTW
Compliance with action-specific ARARs	No action-specific ARARs are identified for this alternative.	Discharges of air emissions would be in compliance with the limits in 6 NYCRR Part 212, or 40 CFR 61 if more stringent. Discharge of treated ground water would be in compliance with the current facility NYSDEC SPDES permit. Disposal of treatment residuals, if any, associated with ground water treatment would meet RCRA management and disposal requirements.	Discharges of air emissions would be in compliance with the limits in 6 NYCRR Part 212, or 40 CFR 61 if more stringent. Discharge of treated ground water would be in compliance with the current facility NYSDEC SPDES permit. Disposal of treatment residuals, if any, associated with ground water treatment would meet RCRA management and disposal requirements.
Compliance with action-specific TBCs	No action-specific TBCs are identified for this alternative.	Design and operation of the air stripper would comply with NYS Air Guide 1 air emission requirements. The NYS Air Guide 1 is not a promulgated regulation.	Design and operation of the air stripper would comply with NYS Air Guide 1 air emission requirements. The NYS Air Guide 1 is not a promulgated regulation.
Long-term effectiveness and implementability			
Magnitude of residual risk	The risks posed by constituents in ground water are reduced in this alternative through natural attenuation. The risk of human ingestion of ground water is minimized by instating deed restrictions precluding ground water use.	The risks posed by constituents in ground water are reduced in this alternative through active treatment of ground water. The risk of human ingestion of ground water is minimized by instating deed restrictions precluding ground water use.	The risks posed by constituents in ground water are reduced in this alternative through active treatment of ground water. The risk of human ingestion of ground water is minimized by instating deed restrictions precluding ground water use.
Adequacy and reliability of controls.	Deed restrictions are adequate and reliable in restricting ground water use.	Deed restrictions are adequate and reliable in restricting ground water use. Collection of ground water and treatment of ground water using air stripping are adequate and reliable controls for ground water contamination.	Deed restrictions are adequate and reliable in restricting ground water use. Collection of ground water and treatment of ground water using air stripping are adequate and reliable controls for ground water contamination.

Table 4. *Detailed evaluation of alternatives.*

Criterion	Alternative -1 - No Action Deed Restrictions Monitoring	Alternative -2 - Deed Restrictions Monitoring Extraction well Ground water treatment Discharge to POTW	Alternative - 3 - Deed restrictions Monitoring Interceptor trench Ground water treatment Discharge to POTW
Reduction of toxicity, mobility, or volume through treatment			
Treatment process used and materials treated	None active treatment technologies are included in this alternative, However, VOCs are expected to be treated through natural attenuation.	Air stripping would be used in this alternative to treat VOCs in recovered ground water.	Air stripping would be used in this alternative to treat VOCs in recovered ground water.
Amount of hazardous material destroyed or treated	There is expected to be some destruction of VOCs due to natural attenuation. The amount is unknown.	Air stripping would address up to 99 % of VOCs in recovered ground water.	Air stripping would address up to 99 % of VOCs in recovered ground water.
Degree of expected reduction in toxicity mobility or volume	Natural attenuation would result in a reduction in toxicity of ground water.	Air stripping would result in a reduction in toxicity of recovered ground water.	Air stripping would result in a reduction in toxicity of recovered ground water.
Degree to which treatment is irreversible	Natural degradation is considered to be irreversible.	Air stripping is considered to be an irreversible treatment.	Air stripping is considered to be an irreversible treatment.
Type and quantity of residuals remaining after treatment	No residuals are expected, however there are expected to be intermediate compounds present over time.	Some residuals may result from filtration pre-treatment process.	Some residuals may result from filtration pre- treatment process.
Short-term effectiveness			
Protection of community during remedial actions	There are no anticipated risks to the community associated with implementation of this alternative.	There are no anticipated risks to the community associated with implementation of this alternative.	Community would not have access to the construction area. Possible short term effects related to dust generated during construction would be minimized through dust control actions.
Protection of workers during remedial actions	There are no anticipated risks to workers associated with implementation of this alternative.	There are no anticipated risks to workers associated with implementation of this alternative.	Protective equipment would be used, as appropriate, during trench excavation activities.

Table 4. *Detailed evaluation of alternatives.*

Criterion	Alternative -1 - No Action Deed Restrictions Monitoring	Alternative -2 - Deed Restrictions Monitoring Extraction well Ground water treatment Discharge to POTW	Alternative - 3 - Deed restrictions Monitoring Interceptor trench Ground water treatment Discharge to POTW
Environmental impacts	There are no anticipated environmental impacts associated with implementation of this alternative.	There are no anticipated environmental impacts associated with implementation of this alternative.	Contaminant transport during interceptor trench construction would be minimized through appropriate methods such as off-site drainage and dust control.
Time until remedial action objectives are achieved.	Would meet remedial action objective to prevent ingestion of ground water immediately following instating deed restrictions.	Would meet remedial action objective to prevent ingestion of ground water immediately following instating deed restrictions. Contaminant mass reduction would be provided immediately upon implementation of this alternative.	Would meet remedial action objective to prevent ingestion of ground water immediately following instating deed restrictions. Contaminant mass reduction would be provided immediately upon implementation of this alternative.
Implementabilty			
Ability to construct and operate the technology	No construction or operation activities are included in this alternative.	This alternative is currently implemented. The ground water collection system and air stripper are currently operating.	A continuous ground water collection trench would be very difficult to construct due to the utilities located underground in this area. An air stripper is currently at the site. A ground water collection system and air stripper are readily operatable.
Reliability of technology	Deed restrictions are reliable.	Collection of ground water using a collection well is reliable. Air stripping is a reliable technology for treating VOCs in ground water.	Collection of ground water using a collection trench is reliable. Air stripping is a reliable technology for treating VOCs in ground water.
Ease of undertaking additional remedial actions, if necessary	Additional remedial actions readily implemented.	Additional remedial actions readily implemented.	Additional remedial actions readily implemented.

Table 4. *Detailed evaluation of alternatives.*

Criterion	Alternative -1 - No Action Deed Restrictions Monitoring	Alternative -2 - Deed Restrictions Monitoring Extraction well Ground water treatment Discharge to POTW	Alternative - 3 - Deed restrictions Monitoring Interceptor trench Ground water treatment Discharge to POTW
Ability to monitor effectiveness of remedy	Ground water monitoring is included in this alternative, and provides an effective method of tracking ground water quality.	Ground water monitoring is included in this alternative, and provides an effective method of tracking the effectiveness of the ground water treatment system.	Ground water monitoring is included in this alternative, and provides an effective method of tracking the effectiveness of the ground water treatment system.
Coordination with other agencies and property owners	Legal coordination with federal and state agencies necessary to implement deed restrictions.	Legal coordination with federal and state agencies necessary to implement deed restrictions. A SPDES permit is currently in place at the facility.	Legal coordination with federal and state agencies necessary to implement deed restrictions. A SPDES permit is currently in place at the facility.
Availability of off-site treatment, storage, and disposal services and capacities	None required.	There is sufficient off-site disposal capacity for residuals associated with the treatment system.	There is sufficient off-site disposal capacity for residuals associated with the treatment system.
Availability of necessary equipment, specialists, and materials.	None required.	The equipment necessary for this alternative is currently in operation at the site.	The equipment necessary to construct the collection trench is readily available. The air stripper for this alternative is currently at the site.
Costs (See Tables 6 though 8)			
Capital cost	$5,000	$5,000	$502,425
Annual Operation and maintenance cost	$16,530	$38,130	$38,130
Total present worth cost (30 years, 7 %)	$231,699	$499,735	$997,160

Table 5. *Potentially applicable relevant and appropriate requirements (ARARs) and to be considered material (TBCs).*

Medium/ Location/ Action	Citation	Requirements	Comments
Chemical-Specific ARARs			
Ground water	6 NYCRR Part 703 - Ground Water Quality Standards	Fresh ground waters must attain Class GA ground water quality standards.	Applicable to study area ground water.
Action-specific ARARs			
Generation and off-site disposal of treatment residuals	6 NYCRR 373 - Hazardous Waste Management Requirements	Provides requirements for management of hazardous wastes.	Potentially applicable for residues generated from ground water treatment systems included in Alternatives 2 and 3.
Generation and off-site disposal of treatment residuals	40 CFR 268 - Land Disposal Restrictions	Prohibits land disposal of certain wastes unless treated prior to disposal.	Potentially applicable for residues generated from ground water treatment systems included in Alternatives 2 and 3.
Generation of air emissions	6 NYCRR Part 212	Provides limits for generation of air emissions from process emission sources.	Potentially applicable for air emissions form air stripper unit included in Alternatives 2 and 3.
Generation of air emissions	40 CFR Part 61 - National Emissions Standards for Hazardous Air Pollutants	Provides limits for generation of air emissions from specified sources.	Not applicable because treatment units used in alternatives for the site are not included in the regulation as sources with emissions limitations. Potentially relevant and appropriate for certain constituents, where more stringent than 6 NYCRR Part 212.
Discharge of treated water to POTW	6 NYCRR Parts 750-758	Requires a SPDES permit and compliance with the permit effluent limitations.	Applicable for treated ground water discharge to the sanitary sewer as envisioned for Alternatives 2 and 3. The facility currently holds a SPDES permit which provides effluent limitations.
Potential action-specific TBCs			
Air	NYS Air Guide 1	Provides Annual Guideline Concentrations (AGCs) and Short-Term Guideline Concentrations (SGCs)for specific chemicals. These are property boundary limitations that would result in no adverse health effects.	This is a guidance document, and will be considered as a TBC.

Table 6. *Estimated cost for Alternative 1*

	Quantity	Unit	Unit Cost	Total Cost
Direct Capital Costs				
Deed Restrictions			Lump Sum	$5,000
Total Direct Capital Costs				$5,000
Annual Operation and Maintenance				
Ground Water Sampling	6	Days	$480	$2,880
Ground Water Sample Analysis	15	Samples	$110	$1,650
Ground Water Reports			Lump Sum	$12,000
Total Annual Operation and Maintenance				$16,530
Five-Year Review (one time cost every 5 years)				$10,000
Present Worth of Annual Operation and Maintenance (30 yrs, 7 %)				$226,699
Total Estimated Present Worth for Alternative 1				$231,699

Assumptions
Ground water monitoring: 10 wells sampled, annually.
Ground water samples: analysis for VOCs, including 5 QC samples.
Ground water reports: quarterly letter reports and one annual letter report.

Table 7. *Estimated cost for Alternative 2*

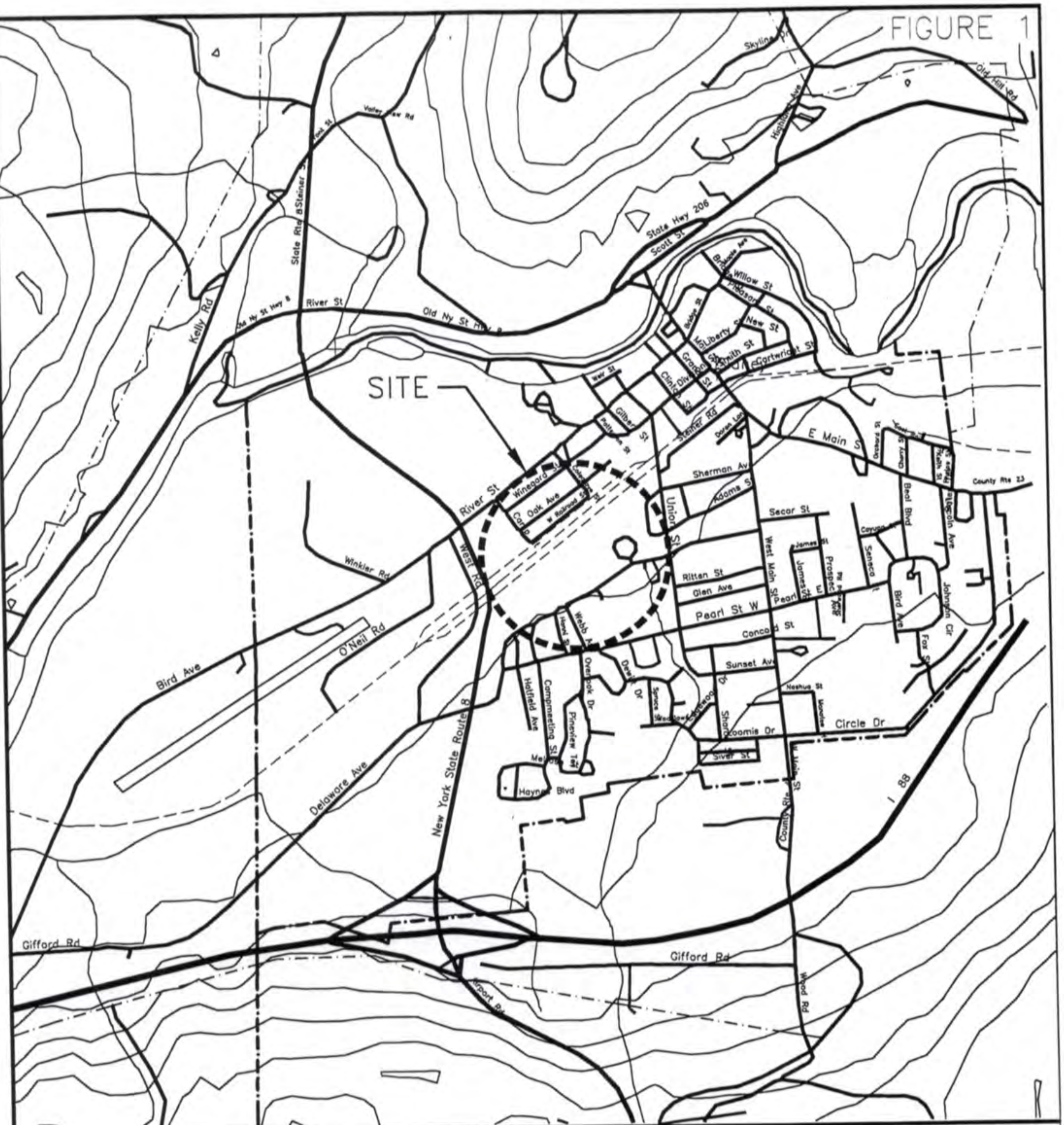
	Quantity	Unit	Unit Cost	Total Cost
Direct Capital Costs				
Deed Restrictions			Lump Sum	$5,000
Total Direct Capital Costs				$5,000
Annual Operation and Maintenance				
Maintenance Labor	288	Hours	$25	$7,200
Electricity	12	Month	$100	$1,200
Materials			Lump Sum	$3,800
Miscellaneous			Lump Sum	$6,000
Effluent Sampling	24	Samples	$100	$2,400
Filter Operation			Lump Sum	$1,500
Pump Operation			Lump Sum	$1,500
Ground Water Sampling	6	Days	$480	$2,880
Ground Water Sample Analysis	15	Samples	$110	$1,650
Ground Water Reports			Lump Sum	$10,000
Total Annual Operation and Maintenance				$38,130
Five-Year Review (one time cost every 5 years)				$10,000
Present Worth of Annual Operation and Maintenance (30 yrs, 7 %)				$494,735
ıl Estimated Present Worth for Alternative 1				$499,735

Assumptions
Ground water monitoring: 10 wells sampled, annually.
Ground water samples: analysis for VOCs, including 5 QC samples.
Ground water reports: quarterly letter reports and one annual letter report.

ıble 8. *Estimated cost for Alternative 3*

ɜm	Quantity	Unit	Unit Cost	Total Cost
rect Capital Costs				
ɜed Restrictions			Lump Sum	$5,000
ːerceptor Trench	750	Linear Foot	$430	$322,500
ɜalth and Safety			Lump Sum	$10,000
obilization			Lump Sum	$9,000
ɔtal Direct Capital Costs				$346,500
direct Capital Costs				
ıgineering (15 % of Direct Capital Costs)				$51,975
ɜgal (5 % of Direct Capital Costs)				$17,325
ɔntingency (25 % of Direct Capital Costs)				$86,625
ɔtal Indirect Capital Costs				$155,925
ɔtal Capital Costs				$502,425
ınual Operation and Maintenance				
aintenance Labor	288	Hours	$25	$7,200
ectricity	12	Month	$100	$1,200
aterials			Lump Sum	$3,800
iscellaneous			Lump Sum	$6,000
ffluent Sampling	24	Samples	$100	$2,400
lter ɜration			Lump Sum	$1,500
ump Operation			Lump Sum	$1,500
round Water Sampling	6	Days	$480	$2,880
round Water Sample Analysis	15	Samples	$110	$1,650
round Water Reports			Lump Sum	$10,000
otal Annual Operation and Maintenance				$38,130
ive-Year Review (one time cost every 5 years)				$10,000
resent Worth of Annual Operation and Maintenance (30 yrs, 7 %)				$494,735
otal Estimated Present Worth for Alternative 1				$997,160

ssumptions
ıterceptor trench: 20 ft deep, 750 ft long, constructed using sheet piling.
iround water monitoring: 10 wells sampled, annually.
iround water samples: analysis for VOCs, including 5 QC samples.
iround water reports: quarterly letter reports and one annual letter report.



BOILER ROOM
FOCUSED FEASIBILITY STUDY
AMPHENOL CORPORATION

SITE LOCATION MAP

0 2000 4000

APPROX. SCALE IN FEET

ADAPTED FROM USGS SIDNEY, NEW YORK QUADRANGLE 7.5 MIN. SERIES

3729.037-011F
OCTOBER, 1996

O'BRIEN & GERE ENGINEERS INC.

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LAYER ON 1,2,3

FIGURE 2

GRID NORTH NY STATE PLANE SYSTEM CENTRAL ZONE

LEGEND

- PIEZOMETER LOCATION
- SOIL BORING HYDROPUNCH LOCATION
- PRODUCTION WELL LOCATION
- A' CROSS SECTION LINE
- VILLAGE OF SIDNEY TEST WELL
- RECOVERY WELL LOCATION
- WEST WELL HOUSE MONITOR WELL
- ONEONTA OIL MONITOR WELL
- BOILER ROOM MONITOR WELL
- WATER SUPPLY SYSTEM MONITOR WELL

BOILER ROOM
FOCUSED FEASIBILITY STUDY
AMPHENOL CORPORATION

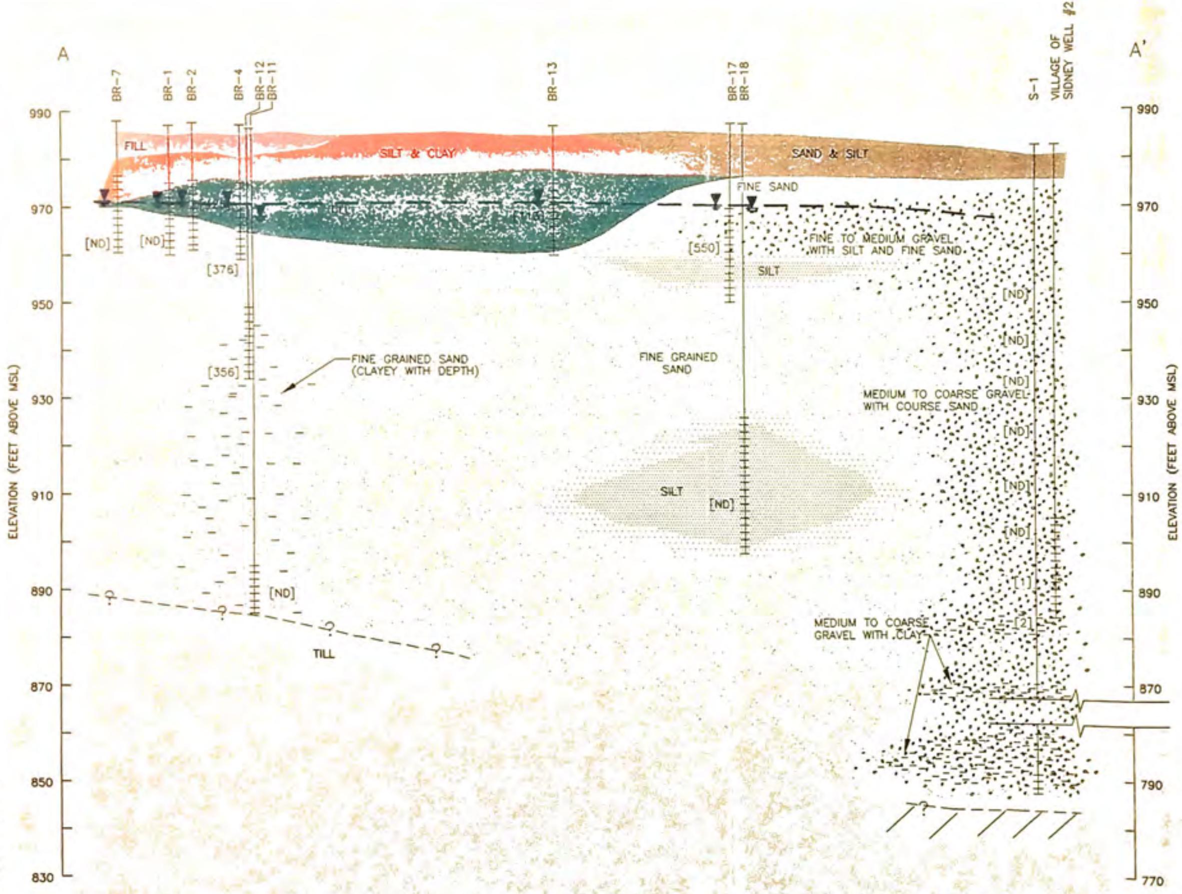
SITE MAP

300 0 300
APPROX. SCALE IN FEET

3729.037- 012

O'BRIEN & GERE ENGINEERS, INC.

FIGURE 3



LEGEND

MONITORING WELL AND SCREEN

[426] TOTAL VOC CONCENTRATION (ppb) (12/95 DATA)

HYPOTHESIZED CONTACT

[ND] NOT DETECTED

GROUND WATER ELEVATION (12/15/95)

GROUND WATER TABLE

NOTE: ANALYTICAL DATA INDICATED FOR S-1 ARE THE ANALYTICAL RESULTS FROM HYDROPUNCH SAMPLING DURING MARCH 1995 AT STB-7. STB-7 IS LOCATED APPROXIMATELY 50 FEET SOUTH OF WELL S-1.

BOILER ROOM
FOCUSED FEASIBILITY STUDY
AMPHENOL CORPORATION

GENERALIZED HYDROGEOLOGI
CROSS-SECTION
A-A'

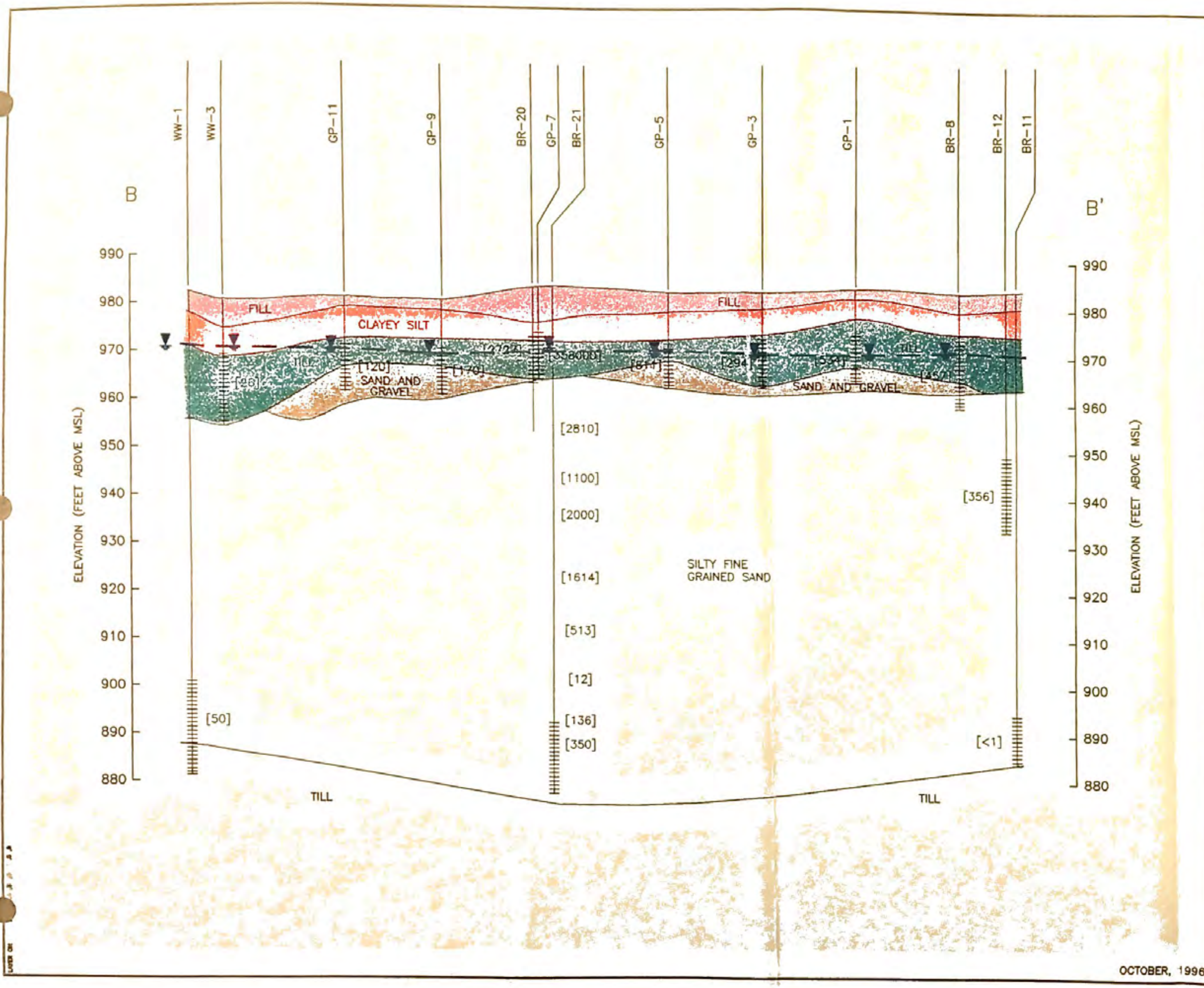
300 0 300
APPROX. HORIZ. SCALE IN FEET

3729.037-013F

O'BRIEN & GERE ENGINEERS INC.

OCTOBER, 1996

FIGURE 4



LEGEND

MONITORING WELL AND SCREEN

[356] TOTAL VOC CONCENTRATION (ppb)(11-12/95 DATA)

GROUND WATER ELEVATION WW AND BR SERIES (12/15/95) GP SERIES (11/10/95)

GROUND WATER TABLE

BOILER ROOM
FOCUSED FEASIBILITY STUDY
AMPHENOL CORPORATION

GENERALIZED GEOLOGIC CROSS SECTION B-B'

200 0 200

APPROX. HORIZ. SCALE IN FEET

3729.037-014F

O'BRIEN & GERE ENGINEERS, INC.

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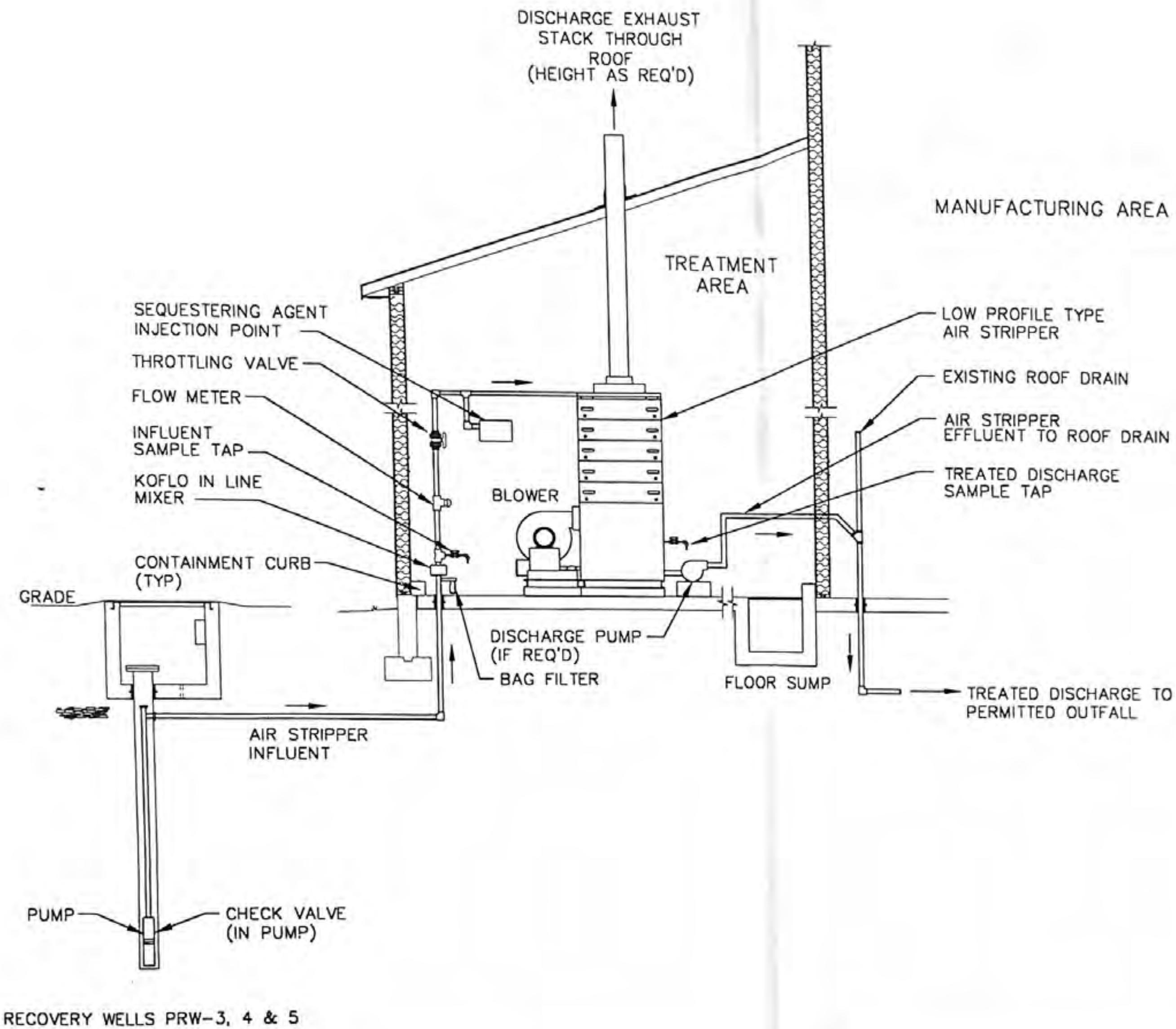
FIGURE 5



BOILER ROOM
FOCUSED REASIBILITY STUDY
AMPHENOL CORPORATION

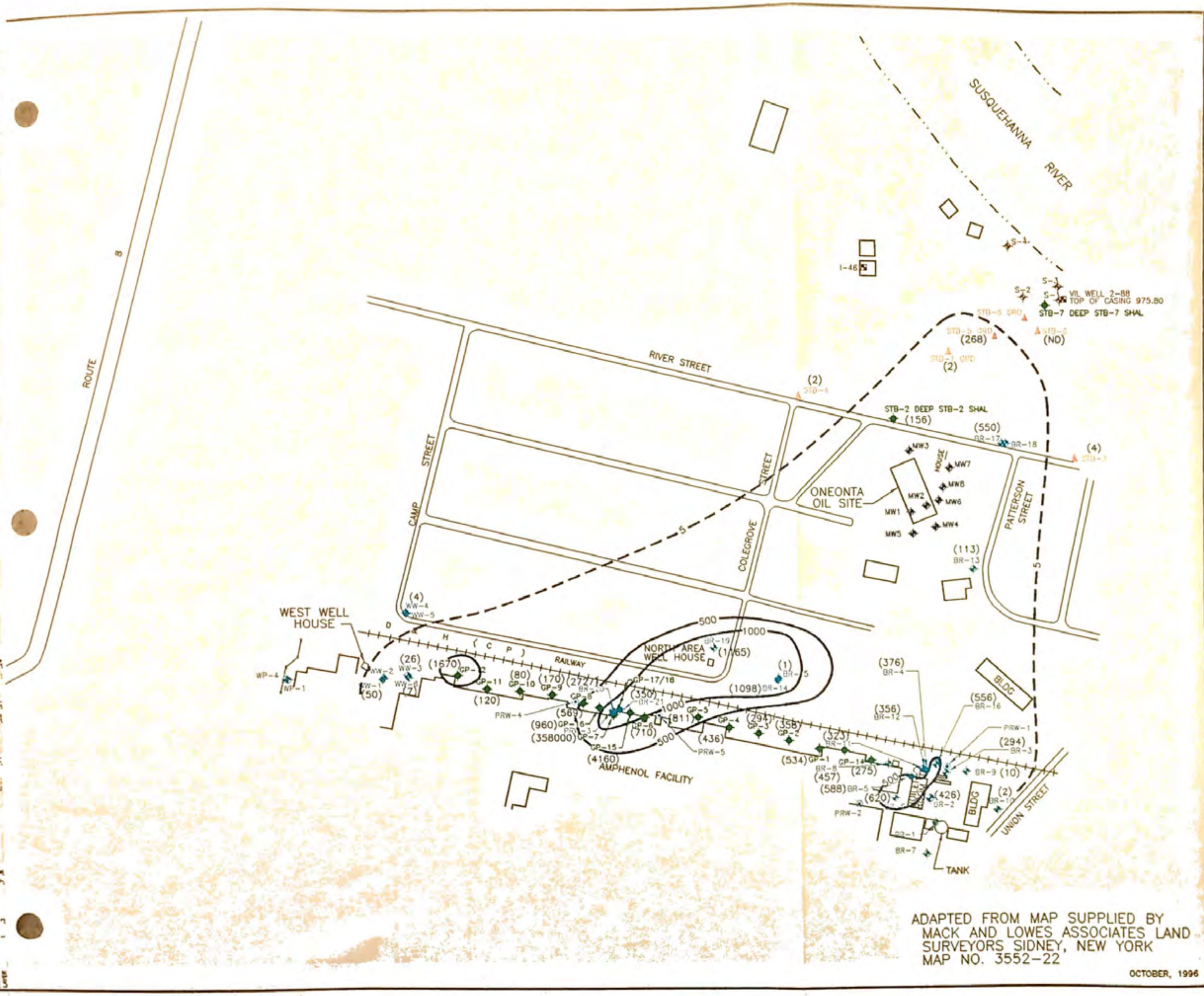
CONCEPTUAL
GROUND WATER
REMEDIATION SYSTEM
PROCESS SCHEMATIC

NOT TO SCALE

FILE NO. 3729.037-010

O'BRIEN & GERE ENGINEERS INC.

FIGURE 6



GRID NORTH NY STATE PLANE SYSTEM CENTRAL ZONE

LEGEND

- PIEZOMETER LOCATION
- SOIL BORING LOCATION
- PRODUCTION WELL LOCATION
- VILLAGE OF SIDNEY TEST WELL
- WEST WELL HOUSE MONITOR WELL
- ONEONTA OIL MONITOR WELL
- BOILER ROOM MONITOR WELL
- WATER SUPPLY SYSTEM MONITOR WELL
- (550) TOTAL VOC CONCENTRATION (ppb) (3/96)
- 1000 TOTAL VOC ISOCONCENTRATION (ppb) (3/96)

BOILER ROOM
FOCUSED FEASIBILITY STUDY
AMPHENOL CORPORATION

SHALLOW GROUND WATER TOTAL VOC CONCENTRATIONS

300 0 300
APPROX. SCALE IN FEET

3729.037-016

O'BRIEN & GERE ENGINEERS, INC.