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July 8, 2015

Josh Haugh
Remedial Bureau E
NYSDEC Division of Environmental Remediation
625 Broadway, 12th Floor, Albany, NY12233-7017

RE: Conceptual Site Model (CSM) and Data Gap Review
Mohonk Road Industrial Plant, NYSDEC – Site No. 356023
MACTEC Engineering and Consulting, P.C., Project No. 3617157346

Dear Mr. Haugh:

This letter presents a Conceptual Site Model (CSM), a Data Gap Review and Recommendations for the Mohonk Road Industrial Plant (MRIP), New York State Department of Environmental Conservation (NYSDEC) Site 356023. The CSM is based on information that is currently available; it is considered a dynamic model that is expected to evolve as new information becomes available. The CSM will be updated if and when additional information is obtained regarding site hydrogeology and/or chemistry.

SITE BACKGROUND

History of Contamination and Initial Response

The MRIP (Site) is located in the Hamlet of High Falls, Ulster County, New York, approximately seven miles north-northwest of the Village of New Paltz (Figure 1). The Site includes the original MRIP property at 186 Mohonk Road and surrounding properties impacted by the contaminated groundwater plume emanating from the Site. Industrial activities have taken place at the Site since the early 1960's, which included metal finishing, wet spray painting and the manufacturing of store display fixtures, card punch machines and computer frames.

The property currently contains a 43,000-square foot, single-story building. Two production wells are located within the building. A septic field serving this building was used to dispose of hazardous substance-containing wastes, such as solvents and wastes from paint and metal-working operations. Drums, paint sludge and other wastes were also buried in several locations on the MRIP Property.

In April 1994 a residential well near the MRIP property was sampled and was found to contain elevated levels of volatile organic compounds (VOCs) above the New York State (NYS) Class GA drinking water standards. NYSDEC began investigating the Site in 1994, and as an interim action, installed 70 dual unit granular activated carbon (GAC) filters at homes or businesses whose wells exceeded the NYS Class GA Standards (5 micrograms per liter [µg/L] for individual VOCs).

An Immediate Investigation Work Assignment was then implemented, and groundwater sampling results demonstrated that background overburden/bedrock interface and bedrock wells contained no detectable VOCs (Lawler, Matusky & Skelly Engineers LLP [LMS], 1997). Other on-site interface and bedrock wells, and the in-service production wells, all had 1,1,1-trichloroethane (1,1,1-TCA) and other compounds above groundwater standards, with the highest levels found in the overburden/bedrock interface wells directly downgradient of the underground septic tank area (i.e. MW-4; 82,000 µg/L).

Groundwater sampling results collected during a Remedial Investigation/Feasibility Study (RI/FS), indicated that downgradient private water supplies contained 1,1,1-TCA concentrations ranging from non-detectable to 880 parts per billion (ppb), and total VOC concentrations ranging from 1.6 ppb to 1,077 ppb (LMS, 1998b). In addition, groundwater in the bedrock aquifer beneath the MRIP property exhibited VOC concentrations above the United States Environmental Protection Agency (USEPA) Maximum Contaminant Level, and NYS Class GA Water Standards.

Based on the findings of the initial investigations, 1,1,1-TCA, 1,1-dichloroethene (1,1-DCE), 1,1-dichloroethane (1,1-DCA), trichloroethene (TCE), tetrachloroethene (PCE), ethylbenzene and xylenes were identified as contaminants of concern (COCs) in Site soils. Data collected from groundwater sampling indicated that a dissolved-phase VOC plume extended approximately one mile north-northeast from the MRIP property.

Remedial Actions

USEPA assumed the role as lead agency with the issuance of the Record of Decision (ROD) in March 2000, which included the following remedial action objectives (RAOs) (USEPA, 2000):

- eliminate inhalation and ingestion of, and dermal contact with, contaminated groundwater associated with the Site that does not meet federal or state drinking water standards;
- restore the bedrock aquifer to its most beneficial use, i.e., as a source of potable water, and restore it as a natural resource;
- prevent or minimize cross-media impacts from COCs in contaminated soil to the underlying groundwater, which will also eliminate potential future soil exposure (Site soil cleanup objectives (SCOs) for COCs would be based on NYSDEC's Technical and Administrative Guidance Memorandum 4046 for groundwater protection); and
- eliminate further off-MRIP property contaminated bedrock groundwater migration.

The selected remedy of the 2000 ROD included the following components.

- Extraction of contaminated groundwater in the near field and far field plume to restore the aquifer to its most beneficial use (as a potable water supply), treatment with an air stripper, and discharge of the treated water to the nearby Rondout Creek and Coxing Kill Creek. The "near field plume" refers to that portion of the groundwater plume with total VOC concentrations greater than 1,000 ppb, while the "far field plume" refers to the component of the groundwater plume with 10 ppb to 1,000 ppb total VOCs.
- The construction of a public water supply system to provide potable water to the residences and businesses in the Towns of Marbletown and Rosendale with impacted or threatened private supply wells. The primary water supply for the system will be the Catskill Aqueduct. In addition, the individual GAC filtration systems currently in use will be operated until the new public water supply system is operational.
- Implementation of a groundwater monitoring program to evaluate the effectiveness of the remedy.
- Institutional controls may be employed to prevent future use of the bedrock aquifer in the impacted or threatened area.
- Excavation of VOC-contaminated soils with concentrations above the cleanup criteria to prevent or minimize cross-media impacts from COCs in soil to groundwater.
- Off-Site disposal of the contaminated soil at appropriately permitted facilities.

In September 2008, USEPA issued a ROD Amendment in which the far field treatment system component of the groundwater remedy was replaced by monitored natural attenuation (USEPA, 2008). The RAOs were updated to reflect activities completed to date including:

- Restoring the aquifer to its most beneficial use, i.e., as a source of potable water, and restore it as a natural resource;
- Eliminating further off-MRIP property contaminated groundwater migration; and
- Eliminating inhalation and ingestion of, and dermal contact with, contaminated groundwater associated with the Site that does not meet state or federal drinking water standards.

Remedy Implementation and Performance

The following remedies were implemented to address the contamination originating from the MRIP Site. Each remedy is summarized in greater detail within the attached Table 1.

- Near field groundwater extraction and treatment system
- Contaminated soils excavation
- Soil vapor extraction system (SVE)
- Vapor intrusion mitigation system
- Institutional controls
- Operation, maintenance and monitoring

HYDROGEOLOGY

The MRIP and surrounding areas are located in the Shawangunk Mountains and are underlain by the Silurian Shawangunk Formation. Previous investigations at the Site have identified several hydrostratigraphic zones. These zones consist of an overburden flow zone, a bedrock interface zone, and a bedrock flow zone, as detailed below and presented in Attachment 1 – Cross Section.

Overburden Flow Zone

The overburden flow zone is characterized by groundwater flow in thin deposits of unconsolidated glacial lodgment, ablation, and weathered till, sand lenses, and fill. Some thicker (up to 50 feet) deposits of unconsolidated materials exist in an area just north of the Site. The till is approximately 9 to nearly 30 feet thick on the MRIP. The flux of groundwater through this flow zone is dependent upon precipitation events and seasonal fluctuations in groundwater recharge. At certain times of the year, this overburden unit may be seasonally perched, or fully saturated. The water table is typically found in this zone and responds quickly to precipitation events. Groundwater levels historically fluctuate greatly (i.e. approximately 6 foot [ft] variations between sampling events in MW-4).

The principal direction of horizontal overburden groundwater flow is predominantly to the north. Based on visual inspection of soils, estimates of hydraulic conductivity developed during the RI/FS indicated permeability of the overburden flow unit in the range of 1×10^{-6} to 0.1 ft/day. Average linear groundwater velocity was calculated to be approximately 1×10^{-4} ft/day (LMS, 1998a). Groundwater in this overburden flow zone also exhibits a downward component of flow into the bedrock interface and bedrock flow zones. Thus, any waste disposed in this zone is anticipated to migrate downward through more conductive sand lenses or fractures within the glacial till unit.

Bedrock Interface Flow Zone

The transition from unconsolidated material to the underlying bedrock includes a bedrock interface zone consisting of sand, gravel, and weathered rock fragments. This zone appears to be in direct hydraulic connection with the underlying bedrock flow zone in certain areas of the site, and it appears to be confined, or partially confined, by the overlying glacial till unit. This zone is anticipated to be more conductive than the overlying overburden. The vertical groundwater flow gradients for this zone are strongly downward, ranging from 0.14 to 0.46 ft/ft (RI/FS) indicating that the MRIP site is located in a recharge zone of the deeper bedrock flow zone. Average linear groundwater velocity within this zone was estimated to be approximately 1.33×10^{-3} ft/day (LMS, 1998a).

Bedrock Flow Zone

The bedrock flow zone represents the principal source of drinking water for the High Falls area. The flow zone is encountered in highly competent orthoquartzites of the Upper Member of the Shawangunk Formation, and also in gray shale deposits (specifically north of the site in the former septic system area). This unit has little to no remaining primary porosity, but is cut by various fractures. Fracture orientation varies from near vertical to near horizontal. These fractures are the primary storage for groundwater and the anticipated pathways for contaminant transport.

The Site is located near a topographic high, and serves as a recharge area for the fractured bedrock aquifer. Vertical gradients are primarily downward within the bedrock flow zone, and recharge to the bedrock aquifer predominantly occurs from the bedrock interface flow zone where permeable glacial overburden overlies the fractured bedrock interface zone. Estimates of hydraulic conductivity developed during the RI/FS indicated permeability of the bedrock flow zone in the range of 0.24 to 0.46 ft/day. Based on the regional groundwater gradient and estimated porosity, the average linear groundwater velocity in bedrock was calculated to be approximately 0.26 ft/day (LMS, 1998a). The primary horizontal direction of bedrock groundwater flow emanating the site is to the north toward Rondout Creek, with minor components of lateral flow to the northeast and northwest.

CONTAMINANTS OF CONCERN (COCs)

As a result of the historic use of solvents and other chemicals at the MRIP Property, Site groundwater contains elevated levels of VOCs above the NYS Class GA Standards. The COCs specifically identified as a result of historic investigations at this site include the following contaminants:

1. 1,1,1-TCA, an industrial solvent, the contaminant typically found in highest concentrations at the site;
2. 1,1-DCA, a breakdown product of 1,1,1-TCA;
3. 1,1-DCE, a breakdown product of 1,1,1-TCA; and
4. TCE, an industrial solvent.

The primary contaminant at the site is 1,1,1-TCA. The breakdown products 1,1-DCE (abiotic) and 1,1-DCA (biotic) have also been detected in both the overburden and bedrock groundwater systems, although the concentrations have been low in comparison to 1,1,1-TCA, indicating that the degradation process is not robust.

The specific gravity of 1,1,1-TCA in liquid form is 1.31, indicating that its density causes it to sink within groundwater systems. When evaluating the possible presence of Dense Non-Aqueous Phase Liquids (DNAPL) the "1 percent of solubility" rule-of thumb (USEPA, 1992) is often applied. Under this approach, DNAPL is suspected present when the concentration of a chemical in groundwater is greater than 1 percent of its pure-phase solubility. The equilibrium solubility of 1,1,1-TCA is 1,334,000 µg/L, resulting in the 1% solubility equal to 13,340 µg/L. In conjunction with the June 2001, January 2002 and August 2002 sampling events, 1,1,1-TCA was detected in ERT-4 at borderline DNAPL concentrations of 13,800, 16,900 and 16,000 µg/L, respectively (USEPA, 2014). However, given the time that has elapsed since the introduction of the 1,1,1-TCA to the environment, it is likely that the chemical is no longer present as a DNAPL, and may have dissolved and diffused at high concentrations into the bedrock matrix and/or low permeability silts overburden soil.

SOURCE AREAS and POINTS OF ENTRY (for the COCs)

Based on data collected by NYSDEC, four areas of concern (Areas of concern [AOCs]-A, B, C, and D) of known soil contamination on the MRIP property were identified and remedial actions were put in place. Table 1 and Figure 2 present the areas of soil contamination on the MRIP property that were identified as requiring removal and disposal (USEPA, 2014).

PCE, benzene, toluene, ethylbenze, xylene (BTEX) compounds, and paint related waste were excavated and disposed from the subsurface in AOCs A, B, and C. However, based on the concentration of 1,1,1-TCA (26%) in the sludge remaining in the onsite underground septic tank, and the prominence of 1,1,1-TCA as a COC, AOC D was likely the primary source disposal zone. AOC D consisted of a 1,000 gallon steel cylindrical tank, and Orangeburg piping (a bitumenized fiber pipe made from layers of wood pulp and pitch) tracing from the building to the septic tank, and subsequently to a distribution box from which two outlet laterals discharged (eastern and western lateral) (see Figure 3). Soil samples collected along the laterals and at their terminal ends revealed little or no contamination. A cross section of the excavated area surrounding the former septic tank is shown in Attachment 1.

The finding of little to no contamination from the laterals led to the conclusion that the underground tank had likely leaked and continued to be a source of contamination to the underlying aquifer. Consequently, an interim remedial measure was implemented consisting of the removal of the tank and contents, and investigation of the soil beneath the tank (LMS, 1998b). The contents of the tank were pumped and the tank itself was completely removed. Upon removal, it was apparent that the tank had corroded and contained large holes in its bottom. Soil sampling was conducted in the excavated area. One sample was collected from stained soil below the area of the tank showing the most severe corrosion. The results from this sample showed no detectable VOCs, however due to the possible mismanagement of the confirmatory soil samples, LMS considered the sample unrepresentative. Eight additional samples were collected from the sidewalls and bottom of the excavated area, however these also showed no VOC detections above the NYS SCOs.

Although approximately 20 cubic yards of soil was excavated from this former septic tank area, and confirmatory sampling at the limits of the excavation showed that the soil cleanup goals for the COCs were met, it is likely that the source of 1,1,1-TCA found in nearby groundwater samples is a result of vertical migration of 1,1,1-TCA from the shallow source area to deeper overburden soil and subsequently to the shallow overburden/bedrock interface zone, and into localized shale deposits or fractures within bedrock.

The vertical migration of 1,1,1-TCA from the former septic system area, and distribution within the bedrock interface flow zone is further evidenced by observations of the historical overburden SVE system (SVE wells 1 – 18). It became apparent that during periods of relatively low groundwater levels, the SVE system recovered substantially more mass of COCs than during periods of high groundwater. Low water tables allowed accelerated SVE recovery from open fracture zones. Hence, during the period from 2006 until early 2011, at times of low water table, there was substantial VOC recovery from the vadose zone.

However, in September 2011, prior to the transfer of Site operations to NYS, the USEPA removal program evaluated the effectiveness of the SVE system in continuing to clean up the vadose zone of residual VOC contamination in the area of the former septic tank. During this evaluation, sample results collected during a period of high water tables at the Site area showed VOC recovery from the vadose zone had diminished dramatically. As a result, the USEPA interpreted that the system was no longer effective at removing VOC mass from the vadose zone, and therefore, the USEPA terminated the operation of the overburden SVE system, and eventually dismantled and removed it from the Site. The recently installed bedrock SVE wells (SVE 19 – 23) are currently capped and in place and are used for groundwater monitoring.

Monitoring wells located within the former septic area have historically showed a consistent downward trend in contaminant concentrations. However, in 2013, following the 2011 shutdown of the SVE system and a temporary period when the extraction/treatment plant was in shutdown mode, source wells (MW-4, MW-5B, and ERT-4) and extraction wells (ERT-1, MW-7R, and MW-5R) had an uptick in concentrations at levels higher than they have exhibited since 2008-2009 (see Figures 4 and 5 below). Three of these wells are those with the shallowest completion depths (MW-4 at 21.5' below ground surface [bgs], MW-5B at 36.2' bgs, and ERT-4 at 50' bgs), with sampling depths located closest to the bedrock interface flow zone in the vicinity of the former septic storage tank. The increase in COC concentrations in these source-area wells suggests residual source material remains in the former septic system area.

Figure 4: 1,1,1-TCA Concentrations (µg/L) in Bedrock Extraction Wells

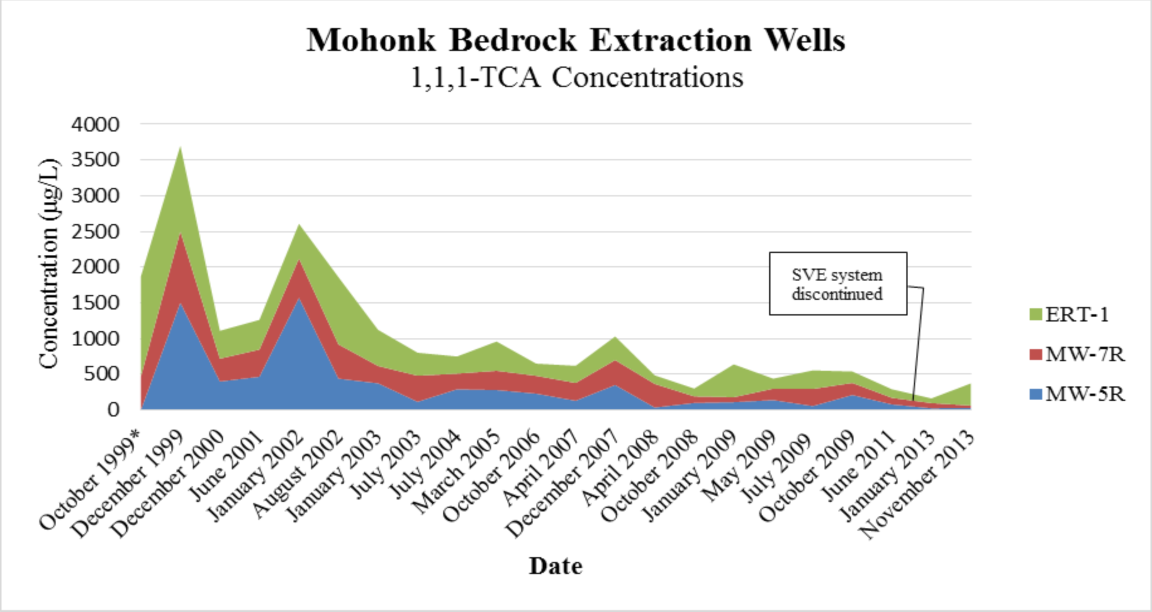
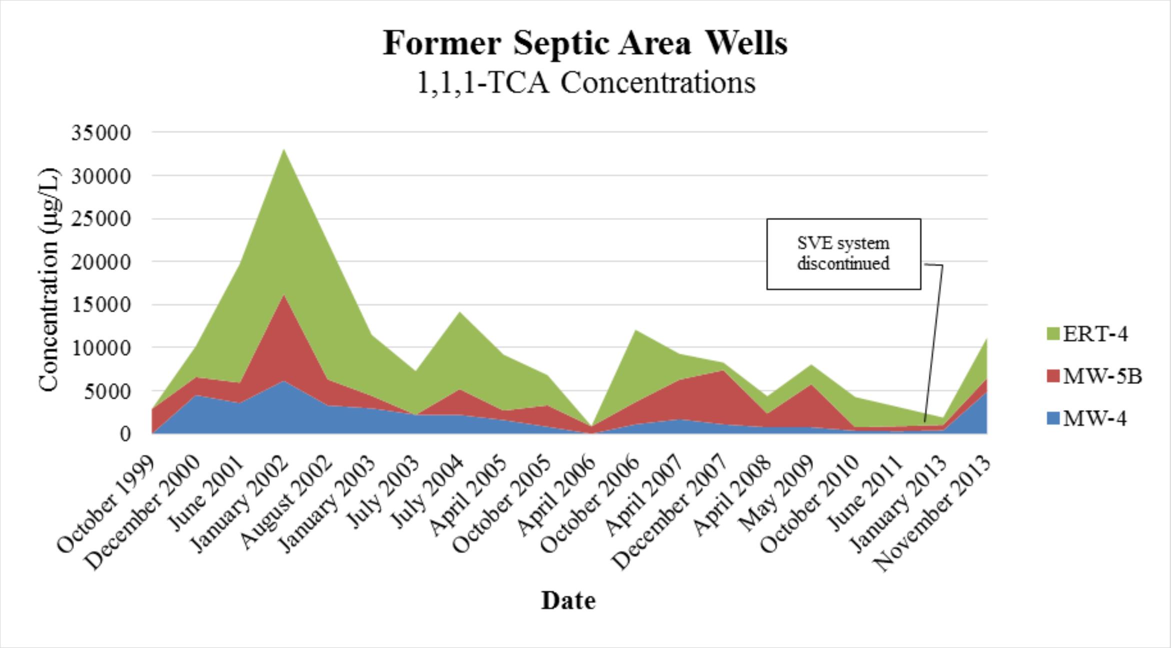


Figure 5: 1,1,1-TCA Concentrations (µg/L) in Former Septic Area Wells



It is also possible that a point of entry may have occurred within the building, or from the 4-inch Orangeburg piping connecting the building septic drains to the underground settling tank. Soil gas data obtained upgradient of the former septic system, within and under the MRIP site building, showed detections of 1,1,1-TCA ranging from non-detectable to 3,500,000 ppb by volume (ppbv) (Lockheed 2006). Based on information reviewed and compiled from studies in NYS, currently, the NYS Department of Health defines typical levels of 1,1,1-TCA around 3 micrograms per cubic meter (µg/m^3) (0.54 ppbv) in the indoor air of homes and office settings, and less than 3 µg/m^3 (0.54 ppbv) in outdoor air. With regards to these typical levels, elevated concentrations of 1,1,1-TCA were localized within and around the MRIP building, and approximate locations are shown in Attachment 2. Six sub-slab ventilation systems, with venting to the outside air, were installed in the sub-surface layer underneath the building's concrete floor slab and currently mitigate vapor intrusion to the Site building.

MIGRATION PATHWAYS

The near-surface contaminated soil within the source area was remediated, effectively eliminating any surface runoff pathway. The overburden glacial till consists predominantly of sandy silt, and contaminant migration within the till is likely controlled by the factors that govern porous media flow. As such, the movement of COCs in the till is likely to be slow. The bedrock interface zone, which is likely weathered, may also act as a porous media. However, it is more likely that the contaminant migration in the bedrock interface zone will behave as a dual porosity model (i.e., fractured and porous media flow). Migration in the underlying fractured bedrock will be controlled by fracture aperture, hydraulic gradients, and total organic carbon content.

The downward vertical hydraulic gradients, coupled with denser-than-water COCs and extended pumping from bedrock extraction wells MW-5R, MW-7R, and ERT-1 appear to have resulted in the vertical migration of COCs through the overburden aquifer into the bedrock aquifer. Additionally, the finding of 1,1,1-TCA in wells upgradient of the former septic system is likely attributed to historical pumping of the MRIP production wells (MRPW-1 and MRPW-2), the pumping of residential wells in the area, and the possible existence of fractures that extend from the area of the tank to these wells. MRPW-1 is located at the west end of the building and MRPW-2 is located at the east end of the building (Figure 3). MRPW-2 was pump tested for 48-hours at a rate of 16 gallons per minute indicating that it intercepts a highly transmissive fracture. MRPW-1 at one time contained 1,1,1-TCA at a concentration of 200 µg/L (LMS, 1998a).

EXPOSURE PATHWAYS

Public water is supplied to the residences and businesses in the Towns of Marbletown and Rosendale with impacted or threatened private supply wells; therefore, there is no current exposure to groundwater via ingestion. The near-surface contaminated soil has been removed, thus eliminating the potential direct contact threat to VOC-contaminated soil. Vapor intrusion at the nearby residences was evaluated and shown not to require mitigation. Vapor intrusion within the MRIP building is currently being remediated with sub-slab depressurization systems. The highest sub-slab concentration in the building is located at its west end, at Sample Port #3 (See Attachment 2). Other sub-slab sampling points in closer proximity to where the Orangeburg piping exits the building to the former septic system showed lower concentrations than Port #3. The source of the elevated soil gas concentrations at Port #3 has not been identified.

DATA GAPS and RECOMMENDATIONS

Concentrations of 1,1,1-TCA above the NYS Class GA Standards have been continually detected in groundwater in source area overburden/bedrock interface and bedrock wells (i.e. MW-4 and MW-5B). Recent first time testing of bedrock groundwater in shallow bedrock SVE-wells (SVE-19 through 23), which are located between the former septic tank and the on-site building, revealed concentrations as high as 8 parts per million for 1,1,1-TCA. It is uncertain at this point as to whether the apparent residual contamination resides in the overburden, at the bedrock interface, or within shallow bedrock fractures (e.g., matrix diffusion).

The concentration rebound in the treatment plant influent following shutdown for carbon change out suggests that, at least in part, matrix diffusion may be occurring. However, matrix diffusion is not limited to bedrock, it can also occur in low permeable unconsolidated deposits such as glacial tills. A soil gas survey conducted in 2006 identified 1,1,1-TCA concentrations indicative of a source area at location SG-9 (3,500,000 ppbv), which was located approximately 10-feet north of the building in proximity to the former septic discharge line (Lockheed, 2006). Soil gas results north of the building ranging from 33,000 to 3,500,000 ppbv combined with the high concentration in the shallow bedrock SVE wells points to a source of contamination that is localized and anticipated to be associated with the former septic system (AOC D). It should be noted that changes in barometric pressure and soil vapor pressure in the vadose zone (i.e., from fluctuating water levels) can result in the migration of contaminated soil gas. As a result, the location of elevated soil gas concentrations are not always associated with areas of residual soil contamination. Confirmatory sampling is recommended when relying on soil gas concentrations to delineate potential source areas.

The former septic system consisted of an outflow pipe from the building that feeds into the septic tank; an outflow pipe from the septic tank that leads to a distribution box; and two, apparently open-ended pipes that lead from the distribution box into a depression a couple hundred feet northeast and northwest of the distribution box. Sludge within the septic tank contained 1,1,1-TCA at a concentration of 260,000 milligrams per kilogram (26%) (LMS, 1997). The tank upon removal showed holes due to corrosion, and soil from around and beneath the tank was removed for disposal; however, there were no indications that the soil removed was contaminated above NYSDEC SCO's. Similarly, one test pit (TP-09) was previously conducted along the Orangeburg piping that led from building to the former septic tank. However, sampling was limited to one sample collected at a depth of 3.5 feet, immediately at the base of the piping. 1,1,1-TCA was detected, but not at concentrations suggestive of a source area.

Based on the above, it is likely that a source of contamination resides in the area between the MRIP building and the SVE wells. Contamination may exist within the overburden, at the bedrock interface, or within the matrix of the bedrock. Recommendations to address this data gap are presented below, and include:

- ✓ a membrane interface probe (MIP) be used via direct-push drilling to screen soil in the area between the former septic tank and the building for the presence of chlorinated solvents for the purpose of identifying residual source areas;
- ✓ collection of confirmatory soil samples via direct push in areas showing the highest concentration of contamination based on the MIP survey;
- ✓ a down-hole geophysical survey be conducted of select on-site bedrock wells including the deeper and most-contaminated bedrock SVE wells and extraction well ERT-4 to identify fractures and possible changes in bedrock stratigraphy that could be serving as contaminant migration pathway(s). Downhole geophysical logging is expected to include borehole caliper, single point resistivity, acoustic televiewer, optical televiewer, heat pulse flow meter, and gamma ray logging;
- ✓ packer testing of select SVE and/or bedrock extraction well(s) subsequent to the results of the down-hole geophysical logging, and the collection of discrete samples for VOCs from each packer interval;
- ✓ limited test pitting be conducted along several points of the Orangeburg piping that leads from the former distribution box, including at the piping terminus area to assess whether residual contamination is present and provides an on-going source of groundwater contamination; and
- ✓ sub-slab soil sampling be conducted using hand driven sampling tubes (e.g., slam-bar with macro core sampler) in the vicinity of the elevated concentrations of 1,1,1-TCA in subslab soil gas points (i.e., Port #3, T2-001 and T2-003) to evaluate possible residual contaminant sources that may exist under the building (Attachment 2).

Contaminant distribution within the overburden and bedrock is not sufficiently understood to optimize remedial measures at this time. The use of combined probe MIP technology will permit collection of chemical (i.e., XSD tool), hydrophysical (i.e., HPT tool) and stratigraphic (lithologic) (EC tool) data that will be used to evaluate the remedy and options for remedial system optimization. Down-hole geophysical logging, combined with packer sampling will provide information regarding the location of transmissive fractures and contaminant concentrations within those fractures. The logging and packer sampling results will be used to potentially re-configure and optimize the location of extraction wells, along with targeting specific elevations within boreholes for contaminant removal.

MACTEC recommends implementing a data gap investigation to provide a better understanding of potential source material remaining, hydrostratigraphic migration pathways, and hydraulic properties at the Site which can further assist in focusing and refining remedial activities.

Please do not hesitate to call me at 207-775-5401 if you have any questions regarding this deliverable.

Sincerely,
MACTEC Engineering and Consulting, P.C.

Jayme Connolly
Project Manager

Hank Andolsek, C.G.
Senior Hydrogeologist

Bryanna Chute
w/permission
by J.B.
Joshua Bowe, C.G., P.G.
Senior Geologist/Technical Review

Enclosures (2)
Attachment 1: Cross Section
Attachment 2: Soil Gas Data

REFERENCES

USEPA, 2014. Five-Year Review Report – Mohonk Road Industrial Plant Superfund Site. March 25, 2014

USEPA, 2008. Record of Decision Amendment – Mohonk Road Industrial Plant Superfund Site. September 2000.

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LMS, 1998b. Interim Remedial Measure Underground Tank Removal Report, Mohonk Road Industrial Plant, Site 356023. January, 1998.

LMS, 1997. Immediate Investigation Work Assignment – Mohonk Road Industrial Plant, Site 356023. January 1997.

Lockheed, 2006. Trip Report – Commercial Facility Sampling – Mohonk Road Industrial Plant, Site356023. June, 27 2006.

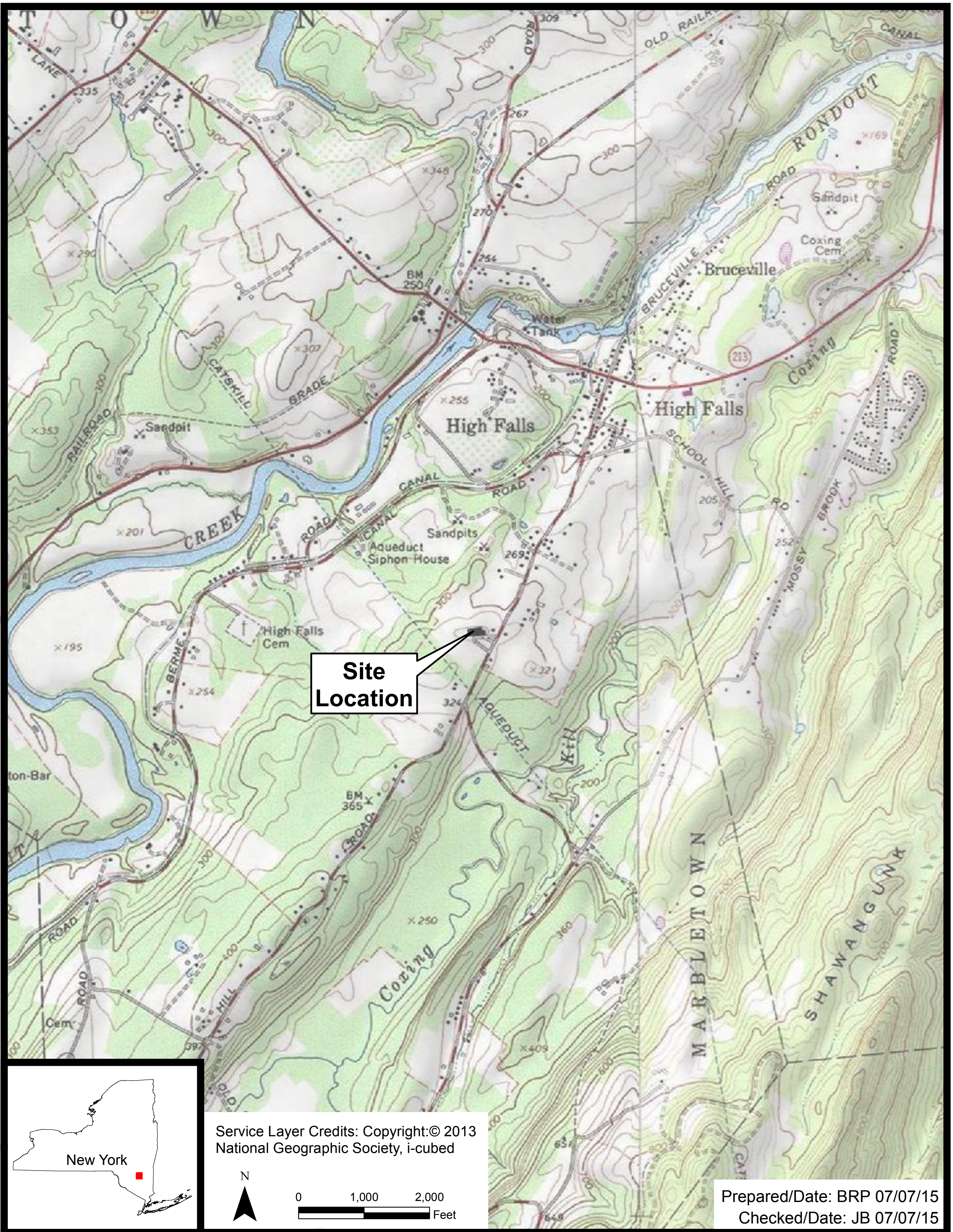
TABLES

Table 1: Summary of MRIP Remedies To Date

Remedy	Matrix	Summary
Near field groundwater extraction and treatment	**Groundwater**	In 2000, the EPA constructed and operated a groundwater treatment system until September 2011 when the EPA transferred responsibility of the ongoing O&M of the near field extraction and treatment system to NYSDEC. Over 100 million gallons of VOC-contaminated groundwater have been extracted, treated and discharged during the remedial program. The extraction system currently consists of three active extraction wells and associated buried piping: MW-5R (125 ft.), MW-7R (180 ft.), and ERT-1 (195ft.) (see Figure 2). The extraction wells are constructed of six-inch casing installed into bedrock with open-hole construction at depth below the casing. Extraction well flow rates vary, but are typically in the range of 5-9 gpm per well. ERT-1 tends to produce slightly more than the other two extraction wells. The total combined influent is approximately 15-20 gpm, however this is much less than the design capacity of the treatment plant.
Contaminated soils excavation	**Soil**	As prescribed by the 2000 ROD, additional removal and disposal of contaminated soil was performed. Soil cleanup levels were also established in the 2000 ROD. The following areas of known soil contamination on the MRIP property were identified as areas potentially requiring remedial action (see Figure 2): **AOC-A** PCE and BTEX compounds located beneath the gravel parking area west of the MRIP building and south of the groundwater treatment building **AOC-B** Paint waste located south of Paint Waste Pit #1 and north of the MRIP building **AOC-C** Paint located waste immediately east of Paint Waste Pit #1. **AOC-D** 1,1,1-TCA located in the vicinity of the former MRIP building septic tank, north of MRIP building During November-December 2000, the EPA excavated contaminated soil from AOC-A and contaminated soil, paint waste and debris from AOC-B and AOC-C. Prior to backfilling of AOCs-A, B and C with clean fill, post-excavation soil samples indicated that no action levels were exceeded in soils remaining within the excavation. During the remedial action, approximately 2,000 tons of contaminated soils, paint waste and debris were removed and disposed of off-site. In September 1997, NYSDEC implemented a removal of the tank, tank contents, and adjacent soil at AOC-D. The soils adjacent to the corroded portions of the tank were heavily stained, and about 25-cy of soil was removed from the excavation and disposed of as non-hazardous soil in November 1997.
Soil vapor extraction system (SVE)	**Soil vapor**	In order to enhance the VOC removal provided by the excavations and the extraction and treatment system, 18 overburden SVE wells (SVE-1 through SVE-18) were installed in 2006 on the MRIP property immediately north of the commercial building and near the former underground septic tank and original septic field. All wells were installed until refusal was encountered, and the system was fully operational by February 2008. In 2009, an additional five SVE wells (SVE-19 through SVE-23) were installed in the vicinity of the pre-existing septic tank at greater depths within the bedrock aquifer (approximately 55 bgs) (Figure 3). However, during late 2011/early2012 the EPA terminated the operation of the SVE system. The newer SVE wells were capped and left in place and are used for groundwater monitoring.
Vapor intrusion mitigation system	**Soil vapor**	In February 2005, the EPA initiated a vapor intrusion investigation to determine if the subsurface groundwater contamination, originating from the MRIP property, was affecting the soil gas and indoor air at nearby residences and businesses. Sub-slab soil gas ports were installed in nearby residential non-residential (41 locations total). The soil vapor sampling determined that, since contaminant concentrations when detected were below the health-based screening levels, no further vapor intrusion evaluation or action was deemed necessary at the residential properties. However, after evaluating the soil gas data obtained in MRIP site building, the EPA recommended that appropriate vapor mitigation systems be installed at various locations in the building to prevent exposure. Between January 29 and February 1, 2007, six sub-slab ventilation systems, with venting to the outside air, were installed in the sub-surface layer underneath the building’s concrete floor slab. Sub-slab mitigation systems, SS-1 and SS-2, are located on the west side of the building; SS-3, SS-4 and SS-5 are located on the north side of the building; and SS-6 is located on the east side of the building (see Figure 4).
Institutional Controls	**Groundwater**	Institutional controls (ICs) are being relied upon to prevent the future use of the aquifer within the HFWD until cleanup levels have been attained. These ICs consist of existing ordinances of the Towns of Marbletown and Rosendale which prohibit the establishment or maintenance of a source of drinking or domestic water separate from the PWS system of the HFWD. These ICs would no longer be necessary following the restoration of groundwater to beneficial use.
Operation, maintenance and monitoring	**Groundwater**	Currently, the extraction and treatment plant is being operated and maintained by NYSDEC via the September 2011 Site transfer agreement with the EPA Region 2. The ongoing operations consist of extraction of the contaminated groundwater, treatment through carbon filters and discharge of the treated groundwater to the Coxing Kill. As part of monitoring program, the influent and effluent concentrations of the extraction and treatment system, as well as extraction wells ERT-1, MW-5R and MW-7R, are routinely sampled. The various monitoring wells throughout the Site area (both on-property and off-property) are sampled annually by the EPA through an Interagency Agreement with the United States Army Corps of Engineers (Army Corps) and its contractors, as part of the long-term response action for the MNA remedy, as identified in the September 2008 ROD Amendment.

Prepared by: DF 7/6/2015
Checked by: HA 7/6/2015

FIGURES



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Prepared/Date: BRP 07/07/15
Checked/Date: JB 07/07/15

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

MACTEC

Site Location Map

Project 3617157346

Figure 1

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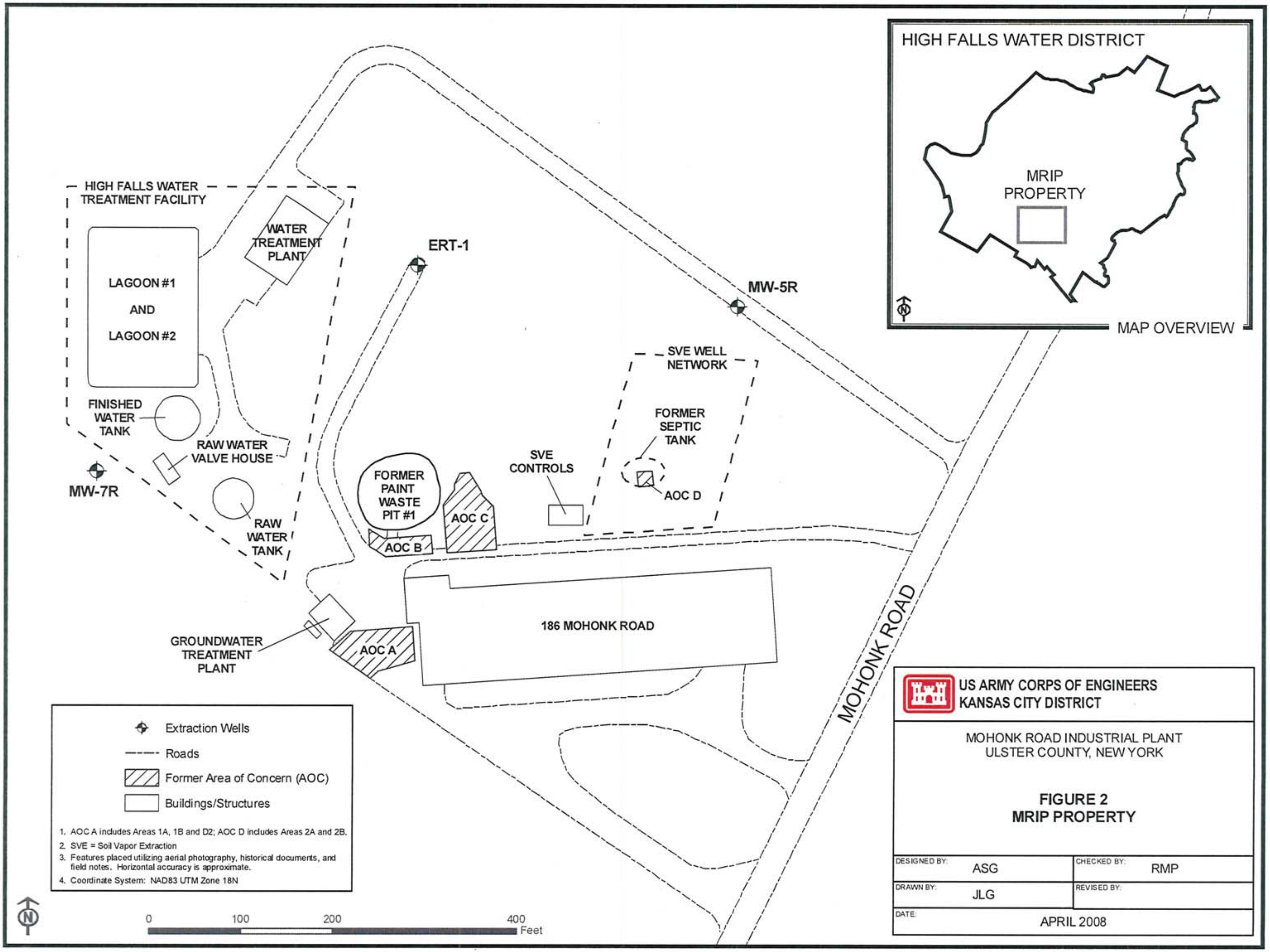
PDF: P:\Projects\nysdec1\Contract D007619\Projects\Mohonk Road Industrial Plant - RSO_SM4.0_Deliverables\4.1_Reports\CSM Data Gap\Figures\Figure 1 - Site Location.pdf 07/07/2015 2:33 PM brian.peters



- ⯐ Extraction Wells
- ---- Roads
- ▨ Former Area of Concern (AOC)
- ☐ Buildings/Structures

1. AOC A includes Areas 1A, 1B and D2; AOC D includes Areas 2A and 2B.
2. SVE = Soil Vapor Extraction
3. Features placed utilizing aerial photography, historical documents, and field notes. Horizontal accuracy is approximate.
4. Coordinate System: NAD83 UTM Zone 18N

US ARMY CORPS OF ENGINEERS
KANSAS CITY DISTRICT

MOHONK ROAD INDUSTRIAL PLANT
ULSTER COUNTY, NEW YORK

FIGURE 2
MRIP PROPERTY

DESIGNED BY: ASG	CHECKED BY: RMP
DRAWN BY: JLG	REVISED BY:
DATE: APRIL 2008	

K:\Mission Projects\htw\mrip\GIS\arcgismaps\ProposedPlan_2008\FIG2_Treatment8x11BW_28APR08.mxd

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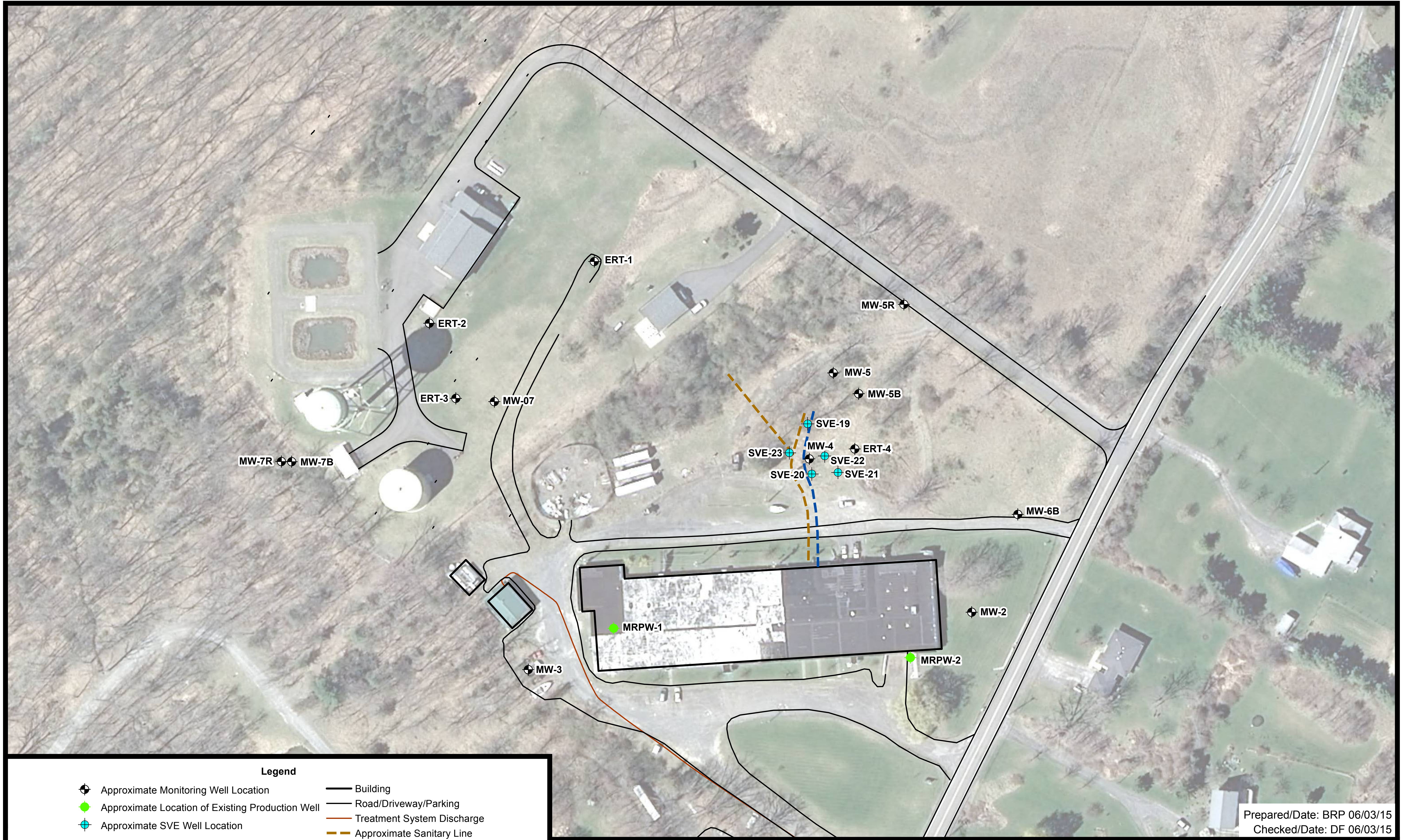

Legend

- ⊕ Approximate Monitoring Well Location
- ● Approximate Location of Existing Production Well
- ⊕ Approximate SVE Well Location
- Building
- Road/Driveway/Parking
- Treatment System Discharge
- Approximate Sanitary Line
- Approximate Drain Line

Ulster County color digital orthoimagery (2013) obtained from
New York State GIS Clearinghouse at: http://www.nysgis.state.ny.us

Prepared/Date: BRP 06/03/15
Checked/Date: DF 06/03/15

NYSDEC
Mohonk Road Industrial Plant
Marbletown, New York

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Former Septic System Source Area

Project 3617157346

Figure 3

ATTACHMENT 1

CROSS SECTION

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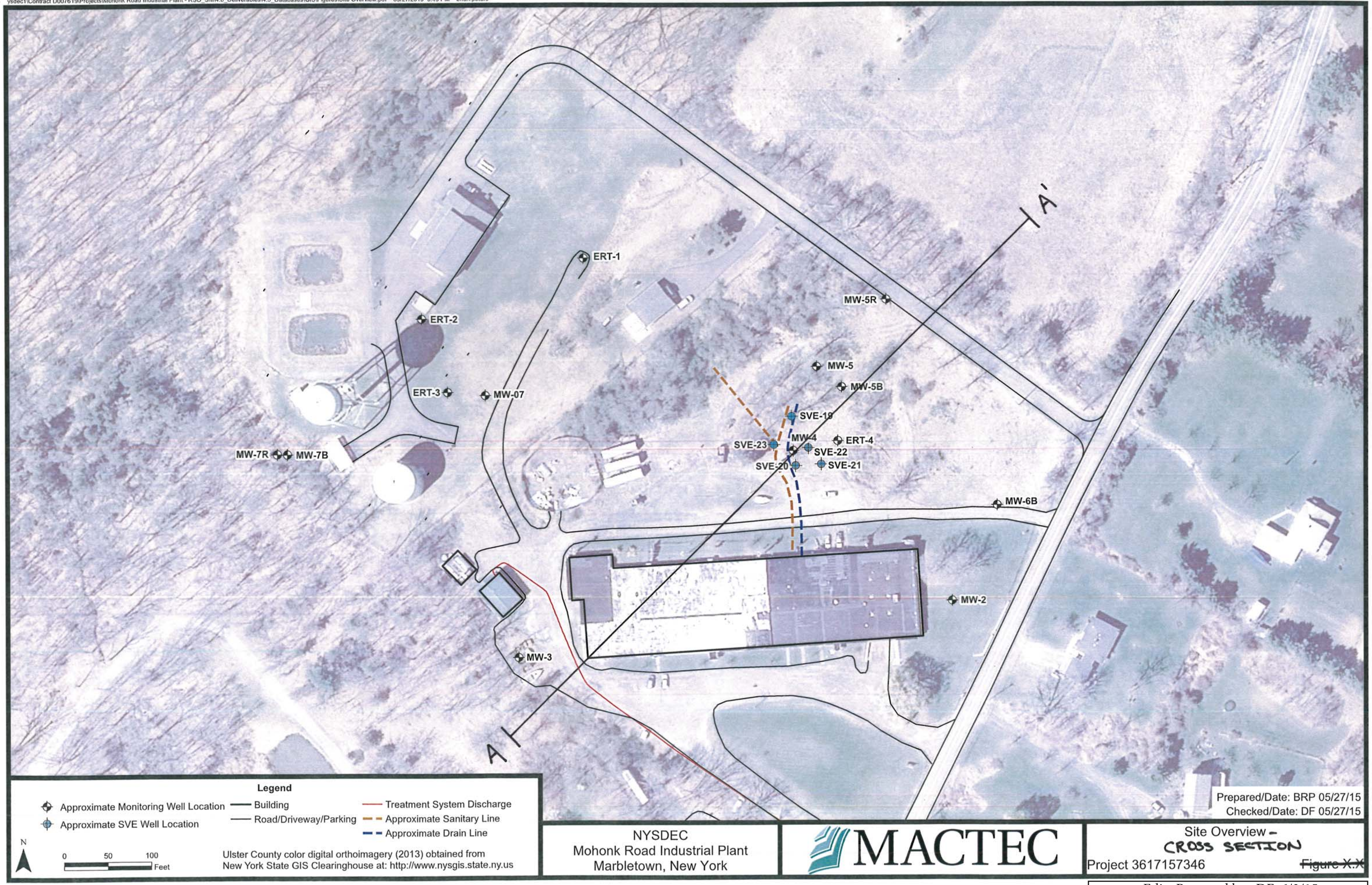

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Mohonk Road Industrial Plant
Marbletown, New York

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Site Overview - CROSS SECTION
Project 3617157346 ~~Figure X.X~~

Edits Prepared by: DF 6/3/15
Edits Checked by: HA 6/3/15

Prepared/Date: WJW 07/06/15
Checked/Date: DF 07/06/15

NYDEC
Mohonk Road Industrial Plant
Marbletown, New York

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ATTACHMENT 1
CROSS SECTION A-A
Project 3617-15-7346
Figure 1

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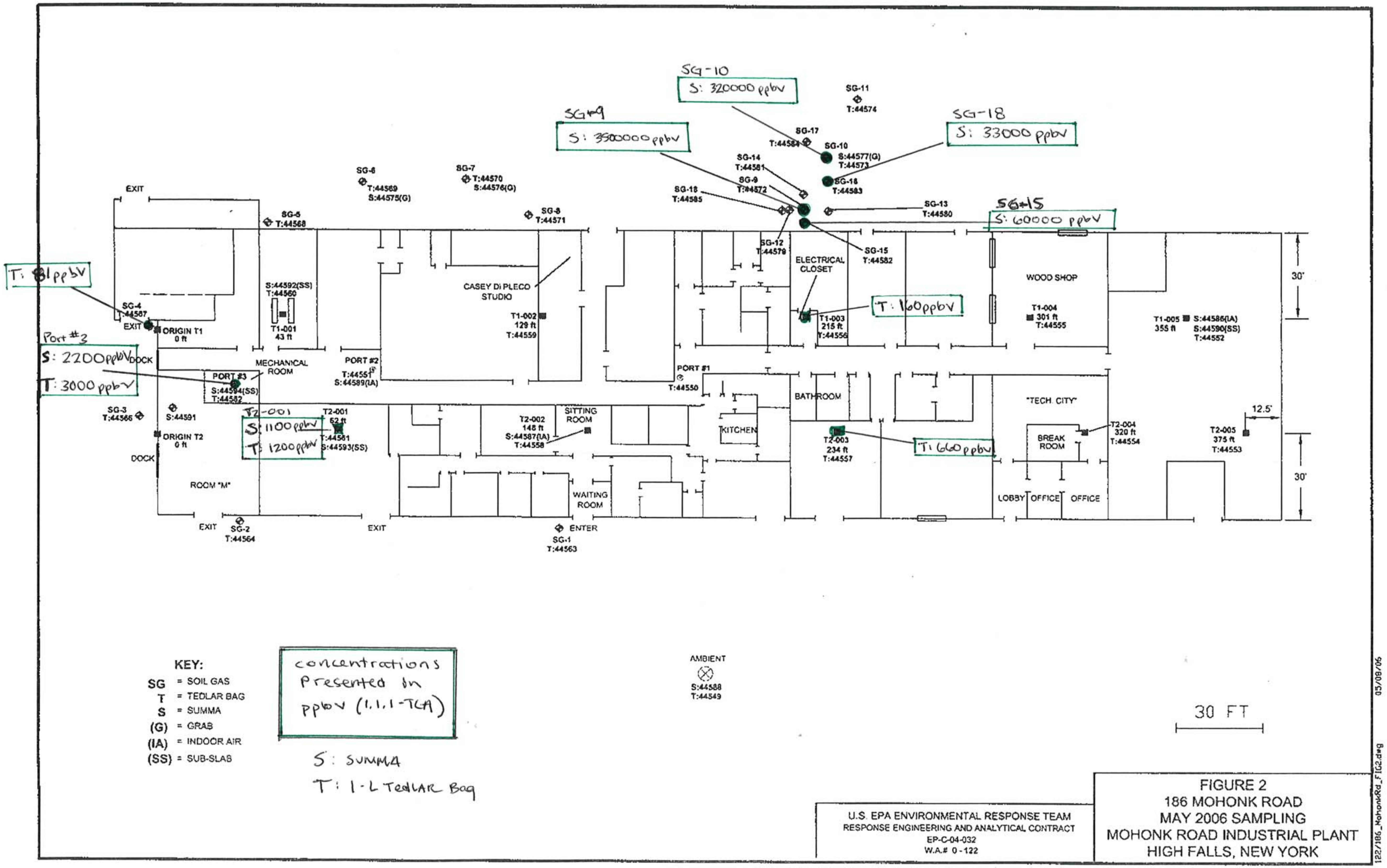
ATTACHMENT 2

SOIL GAS DATA



concentrations presented in ppbv (1,1,1-TCA)

S: SUMMA
T: 1-L Tedlar Bag

U.S. EPA ENVIRONMENTAL RESPONSE TEAM
RESPONSE ENGINEERING AND ANALYTICAL CONTRACT
EP-C-04-032
W.A.# 0-122

FIGURE 2
186 MOHONK ROAD
MAY 2006 SAMPLING
MOHONK ROAD INDUSTRIAL PLANT
HIGH FALLS, NEW YORK

Edits Prepared by: DF 6/3/15
Edits Checked by: HA 6/3/15

Table: 1
Comparison of Current and Historical Sub-Slab Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Sampling Events:
February 2005, March 2006, May 2006

LOCATION	PORT #1			
SAMPLE #	17885	0-122-001	44550	44550
SAMPLE TYPE	S	S	T	T
ANALYSIS	SUMMA	SUMMA	TAGA	GC/MS
DATE	Feb-05	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv
TCE	5.3	4.3	4.4	U
TCA	72	32	70	61

PORT #2			
17886	0-122-002	44551	44551
S	S	T	T
SUMMA	SUMMA	TAGA	GC/MS
Feb-05	Mar-06	May-06	May-06
ppbv	ppbv	ppbv	ppbv
5.3	4.7	8.7	8.3
140	97	20	240

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
U = Not Detected

Table: 2
Comparison of Sub-Slab Data
SUMMA Canister and Tedlar Bag Samples
186 Mohonk Road
REAC Sampling Event: May 2006

LOCATION	PORT #3			T1-001			T1-002		T1-003		T1-004	
SAMPLE #	44594	44562	44562	44592	44560	44560	44559	44559	44556	44556	44555	44555
SAMPLE TYPE	S	T	T	S	T	T	T	T	T	T	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS	SUMMA (TO-15)	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS
DATE	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	1600	1700	3200 D	1	0.87	U	0.4 J	U	9.6	14	0.24 J	U
TCA	2200	3000	2100	21	19	19	5.4	7.3	160	260	87	74

LOCATION	T1-005			T2-001			T2-002		T2-003		T2-004		T2-005	
SAMPLE #	44590	44552	44552	44593	44561	44561	44558	44558	44557	44557	44554	44554	44553	44553
SAMPLE TYPE	S	T	T	S	T	T	T	T	T	T	T	T	T	T
ANALYSIS	SUMMA (TO-15)	TAGA	GC/MS	SUMMA (TO-15)	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS	TAGA	GC/MS
DATE	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	U	72	58	1500	1300	1400D	3.9	5.2	4.9	0.22	DL=0.22	U	DL=0.22	U
TCA	64	0.23J	U	1100	1200	100D	95	130	660	1100 D	29	23	54	57

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
J = Estimated Value
DL = Detection Limit
D = Sample Diluted
U = Not Detected

Table: 3
Comparison of Soil Gas Results
Tedlar Bag TAGA Analysis and SUMMA Canister Results
186 Mohonk Road
REAC Sampling Event: May 2006

LOCATION	SG-1	SG-2	SG-3	SG-4	SG-5	SG-6		SG-7	
SAMPLE #	44563	44564	44566	44567	44568	44569	44575	44570	44567
SAMPLE TYPE	T	T	T	T	T	T	G	T	G
ANALYSIS	TAGA	TAGA	TAGA	TAGA	TAGA	TAGA	SUMMA (TO-15)	TAGA	SUMMA (TO-15)
DATE	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	DL=0.11	0.3 J	19	43	DL=0.11	DL=0.11	U	DL=0.11	0.92
TCA	1.3	20	39	81	0.8	6.2	1.88	4	0.08 J

LOCATION	SG-8	SG-9	SG-10		SG-11	SG-12
SAMPLE #	44571	44572	44573	44577	44574	44579
SAMPLE TYPE	T	T	T	G	T	T
ANALYSIS	TAGA	TAGA	TAGA	SUMMA (TO-15)	TAGA	TAGA
DATE	May-06	May-06	May-06	6-May	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	0.2 J	380	69 J	0.6	DL= 55	DL= 22
TCA	6.4	3500000	320000	74.5	1700	5100

LOCATION	SG-13	SG-14	SG-15	SG-16	SG-17	SG-18
SAMPLE #	44580	44581	44582	44583	44584	44585
SAMPLE TYPE	T	T	T	T	T	T
ANALYSIS	TAGA	TAGA	TAGA	TAGA	TAGA	TAGA
DATE	May-06	May-06	May-06	May-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv	ppbv	ppbv	ppbv
TCE	DL= 22	DL= 22	DL= 55	0.43	0.2 J	DL= 22
TCA	820	10000	60000	95	100	33000

Key:
T = 1-L Tedlar Bag
S = SUMMA Canister
G = Grab
DL = Detection Limit
J = Estimated Value
SG = Soil Gas

Note: DL=X
indicates a non-detect, with the DL for that sample listed, for TAGA results.

Table: 4

Comparison of TAGA Monitoring and Indoor Air Sampling Data

SUMMA Canister and Tedlar Bag Samples

186 Mohonk Road

REAC Monitoring/Sampling Events:

March 2006, May 2006

LOCATION	ROOM "M"		
TAGA FLAG/SAMPLE #	FG	R1S1	44591
ANALYSIS	TAGA	TAGA	SUMMA (TO-15)
DATE	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	0.9	1.3	0.91
TCA	NA	3.8	2.5

PORT #2		
P1E1	L1M1	44589
TAGA	TAGA	SUMMA (TO-15)
Mar-06	May-06	May-06
ppbv	ppbv	ppbv
0.98	0.53	0.4
NA	1.2	0.7

LOCATION	T2-002		
TAGA FLAG/SAMPLE #	DE	D1E1	44587
ANALYSIS	TAGA	TAGA	SUMMA (TO-15)
DATE	Mar-06	May-06	May-06
ANALYTE	ppbv	ppbv	ppbv
TCE	0.7	0.32	0.39
TCA	NA	0.84	0.71

T1-005		
NA	NA	44586
TAGA	TAGA	SUMMA (TO-15)
Mar-06	May-06	May-06
ppbv	ppbv	ppbv
NA	NA	0.2
NA	NA	0.47

Key:
NA = No Data Collected