
Division of Environmental Remediation

Record of Decision
Carroll Town Landfill Site
Town of Carroll, Chautauqua County, New York
Site Number 9-07-017

March 2009

New York State Department of Environmental Conservation
DAVID A. PATERSON, *Governor* PETE GRANNIS, *Commissioner*

DECLARATION STATEMENT - RECORD OF DECISION

Carroll Town Landfill Inactive Hazardous Waste Disposal Site Town of Carroll, Chautauqua County, New York Site No. 9-07-017

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the Carroll Town Landfill site, a Class 2 inactive hazardous waste disposal site. The selected remedial program was chosen in accordance with the New York State Environmental Conservation Law and is not inconsistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended.

This decision is based on the Administrative Record of the New York State Department of Environmental Conservation (the Department) for the Carroll Town Landfill inactive hazardous waste disposal site, and the public's input to the Proposed Remedial Action Plan (PRAP) presented by the Department. A listing of the documents included as a part of the Administrative Record is included in Appendix B of the ROD.

Assessment of the Site

Actual or threatened releases of hazardous waste constituents from this site, if not addressed by implementing the response action selected in this ROD, presents a current or potential significant threat to public health and/or the environment.

Description of Selected Remedy

Based on the results of the Remedial Investigation and Feasibility Study (RI/FS) for the Carroll Town Landfill site and the criteria identified for evaluation of alternatives, the Department has selected to place a soil cap on the landfill to improve drainage and to reduce surface water infiltration and to treat the groundwater migrating towards the municipal water supply to remove contaminants from the groundwater. The components of the remedy are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.
2. An evaluation will be made to consolidate the landfill. The consolidation will include the excavation of waste from east cell and consolidate into the west cell that will result in a smaller landfill footprint and restore the east cell to a usable land. If the consolidation of the landfill is not found to be cost effective or practical, the landfill will be covered with a soil cover.
3. A treatment system will be designed and installed at Well No.5 to insure that drinking water standards are not contravened. The Frewsburg Water district could use the treated water for public water supply.

4. A soil cover will be constructed over the landfill to prevent exposure to contaminated soils and provide contouring to promote runoff of surface water. The cover materials will be further evaluated during design but nominally would consist of 6 inches of topsoil and 18 inches of clean soil material underlain by an indicator such as orange plastic snow fence to demarcate the cover soil from the subsurface soil. Clean soil will constitute soil that meets the Division of Environmental Remediation's criteria for backfill or local site background. Non-vegetated areas such as roadways are not anticipated at this site but if they are required, these areas will be covered by a paving system at least 6 inches thick.
5. Imposition of an institutional control in the form of an environmental easement that will require (a) limiting the use and development of the property to permit commercial or industrial uses; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.
6. Development of a site management plan which will include the following institutional and engineering controls: (a) management of the final cover system to restrict excavation below the soil cover's demarcation layer. Excavated soil will be tested, properly handled to protect the health and safety of workers and the nearby community, and will be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on or adjacent to the site, including provision for mitigation of any impacts identified; (c) monitoring of groundwater; (d) identification of any use restrictions on the site; (e) provisions for the continued proper operation and maintenance of the groundwater treatment system and other components of the remedy.
7. The property owner will provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal will: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that will impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.
8. The soil cover will be maintained periodically. Maintenance will include mowing the cover and repair of any areas of the cover that were damaged or compromised in any way. Since the remedy results in untreated waste remaining at the site, a long-term monitoring program will be instituted. This program will allow the effectiveness of the landfill cover and treatment system to be monitored and will be a component of the long-term management for the site.

New York State Department of Health Acceptance

The New York State Department of Health (NYSDOH) concurs that the remedy selected for this site is protective of human health.

Declaration

The selected remedy is protective of human health and the environment, complies with State and Federal requirements that are legally applicable or relevant and appropriate to the remedial action to the extent practicable, and is cost effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery technologies, to the maximum extent practicable, and satisfies the preference for remedies that reduce toxicity, mobility, or volume as a principal element.

MAR 31 2009

Date



Dale A. Desnoyers, Director
Division of Environmental Remediation

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RECORD OF DECISION

**Carroll Town Landfill Site
Town of Carroll, Chautauqua County, New York
Site No. 9-07-017
February 2009**

SECTION 1: SUMMARY OF THE RECORD OF DECISION

The New York State Department of Environmental Conservation (the Department), in consultation with the New York State Department of Health (NYSDOH), has selected this remedy for the Carroll Town Landfill Site. The presence of hazardous waste has created significant threats to human health and/or the environment that are addressed by this remedy. As more fully described in Sections 3 and 5 of this document, landfilling of municipal and industrial waste and construction debris at the site have resulted in the disposal of hazardous wastes, including volatile organics (VOCs), semi-volatile organics (SVOCs), and inorganics. These wastes have contaminated the groundwater and landfill waste at the site, and have resulted in:

- a significant threat to human health associated with current and potential exposure to groundwater and landfill waste.
- a significant environmental threat associated with the current and potential impacts of contaminants to groundwater.

To eliminate or mitigate these threats, the Department has selected to place a soil cap on the landfill to improve drainage and to reduce surface water infiltration. This will reduce the amount of water entering the landfill mass and eliminate direct exposure to landfill waste. The groundwater migrating towards the municipal water supply will be treated to remove contaminants from the groundwater.

The selected remedy, discussed in detail in Section 8, is intended to attain the remediation goals identified for this site in Section 6. The remedy must conform to officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate requirements (ARARs). The selection of a remedy must also take into consideration guidance, as appropriate. Standards, criteria, and guidance are hereafter called SCGs.

SECTION 2: SITE LOCATION AND DESCRIPTION

The Town of Carroll Landfill is a former municipal and construction and demolition (C&D) debris landfill and solid waste transfer station in the Village of Frewsburg, Town of Carroll, Chautauqua County (Figure 1). The landfill is located at the end of an unnamed gravel road, approximately 1,700 feet north of NYS Route 62 (also known as Ivory Road). The landfill is approximately 25 acres. The surrounding area includes farmland, wooded areas, wetlands, and private homes. Conewango Creek lies to the north, northwest, and west of the Site within a broad floodplain.

The Site is located in the Allegheny Plateau physiographic province of New York State and is composed of fill, lacustrine sandy silt and silty clay, glacial outwash sand and gravel, till, and bedrock. The total depth of fill within the landfill ranged from approximately 2-ft to 10-ft. The top of the fill material was encountered between approximately 1 and 5-ft within each test pit. The sandy silt unit varies in thickness from 5 ft (southwest) to 10 ft (northeast) and the silty clay unit varies in thickness from about 3 ft to 10 ft. The total depth of these units ranges from 7 ft to 20 ft below ground surface. An outwash of sand and gravel, at a total approximate depth of 45-ft, underlies the sandy silt and silty clay units. The till layer beneath the outwash sand and gravel unit is about 15-ft deep. The weathered shale bedrock was encountered at 76 to 81 ft below ground surface.

Groundwater was observed between 3 ft and 9 ft below grade. The natural flow of groundwater is generally northerly toward Conewango Creek. Shallow groundwater was observed to have a flow component to the west-northwest and to the west-southwest. Groundwater in the intermediate zone flows to the southwest. It is likely that groundwater flow direction is being influenced to the southwest by pumping activities of the Frewsburg Water District Supply Well No. 5 beginning in April 2000. The well No. 5 is installed at a depth of approximately 80 feet with a 10 foot screen at the bottom.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

The Site operated as a former municipal landfill from the early 1960's to 1979. A Part 360 Permit for landfill operation expired in 1976. In June 1979, the Town of Carroll filed a permit application to operate a transfer station at the site. Following the issuance of a Consent Order on October 2, 1979, to address several solid waste violations including failure to provide a complete application for the landfill operation, the Town operated the site as a C&D debris landfill and transfer station. The western disposal area was closed in 1980.

During a public meeting for the remedial investigation of the Vac Air Alloys site (Site No. 907016), citizens attending the meeting alleged that Vac Air Alloys disposed industrial waste at the Town of Carroll Landfill. Allegations included citizen's reports of having witnessed drums of waste labeled as "trichloroethene" being disposed at the landfill. NYSDEC records indicated that industrial waste was allegedly disposed in the landfill during its operation. These records indicated that Vac Air Alloys allegedly disposed drums containing metal debris and metal turnings. Inspections by NYSDEC indicated the presence of partially buried 55-gallon drums in April 1992.

3.2: Remedial History

In May 1998, the Department listed the site as a Class 2 site in the Registry of Inactive Hazardous Waste Disposal Sites in New York. A Class 2 site is a site where hazardous waste presents a significant threat to the public health or the environment and action is required.

Between December 1992 and March 1993, Moody and Associates, Inc. performed a hydrogeologic investigation for the Frewsburg Water District to locate a water supply well. After identifying the Town of Carroll Public Works site, which is adjacent to the landfill, as the probable site for the new water supply well, water quality testing was performed to characterize the aquifer. Groundwater samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), iron, manganese, dissolved solids, hardness, and

chloride. At that time, test parameters indicated the water quality was good, except for chloride, which was attributed to runoff from the road salt storage pile and brine storage tank at the Public Works Garage.

Subsequent sampling results indicated that volatile organic compounds (VOCs) in leachate may have been migrating from the Site. This led to making the Site a potential hazardous waste disposal site on June 9, 1992. A Preliminary Site Assessment (PSA) was completed in February 1997. The resulting determinations of a significant threat lead to the listing of the site as Class 2 site on the Registry of Inactive Hazardous Waste Disposal Sites in May 1998.

SECTION 4: ENFORCEMENT STATUS

Potentially Responsible Parties (PRPs) are those who may be legally liable for contamination at a site. This may include past or present owners and operators, waste generators, and haulers.

The PRPs for the site, documented to date, include: the Town of Carroll, the current owner of the site and Keywell, L.L.C. the successor corporation to Vac Air Alloys Corporation.

The PRPs declined to implement the RI/FS at the site when requested by the Department. After the remedy is selected, the PRPs will again be contacted to assume responsibility for the remedial program. If an agreement cannot be reached with the PRPs, the Department will evaluate the site for further action under the State Superfund. The PRPs are subject to legal actions by the State for recovery of all response costs the State has incurred.

SECTION 5: SITE CONTAMINATION

A remedial investigation/feasibility study (RI/FS) has been conducted to evaluate the alternatives for addressing the significant threats to human health and the environment.

5.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site. The RI was conducted between August 2004 and November 2004. The field activities and findings of the investigation are described in detail in the RI report.

The RI included the following activities:

- Environmental samples were collected from the following media: soil vapor, surface soil, surface water, sediment, landfill waste, leachate seep liquid, and groundwater.
- Groundwater wells were installed.
- Landfill waste was sampled from test pits excavated at locations along the boundary of the western cell.
- Surface water and sediment samples were collected from a drainage swale (intermittent stream) north of the landfill cells, the wetland area west of the western landfill cell, and the drainage swale between the eastern and western landfill.

Figure 2 shows the locations of all the samples collected at the site.

5.1.1: Standards, Criteria, and Guidance (SCGs)

To determine whether the landfill waste and groundwater contains contamination at levels of concern, data from the investigation were compared to the following SCGs:

- Groundwater, drinking water, and surface water SCGs are based on the Department's 'Ambient Water Quality Standards and Guidance Values' and Part 5 of the New York State Sanitary Code.
- Soil SCGs are based on 6 NYCRR Subpart 375-6 – Remedial Program Soil Cleanup Objectives.
- Sediment SCGs are based on the Department's "Technical Guidance for Screening Contaminated Sediments".
- Soil vapor SCGs are based on the NYSDOH "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" dated October 2006.

Based on the RI results, in comparison to the SCGs and potential public health and environmental exposure routes, certain media and areas of the site require remediation. These are summarized in Section 5.1.2. More complete information can be found in the RI report.

5.1.2: Nature and Extent of Contamination

This section describes the findings of the investigation for all environmental media that were investigated.

As described in the RI report, many soil, groundwater, surface water, and sediment samples were collected to characterize the nature and extent of contamination. As summarized in Table 1, the main categories of contaminants that exceed their SCGs are volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and inorganics (metals). For comparison purposes, where applicable, SCGs are provided for each medium in parentheses next to the compound.

Chemical concentrations are reported in parts per billion (ppb) for water, microgram per liter (ug/l) for leachate and parts per million (ppm) for waste, soil, and sediment. Air samples are reported in micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).

Table 1 summarizes the degree of contamination for the contaminants of concern in the groundwater, soils, soil vapor, leachate, sediment and surface water and compares the data with the SCGs for the site. The following are the media which were investigated and a summary of the findings of the investigation.

Leachate

The only VOC detected was trichloroethene at a concentration of 21 ug/l (guidance value is 40 ug/l) which is less than the established NYS Class C water quality criteria. Twelve inorganic constituents were detected at concentrations that exceeded NYS Class C water quality criteria. Review of the data indicates that the highest concentrations of these constituents were detected at the LT-03 location to the northwest of the western landfill cell. Some of the inorganics detected above the water quality standards are cadmium at 24.9

ug/l (SCG is 4) and zinc at 4150 ug/l (SCG is 152). Lead was detected at a concentration of 302 ug/l (SCG is 300) which is marginally greater than the SCG. No SVOCs, pesticides or PCBs were detected in the samples.

Surface Soil (0-2 inches)

Surface soil concentrations of inorganic constituents that appear to be related to the landfill due to their elevated concentrations include cadmium, lead and zinc at the SS-09 location as well as lead and zinc at the SS-10 location. The highest concentration detected was cadmium at 2.9 ppm (SCG is 2.5), barium at 448 ppm (SCG 350), zinc at 381 (SCG 109), nickel at 52.4 (SCG 30) and lead at 98 ppm (SCG is 63). These surface soil samples were collected within the eastern landfill cell. Although lead concentrations at SS-09 may be related to landfill operations, the concentration is within the range for Eastern United States background soils. The analytical results for pesticides and PCBs indicate that concentrations are below SCG for unrestricted future use.

Subsurface Soil

Fifteen VOCs including 1,4-dichlorobenzene, cis-1,2-dichloroethene and trichloroethene were detected in the subsurface soil samples but none of them exceeded the SCG for unrestricted future use.

Inorganic constituents within subsurface soil that appear to be related to the landfill due to their elevated concentrations include arsenic, cadmium, chromium, copper, mercury, nickel, and zinc. These subsurface soil samples were from test pits installed at the northern, eastern, and southern limits of the western landfill cell. Concentrations of cadmium, chromium, copper and nickel exceeded the cleanup level for unrestricted future use. Chromium and nickel are the only inorganic compounds of concern that was detected at significant concentration at two locations. At TP-07, chromium was detected at a concentration of 8870 ppm (SCG is 30) and nickel was detected at 30,700 ppm (SCG 30). At TP-10 chromium was detected at 5900 ppm and nickel at 4300 ppm.

Groundwater

Groundwater samples were collected from eighteen wells installed at the site and one water sample collected from each of three test pits. One round of groundwater samples were collected in October 2004 and another round of samples were collected in January 2005. A recent groundwater sampling event was conducted in August 2008 to obtain current groundwater quality after the pumping at well#5 was discontinued in early 2007. Figure 3 shows the groundwater samples from the wells installed at the site and the concentration of contaminants detected at each location.

Based on the results from 2004 and 2005 sampling, only two monitoring wells had VOC concentration exceeding the groundwater standard. The highest concentration of VOCs was detected at MW-107S with 600 ppb of vinyl chloride (SCG is 2 ppb) and 69 ppb of cis-1,2-dichloroethene (SCG is 5 ppb). The wells installed around this location detected very low levels of these compound which indicate that this could be a localized impact from past disposal activities and is not a widespread area of contamination. Soil samples collected from test pits installed adjacent to this location did not detect these compounds. The same two compounds were detected at MW-102I but at low concentrations and marginally exceeding the groundwater standard.

The detection of VOCs in the shallow, intermediate and deep monitoring wells suggests that VOCs have migrated from the landfill. However, based on the groundwater analytical data, VOC concentrations appear to decrease with depth. This may suggest that the limited detection and low concentration of VOCs in the intermediate and deep sand and gravel unit are the result of biodegradation/natural attenuation of VOCs along the migration pathways.

Based on the analytical data, vinyl chloride and cis-1, 2-dichloroethene have migrated from the landfill to public water supply well No. 5. The supply well was installed west of the landfill and pumping was initiated in 2000. The Town has installed a sentinel monitoring well (MW-13) approximately 600 feet from the west of the landfill and 185 feet east of the supply well. The well is being sampled periodically to monitor contaminant migration from the landfill towards the public water supply well, prior to the contaminated groundwater reaching the water supply. While well No. 5 was operational in June 2005 the groundwater samples were collected from MW-13 and well No. 5. The concentrations of vinyl chloride and cis-1, 2-dichloroethene were detected at 10 ppb and 15 ppb respectively in MW-13. Vinyl chloride and cis-1, 2-dichloroethene were detected at 0.8 ppb and 2.4 ppb respectively in well No. 5. Although the concentration was less than the drinking water standards, pumping of supply well No. 5 was discontinued in early 2007 to insure that groundwater standards were not exceeded. The May 2007 sampling detected vinyl chloride and cis-1,2-dichloroethene at 0.6 ppb and 9.3 ppb respectively at MW-13 and non-detect at supply well No. 5. This indicates that when pumping at well No. 5 is operational contamination is migrating from the landfill to the supply well. Conversely, the recent groundwater sampling conducted in August 2008 indicate that the contaminated plume is no longer migrating toward the water supply, as evidenced from the decreasing contaminant concentration in MW-13, because of the termination of pumping at well No. 5.

Three SVOCs (4-methylphenol, 4-chloro-3-methylphenol, and 4-nitrophenol) were detected in the temporary well water sample collected from TW-TP-02 at concentrations exceeding NYS Class GA groundwater standards. The water collected from the TW-TP-02 location was in contact with the fill materials. SVOCs were not detected in the groundwater samples collected from the monitoring wells suggesting that the migration of SVOCs present within the fill materials to groundwater is limited.

Arsenic, barium, chromium, iron, lead and manganese were detected within groundwater at concentrations exceeding groundwater standards. Of these contaminants, iron was the only contaminant that was detected consistently (30 of 31 samples) exceeding groundwater standards in the groundwater samples. Inorganic concentrations above the groundwater standards were detected sporadically, both spatially and temporally, with the exception of iron. Review of the iron concentrations, combined with the frequency of detection suggests that the detected concentrations are likely representative of naturally occurring background groundwater quality conditions.

Surface Water

Phenol was detected in surface water sample SW1 at a concentration of 11 ppb, which is slightly exceeds the NYS Class C water quality criteria of 5 ppb. No other SVOCs were detected in the surface water samples at concentrations exceeding NYS Class C water quality criteria.

Inorganic contaminants in surface water at concentrations exceeding NYS Class C water quality criteria included cobalt, lead, vanadium, and zinc. The concentration of these compounds range from 0.99 – 11.2 ppb (SCG is 5 ppb) for cobalt, 8.4 – 22.5 ppb (SCG is 5 ppb) for lead, 1.1 – 16.6 ppb (SCG is 14 ppb) for vanadium and 8.8 – 210 ppb (SCG is 152 ppb) for zinc. The inorganic contaminants detected in the surface

water samples are likely attributable to the migration of leachate from the landfill to drainage swales between the two landfill cells, which ultimately drain to the drainage swale to the north of the cells. Similar inorganic contaminants were detected in the surface water samples as in the leachate samples. The potential for these contaminants to impact the Conewengo Creek is minimal because the creek is located approximately 4000 feet to the west of the site.

Drainage Swale Soils

No VOCs or SVOCs were detected above the sediment cleanup guidance.

Drainage swale soil samples were co-located with the surface water samples. In general, similar inorganic contaminants were detected in the drainage swale soil samples as in the surface water samples. However, in almost all cases, contaminant concentrations in the drainage swale soil were higher than those detected in surface water. Inorganic drainage swale soil concentrations were collected in locations where surface water is not present throughout the year, the concentrations were compared to soil cleanup levels. The concentrations of inorganics in drainage swale soil samples were below cleanup levels when compared to soil cleanup objectives.

Soil Vapor

Thirty-seven soil vapor points were installed within the landfill area for VOC and methane screening purposes. VOCs were detected in soil vapor within the boundaries of the landfill cells at four locations. The soil vapor data were screened according to NYSDOH guidance to evaluate potential vapor impacts relative to potential future uses of the landfill property. However, occupied structures are not currently present in the immediate vicinity of the landfill, therefore the potential for vapor impacts are considered minimal.

Methane was detected at three locations ranging from 2.4% - 14.0%. These concentrations range above the Lower Explosive Level of 5% and are less than the Upper Explosive Level of 15%. During the design of the proposed remedy, evaluation would be done to include a venting system in the soil cover to be placed on the landfill.

Review of the soil vapor VOC data indicates that detected VOCs consist mainly of petroleum hydrocarbons and other compounds such as benzene, toluene, ethylbenzene, xylene. Other chlorinated compounds such as trichloroethene, and tetrachloroethene were also present in soil vapor. The highest concentrations of VOCs were generally detected in the soil vapor sample collected at SV-16. The magnitudes of detected concentrations in the soil vapor samples are relatively low and do not appear indicative of the presence of a significant source at the soil vapor sample locations. Soil vapor samples were collected within the waste limits.

5.2: Interim Remedial Measures

An interim remedial measure (IRM) is conducted at a site when a source of contamination or exposure pathway can be effectively addressed before completion of the RI/FS and a direct threat to humans or environment exist.

An IRM was initiated by the Department in early 2006 to evaluate the existing problems with the treatment system at well No. 2A and repair the system as necessary. The IRM was initiated because the sentinel well MW-13 located upgradient of well No. 5 detected vinyl chloride above drinking water standards and well No. 5 detected vinyl chloride but below drinking water standards. In order for the Frewsburg Water District to meet water supply demand, the treatment on well No. 2A needed to be repaired.

The evaluation of the treatment system on well No. 2A was completed in September 2006. During the evaluation, it was identified that the influent pipe which extends above the roof freezes during winter and shuts down the air stripper tower, hammering occurs along the supply line and the service pumps are subject to frequent cycling. These issues were evaluated and several alternatives were proposed during the evaluation. Final alternatives were selected and equipment was purchased to implement the selected alternatives.

Equipment installation began on October 5, 2006 and completed on October 10, 2006. Based on trial runs, the equipment installed to resolve the problems is functioning properly. The Department provided assistance to the Town by helping them to train the Town staff to operate the new equipment.

5.3: Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the human exposure pathways can be found in Section 7.0 (Appendix I) of the RI report. An exposure pathway describes the means by which an individual may be exposed to contaminants originating from a site. An exposure pathway has five elements: [1] a contaminant source, [2] contaminant release and transport mechanisms, [3] a point of exposure, [4] a route of exposure, and [5] a receptor population.

The source of contamination is the location where contaminants were released to the environment (any waste disposal area or point of discharge). Contaminant release and transport mechanisms carry contaminants from the source to a point where people may be exposed. The exposure point is a location where actual or potential human contact with a contaminated medium may occur. The route of exposure is the manner in which a contaminant actually enters or contacts the body (e.g., ingestion, inhalation, or direct contact). The receptor population is the people who are, or may be, exposed to contaminants at a point of exposure.

An exposure pathway is complete when all five elements of an exposure pathway exist. An exposure pathway is considered a potential pathway when one or more of the elements currently does not exist, but could in the future.

Under current and future use scenario's, there exists the potential for exposure to metals via incidental ingestion or dermal contact with on-site contaminated surface soils, subsurface soils and leachate. There could also be exposure to volatile organic compounds via soil vapor intrusion should structures be build on or in the vicinity of the site.

Groundwater in the vicinity of the site is utilized for drinking water for the Village of Frewsburg. The groundwater on site is contaminated with volatile organic compounds. This contamination represents a threat to this public water supply source.

5.4: Summary of Environmental Assessment

This section summarizes the assessment of existing and potential future environmental impacts presented by the site. Environmental impacts include existing and potential future exposure pathways to fish and wildlife receptors, as well as damage to natural resources such as aquifers and wetlands.

The Fish and Wildlife Impact Analysis, which is included in Section 6.0 of the RI report, presents a detailed discussion of the existing and potential impacts from the site to fish and wildlife receptors.

The following environmental exposure pathways and ecological risks have been identified:

- Aquatic areas existing on-site include a portion of the unnamed tributary of Conewango Creek, emergent and scrub-shrub wetlands and several drainage ways. The wetlands provide habitat for a variety of terrestrial and aquatic receptors. The unnamed tributary likely provides some habitat for a variety of fish and other wildlife species that frequent aquatic habitats. However, the relatively small size of the tributary limits the value of this habitat to some wildlife, particularly fish.
- The terrestrial areas surrounding the site and within the study area consists of a mixture of natural communities and areas exhibiting rural (predominantly agricultural and residential) land use. Approximately 45 percent of the aerial extent of the study area consist of agricultural and residential land uses that may somewhat limit use by transient or residential wildlife species.
- Approximately 55 percent of the aerial extent of the study area consists of natural cover types such as coniferous and hardwood forest; freshwater wooded, scrub-shrub and emergent wetlands; and streams that provide appropriate habitat for a variety of fish and wildlife species.
- Due to the presence of chemical constituents in surface soil, surface water and sediment associated with the site, complete exposure pathways to terrestrial and aquatic receptors likely exist at and down-gradient of the site.

Site contamination has impacted the groundwater to the southwest of the landfill, which in turn was migrating towards the Frewsburg Water District Supply Well No. 5 when the well was in use. Based on available data from the Chautauqua County Department of Health, vinyl chloride and cis-1, 2-DCE have been detected but have not exceeded the drinking water standard in the supply well since 2003.

The proposed remedy will minimize the impacts from contaminants found at the site to wetlands and other surface water bodies. In addition, the impacted groundwater will be addressed in the proposed remedy.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375. At a minimum, the remedy selected must eliminate or mitigate all significant threats to public health and/or the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The remediation goals for this site are to eliminate or reduce to the extent practicable:

- Exposures of persons at or around the site to landfill waste;

- Exposures to contaminated groundwater via the Frewsburg Water District drinking water well located adjacent to the Site;
- Environmental exposures of flora or fauna to inorganics in leachate and surface water;
- The release of contaminants from soil into groundwater that may create exceedances of groundwater quality standards; and
- The potential for vapor intrusion into structures on or nearby the landfill.

Further, the remediation goals for the site include attaining to the extent practicable:

- Ambient groundwater quality standards.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy must be protective of human health and the environment, be cost-effective, comply with other statutory requirements, and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the Carroll Town Landfill Site were identified, screened and evaluated in the FS report which is available at the document repositories established for this site. However, in some instances, the alternatives presented in the FS have been modified as determined appropriate for the site related to current activities associated with the public drinking water wells, as well as, following currently accepted presumptive remedies as established by the EPA.

The use of a part 360 low permeable landfill cap was evaluated as one of the alternatives in the FS report but is not included in the PRAP as an alternative. The soil cover considered in the PRAP will minimize infiltration, provides proper drainage, promote natural attenuation and will offer flexibility for future beneficial use. The soil cover will be as effective as the low permeable cover in eliminating the direct exposure to humans and wildlife. The soil cover will be contoured to promote surface water runoff thereby reducing water infiltration further. This will effectively reduce infiltration of water into the landfill waste and minimize the migration of contamination from the waste. An impermeable part 360 cap will eliminate infiltration into the waste but at an increased cost of \$2.5 million in capital costs. It is our proposal that the measures taken to reduce the infiltration through contouring a soil cover will result in a landfill that will effectively minimize contamination migrating from the landfill.

A summary of the remedial alternatives that were considered for this site is discussed below. The present worth represents the amount of money invested in the current year that will be sufficient to cover all present and future costs associated with the alternative. This enables the costs of remedial alternatives to be compared on a common basis. As a convention, a time frame of 30 years is used to evaluate present worth costs for alternatives with an indefinite duration. This does not imply that operation, maintenance, or monitoring will cease after 30 years if remediation goals are not achieved.

7.1: Description of Remedial Alternatives

The following potential remedies were considered to address the contaminated groundwater, leachate, and landfill waste at the site.

Alternative 1: No Action

The No Action Alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative will leave the site in its present condition and will not provide any additional protection to human health or the environment. It also will not achieve the remedial goals and will not satisfy the ARARs established for the site.

<i>Present Worth:</i>	\$221,500
<i>Capital Cost:</i>	\$0
<i>O&M Present Cost:</i>	\$221,500
<i>Annual O&M Costs:</i>	\$11,300
<i>Time to Implement:</i>	NA

Alternative 2: Landfill Cover with Monitored Natural Attenuation

Alternative 2 includes a landfill cover with continued monitoring. Based on the RI data, the soil or the waste samples collected from the landfill detected contamination but the contamination was below the SCGs. Groundwater contamination can be attributed to the migration of surface water through the landfill carrying contaminants to the groundwater. Also, leachate can generally be attributed to surface water entering the landfill at a higher elevation and migrating to seeps at lower elevations and to surrounding surface waterways. A soil cap will be placed on the landfill to improve surface drainage thereby reducing the infiltration of surface water; and will eliminate direct exposure to landfill waste.

An evaluation will be made to consolidate the landfill. The consolidation will include the excavation of waste from east cell and consolidate into the west cell that will result in a smaller landfill footprint and restore the east cell to a usable land. If the consolidation of the landfill is found to be not cost effective or practical, the landfill will be covered with the soil cover as it exists now.

Soil cover will consist of 6 inches of topsoil and 18 inches of soil material. During the design of the remedy, the soils to be used will be further evaluated to determine the availability of low permeability soils and their impact on infiltration of water into the landfill. The surface will be sloped so that drainage was directed away from the landfill towards the swale that flows towards the north. Control of the surface water should also minimize concerns associated with leachate. Covering the landfill waste will minimize potential exposure to humans in and around the landfill.

It is evident from the groundwater sampling results that subsurface biological activity is occurring at the site and therefore, under this alternative, groundwater will continue to naturally attenuate. Groundwater will be monitored for increases in contaminant levels and any direct threats to humans, particularly if the public water system Well No. 5 was to be used for potable water. However, institutional controls such as an environmental easement will be required to restrict the use of groundwater for potable purposes.

Costs are based on construction of a landfill cover followed by continued monitoring over a 30 year period.

<i>Present Worth:</i>	\$2,941,500
<i>Capital Cost:</i>	\$2,720,000
<i>O&M Present Cost:</i>	\$221,500
<i>Annual O&M Costs:</i>	\$11,300
<i>Time to Implement:</i>	8 months

Alternative 3: Landfill Cover with In Situ Treatment

Similar to Alternative 2, a landfill cover would be constructed under Alternative 3 in a similar manner. In addition, in situ treatment will be performed to address the groundwater contamination. In order to accelerate the current subsurface biological activity, an in-situ treatment product capable of reducing contaminant levels would be installed/injected, or an air sparging system would be installed. Since the groundwater plume has been identified between the landfill and the sentry well, this area and extending north to intercept the natural groundwater flow direction northwest of the landfill would be the focus for in situ treatment.

A pilot study will be conducted to determine the number of injection points and the biological compound or the air sparging compound that will be applicable for the site conditions. In addition, institutional controls preventing the use of public supply Well No. 5 should be implemented during the implementation of this technology because the pumping at Well No. 5 would draw the injected compound towards the direction of pumping and could compromise the effectiveness of this technology.

Groundwater will be monitored for changes in contaminant levels, particularly increases. Institutional controls such as an environmental easement will be required to restrict the use of groundwater for potable purposes.

Costs are based on construction of a landfill cover and a one time injection of an in situ bioremediation product followed by continued monitoring over a 30 year period.

<i>Present Worth:</i>	\$4,066,500
<i>Capital Cost:</i>	\$3,845,000
<i>O&M Present Cost:</i>	\$221,500
<i>Annual O&M Costs:</i>	\$11,300
<i>Time to Implement:</i>	8 months

Alternative 4: Landfill Cover with Ex Situ Treatment

Similar to Alternative 2, a landfill cover will also be constructed under Alternative 4 in a similar manner. In addition, ex situ treatment will be performed to address the groundwater contamination. An appropriate treatment system will be installed at well No. 5 to treat the groundwater. The treatment system will be installed and operated for a period of one year following the Department's approval of the final engineering report and then the responsibility of operating the system will be transferred to the Town. During this time, training to operate the system will be provided to the Town staff.

Groundwater will be monitored for changes in contaminant levels.

Costs are based on construction of a landfill cover and installation of a treatment system such as an air stripper for VOC removal within the pump house at Well No. 5. Operation and maintenance of the treatment system is assumed for a period of 1 year and the maintenance and monitoring of the landfill is assumed for a period of 30 years.

<i>Present Worth:</i>	\$3,291,700
<i>Capital Cost:</i>	\$3,032,000
<i>O&M Present Cost:</i>	\$259,700
<i>Annual O&M Costs:</i>	\$ 49,500
<i>Time to Implement:</i>	8 months

7.2 Evaluation of Remedial Alternatives

The criteria to which potential remedial alternatives are compared are defined in 6 NYCRR Part 375, which governs the remediation of inactive hazardous waste disposal sites in New York. A detailed discussion of the evaluation criteria and comparative analysis is included in the FS report.

The first two evaluation criteria are termed “threshold criteria” and must be satisfied in order for an alternative to be considered for selection.

1. Protection of Human Health and the Environment. This criterion is an overall evaluation of each alternative’s ability to protect public health and the environment.
2. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether a remedy will meet environmental laws, regulations, and other standards and criteria. In addition, this criterion includes the consideration of guidance which the Department has determined to be applicable on a case-specific basis.

The major SCGs applicable for this site include groundwater and drinking water standards in the Department’s Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1) – Class C Surface Water Criteria. The discharge of treated groundwater to surface water would also have to meet state pollution discharge elimination system requirements.

The next five “primary balancing criteria” are used to compare the positive and negative aspects of each of the remedial strategies.

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared against the other alternatives.
4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on-site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the engineering and/or institutional controls intended to limit the risk, and 3) the reliability of these controls.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.

6. Implementability. The technical and administrative feasibility of implementing each alternative are evaluated. Technical feasibility includes the difficulties associated with the construction of the remedy and the ability to monitor its effectiveness. For administrative feasibility, the availability of the necessary personnel and materials is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, institutional controls, and so forth.

7. Cost-Effectiveness. Capital costs and annual operation, maintenance, and monitoring costs are estimated for each alternative and compared on a present worth basis. Although cost-effectiveness is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the other criteria, it can be used as the basis for the final decision.

This final criterion, community acceptance, is considered a “modifying criterion” and is taken into account after evaluating those above. It is evaluated after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the PRAP have been evaluated. The responsiveness summary (Appendix A) presents the public comments received and the manner in which the Department addressed the concerns raised.

In general, the public comments received were supportive of the selected remedy. Several comments received, however, pertaining to the landfill consolidation. The public raised concerns about the proposal to consolidate the waste from east cell of the landfill into the west cell because the public did not want the landfill waste to be disturbed. The landfill waste is already covered with soil. Additionally, the consolidation will increase the height of the landfill with the soil cover which is unacceptable.

As proposed by the Department, a detailed evaluation will be made to consolidate the landfill. If the consolidation of the landfill is found to be not cost effective or practical, the landfill will be covered with the soil cover as it exists now.

SECTION 8: SUMMARY OF THE SELECTED REMEDY

The Department has selected Alternative 4, Landfill Cover with Ex Situ Treatment, as the remedy for this site. The selected remedy is based on the results of the RI and the evaluation of alternatives presented in this document and the FS.

The components of the remedy include the construction of a landfill cover to minimize infiltration of surface water and subsequent migration of contamination from the landfill waste. The cover will promote water runoff thereby minimizing migration of leachate from the landfill waste to the surface drainage ditches. A treatment system will be installed at Well No. 5 and be used as an ex situ treatment system of the groundwater. This will provide the Frewsburg Water district with an effective supply well which could be used under current conditions. Refer to Figure 4 for the layout of the proposed remedy.

Alternative 4 is being selected based on the evaluation of the four alternatives developed for this site. With the exception of the No Action alternative, each of the alternatives will comply with the threshold criteria,

although Alternative 2 may take a longer period due to natural attenuation. In addition, alternatives 2, 3 and 4 will comply with the balancing criteria but the level of compliance varies for each alternative. The major differences between the three alternatives are overall effectiveness and cost. Essentially, Alternative 4 provides the greatest certainty of achieving the remediation goals for the site and is effective.

Alternative 2 (Landfill Cover with Monitored Natural Attenuation) is the lowest cost compared to Alternatives 3 and 4, but the groundwater cleanup goals may take a significant time for natural attenuation to achieve clean up goals. The soil cover under Alternative 2 will improve surface drainage thereby reducing the infiltration of surface water; and will eliminate direct exposure to landfill waste but the groundwater contamination plume will continue to pose exposures to public health and the environment.

Alternative 3 (Landfill Cover with In Situ Treatment) will rely on effective design and implementation of an in situ remediation compound or air sparging system to treat the contaminated groundwater. Alternative 3 will require a pilot study prior to the implementation of this treatment technology on a full-scale level at the site. The long-term effectiveness of Alternative 3 will depend on its implementability and availability of experienced contractors. Also groundwater flow will need to be better defined in order to properly design a treatment system. Alternative 4 will be readily implementable.

Compared to other alternatives, Alternative 4 will be effective in removing the contaminants from the groundwater and will eliminate the threat of potential ingestion of contaminated groundwater.

The cost of the alternatives varies. Alternative 4 is less expensive than Alternative 3. The costs for Alternatives 2 and 4 are approximately the same. Alternative 3 costs significantly more and its implementability and effectiveness are uncertain. Designing the remedy, mobilizing the equipments, preparing the site, and construction management are substantial costs associated with each of these remedies.

The estimated present worth cost to implement the remedy is \$3,198,200. The cost to construct the remedy is estimated to be \$3,032,000 and the estimated average annual O & M cost is \$38,200.

The elements of the proposed remedy are as follows:

1. A remedial design program will be implemented to provide the details necessary for the construction, operation, maintenance, and monitoring of the remedial program.
2. An evaluation will be made to consolidate the landfill. The consolidation will include the excavation of waste from east cell and consolidate into the west cell that will result in a smaller landfill footprint and restore the east cell to usable land. If the consolidation of the landfill is not found to be cost effective or practical, the entire landfill will be covered with a soil cover.
3. A treatment system will be designed and installed at Well No.5 to insure that drinking water standards are not contravened. The Frewsburg Water district could use the treated water for public water supply.
4. A soil cover will be constructed over the landfill to prevent exposure to contaminated soils and provide contouring to promote runoff of surface water. The cover materials will be further evaluated during design but nominally would consist of 6 inches of topsoil and 18 inches of clean soil material underlain by an indicator such as orange plastic snow fence to demarcate the

cover soil from the subsurface soil. Clean soil will constitute soil that meets the Division of Environmental Remediation's criteria for backfill or local site background. Non-vegetated areas such as roadways are not anticipated at this site but if they are required, these areas will be covered by a paving system at least 6 inches thick.

5. Imposition of an institutional control in the form of an environmental easement that will require (a) limiting the use and development of the property to permit commercial or industrial uses; (b) compliance with the approved site management plan; (c) restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH; and (d) the property owner to complete and submit to the Department a periodic certification of institutional and engineering controls.
6. Development of a site management plan which will include the following institutional and engineering controls: (a) management of the final cover system to restrict excavation below the soil cover's demarcation layer. Excavated soil will be tested, properly handled to protect the health and safety of workers and the nearby community, and will be properly managed in a manner acceptable to the Department; (b) continued evaluation of the potential for vapor intrusion for any buildings developed on or adjacent to the site, including provision for mitigation of any impacts identified; (c) monitoring of groundwater; (d) identification of any use restrictions on the site; (e) provisions for the continued proper operation and maintenance of the groundwater treatment system and other components of the remedy.
7. The property owner will provide a periodic certification of institutional and engineering controls, prepared and submitted by a professional engineer or such other expert acceptable to the Department, until the Department notifies the property owner in writing that this certification is no longer needed. This submittal will: (a) contain certification that the institutional controls and engineering controls put in place are still in place and are either unchanged from the previous certification or are compliant with Department-approved modifications; (b) allow the Department access to the site; and (c) state that nothing has occurred that will impair the ability of the control to protect public health or the environment, or constitute a violation or failure to comply with the site management plan unless otherwise approved by the Department.
8. The soil cover will be maintained periodically. Maintenance will include mowing the cover and repair of any areas of the cover that were damaged or compromised in any way. Since the remedy results in untreated waste remaining at the site, a long-term monitoring program will be instituted. This program will allow the effectiveness of the landfill cover and treatment system to be monitored and will be a component of the long-term management for the site.

TABLE 1
Nature and Extent of Contamination
Groundwater

Groundwater	Contaminants of Concern	Concentration Range Detected (ppb)	SCG (ppb)	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Cis-1,2 Dichloroethene	1 – 69	5	6 of 38
	Dichlorodifluoromethane	0.6 – 9	5	1 of 38
	1,2 Dichloroethene	0.6 – 2	0.6	1 of 38
	Benzene	0.6 - 2	1	1 of 38
	Chloroethane	1-7	5	1 of 38
	Vinyl Chloride	1 – 600	2	6 of 38
	Xylene (total)	ND - 11	5	1 of 38
Semivolatile Organic Compounds (SVOCs)	4-Methylphenol	ND – 60	1	1 of 5
	4-chloro-3-Methylphenol	ND- 5	1	1 of 5
	4- Nitrophenol	ND – 2	1	1 of 5
Inorganic Compounds	Arsenic	2.7 – 87.8	25	8 of 31
	Barium	97.2 - 1230	1000	1 of 31
	Chromium	0.94 - 112	50	2 of 31
	Iron	32.7 – 82,600	300	30 of 31
	Lead	0.74 – 157	25	5 of 31
	Manganese	41.1 - 12300	3000	4 of 31

Key:
 ppb = parts per billion, which is equivalent to micrograms per liter, µg/L
 SCG = standards, criteria, and guidance values – NYSDEC Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1) – Class GA groundwater Criteria.

TABLE 1
Nature and Extent of Contamination
Leachate

Leachate	Contaminants of Concern	Concentration Range Detected (ppb)	SCG (ppb)	Frequency of Exceeding SCG
Inorganic Compounds	Lead	9.9 – 302	5	3 of 3
	Aluminum	998 – 110,000	100	3 of 3
	Arsenic	2.7 – 156	150	1 of 3
	Cadmium	0.2 – 24.9	4	1 of 3
	Cobalt	0.99 – 291	5	1 of 3
	Copper	4.9 – 365	18	1 of 3
	Iron	14,600 – 721,000	300	3 of 3
	Mercury	0.02 – 0.78	0.77	1 of 3
	Nickel	5.7 – 2560	101	1 of 3
	Selenium	2.7 – 31.23	4.6	1 of 3
	Thallium	3.7 – 22.9	8	1 of 3
	Vanadium	1.1 – 195	14	1 of 3
	Zinc	56.3 – 4150	152	1 of 3

Key:
ppb = parts per billion, which is equivalent to micrograms per liter, µg/L
SCG = standards, criteria, and guidance values – NYSDEC Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1) – Class C Surface Water Criteria.

TABLE 1
Nature and Extent of Contamination
Surface Water

Surface Water	Contaminants of Concern	Concentration Range Detected (ppb)	SCG (ppb)	Frequency of Exceeding SCG
Semivolatile Organic Compounds (SVOCs)	Phenol	ND – 11	5	1 of 5
Inorganic Compounds	Lead	8.4 – 22.5	5	4 of 5
	Aluminum	253 – 10,200	100	5 of 5
	Cobalt	0.99 – 11.2	5	3 of 5
	Iron	1350 – 38,000	300	5 of 5
	Vanadium	1.1 – 16.6	14	1 of 5
	Zinc	8.8 – 210	152	1 of 5

Key:
ppb = parts per billion, which is equivalent to micrograms per liter, µg/L
SCG = standards, criteria, and guidance values – NYSDEC Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1) – Class C Surface Water Criteria.

TABLE 1
Nature and Extent of Contamination
Soil Vapor and Surface Soil

Soil Vapor	Contaminants of Concern	Concentration Range Detected (ppbv)	SCG (ppbv)	Frequency of Exceeding SCG
Volatile Organic Compounds (VOCs)	Dichlorodifluoromethane	0.6 - 7600	400	1 of 4
	Trichloroethylene	ND - 18	4.1	1 of 4
	1,2,4-Trimethylbenzene	0.6 - 19	12	1 of 4

Key:
 ppbv = parts per billion volume
 SCG = standards, criteria, and guidance values – USEPA, 2002 - OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils

Surface Soil	Contaminants of Concern	Concentration Range Detected (ppm)	SCG (ppm)	Frequency of Exceeding SCG
Inorganic Compounds	Barium	81.3 - 448	300	1 of 5
	Cadmium	0.4 – 2.9	2.5	1 of 5
	Lead	16.1 - 98	63	1 of 5
	Nickel	18.8 – 52.4	30	2 of 5
	Zinc	42.8 - 381	109	2 of 5

Key:
 ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil
 SCG = standards, criteria, and guidance values – “Technical and Administrative Guidance Memorandum [TAGM 4046]; Determination of Soil Cleanup Objectives and Cleanup Levels” and 6 NYCRR Subpart 375-6 – Remedial Program Soil Cleanup Objectives).

TABLE 1
Nature and Extent of Contamination
Subsurface Soil

Subsurface Soil	Contaminants of Concern	Concentration Range Detected (ppm)	SCG (ppm)	Frequency of Exceeding SCG
Inorganic Compounds	Arsenic	5.3 – 29.7	13	2 of 8
	Cadmium	0.87 – 23.9	2.5	1 of 8
	Chromium	15 - 8870	30	3 of 8
	Copper	11.3 - 1800	50	3 of 8
	Mercury	0.04 – 2.2	0.18	2 of 8
	Nickel	23 – 30,700	30	3 of 8
	Zinc	56.4 - 1820	109	6 of 8

Key:
ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil
SCG = standards, criteria, and guidance values - “Technical and Administrative Guidance Memorandum [TAGM 4046]; Determination of Soil Cleanup Objectives and Cleanup Levels” and 6 NYCRR Subpart 375-6 – Remedial Program Soil Cleanup Objectives.

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost (\$)	Annual Costs (\$)	Total Present Worth (\$)
No Action	0	0	0
Landfill Cover with Monitored Natural Attenuation	2,720,000	11,300	2,941,500
Landfill Cover with In Situ Treatment	3,845,000	11,300	4,066,500
Landfill Cover with Ex Situ Treatment	3,032,000	38,200	3,291,700

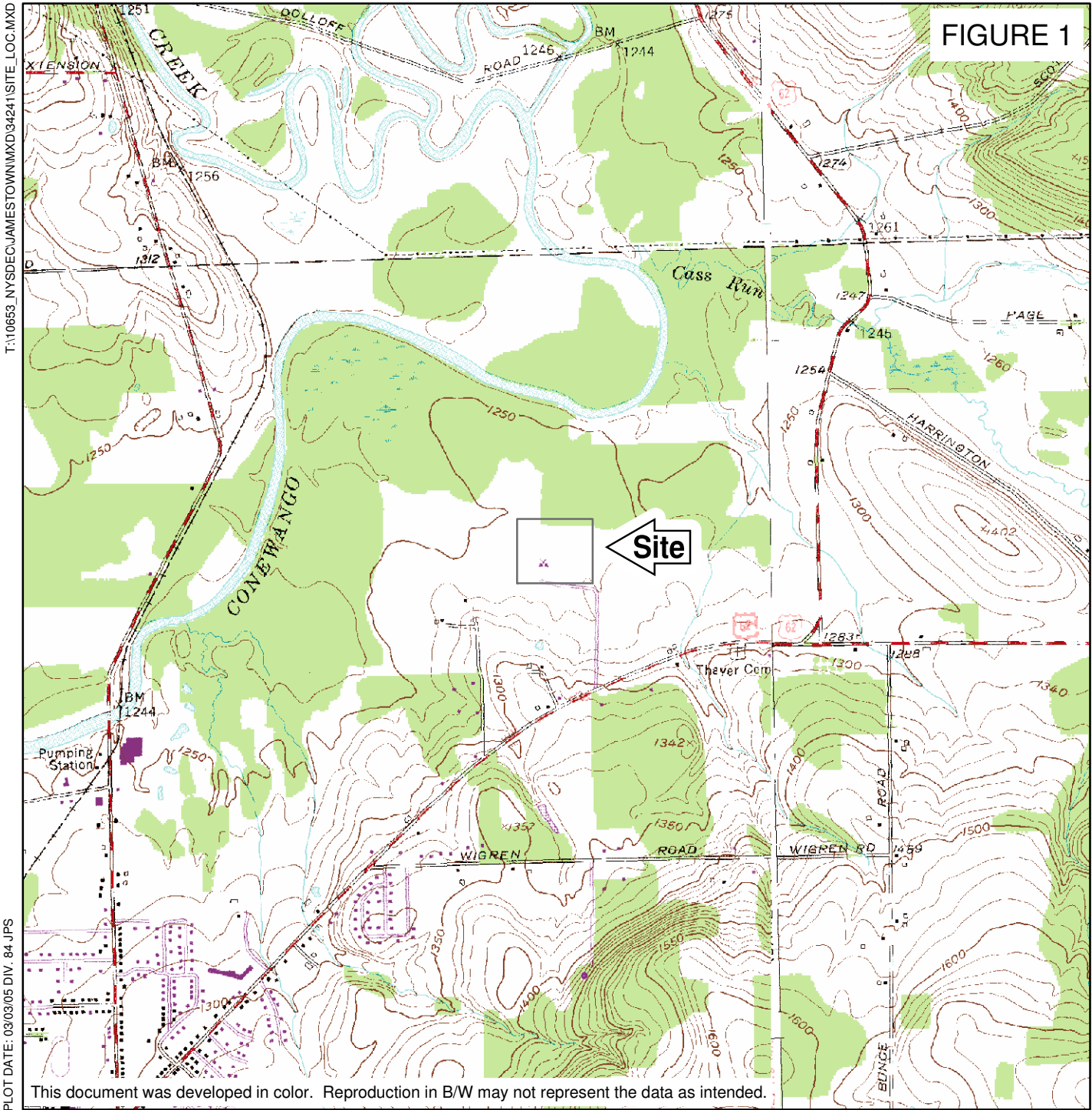
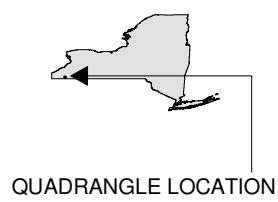


FIGURE 1

ADAPTED FROM: IVORY AND JAMESTOWN, NEW YORK USGS QUADRANGLES.



**TOWN OF CARROLL
LANDFILL SITE
FREWSBURG, NEW YORK
SITE LOCATION**

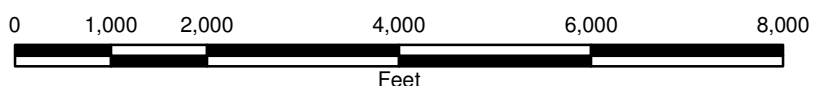


FIGURE 2

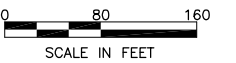


LEGEND

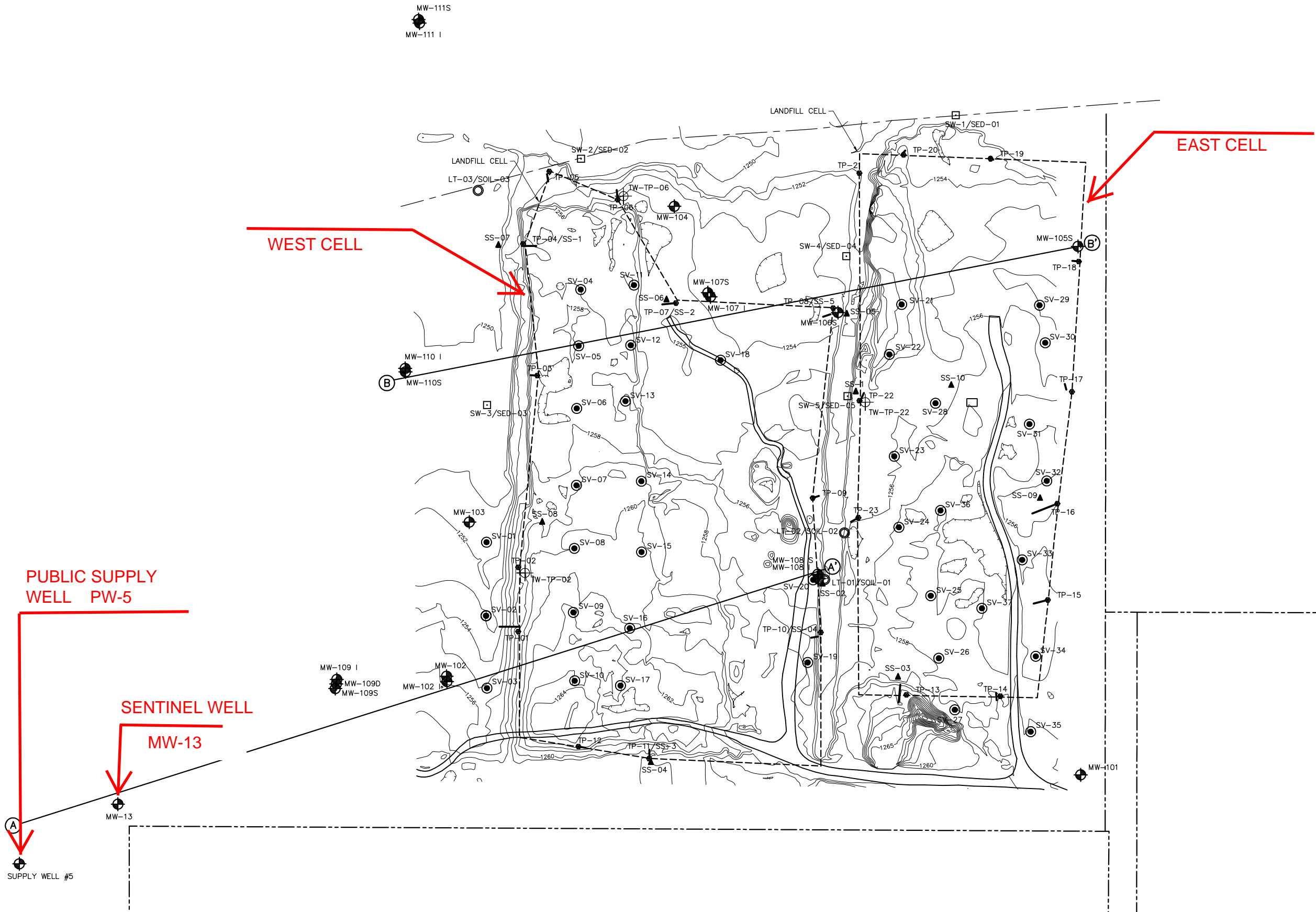
- PROPERTY LINE
- - - EDGE OF CREEK
- ACCESS ROAD
- SV-30 SOIL VAPOR LOCATIONS
- SW-1/SED-01 SURFACE WATER AND SEDIMENT LOCATIONS
- ▲ SS-07 SURFACE SOIL LOCATIONS
- LT-01 LEACHATE SEEP LOCATIONS
- TP-18 TEST PIT LOCATIONS
- MW-105S MONITORING WELL LOCATIONS
- A CROSS SECTION LINES
- ⊕ TW-TP-02 TEMPORARY WELL

TOWN OF CARROLL
LANDFILL SITE
FREWSBURG, NEW YORK
NYSDEC SITE #9-07-017

SAMPLE LOCATION PLAN



FILE NO.10653.34241.013
DECEMBER 2005



WEST CELL

EAST CELL

PUBLIC SUPPLY WELL PW-5

SENTINEL WELL MW-13

SUPPLY WELL #5

FIGURE NO. 4

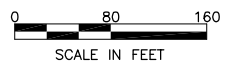


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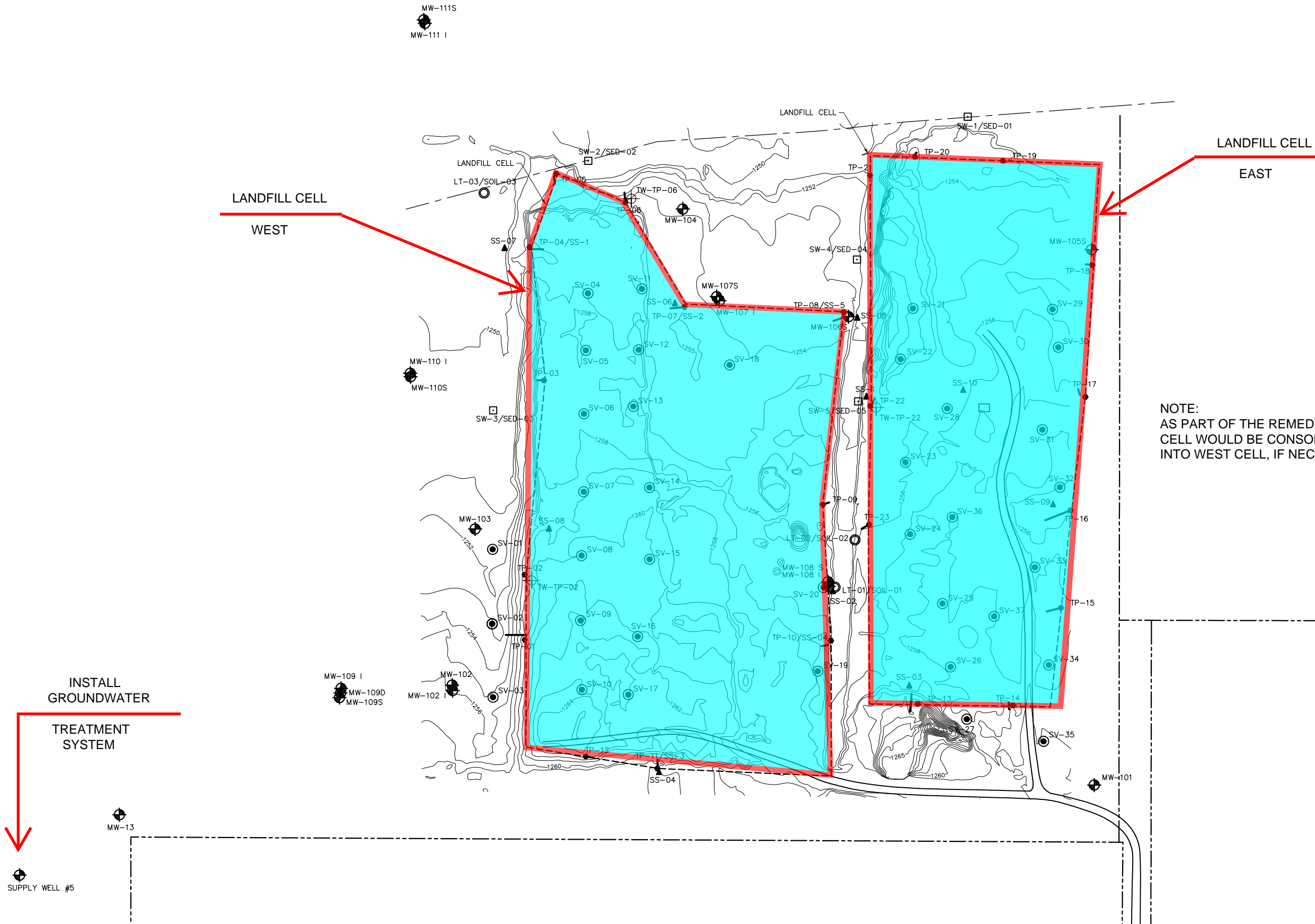
- PROPERTY LINE
- - - EDGE OF CREEK
- == ACCESS ROAD
- SV-30 SOIL VAPOR LOCATIONS
- SW-1/SED-01 SURFACE WATER AND SEDIMENT LOCATIONS
- SS-07 SURFACE SOIL LOCATIONS
- LT-01 LEACHATE SEEP LOCATIONS
- TP-18 TEST PIT LOCATIONS
- MW-105S MONITORING WELL LOCATIONS
- TW-TP-02 TEMPORARY WELL

TOWN OF CARROLL
LANDFILL SITE
FREWSBURG, NEW YORK
NYSDEC SITE #9-07-017

PROPOSED
REMEDY
LAYOUT



FILE NO.10653.34241.027
MAY 2005



NOTE:
AS PART OF THE REMEDY, EAST
CELL WOULD BE CONSOLIDATED
INTO WEST CELL, IF NECESSARY.

APPENDIX A

RESPONSIVENESS SUMMARY

APPENDIX A

Responsiveness Summary

Carroll Town Landfill Site Town of Carroll, Chautauqua County, New York Site No. 907017

The Proposed Remedial Action Plan (PRAP) for the Carroll Town Landfill site, was prepared by the New York State Department of Environmental Conservation (the Department) in consultation with the New York State Department of Health (NYSDOH) and was issued to the document repositories on November 17, 2008. The PRAP outlined the remedial measure proposed for the contaminated groundwater and the landfill waste at the Carroll Town Landfill site.

The release of the PRAP was announced by sending a notice to the public contact list, informing the public of the opportunity to comment on the proposed remedy.

A public meeting was held on January 21, 2009, which included a presentation of the Remedial Investigation (RI) and the Feasibility Study (FS) as well as a discussion of the proposed remedy. The meeting provided an opportunity for citizens to discuss their concerns, ask questions and comment on the proposed remedy. These comments have become part of the Administrative Record for this site. The public comment period for the PRAP ended on February 4, 2009.

This responsiveness summary responds to all questions and comments raised during the public comment period. The following are the comments received, with the Department's responses:

COMMENT 1: An ecosystem thrives in and around the landfill. We do not want you to disturb this by consolidating the landfill.

RESPONSE 1: Although there may be some short-term impacts due to consolidation the long-term benefits of reducing water infiltration into the waste and thereby reducing the migration of contaminants from the landfill is preferable. However, if the consolidation of cells is found not to be cost effective or practical, the landfill will be covered in the footprint that exists at present. As stated in the PRAP, we will evaluate in detail the option to consolidate material from one cell to the other to minimize the landfill footprint and therefore, the amount of soil cover. Consolidation would remove the waste from the east cell making it available for unrestricted future development.

COMMENT 2: Why consolidate the waste into the west cell which is closer to public supply well PW-5? Why not consolidate the west cell into the east cell?

RESPONSE 2: Consolidation of the east cell into the west cell is preferable because the east cell is smaller in size compared to the west cell and the groundwater samples from two of the monitoring wells installed on the west cell showed high concentrations of volatile organic compounds. Disturbance of the west cell could cause contaminants to migrate from the landfill. Additionally, the waste is found to be deeper in the west cell compared to the east cell. Therefore, less waste will need to be excavated from the east cell compared to the west cell for consolidation.

COMMENT 3: What are the benefits of consolidation? Why does the landfill need a cover and what are the advantages of the cover? We want to let you know that about fifteen property owners who live around the landfill will be against consolidation of the landfill.

RESPONSE 3: Please refer to Response 1. Landfill consolidation would minimize the footprint of the landfill and therefore, minimize the amount of soil cover to be placed on the landfill and reduce the amount of water infiltrating into the landfill via rainfall or snowmelt. Also, after consolidation, the area currently occupied by the east cell would be available for unrestricted future use. A soil cover will be placed on the landfill with or without consolidation to eliminate direct contact with landfill waste and promote surface water runoff. The soil cover will minimize the amount of water that infiltrates into the landfill and hence, reduce the leachate originating from the landfill.

COMMENT 4: What would be the thickness of the cap (cover) and how high will the landfill be after the placement of the cover?

RESPONSE 4: The soil cover will consist of 6 inches of topsoil and 18 inches of soil material underlain by an indicator (e.g. orange plastic snow fence) to demarcate the cover soil from the subsurface soil. The final cover without consolidation will be approximately 2 feet higher than the current surface elevation. Should the landfill be consolidated, the final cover placed after consolidation of the landfill will be approximately 4 to 6 feet higher than the existing surface elevation and the area of the east cell of the landfill will be contoured to meet the existing surrounding grade.

COMMENT 5: Are there any safety issues to walk, hunt or walk the dog in the landfill area?

RESPONSE 5: Currently the landfill is moderately wooded, has an uneven surface with localized areas of stagnant water. There is potential for direct contact with exposed landfill waste. We suggest not using the landfill for any outdoor activities until it is properly covered to avoid contacting the waste.

COMMENT 6: Will anything from the landfill affect property owners who live close to the site? If nothing is done could contaminated groundwater reach any private wells?

RESPONSE 6: The landfill is heavily vegetated and moderately wooded and therefore the potential for landfill waste to become airborne during windy conditions and move to adjacent areas does not exist. The groundwater from the landfill is moving west. The properties are located either side-gradient or up-gradient of the landfill and there is no potential for contaminated groundwater to reach private wells.

COMMENT 7: How significant are the volatile organic compounds found in the groundwater? Would you supply your family with this water?

RESPONSE 7: The contaminated groundwater at the landfill has volatile organic compounds that exceed the groundwater standards. For this reason, the selected remedy for the site includes the imposition of an institutional control in the form of an environmental easement that will require restricting the use of groundwater at the site as a source of potable water, without necessary water treatment as determined by NYSDOH. As part of the proposed remedy, the treatment system to be installed at the public supply well PW-5 will remove the contaminants from the water and the treated water can be used for potable purposes.

COMMENT 8: Instead of treating the water at public supply well PW-5, why not find a new clean well in another part of the Town?

RESPONSE 8: Prior to finalizing the Proposed Remedial Action Plan, the Town asked the Department not to install a treatment system and instead wanted to conduct exploratory work to identify a location for a new well that would provide clean water with no treatment. The exploratory work was conducted in March 2008 by drilling at four different locations. Unfortunately this work was unsuccessful because the drilling encountered bedrock at all locations and would not be able to produce an adequate supply of water for Town purposes. As a result the Town requested the Department to finalize the Proposed Remedial Action Plan that includes the installation of a treatment system at well PW-5.

COMMENT 9: When the landfill was originally closed was it covered with clean soil? Which landfill cell is leaching contamination into the groundwater?

RESPONSE 9: We do not have the information or the details of the cover that was placed on the landfill after the operations at the landfill were discontinued. During our investigation we found that a soil cover was in place on the landfill in most of the areas and was thickly vegetated. The landfill is not graded properly for surface water run-off from the landfill. In addition, the landfill contains many pockets and areas where water runs onto the landfill. Both landfill cells would have contributed contamination to the groundwater. Results from the latest investigation indicated groundwater contamination exceeding the groundwater standards in the west cell.

COMMENT 10: Would VacAir Alloys pay for the cost of remediating this site? If not, where do the funds for clean up come from?

RESPONSE 10: The Department will pursue all the potentially responsible parties to have them assume responsibility for the clean up of the site. If an agreement cannot be reached with potentially responsible parties, the Department will evaluate the site for further action under the State Superfund. The potentially responsible parties are subject to legal actions by the State for recovery of all response costs the State has incurred.

COMMENT 11: Who will maintain the landfill after the placement of the soil cover?

RESPONSE 11: If potentially responsible parties do not implement the remedy and maintain the landfill then the Department will take over responsibility for the site. The groundwater at the site will be monitored to determine whether the treatment system installed at public supply well PW-5 is effectively meeting remediation requirements.

COMMENT 12: During the bidding of the construction contract, is the State obligated to select the low-bid contractor? Can the State hire the Town to do the work?

RESPONSE 12: To the extent the State performs the work; the State is obligated to select the low-bid contractor. The State will verify the low-bid contractor's qualification and experience and evaluate whether the contractor can do the work. The Town may submit a bid for the work if they can meet the requirements of bidding.

COMMENT 13: What is the next step in this process? Are the timelines presented tonight firm?

RESPONSE 13: The following was presented at the meeting as the next step and approximate timelines:

After the completion of the public comment period on February 5, 2009, the Record of Decision (ROD) will be prepared and a responsiveness summary summarizing all the comments received along with our response will be attached to the ROD.

The environmental easement will be prepared to be signed by the Department and the Town. The details of the treatment system and the operation and maintenance of the system will be discussed with the Town.

The ROD will be completed by the end of March 2009. Remedial Design will take twelve (12) months from the date of the approval of the design budget. Remedial Construction will take twelve (12) to eighteen (18) months from the date of the approval of the construction contract. The project schedule depends on the amount of time it takes to negotiate with responsible parties and to get approval for the design budget and the construction contract.

COMMENT 14: Are there other town dumps in this area being worked on by the Department?

RESPONSE 14: There are no other municipal landfills in this area that are currently being investigated and/or being remediated by our Division.

COMMENT 15: What is the best way to communicate comments?

RESPONSE 15: You can call the Project Manager at the toll free number 1-888-459-8667 or mail your comments to Vivek Nattanmai at 625 Broadway, Albany, NY 12233 or e-mail comments to vrnattan@gw.dec.state.ny.us

Please note that the fact sheet that was mailed to the residents and public officials has all the information to communicate with the Department and the agenda handed out at the public meeting had the Project Manager's business card at the bottom.

The following are the responses to written comments received during the comment period:

COMMENT 16: The project manager, Vivek Nattanmai, received several comment letters and e-mails with same message. The main issues raised in these letters are: 1) There is little or no value in consolidating the landfill. It will do more harm to the environment than good by consolidating the landfill and 2) Since the Town is struggling with the water supply issues for many years, the State should help the town financially to locate a new well in an area away from the landfill that will yield clean water on a long-term basis for the Town residents.

RESPONSE 16: Please refer to responses 1, 2, 3 and 9 concerning landfill consolidation. Regarding issue No.2, the Department has already explored this option with the Town. See Response 8. Unfortunately, a location for a new water supply well was not found that could meet the Town's requirements.

COMMENT 17: The project manager received a comment letter dated February 2, 2009 from Douglas E. Conroe, Chairman, Chautauqua Environmental Management Council and also received a comment letter dated January 30, 2009 from Randall S. Peterson, Deputy General Manager, Board of Public Utilities, Jamestown, New York.. The comments included in these letters are similar which are: 1) consideration should be given to evaluate the possibility of using the water supply source from Jamestown and then utilize less expensive remediation technology to address the contamination from the landfill; 2) utilizing the Jamestown water supply source would provide water with no treatment requirements and would not require new infrastructure for the proposed treatment system; and 3) should the groundwater from the site be utilized for public water supply prior to the completion of remediation?

RESPONSE 17: The Proposed Remedial Action Plan (PRAP) was developed to address the contamination found in groundwater and to place a cover on the landfill to prevent direct contact with the landfill waste. The PRAP was developed based on the results from the Remedial

Investigation conducted at the Carroll Town Landfill site and a Feasibility Study that was conducted to evaluate the potential remedial alternatives that are applicable for the groundwater contamination found at the site. Some of the remedial alternatives that were considered for groundwater include bio-remediation, air sparging and extraction and treatment. Bio-remediation and air sparging technologies rely on effective design and implementation of an in-situ remediation compound or air sparging system to treat the contaminated groundwater and will require a pilot study prior to the implementation of this treatment technology on a full-scale level at the site. The effectiveness of these technologies is uncertain. An extraction and treatment system is the appropriate remedial technology and is both reliable and cost effective.

Therefore, to address the contaminated groundwater originating from the landfill we proposed to install the treatment system at the public supply well PW-5, which is located approximately 800 feet west of the site instead of installing an extraction and treatment system at the site. The treated groundwater would meet both groundwater and drinking water standards and allow the Town to use the treated water as part of their water supply system. We are proposing a remedy for the landfill site and the contaminated groundwater originating from the site and not proposing an alternate public water supply source for the Town. It is our current understanding that the water district is adequately supplied by the remaining two supply wells operated by the Town of Carroll. Nevertheless, the water quality exiting the treatment unit will meet both groundwater and drinking water standards. In December 2006, the County Health Department asked the Town not use well No.5 for public water supply. Well No.5 has been shut down since then. The groundwater from the site can be used for public water supply after the treatment system is installed and becomes operational.

COMMENT 18: The project manager received a letter dated February 3, 2009 from Michael Bolender, the Town Attorney. The comments included in the letter are: 18-1: will the treatment system installed as part of the remedy be able to treat other contaminants such as arsenic, barium, chromium, iron, lead and manganese that were found above groundwater standards in the groundwater at the site?; 18-2: the PRAP indicates that the treatment system will be installed within the building of the well PW-5 but the building does not have enough space to accommodate the system; 18-3: the PRAP states that the interim remedial measure completed at well 2A is functioning properly but there are other items and issues that need to be resolved to make the system at well 2A function properly; 18-4: concerns were raised during the public meeting about the consolidation of the landfill. We suggest that the west cell be consolidated into the east cell to increase the distance between the landfill and well PW-5 and other sensitive areas around the site; and 18-5: what would the cover placed at the landfill be capable of sustaining in the future? The letter also states that the Town attorney had a discussion with a representative of the Jamestown Board of Public Utilities about the possibility of obtaining water from Jamestown. The Town would like to cooperate with the State in completing this remedial work and will take responsibility of the treatment system after the completion of construction.

RESPONSE 18:

Response to comment 18-1: We will evaluate the treatment of contaminants other than VOCs during the design of the treatment system. Sampling done by the Town and the County Health Department during the approximately nine years of operation of the public supply well PW-5 indicated that no metal compounds were detected above groundwater standards. The volatile organic compounds (VOCs) detected at the public water supply well did not exceed the groundwater standards but the sentinel well MW-13 did detect VOCs above groundwater standards.

Response to comment 18-2: Spacing limitations within the building will be evaluated during the design. We will coordinate with the Town during the design and obtain your comments prior to finalizing the design document.

Response to comment 18-3: The PRAP states that the problems identified by the Department at well 2A have been addressed by the installation of a relief valve and a variable frequency device and that the equipment is functioning properly. It was our understanding that the Town will have the original design engineer evaluate the electronic components of the system and make adjustments to improve operating efficiency. The Town was notified by letter dated February 3, 2009 that the Department's efforts to resolve the problems at well 2A are completed.

Response to comment 18-4: Please refer to responses 1, 2, 3 and 9.

Response to comment 18-5: The landfill with the cover system could be used for commercial purposes such as parking lot or passive recreational purposes such as a ball field with prior approval from the Department. Should beneficial uses of the landfill, be made by the municipality all operation and maintenance associated with those uses would be the responsibility of the municipality.

COMMENT 19: The project manager received a letter dated February 3, 2009 from Thomas H. Forbes, Benchmark Environmental Engineers for their client, Keywell, LLC, a PRP for the site. The comments included in the letter are:

Comment 19-1: The site does not pose human health and environmental risks because there are only limited exceedances of soil cleanup objectives and minor exceedance of groundwater standards. In addition, the chemicals found in all the media are typical of sanitary landfills and the need for pumping at well 5 does not exist because well 2A is functional. Based on the above reasons, the site should be reclassified to a Class 3 Site;

Comment 19-2: The need for the proposed landfill consolidation and cover system as remedial measures is not justified because the organic compounds detected in soil were below SCOs and the inorganics found in surface soil can be addressed by an environmental easement that would limit future site use to commercial or industrial applications. Certain inorganics detected in subsurface soil are addressed with the existing surface soil cover which is at least 1 foot thick

and therefore the landfill should be closed under Part 360 which governs construction, operation and closure of solid waste facilities rather than closing the landfill under Part 375;

Comment 19-3: If a cover system is required to satisfy Part 360 requirements the Town could reopen the landfill as a construction and demolition debris C&D landfill until such time as desired subgrade elevations were achieved that would provide revenues in the form of C&D tipping fees that could be used to substantially offset final cover system construction cost. To avoid transportation costs and minimize short term impacts from truck traffic associated with import of cover soil from an offsite borrow source harvesting of soil from areas adjacent to the landfill could be considered;

Comment 19-4: The remedial benefits from pumping and treatment at municipal well No.5 will be minimal because pumping at well 5 will exacerbate the migration of contaminants to the southwest which would otherwise be expected to attenuate southwest of the site. The proposed air stripping system will only remove VOCs; it will not address other groundwater constituents such as arsenic and other landfill contaminants. This will require not only additional cost but will again increase health risk in that fouling will reduce air stripper efficiency and potentially allow for contaminant pass-through. The data support monitored natural attenuation as a better means to address the low levels of landfill constituents in groundwater and

Comment 19-5: The protection against exposures from the impacted drinking water well is best achieved by either decommissioning municipal well No. 5 and relying on the remaining existing municipal pumping wells (as has been the case for over a year), or relocating municipal well No.5 to another site outside the influence of the landfill and other potential contaminant sources. This latter alternative is consistent with NYSDEC's DER-24 guidance entitled "Assistance for Contaminated Water Supplies". The Town's efforts to locate a new pumping well, if required for capacity purposes, would be far less expensive and much more protective of human health and the environment than the wellhead treatment alternative. It is therefore recommended that the NYSDEC employ a monitored natural attenuation approach to address groundwater at the site and confirm the continued degradation of VOCs.

RESPONSE 19:

Response to comment 19-1: The site was classified as a Class 2 Inactive Hazardous Waste Site on the registry of NYS Inactive Hazardous Waste Disposal Sites in 1998 based on VOC's in the groundwater. The Class 2 designation means that a significant threat to the public health or environment exists and action is required. Subsequent investigations have confirmed this determination and fully demonstrate that groundwater as well as soil, leachate and sediment are contaminated. Further, the groundwater contamination has resulted in the County Department of Health stating that the Town discontinue use of public water supply well number 5 located down gradient of the site because of the threat posed by the contamination in the nearby sentinel well.

Response to comment 19-2: Two of the applicable groundwater Remedial Action Objective's for Public Health Protection at this site are to restore the groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable and to prevent ingestion of groundwater

with contaminant levels exceeding drinking water standards. The selection of this remedy is based on a goal of eliminating or reducing potential exposures to the extent practicable. While it is true that an environmental easement can limit further use of the site to commercial or industrial use, the easement by itself, with no other action, does nothing to reduce potential exposures.

Two of the applicable soil Remedial Action Objective's at this site are to prevent ingestion/direct contact with contaminated soil and to prevent migration of contaminants that would result in groundwater or surface water contamination. Our investigation indicates that a one foot soil cover does not exist as a continuous layer over the entire site. The remedy to be implemented will be in conformance with NYCRR Part 360.2-15, Landfill Closures and Post Closure Criteria. Additionally, landfill consolidation will be evaluated during the initial design phase. Consolidation has the benefit of reducing the footprint which reduces the waste mass subject to rainfall infiltration, reduces cover material requirements and ultimately reduces OM&M costs. It also makes more land available for other uses.

NYCRR Part 375 addresses Environmental Remediation Programs in general and does not provide specific engineering details for the remediation of any sites.

Response to comment 19-3: The objective of the proposed remedy is to close the existing landfill in accordance with our Part 360 regulation and not reopen the landfill for the disposal of waste. However, prior to the Department's implementation of the remedy the Responsible Parties will be offered an opportunity to implement the remedy. At that time, the PRPs may discuss with DEC Legal Staff innovative ways to accomplish the remedial plan for the site. Any major revision to the remedy would be subject to citizen participation and Department's approval.

Response to comment 19-4: Natural attenuation of some VOC's in groundwater is occurring at, and down gradient of the site. However, Vinyl Chloride will not naturally attenuate to a concentration low enough to alleviate the threat to the water supply and requires treatment. Vinyl Chloride has been detected in Monitor Well MW-13 exceeding groundwater standards. MW-13 is located in close proximity to the water supply well and is approximately 100 feet upgradient of well 5. The use of water supply well number 5 was discontinued because of the potential threat as measured in MW-13. The aquifer in this immediate area has a particularly high yield, is not easily replaceable and is, therefore, worthy of remediation. Well number 5 being in close proximity to MW-13 provides an opportunity to avoid construction of a new well and associated structure to implement the remedy.

Further, we do not believe that inorganic compounds will be an overly burdensome problem to mitigate in the treatment process.

Response to comment 19-5: The replacement of well number 5 has been explored with the

Town over the past year. Unfortunately, no other location providing the same high yield, in reasonable proximity to the existing distribution system, was found. Well 2A still requires some electronics control correction but is operating and the current system needs are being met.

Natural attenuation of Vinyl Chloride was discussed in response to comment 19-4 above. For dechlorination of Vinyl Chloride to occur, a bioremedial technology would need to be employed. This technology was evaluated and found to be more costly and the outcome would be more uncertain than ex-situ treatment. The use of natural attenuation alone is not consistent with the the Remedial Action Objectives for groundwater for this site as discussed in response 19-2 above.

COMMENT 20: The project manager received an e-mail dated February 5, 2009 (after the end of comment period) from Mark Stow, Director of Human Health Services, Chautauqua County Department of Health. The County DOH would like to know who will be responsible for operating the treatment system during the first year, the type of expenses that will be covered and whether an agreement will be signed between the Town and the Department. Also, the county DOH wants a third party to estimate the difference in cost of providing the water from well PW-5 after treatment versus obtaining water from the Jamestown Board of Public Utilities.

RESPONSE 20: As stated in the PRAP, the Department will pay for the cost of operating and maintaining the system for a period of one year following the Department's approval of the final engineering report. The responsibility of operating and maintaining the system will be negotiated with the Town based on the usage of treated water by the Town. During the Design, the Department will enter into an agreement with the Town for the transfer of responsibility of operating and maintaining the system. All costs incurred by the State are subject to recovery from PRPs.

Please refer to Response 17, page A-7. The Department is proposing a remedy for the landfill site and the contaminated groundwater originating from the site and not proposing an alternate public water supply source for the Town. The cost estimation referred in your letter should be the responsibility of the Town.

APPENDIX B

Administrative Record

Administrative Record

Carroll Town Landfill Site Site No. 907017

1. Proposed Remedial Action Plan for the Carroll Town Landfill Site, dated November 2008, prepared by the Department.
2. Preliminary Site Assessment, Volume 1, February 1997, prepared by ABB Environmental Services.
3. RI/FS Work Plan, July 2004, prepared by O'Brien & Gere Engineers.
4. Citizen Participation Plan, January 2005, prepared by the Department.
5. Final RI Report, December 2005, prepared by O'Brien & Gere Engineers.
6. Final FS Report, April 2006, prepared by O'Brien & Gere Engineers.
7. IRM Work Plan, June 2006, prepared by Ecology & Environment Inc.
8. IRM Report on the problems identified with the treatment system at well -2A, July 2006, prepared by Ecology & Environment Inc.
9. IRM Report summarizing the work performed to address the problems with the treatment system at well-2A, October 2006, prepared by Ecology & Environment.
10. Hydraulic Analysis Report, May 2007, prepared by Nussbaumer & Clarke, Inc. for the Town of Carroll.
11. Letter from the Town Supervisor dated July 15, 2008, requesting the Department to install the treatment system at the public supply well PW-5 as included in the proposed remedy.
12. Letter from the Vivek Nattanmai to Mike Bollender, Town attorney, dated February 3, 2009 regarding the completion of the IRM at well-2A.
13. Fact Sheet, December 2008, prepared by the Department.
14. Copy of all the comment letters.