Division of Environmental Remediation

Record of Decision

Former Duso Chemical Site Poughkeepsie (T), Dutchess County, New York Site Number 3-14-103

March 2008

New York State Department of Environmental Conservation

David A. Paterson, Governor

Alexander B. Grannis, Commissioner

DECLARATION STATEMENT - RECORD OF DECISION

Former Duso Chemical Inactive Hazardous Waste Disposal Site Poughkeepsie (T), Dutchess County, New York Site No. 3-14-103

Statement of Purpose and Basis

The Record of Decision (ROD) presents the selected remedy for the Former Duso Chemical 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 Former Duso Chemical 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 Former Duso Chemical site and the criteria identified for evaluation of alternatives, the Department has selected a combination of in-situ thermal desorption and enhanced bioremediation to treat contaminated soil and 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 on-site remedial component for the Former Duso Chemical property consisting of Enhanced In-Situ Biological Treatment (EISB). EISB will be implemented using the following approach:
 - Characterization of groundwater geochemistry (inorganic and organic), the oxidationreduction redox) conditions, and bacterial populations in site groundwater.

Groundwater samples will be collected from representative wells and analyzed for VOCs, dissolved light hydrocarbons (methane, ethane, ethene), dissolved carbon dioxide gas, volatile fatty acids, sulfide, sulfate, nitrate, nitrite, total iron, dissolved oxygen and oxidation reduction potential.

- Bench scale testing to evaluate surfactant properties associated with biological processes with the objective being to evaluate whether it will be possible to make potential residual DNAPL more bio-available.
- Installation of injection wells on the Former Duso Chemical property to deliver soluble electron donors in to the groundwater beneath the site (see Figure 9). Conceptually, 28 wells will be installed in five transects oriented perpendicular to groundwater flow with application of soluble electron donors through the injection wells on a bimonthly basis for the first year.
- Evaluation of EISB performance by post-injection geochemical and biological groundwater monitoring as part of the Site Management Plan.
- 3. An off-site remedial component to remove and treat source areas present on the site and adjacent MHBP by In-Situ Thermal Desorption (ISTD). ISTD will require the construction of conductive heating wells for treating the portion of the MHBP where soil and groundwater concentrations exceed SCGs. Prior to implementation, the extent of the contamination will have to be further delineated vertically and horizontally. A subset of heater wells will have vapor recovery screens to capture vapors generated during treatment. Vapors (steam, air, COCs) and water will be extracted from the vertical extraction screens and treated. ISTD will be followed by EISB in this area, as necessary.
- 4. 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 commercial use, which will also permit industrial use; (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.
- 5. Development of a site management plan which will include the following institutional and engineering controls: (a) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (b) monitoring of groundwater; (c) identification of any use restrictions on the site; and (d) provisions for the continued proper operation and maintenance of the components of the remedy for all areas on-site and off-site, including the former railroad line and the MHBP property.
- 6. The remedial party 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 would 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.

7. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

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.

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Date		Dale A. Desnoyers, Director Division of Environmental Remediation

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RECORD OF DECISION

Former Duso Chemical Site
Poughkeepsie (T), Dutchess County, New York
Site No. 3-14-103
March 2008

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 Former Duso Chemical 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, historical usage of the property as a chemical storage facility has resulted in the disposal of hazardous wastes, primarily volatile organic compounds (VOCs). These wastes have contaminated the soil, groundwater and soil vapor at the site, and have resulted in:

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

To eliminate or mitigate these threats, the Department has selected a combination of in-situ thermal desorption and enhanced bioremediation to treat contaminated soil and 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 with officially promulgated standards and criteria that are directly applicable, or that are relevant and appropriate. 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 Former Duso Chemical site is an approximately three acre property located off of Route 9N at 33 Fulton Street, in the Town of Poughkeepsie, New York. A site location map is included as Figure 1. The property is currently operated by Star Gas Products, Inc., a propane distribution facility. The topography of the site and surrounding properties is relatively level, sloping gently to the west. A steep embankment borders the property to the east and a former railroad track bed and intermittent stream border the property to the west. The site is located within a mixed neighborhood of commercial establishments and residential properties.

The site geology consists of four major geologic units. The uppermost unit is a brown fine sand and silt unit which is underlain by a lower permeability gray silt and clay unit. Below the silt and clay unit is a coarse sand and gravel unit which directly overlies bedrock throughout the site. The

elevation of the top of bedrock varies from approximately 10 feet below ground surface (bgs) at well cluster MHBP-18, to approximately 74 ft. bgs at well OBG-70B. Groundwater at the site ranges in depth from approximately 0.5 ft. to 13 ft. bgs.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

Sanborn records indicate that from 1950 through 1990 the site was occupied by the Duso Chemical Company. Duso Chemical is a distributor of bulk chemicals. In 1963, a chemical fire occurred at the Duso Chemical Company warehouse and is believed to have resulted in a large scale release of various VOCs to the environment. In 1990, the Duso Chemical property was purchased and Star Gas Products, Incorporated subsequently began operating there. The current use of the site is a propane distribution facility. The Former Duso site is located immediately east of the "Mid-Hudson Business Park" (MHBP), which has a long industrial past. Figure 2 shows the designated boundaries for the Former Duso Site and MHBP.

From 1910 to 1917, FIAT of Poughkeepsie manufactured approximately 2000 automobiles at the MHBP property. Western Publishing began production at the property in 1935 and by the 1950s the Western Publishing plant had grown to nearly 400,000 square feet. Operations at the facility included: photography; lithography plate production; rotary and offset web printing operations; coating, gluing and binding operations; shipping and receiving; and general plant operations and maintenance.

3.2: Remedial History

The site was initially discovered during an investigation at the adjacent MHBP during the mid-1990s. Elevated levels of chlorinated solvents were detected in the soil and groundwater at MHBP. The investigation revealed the origin of the contamination, however, was the Former Duso Chemical property.

In April of 1999, the Department listed the Former Duso Chemical property as a Class 2 site in the State's Registry of Inactive Hazardous Waste Disposal Sites. A Class 2 site is a site where hazardous waste has been deemed to pose a significant threat to the public health or the environment, and action is required.

A Remedial Investigation (RI) was initiated in 2005 and conducted in several phases. The first phase was conducted from June to August of 2005 and a second sampling event was conducted in March of 2007. A Feasibility Study (FS) was developed in the fall of 2007, based upon the findings of the RI.

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 Star Gas Properties, Inc., the current property owner, Star Gas Products, Inc., John V. and Dorothy S. Bush, Duso Chemical Company, and Kantorer Realty Associates.

The PRPs contacted 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 completed in two phases between June 2005 and April 2007. A variety of site related media were sampled including soil, surface soil, groundwater, indoor air and sub-slab vapor. Figure 3 shows the sampling locations. Site activities included monitoring well integrity testing of existing wells to determine their usability, and installation of additional wells to provide a more comprehensive groundwater monitoring network. All samples were initially analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), metals and PCBs until a focused set of compounds could be determined. A more detailed description of the field activities along with the findings of the investigation are described in the RI report.

5.1.1: Standards, Criteria, and Guidance (SCGs)

To determine whether the soil, groundwater and soil vapor contain 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.
- Title 6 of the New York Codes, Rules, and Regulations (6 NYCRR) Part 375-6 Remedial Program Soil Cleanup Objectives (SCOs).
- Concentrations of VOCs in air were evaluated using the air guidelines provided in the NYSDOH guidance document titled "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 and surface water samples were collected to characterize the nature and extent of contamination. The RI was conducted in two phases. The first phase was conducted from June to August of 2005 and the second sampling event was conducted in March of 2007. As seen in Figures 4 through 7 and summarized in Table 1, the main categories of contaminants that exceed their SCGs are VOCs, SVOCs, and inorganic compounds (metals). For comparison purposes, where applicable, SCGs are provided for each medium. As indicated by Table 1 and the Figures, contamination extends from the Former Duso Chemical site to areas off-site, including the former railroad line and the MHBP property.

Chemical concentrations are reported in parts per billion (ppb) for water and parts per million (ppm) for soil. Air samples are reported in micrograms per cubic meter ($\mu g/m^3$).

Table 1 summarizes the degree of contamination for the contaminants of concern in soil, groundwater and soil vapor 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.

Subsurface Soil

During the investigation, 41 soil samples were collected from soil boring and monitoring well locations on and off-site. Soil samples were screened with a photoionization detector (PID) to assist in sampling selection.

VOC contamination was not observed in the unsaturated soil during the investigation. During the first phase of the investigation, soil samples were collected at or below the water table and relatively low contamination was encountered at several locations. The SCOs for the primary VOCs of concern are 0.68 ppm for 1,1,1 trichloroethane (TCA), 0.27 ppm for 1,1 dichloroethane (DCA), 1.3 ppm for tetrachloroethene (PCE), 0.47 ppm for trichloroethene (TCE), 0.25 ppm for cis-1,2 dichloroethene (DCE), and 0.02 ppm for 1,2 (DCA). The maximum detected concentration of 1,1,1-TCA was 410 ppm at sample location GP-9 (8-12 ft.), while the maximum detected concentrations of 1,1-DCA and 1,2-DCA were 29 ppm and 15 ppm, respectively, at GP-16 (20-24 ft.). The maximum detected concentrations of PCE and cis-1,2-DCE, were 24 ppm and 1.5 ppm, respectively. These two concentrations were from GP-11 (4-8 ft.). The maximum detection of TCE was 17 ppm at GP-5 (8-12 ft.). During the supplemental sampling event, additional soil samples were collected from unsaturated soil on the Star Gas Property. VOC contamination was not detected in any of these samples.

Metals contamination was observed in the subsurface soil. Metals of concern include arsenic, cadmium, chromium, copper, lead, mercury, nickel, and selenium. During the first phase of the RI, the maximum detected concentrations of lead and mercury were 86.5 ppm and 0.24 ppm from the

soil sample associated with OBG-3S (8-10 ft.), compared to their respective SCOs of 63 ppm and 0.18 ppm. The maximum detected concentration of chromium was 20.1 ppm from the soil sample associated with OBG-7I (36-42 ft.) compared to its SCO of 10 ppm. The maximum concentration of nickel was 47.2 ppm at GP-1 (4-5 ft.). Nickel's SCO is 30 ppm. During the second sampling event, the maximum detected concentration of arsenic was 16.8 ppm from GP-21 (0-4 ft.), compared to its SCG of 13 ppm. The maximum detected concentrations of cadmium, copper, nickel, and selenium were 14.4 ppm, 6,590 ppm, 408 ppm, and 6.4 ppm from GP-25 (3-4 ft.) vs. their respective SCOs of 2.5 ppm, 50 ppm, 30 ppm and 3.9 ppm. The maximum concentrations of chromium and mercury were 78.3 ppm and 2.8 ppm, respectively, from GP-24 (0-4 ft.). The maximum concentration of lead was 531 ppm from GP-20 (0-4 ft.).

Subsurface soil contamination identified during the RI/FS, was limited to the saturated soils. Therefore, remedial alternatives will address subsurface soil contamination in conjunction with groundwater contamination.

Surface Soil

During the investigation, 18 surface soil samples (5 on-site, 13 off-site) were collected including 3 background samples. The samples were collected along the eastern portion of the Star Gas property and from the former railroad area (refer to Figure 7). Detected compounds of concern include SVOCs and metals.

SVOCs

As seen in Table 1, the maximum detected concentration of the SVOCs benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-c,d)pyrene were 8.4 ppm, 8.1 ppm, 14 ppm, 3.7 ppm, 9.3 ppm, 1.1 ppm, and 3.2 ppm, respectively. Table 1 lists the SCOs for each compound which are 1 ppm for benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene and chrysene, 0.8 ppm for benzo(k)fluoranthene, 0.5 ppm for indeno(1,2,3-c,d)pyrene, and 0.33 ppm for dibenz(a,h)anthracene.

Metals

As seen in Table 1 the maximum detected concentrations of mercury, cadmium, chromium, lead, and zinc were 0.98 ppm, 6.6 ppm, 41.6 ppm, 617 ppm, and 877 ppm vs. the SCOs of 0.18 ppm, 2.5 ppm, 10 ppm, 63 ppm, and 109 ppm, respectively.

As noted above, concentrations of select contaminants in surface soil exceeded SCOs for unrestricted use. When evaluated against SCOs for commercial use (which includes passive recreational uses), however, few exceedances were noted (benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenz(a,h)anthracene) and at concentrations only marginally above cleanup objectives. Surface soils, therefore, do not represent a significant source of contamination. Thus, no remedial alternatives need to be evaluated for surface soil.

Groundwater

The site's hydrogeologic model identifies two water-bearing units: the unconsolidated hydrogeologic unit and the shallow bedrock unit. Groundwater in the unconsolidated hydrogeologic unit flows across the site to the west and south. Groundwater flow east of the site generally mimics the topography and flows east to west until it is influenced by the intermittent stream and subsurface utilities. The intermittent stream flows north to south along the abandoned railroad tracks located between the Former Duso Chemical facility and the MHBP. In the western portion of the site, groundwater flows in a southeastern direction across the MHBP property and is similarly influenced by the intermittent stream and subsurface utilities. Shallow bedrock groundwater appears to be flowing in a southwestern direction across the site towards the Hudson River, which acts as a regional discharge point.

A total of 79 groundwater samples were collected both on-site and off-site for analysis during the investigation. All new and existing monitoring wells were sampled during the first phase of the investigation which consisted of two rounds of sampling. Phase II of the investigation consisted of one round of ten groundwater samples (6 new and 4 existing wells) to further delineate the nature and extent of the contamination. In total, twenty two existing wells and nineteen new wells were sampled. The main contaminants of concern are VOCs including PCE, TCE and their degradation products, cis-1,2-DCE, 1,1-DCE, vinyl chloride; 1,1,1-TCA, 1,1-DCA, chloroethane; and 1,2-DCA. The SCGs for these contaminants are 5 ppb with the exceptions of vinyl chloride and 1,2 DCA, which have SCGs of 2 ppb and 0.6 ppb, respectively. As seen in Figure 8, the groundwater contamination is predominantly concentrated on the MHBP property due to the nature of the geology in this area. Groundwater contamination appears to be confined to the overburden. No bedrock groundwater contamination was observed during the course of the RI. Figure 8 shows the site's overburden groundwater contours.

As seen in Table 1, the maximum detected concentrations of TCE, 1,1-DCE, and 1,1,1-TCA were 1,100 ppb, 2,850 ppb, and 1,250,000 ppb, respectively at MHC-29. The maximum detected concentrations of 1,1-DCA and 1,2-DCA were 276,000 ppb and 48,400 ppb, respectively, at location MHBP-12. The maximum detected concentrations of vinyl chloride (1,060 ppb) and chloroethane (17,000 ppb) were at MHBP-13S. Finally, the maximum concentrations of PCE and cis-1,2-DCE were 15.9 ppb and 4,100 ppb, at MHC-22 and MHC-23, respectively.

The VOC contamination in groundwater identified during the RI/FS will be addressed in the remedy selection process.

Surface Water

Five surface water samples were collected in the former railroad bed from the intermittent stream along the former Conrail line (Figure 7). The samples were analyzed for VOCs, SVOCs and metals.

No site-related surface water contamination of concern was identified during the RI/FS. Therefore, no remedial alternatives need to be evaluated for surface water.

Soil Vapor/Sub-Slab Vapor/Air

Due to the nature of the contamination (i.e. volatile compounds), there were concerns that vapor intrusion might be an issue affecting the indoor air quality at on-site and nearby buildings. Air samples were obtained during the investigation to assess the potential for vapor intrusion.

Sub-slab vapor, indoor air and ambient air samples were collected from the Star Gas property and adjacent MHBP property (Staples and adjacent abandoned building). In all, seven sub-slab vapor and eight indoor air samples were collected. Compounds of concern were compared with NYSDOH air guidance matrices to determine if mitigation or continued monitoring of these buildings was necessary.

Compounds of concern detected in the Star Gas building include: PCE, TCE, and 1,1,1-TCA. PCE was detected at 37,000 μ g/m³ in the sub-slab vapor, and 12 μ g/m³ and 9.5 μ g/m³ in the indoor air and indoor air duplicate, respectively. TCE was detected at 14,200 μ g/m³ in the sub-slab vapor, and 5.9 μ g/m³ and 5.4 μ g/m³ in the indoor air and duplicate sample. 1,1,1-TCA was detected at a concentration of 143 μ g/m³ in the sub-slab vapor, and 4.2 μ g/m³, 1.3 μ g/m³ and 1.2 μ g/m³ in the indoor air and indoor air duplicate, respectively. The concentrations of PCE and TCE warranted mitigation.

Two MHBP buildings were also sampled for the compounds of concern listed above. Sub-slab and indoor air sampling indicated that soil vapor intrusion is not likely to occur. Refer to Table 1 - Sub-slab Vapor and Indoor Air Sampling Results, to view the range of all detected sub-slab and indoor air concentrations.

Soil vapor and indoor air contamination identified during the RI/FS was addressed by an IRM. The IRM consisted of a sub-slab depressurization system which was installed at the Star Gas facility. The IRM is described in Section 5.2.

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.

After the initial phase of the RI, it was determined that an IRM was necessary to eliminate contaminant exposures resulting from elevated soil vapor levels. The detected levels of PCE and TCE in the sub-slab and indoor air samples of the Star Gas building were above NYSDOH guidance for the protection of human health. Thus mitigation measures were undertaken in the form of a sub-slab depressurization system (SSDS) for the Star Gas facility which aimed to address current human exposures (via inhalation) to volatile organic compounds associated with soil vapor intrusion. The system was installed in February of 2006. Confirmatory samples were collected to ensure that the SSDS is operating effectively. The concentrations of all compounds of concern in indoor air have been reduced to below their respective action levels.

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 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.

There are potential exposure pathways associated with contaminated soil, groundwater and soil vapor from this site.

The potential for exposures related to contaminated soil is unlikely since contaminated soils are subsurface and buildings, gravel/pavement or grass covers the site. However, redevelopment or subsurface utility work in the future could bring workers into contact with contaminated soils in the subsurface.

Ingestion of contaminated groundwater is a potential pathway at this site. However, the facility and the surrounding neighborhood are supplied with public water. Therefore, ingestion of contaminated groundwater is not expected.

There is currently an active commercial building on the site; therefore the potential exists for exposures related to soil vapor intrusion. Sampling indicates the sub-slab vapor is contaminated beneath the on-site building. Indoor air sampling in this building also identified site-related chemicals, which originate from site contamination. A sub-slab depressurization system was installed in the building to minimize the potential for soil vapor intrusion to occur. The potential for soil vapor intrusion in buildings adjacent to the site was evaluated and sampling indicated that vapor intrusion is not likely to occur.

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 Former Duso Chemical site and identified areas of off-site impact, are located in an urban setting including commercial properties with paved lots. This commercial setting leaves very limited opportunities for wildlife resources.

Subsurface soil contamination has negatively impacted the groundwater resource. The impacted groundwater has migrated downgradient, extending the contamination to the groundwater off-site.

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

• Site contamination has adversely impacted the groundwater resource in the unconsolidated hydrogeologic unit so as to render the aquifer unusable without treatment, in the area depicted on Figures 4-7.

The Fish and Wildlife Impact Analysis, which is included in the RI report, presents a more detailed discussion of the existing and potential environmental impacts.

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 VOCs in soil and groundwater;
- the release of contaminants from the saturated soil into groundwater that may create exceedances of groundwater quality standards; and
- the release of contaminants from groundwater into indoor air through soil vapor intrusion

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 Former Duso Chemical Site were identified, screened and evaluated in the FS report which is available at the document repositories established for this site.

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 would 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 would cease after 30 years if remediation goals are not achieved.

7.1: <u>Description of Remedial Alternatives</u>

The following potential remedies were considered to address the contaminated soil and groundwater at the site.

Alternative 1: No Further Action

The No Further Action alternative recognizes remediation of the site conducted under the previously completed IRM. To evaluate the effectiveness of the remediation completed under the IRM, only continued monitoring would be necessary.

This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

<i>Present Worth</i> :\$ 40,000
Annual Costs: Periodic Review (assumed every 5 years in accordance with SMP)
(Years 1-30):

Common Remedy Components

An environmental easement, a site management plan, and groundwater monitoring are common elements to the remaining alternatives being evaluated for the site. A description of these elements is included below.

<u>Environmental Easement</u>. Institutional controls, engineering controls, use restrictions and/or any site management requirements applicable to the site will be contained in an environmental easement. An environmental easement would consist of land use and groundwater restrictions for the contaminated property. Land use restrictions would restrict activities that could result in unacceptable exposure to contaminated soil. Groundwater restrictions would preclude the use of groundwater without prior notification and approval from NYSDEC and NYSDOH. Building use restrictions would preclude site activities that result in unacceptable exposures to contaminated vapors. An environmental easement would also include requirements that remediation systems be operated, maintained and monitored to maintain protectiveness, and call for periodic reviews.

<u>Site Management Plan</u>. A Site Management Plan would provide for management of residual contamination and guide future activities at the site by addressing use restrictions and by developing requirements for periodic site management reviews and groundwater monitoring. The periodic site management reviews would among other things, focus on evaluating the on-site and off-site

conditions with regard to the continuing protection of human health and the environment as evidenced by information such as groundwater monitoring and documentation of field inspections.

Alternative 2: Monitored Natural Attenuation

Alternative 2 would consist of an environmental easement and site management plan, which spells out the necessary monitoring to assure monitored natural attenuation (MNA) of VOCs in groundwater.

Natural attenuation relies on natural physical, chemical and biological processes that occur in the subsurface to clean up or *attenuate* pollution in soil and groundwater. Natural attenuation occurs at most polluted sites under the right conditions. During the RI, MNA parameters were evaluated and contaminant break-down products were observed. This indicates that the conditions at the Former Duso Chemical Site are conducive to MNA. To demonstrate that MNA is actually occurring at the site, periodic groundwater monitoring is necessary to show that natural conditions are decreasing VOC concentrations.

MNA would initially comprise a quarterly groundwater monitoring program to collect MNA data from approximately twelve existing monitoring wells. Groundwater samples would be analyzed for standard MNA parameters including, redox field parameters; VOCs and associated daughter products; dissolved hydrocarbon gases (methane, ethane, and ethene); and standard anion redox indicators. Quarterly monitoring for these parameters would proceed for a minimum of one year to establish groundwater quality data and to estimate a VOC attenuation rate. Annual sampling would be implemented after the initial baseline data was attained.

Present Worth:		
Capital Cost:		\$200,000
Annual Costs:		
(Years 1-2):		\$15,000
(Years 3-30):	• • • • • • • • • • • • • • • • • • • •	

Alternative 3: Enhanced In-Situ Bioremediation of Groundwater

Alternative 3 would consist of an environmental easement, site management plan, groundwater monitoring, and *in situ* biological treatment of groundwater via Enhanced In-Situ Bioremediation (EISB). EISB allows natural processes to clean up harmful chemicals in the environment. Microorganisms that live in soil and groundwater are able to digest certain harmful chemicals, such as those found at the Former Duso Site. When microbes completely digest these chemicals, they change them into water and other harmless bi-products. EISB involves creating and/or optimizing groundwater conditions required for the microorganisms that facilitate the biodegradation reactions. This would be achieved through the subsurface injection of carbon-based electron donors, nutrients (biostimulation) and/or an assortment of bacteria (bioaugmentation).

It is expected that EISB would be effective in reducing the concentrations of contaminants at the site and in off-site groundwater. Before implementing the remedy, a study would be required to analyze

the conditions at the site and determine the best electron donor for injection. The remedy would take a number of years to implement as multiple electron donor injections would be required over time.

Present Worth:	\$1,700,000
Capital Cost:	\$670,000
Annual Costs:	
(Years 1-2):	\$21,000
(Years 3-30):	\$1,400
Enhanced Bioremediation injections (Years 2, 4, 6)	

Alternative 4: Enhanced In-Situ Bioremediation (EISB) and Thermal Treatment

Alternative 4 would consist of an environmental easement, site management plan, *in situ* thermal treatment of soil and groundwater on the MHBP property and former rail line, and *in situ* biological treatment of groundwater on the Former Duso Chemical property.

The EISB portion of the remedy would be consistent with Alternative 3 except that the injections would be limited to the Former Duso Chemical property. No residual DNAPL is present in this area, thus contaminant concentrations in groundwater would be reduced over time more rapidly.

Thermal treatment would consist of a conductive heating technology, *in situ* thermal desorption (ISTD), of the VOCs in the saturated overburden of the MHBP. Thermal treatment would be effective for treating both soil and groundwater to SCGs in the designated treatment zone. If present in the treatment zone, DNAPL would also be treated and source reduction would be achieved.

For ISTD, a system of heating units would be installed to heat the contaminated soil and groundwater to a desired temperature. As the soil is heated, volatile constituents of concern (COCs), would be vaporized and/or destroyed by a number of mechanisms, including: (1) evaporation into the subsurface air stream; (2) steam distillation; (3) boiling; and (4) hydrolysis. A subset of heater wells would have vapor recovery screens to capture vapors generated when boiling potential DNAPL and water. Vapors comprised of steam, air, COCs and water would be extracted from the vertical extraction screens and treated using cooling, condensation, and granular activated carbon. ISTD would be followed by EISB in this area, if deemed appropriate.

It is estimated that the ISTD system would be operated for approximately 6 months. It is expected that within 1 year, ISTD would effectively reduce the levels of contaminants in the soil and groundwater of the MHBP. The time frame for implementing the EISB program will not be definitively known until further testing is completed. It is likely that multiple electron donor injections would be required to reach the desired contaminant levels.

Present Worth:	\$2,500,000
Capital Cost:	\$1,600,000
Annual Costs:	
(Years 1-2):	\$36,000
(Years 3-30):	\$2,500
Enhanced Bioremediation injections (Years 2,4,6)	\$17,000

Alternative 5: Soil Removal and Groundwater Collection/Treatment/Discharge

Alternative 5 would consist of an environmental easement, a site management plan, excavation of accessible unsaturated soil exceeding SCOs; off-site landfill disposal of excavated soil; and groundwater extraction, treatment, and discharge to a storm sewer.

Under the remedy, unsaturated soil exceeding unrestricted SCOs in 6 NYCRR Part 375, which is accessible (i.e., not underneath site buildings and utilities), would be excavated and transported to an off-site permitted landfill. Based on contaminant concentrations in the area of soil to be excavated, it is anticipated that excavated soil would not exhibit the characteristics of a hazardous waste. Therefore, it is not expected that it would require treatment before disposal.

Groundwater exceeding Class GA standards would be extracted, treated, and discharged to the storm sewer. Treatment would include the design of processes, such as settling, metals pretreatment (if necessary), filtration, air stripping, and carbon adsorption.

Present Worth:	\$5,900,000
Capital Cost:	\$2,040,000
Annual Costs:	
(Years 1-2):	\$31,000
(Years 3-30):	\$2,000
Groundwater Treatment system operation (30 years)	\$4,500

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. <u>Protection of Human Health and the Environment</u>. This criterion is an overall evaluation of each alternative's ability to protect public health and the environment.
- 2. <u>Compliance with New York State Standards, Criteria, and Guidance (SCGs)</u>. 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 next five "primary balancing criteria" are used to compare the positive and negative aspects of each of the remedial strategies.

- 3. <u>Short-term Effectiveness</u>. 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. <u>Long-term Effectiveness and Permanence</u>. 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. <u>Reduction of Toxicity, Mobility or Volume</u>. Preference is given to alternatives that permanently and significantly reduce the toxicity, mobility or volume of the wastes at the site.
- 6. <u>Implementability</u>. 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. <u>Cost-Effectiveness</u>. 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. The costs for each alternative are presented in Table 2.

This final criterion 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. <u>Community Acceptance</u> - Concerns of the community regarding the RI/FS reports and the PRAP have been evaluated. The responsive 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. Comments were received, however, pertaining to the origin/source of the identified contamination. These comments have been addressed in the responsiveness summary.

SECTION 8: SUMMARY OF THE SELECTED REMEDY

Based on the Administrative Record (Appendix B) and the discussion presented below, the Department has selected Alternative 4, Enhanced In-Situ Bioremediation (EISB) and Thermal Treatment as the remedy for this site. Figure 9 shows the proposed injection points and approximate

area of thermal treatment for the proposed remedy. The elements of this remedy are described at the end of this section.

The selected remedy is based on the results of the RI and the evaluation of alternatives presented in the FS. Alternative 4 is being proposed because, as described below, it satisfies the threshold criteria and provides the best balance of the primary balancing criteria described in Section 7.2. It would achieve the remediation goals for the site by reducing the residual source material at the site and creating conditions conducive to the restoration of groundwater quality to the extent practicable.

Alternatives 2 through 5 would all meet the threshold criteria. They would be protective of human health and the environment by addressing potential future exposures to VOCs in groundwater through natural attenuation or active treatment of groundwater. Alternative 4 would provide increased protection through potential source reduction thereby creating conditions to significantly reduce the concentrations of VOCs in groundwater. Alternative 5 would provide increased protection by minimizing off-site groundwater migration upon implementation and removing accessible soil exceeding SCGs. Groundwater monitoring included in Alternatives 2, 3, 4 and 5 would provide a means of evaluating the progress toward attainment of groundwater SCGs. Overall, Alternatives 2, 3, and 5 would comply with the threshold selection criteria but to a lesser degree or with lower certainty than Alternative 4.

Because Alternatives 2, 3, 4, and 5 satisfy the threshold criteria, the five balancing criteria are particularly important in selecting a final remedy for the site.

Short-term effectiveness would be achieved by all Alternatives. With the exception of Alternative 5, the remedies would not require extensive intrusive activities during implementation. Thus, each alternative would be protective of workers and the community during implementation through the use of appropriate controls. The estimated time frame for attainment of the remedial objectives for groundwater exceeding SCGs can not be predicted with precision for Alternatives 2, 3 and 4. However, it is expected that Alternative 4 would require the least amount of time while Alternative 2 would require the most. The potential for off-site migration of groundwater exceeding SCGs would be attained most rapidly by Alternative 5.

Long-term effectiveness would be attained by Alternatives 2 through 5. There would be minimal residual exposure through adequate and reliable institutional controls for impacts from groundwater, soil, surface water, and indoor air; including continued O&M of the IRM system. Residual exposures would be further reduced in Alternatives 3, 4 and 5 through treatment and removal. Alternative 4 has the potential for the most significant reduction in residual source contamination and would provide the greatest long-term protection.

Each alternative, through natural attenuation or active treatment would result in reduction of VOC contamination in groundwater. Accelerated reduction of VOCs in groundwater would be expected with active treatment in Alternatives 3, 4 and 5. Alternative 4 would provide the most reduction of VOCs by treating both soil and groundwater.

All alternatives can be implemented at the site. Alternative 2 would be the most readily implementable. Alternatives 3 and 4 would be implementable, but would require bench/pilot testing

in support of their associated treatment and injections. Alternative 5 would require State/local approval for discharging the treated groundwater. Each alternative would allow for additional remedial actions to be implemented, if necessary, and would be readily monitored for effectiveness of the remedy. Disposal facilities are readily available for the treatment required by Alternatives 4 and 5.

Detailed cost estimates for Alternatives 1 through 5 are included as Table 2.

The cost of the alternatives varies significantly. Although Alternative 2 would be the least expensive remedy, it would not actively remediate any of the contamination. Alternative 3 is a moderate cost remedy that would actively remediate the groundwater, but its effectiveness and time frame for implementation would be uncertain. Alternative 4 would be very favorable because it would remediate both the soil and groundwater and would decrease the source of groundwater contamination. The cost associated with Alternative 4 would be moderate while Alternative 5 would be the most costly remedy and its effectiveness and time frame to implement is uncertain. All remedies would have costs associated with institutional controls and monitoring.

The estimated present worth cost to implement the remedy is \$2,500,000. The cost to construct the remedy is estimated to be \$1,600,000 and the estimated average annual costs for 30 years is \$2,500 for years 3-30.

The elements of the selected 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 on-site remedial component for the Former Duso Chemical property consisting of Enhanced In-Situ Biological Treatment (EISB). EISB will be implemented using the following approach:
 - Characterization of groundwater geochemistry (inorganic and organic), the oxidation-reduction redox) conditions, and bacterial populations in site groundwater.
 Groundwater samples will be collected from representative wells and analyzed for VOCs, dissolved light hydrocarbons (methane, ethane, ethene), dissolved carbon dioxide gas, volatile fatty acids, sulfide, sulfate, nitrate, nitrite, total iron, dissolved oxygen and oxidation reduction potential.
 - Bench scale testing to evaluate surfactant properties associated with biological processes with the objective being to evaluate whether it will be possible to make potential residual DNAPL more bio-available.
 - Installation of injection wells on the Former Duso Chemical property to deliver soluble electron donors in to the groundwater beneath the site (see Figure 9). Conceptually, 28 wells will be installed in five transects oriented perpendicular to groundwater flow with application of soluble electron donors through the injection wells on a bimonthly basis for the first year.

- Evaluation of EISB performance by post-injection geochemical and biological groundwater monitoring as part of the Site Management Plan.
- 3. An off-site remedial component to remove and treat source areas present on the site and adjacent MHBP by In-Situ Thermal Desorption (ISTD). ISTD will require the construction of conductive heating wells for treating the portion of the MHBP where soil and groundwater concentrations exceed SCGs (see Figure 9). Prior to implementation, the extent of the contamination will have to be further delineated vertically and horizontally. A subset of heater wells will have vapor recovery screens to capture vapors generated during treatment. Vapors (steam, air, COCs) and water will be extracted from the vertical extraction screens and treated. ISTD will be followed by EISB in this area, as necessary.
- 4. 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 commercial use, which will also permit industrial use; (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.
- 5. Development of a Site Management Plan which will include the following institutional and engineering controls: (a) continued evaluation of the potential for vapor intrusion for any buildings developed on the site, including provision for mitigation of any impacts identified; (b) monitoring of groundwater; (c) identification of any use restrictions on the site; and (d) provisions for the continued proper operation and maintenance of the components of the remedy for all areas on-site and off-site, including the former railroad line and the MHBP property.
- 6. The remedial party 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 would 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.
- 7. The operation of the components of the remedy will continue until the remedial objectives have been achieved, or until the Department determines that continued operation is technically impracticable or not feasible.

SECTION 9: HIGHLIGHTS OF COMMUNITY PARTICIPATION

As part of the remedial investigation process, a number of Citizen Participation activities were undertaken to inform and educate the public about conditions at the site and the potential remedial alternatives. The following public participation activities were conducted for the site:

- Repositories for documents pertaining to the site were established.
- A public contact list, which included nearby property owners, elected officials, local media and other interested parties, was established.
- Fact Sheets were mailed to the site contact list, updating the public on various stages of the Remedial Investigation.
- A Public Availability Session was held on August 7, 2007 to present the findings of the RI.
- A Public Meeting was held on March 6, 2008 to present and receive comment on the PRAP.
- A Responsiveness Summary (Appendix A) was prepared to address the comments received during the public comment period for the PRAP.

TABLE 1
Nature and Extent of Contamination

Range of sampling dates: June 2005- March 2007

SURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm) ^a	SCO ^b (ppm) ^a	Frequency of Exceeding SCG ^c
Semi-volatile	Benzo(a)anthracene	1.4 - 8.4	1	15 of 18
Organic	Benzo(a)pyrene	1.5 - 8.1	1	15 of 18
Compounds	Benzo(b)fluoranthene	1.3 - 14	1	16 of 18
	Chrysene	1.7- 9.3	1	15 of 18
	Indeno(1,2,3-c,d)pyrene	0.68 - 3.2	0.5	15 of 18
	Benzo(k)fluoranthene	0.86 - 3.7	0.8	15 of 18
	Dibenzo(a,h)anthracene	0.38 - 1.1	0.33	13 of 18
Inorganic	Mercury	0.19 - 0.98	0.18	13 of 18
Compounds	Lead	72.7 - 617	63	16 of 18
	Zinc	114 - 877	109	16 of 18
	Cadmium	2.6 - 6.6	2.5	5 of 18
	Chromium	10.7 - 41.6	30	3 of 18

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm) ^a	SCO ^b (ppm) ^a	Frequency of Exceeding SCG
Volatile Organic	PCE	24	1.3	1 of 41
Compounds	TCE	1.8 - 17	0.47	4 of 41
	1,1,1 TCA	1.8 - 410	0.68	7 of 41
	1,1 -DCA	0.69 - 29	0.27	8 of 41
	cis -1,2 -DCE	0.33 - 1.5	0.25	2 of 41
	1,2 -DCA	0.1 - 15	0.02	6 of 41

SUBSURFACE SOIL	Contaminants of Concern	Concentration Range Detected (ppm) ^a	SCO ^b (ppm) ^a	Frequency of Exceeding SCG
Inorganic	Arsenic	16.8	13	1 of 41
Compounds	Cadmium	3.4 - 14.4	2.5	5 of 41
	Chromium	10.2 - 78.3	30	3 of 41
	Copper	89.8 - 6590	50	5 of 41
	Lead	80.9 - 531	63	5 of 41
·	Mercury	0.24 - 2.8	0.18	6 of 41
	Nickel	32.2 - 408	30	6 of 41
	Selenium	4 - 6.4	3.9	4 of 41

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb) ^a	SCG° (ppb)	Frequency of Exceeding SCG
Volatile Organic	PCE	6.1 - 15.9	5	3 of 79
Compounds	TCE	5 - 1,100	5	16 of 79
·	1,1 -DCE	7 - 2,850	5	17 of 79
	cis -1,2 -DCE	9.5 - 4,100	5 .	14 of 79
	Vinyl Chloride	2 - 1,060	2	16 of 79
	1,1,1 -TCA	6 - 1,250,000	5	23 of 79
	1,1 -DCA	6 - 276,000	5	34 of 79
	1,2 -DCA	0.6 - 48,400	0.6	27 of 79
	Chloroethane	11 - 17,000	5	18 of 79
Inorganic	Arsenic	26.1 - 546	25	23 of 79
Compounds	Barium	1,010 - 7,140	1000	7 of 79
	Beryllium	2.2 - 35.1	3	12 0f 79
	Cadmium	5.6 - 26.5	5	8 of 79
	Chromium	55 - 1,110	50	24 of 79
·	Copper	214 - 2,880	200	12 of 79
	Lead	29.5 - 1,090	25	24 of 79

GROUNDWATER	Contaminants of Concern	Concentration Range Detected (ppb) ^a	SCG ^c (ppb)*	Frequency of Exceeding SCG
Inorganic	Mercury	0.84 - 2.6	0.7	3 of 79
Compounds	Nickel	108 - 1,880	100	17 of 79
	Selenium	10.6 - 84.7	10	12 of 79
	Zinc	4,240 - 7,690	2000	2 of 79

Sub-Slab/Indoor Air (Star Gas Property)	Contaminants of Concern	Sub-Slab Concentration Range Detected (µg/m³)ª	Indoor Air Conc. Range (µg/m³)ª	NYSDOH Decision Matrix Recommendation ^d	Frequency of Exceeding SCG
Volatile Organic	Tetrachloroethene	ND - 37,000	ND - 12	Mitigation	1 of 3
Compounds	Trichloroethene	4.9 - 14,200	3.4 - 5.9	Mitigation	1 of 3
	1,1,1 Trichloroethane	ND - 143	ND - 4.2	Monitor	1 of 3

Sub-Slab/Indoor Air (MHBP)	Contaminants of Concern	Sub-Slab Concentration Range Detected (µg/m³)²	Indoor Air Conc. Range (μg/m³) ^a	NYSDOH Decision Matrix Recommendation ^d	Frequency of Exceeding SCG
Volatile Organic	Tetrachloroethene	ND	ND - 4.8	NFA°	0 of 5
Compounds	Trichloroethene	ND - 8.1	ND - 0.47 J	NFA	0 of 5
	1,1,1 Trichloroethane	ND - 17	ND - 0.49 J	NFA	0 of 5

^a ppb = parts per billion, which is equivalent to micrograms per liter, ug/L, in water; ppm = parts per million, which is equivalent to milligrams per kilogram, mg/kg, in soil; ug/m³ = micrograms per cubic meter

^bSCO = soil cleanup objectives

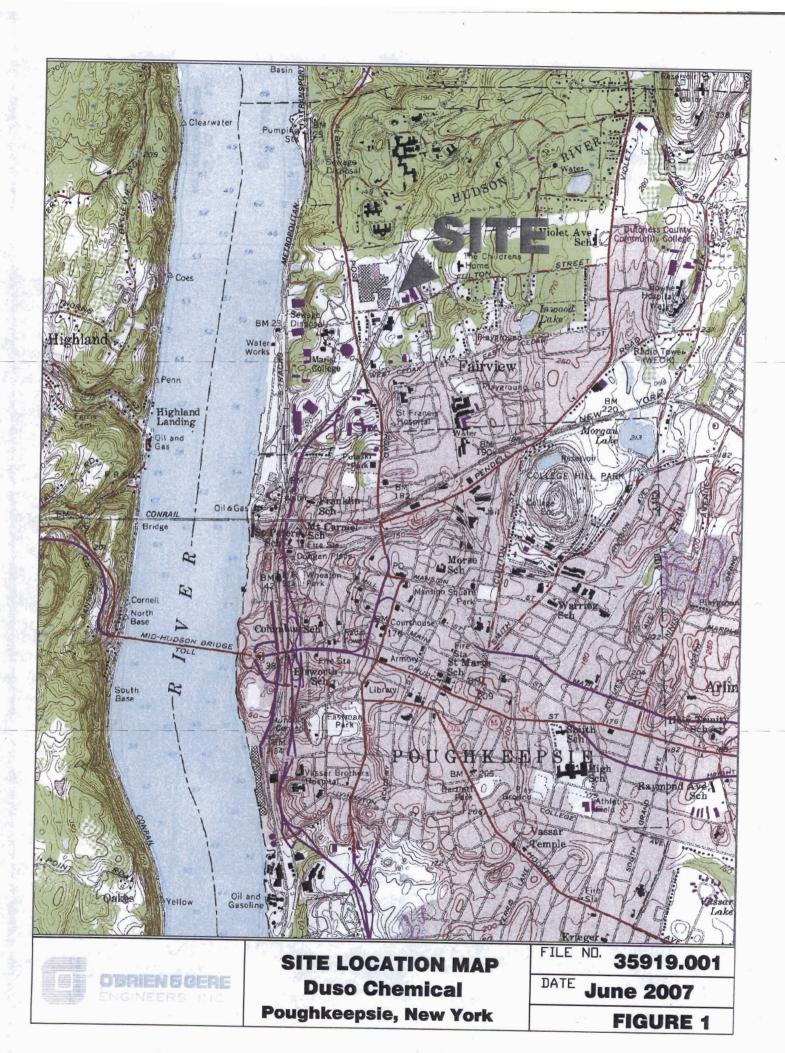
[°]SCG = standards, criteria, and guidance values

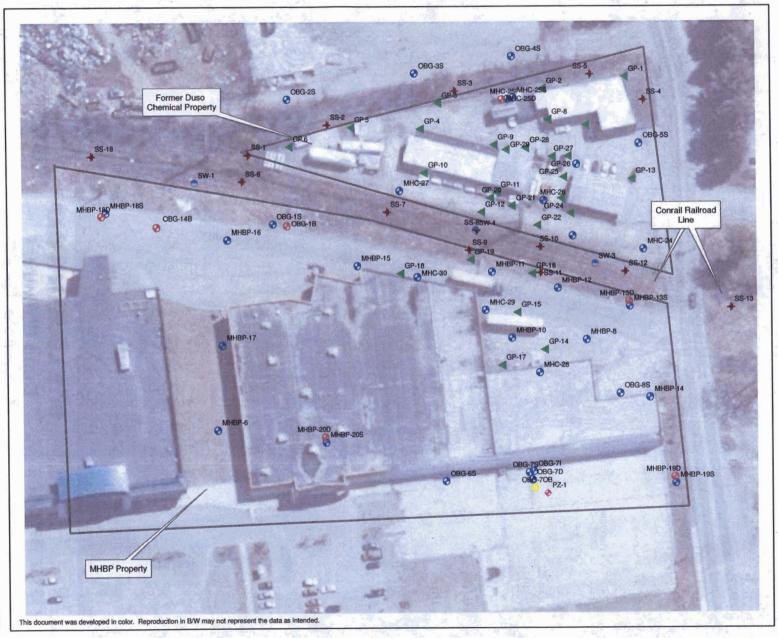
^dNYSDOH 2006 Final Soil Vapor Intrusion Guidance for Evaluating Soil Vapor Intrusion in the State of New York

^e NFA = No Further Action

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual Costs	Total Present - Worth
No Further Action	\$0	\$2,000	\$40,000
Monitored Natural Attenuation	\$200,000	\$15,000	\$800,000
Enhanced In-Situ Bioremediation (EISB)	\$670,000	\$21,000	\$1,700,000
EISB and Thermal Treatment	\$1,600,000	\$36,000	\$2,500,000
Soil Removal and Groundwater Collection/Treatment/Discharge	\$2,040,000	\$31,000	\$5,900,000







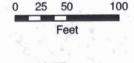
Legend

- Bedrock Well
- ★ Surface Soil Sampling Location
- ▲ Subsurface Soil Boring
- Surface Water Sampling Location
- Overburden Well
- Overburden/Bedrock Interface Well
- Piezometer Location
- Property Outlines

Note: SS-1 through SS-5 are approximate locations. Sample locations were never surveyed.

NYSDEC FORMER DUSO CHEMICAL POUGHKEEPSIE, NY

FEASIBILITY STUDY SITE MAP



June 2007 RI-Fig-2_basemapON.mx



90/90/9



Legend

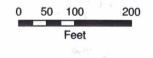
- Surface Soil Sampling Location
- ▲ Subsurface Soil Boring
- Surface Water Sampling Location
- Overburden Well
- Overburden/Bedrock Interface Well
- Bedrock Well
- Piezometer Location

Note: SS-1 through SS-5 are approximate locations. Sampling locations were not surveyed.

NYSDEC FORMER DUSO CHEMICAL POUGHKEEPSIE, NY

REMEDIAL INVESTIGATION

BASE MAP ON-SITE AND OFF-SITE



June 2007 RI-Fig-3_basemapOFF.m



90/90/9





Legend

Tetrachloroethylene (1.3 mg/kg)*

Trichloroethylene (0.47 mg/kg)*

cis-1,2-Dichloroethylene (0.25 mg/kg)*

1,1-Dichloroethylene (0.33 mg/kg)*

Vinyl Chloride (0.02 mg/kg)*

ND

O 0 - 1 mg/kg

1 - 10 mg/kg

10 - 100 mg/kg

▲ Soil Boring

Monitoring Well

* 6NYCRR Part 375.6 Unrestricted Use soil cleanup objective

NYSDEC FORMER DUSO CHEMICAL POUGHKEEPSIE, NY

PCE AND BREAKDOWN PRODUCTS IN SOIL PHASE 1









Legend

Soil Borings

Monitoring Well

1,1,1-Trichloroethane (0.68 mg/kg)*

1,1-Dichloroethane (0.27 mg/kg)*

Chloroethane (1.9 mg/kg)*

ND

O 0 - 1 mg/kg

1 - 10 mg/kg

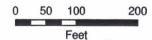
) 10 - 100 mg/kg

() 100 - 1,000 mg/kg

*6NYCRR Part 375.6 Unrescricted Use soil cleanup objective

NYSDEC FORMER DUSO CHEMICAL POUGHKEEPSIE, NY

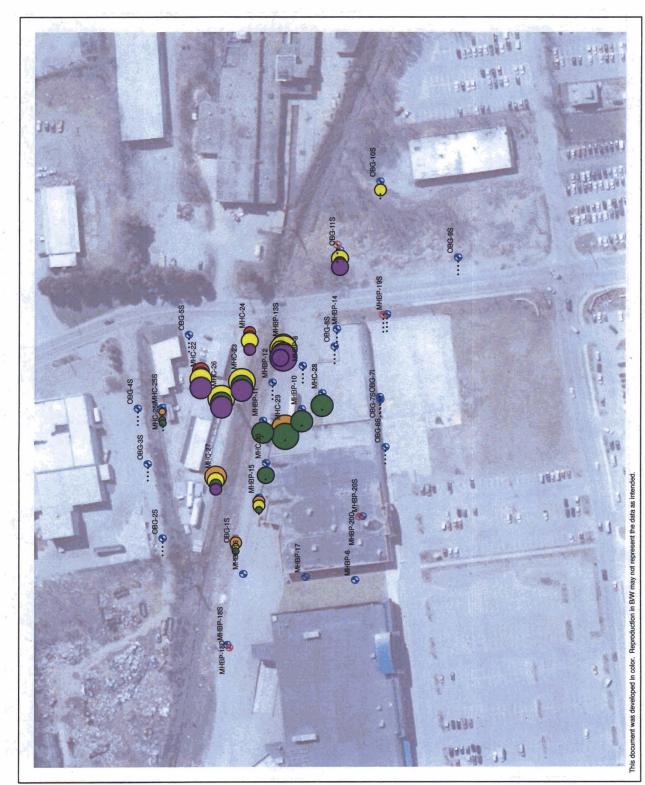
1,1,1-TCA AND BREAKDOWN PRODUCTS IN SOIL PHASE 1



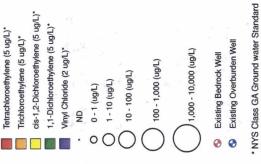
June 2007



8/06/06



Legend



NYSDEC FORMER DUSO CHEMICAL POUGHKEEPSIE, NY

PCE AND BREAKDOWN PHASE 1, ROUND 1 PRODUCTS IN GW



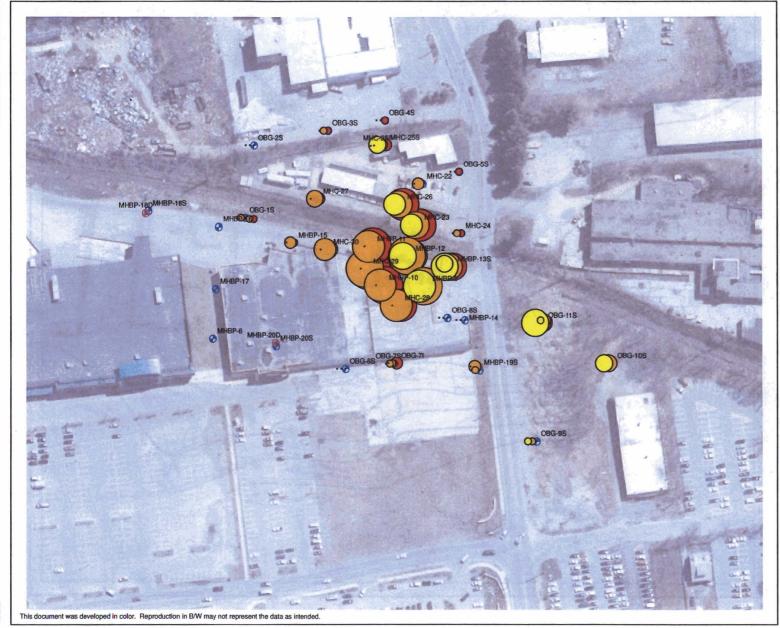


FIGURE 7 Legend S Existing Bedrock Well **Existing Overburden Well** 1,1,1-Trichloroethane (5 ug/L)* 1,1-Dichloroethane (5 ug/L)* Chloroethane (5 ug/L)* 0 - 1 ug/L 0 1 - 10 ug/L 10 - 100 ug/L 100 - 1,000 ug/L 1,000 - 10,000 ug/L 10,000 - 100,000 ug/L 100,000 - 1,000,000 ug/L ,000,000 - 10,000,000 ug/L * NYS Class GA Ground water Standard NYSDEC FORMER DUSO CHEMICAL POUGHKEEPSIE, NY **TCA AND BREAKDOWN PRODUCTS IN GW** PHASE 1, ROUND 1 50 100 200

Feet

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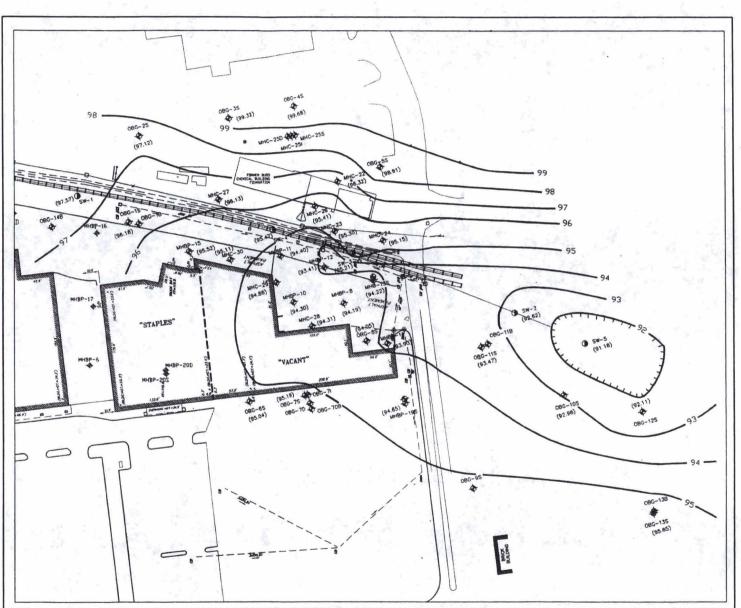


FIGURE 8



LEGEND

MHBP-16 MONITORING WELL LOCATION
WITH GROUND WATER
(93.79) ELEVATION IN FT AMSL

95—GROUND WATER CONTOURS (DASHED WHERE INFERRED)

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

FORMER DUSO
CHEMICAL SITE
OVERBURDEN
GROUND WATER CONTOUR
MARCH 26, 2007



FILE NO. 10653.35919 JUNE 2007



2007 © O'Brien & Gere Engineers, Inc.

FIGURE 9



Legend

Proposed Injection Locations

Approximate Limits for Thermal Conduction

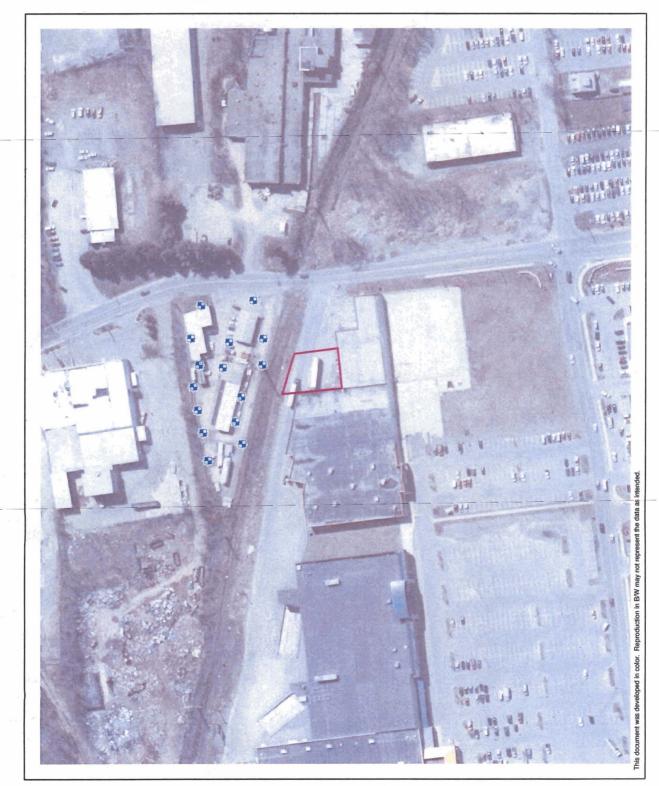
NYSDEC FORMER DUSO CHEMICAL POUGHKEEPSIE, NY

ALTERNATIVE 4
CONCEPTUAL PLAN









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APPENDIX A

Responsiveness Summary

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RESPONSIVENESS SUMMARY

Former Duso Chemical Site Poughkeepsie (T), Dutchess County, New York Site No. 3-14-103

The Proposed Remedial Action Plan (PRAP) for the Former Duso Chemical 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 February 19, 2008. The PRAP outlined the remedial measure proposed for the contaminated soil and groundwater at the Former Duso Chemical 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 March 6, 2008, 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 was to have ended on March 19, 2008, however it was extended to March 28, 2008, at the request of the public.

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: I represent the successor to the former property owner, Duso Chemical, and I am in receipt of various project documents. So that I can review the final RI/FS in detail, I'm requesting an extension of the comment period (two other parties in attendance supported the extension request).

RESPONSE 1: The comment period was extended to March 28, 2008 for all parties in attendance at the public meeting. These individuals were advised of the extension via letter dated March 10, 2008.

COMMENT 2: If my client Duso Chemical is being considered a PRP, then they should be kept in the loop. They hadn't heard about this site in quite a while, until they received the fact sheet announcing the public meeting.

RESPONSE 2: A site contact list was established and routine notices (i.e., fact sheets) were sent to that list. The site contact list consists of the site owner; adjacent and nearby property owners; local public officials; media; and any person or group that has asked to be on that list. It should be noted that Duso Chemical was advised of their status as a potentially responsible party (PRP) and as such, approached by the Department and given the opportunity to conduct the RI/FS themselves. Duso Chemical, however, declined to participate. Upon their refusal, the Department moved forward conducting the required program using State Superfund monies. With the completion of the RI/FS,

Duso Chemical was provided with notice of the public meeting and with a copy of the PRAP for review. Duso will again be approached by the Department to assess their willingness to participate in the remedial program.

COMMENT 3: In regard to the exposure assessment, was it just focused on chlorinated solvents? The RI identified high concentrations of metals in the surface soil of the MHBP site.

RESPONSE 3: The RI confirmed the presence of volatile organic compounds (VOCs) including PCE and its breakdown products; and 1,1,1-TCA and its breakdown products. Metals were also observed including: arsenic, cadmium, chromium, copper and lead. These contaminants have been identified in soil and groundwater and there are potential exposure pathways present. The elevated concentrations of metals in surface soil identified in the RI are located on the former Conrail property, not the Former Duso Chemical site or MBHP property. The above-referenced metals in surface soil exceed the soil cleanup objectives (SCOs) for unrestricted use. When contaminant levels are evaluated against SCOs for commercial use (which includes passive recreational uses) the only metal above SCOs is arsenic. The elevated arsenic concentrations can be attributed to the past use of this area as an active railroad line, where arsenic is a common component of wood preservatives used on the railroad ties.

COMMENT 4: In your cleanup objectives, is it correct that soil is not an issue? I just saw objectives for groundwater.

RESPONSE 4: Contamination has been observed in both soil and groundwater. The remediation goals, which are stated in Section 6 of the ROD, are to eliminate or reduce exposures of persons at or around the site to contamination in soil and groundwater; to eliminate or reduce the release of contaminants from the saturated soil into groundwater, and the release of contaminants from groundwater into indoor air; and attaining to the extent practicable, ambient groundwater quality standards.

COMMENT 5: You describe the configuration of the observed groundwater contamination as a "bowl". It appears to me to be more of a "trough". Was there any free product found and if not, does it mean that some product has broken down?

RESPONSE 5: In the northern portion of the study area (the site and MHBP), the top of bedrock slopes fairly uniformly to the south-southeast. In the southern portion of the study area, the top of bedrock slopes fairly uniformly to the north-northwest, thus producing a "trough" which trends in a northeast to southwest direction. The trough is framed by the bedrock and filled with (from bedrock upward) a sand/gravel layer; a silty clay/silt layer; and a fine sand/silt layer. The sand/gravel layer, silty clay/silt layer, and hydrogeologic gradients follow the contour of the trough in general. All of the soil layers are thinned/pinched at the top ends of the trough and thickened/widened at the middle or deep end of the trough. The contamination is primarily within the upper to middle silty clay/clay layer. No free product was observed in the trough or elsewhere during the RI. While free product was reported to have been observed during the investigation of the adjacent former MHBP (Chazen Companies, 1998), based on the concentrations observed during the RI (e.g., 1,1,1-TCA at 1,250,000 ppb in MHC-29; 1,1 DCA at 276,000 ppb in well MHBP -12), it is reasonable to believe

that free product is present. It is also likely that some of the free product has broken down over time and converted to the aqueous phase.

COMMENT 6: From what I see, 1,1,1-TCA was identified on the MHBP site, and PCE is more confined to the Former Duso property. Since 1,1,1-TCA was used at MHBP, this suggests these contaminants be from different events.

RESPONSE 6: 1,1,1-TCA and its breakdown products, and PCE and its breakdown products, were observed on-site and off-site. The topographical and hydrological gradients to the east of the observed trough (the Former Duso property) are, in general, steeper than those to the west of the trough (MHBP). This shows that in general there is more of a contribution from the groundwater flowing under the site towards the trough, than that of the groundwater flowing towards the trough from the MHBP. Also, the mapped contamination plume shows a clear westward flow down the hydrological gradient from the site into and resting in the trough. This supports that the Former Duso Chemical is the origin of the contamination.

COMMENT 7: Your fact sheet says Star Energy came onto the site after Duso Chemical left. Please note that Star Energy was there when Duso Chemical was in operation.

RESPONSE 7: Comment noted.

COMMENT 8: Sending out a fact sheet saying who the potentially responsible parties (PRPs) are is a callous, off-the-wall approach to take. Just how did you decide who the PRPs were for this site?

RESPONSE 8: A responsible party is defined as by Environmental Conservation Law (ECL) 27-1323, and includes:

- Any person who currently owns or operates a site or any portion thereof;
- Any person who owned or operated a site or any portion thereof at the time of disposal of the contaminant;
- Any person who generated any contaminants disposed at a site;
- Any person who transported any contaminants to a site selected by such person;
- Any person who disposed of any contaminants at a site;
- Any person who arranged for:
 - (i) the transportation of any contaminants to a site; or,
 - (ii) the disposal of any contaminants at a site; and
- Any other person who is responsible according to the applicable principles of statutory or common-law liability pursuant to ECL 27-1313(4) and/or CERCLA.

Those parties deemed potentially responsible for contamination at the Former Duso Chemical site are identified in the PRAP and the ROD. Although the site's remedial history was discussed in the fact sheet announcing the availability of the PRAP, those parties were not identified in that notice as PRPs.

COMMENT 9: At the meeting hosted by the Department in August of 2007, I told you that MHBP is contaminated; that the MHBP should never have been delisted; and that the report submitted by the Chazen Companies was suspect. Why haven't you looked at the MHBP for the true polluter?

RESPONSE 9: The Department agrees that contamination exists on the MHBP property. As part of the RI the Department again evaluated the findings of the Chazen Companies investigation referenced, which served as the basis for a 1998 delist petition. That study showed that while there was significant groundwater contamination by VOCs on the MHBP property's southeast corner (the trough discussed above), no VOC contamination was present in wells located to the north, west and southwest of the site (i.e., outside the trough on MHBP property). This supports that the contamination present has originated and migrated from an upgradient source located to the east (i.e., the Former Duso Chemical property). Based on those findings, the MHBP (a.k.a. Former Western Publishing site) was delisted from the State's Registry of Inactive Hazardous Waste Disposal Sites. The 2007 RI findings are consistent with the conclusions of the Chazen investigation, supporting that the Former Duso Chemical site, not the MHBP, is the source of the identified contamination.

COMMENT 10: Why was the Former Western Publishing site delisted?

RESPONSE 10: See Response No. 9.

COMMENT 11: Since the heaviest concentration of contaminants in the groundwater is off the Former Duso Chemical site, and on MHBP property, doesn't that clearly show that the pollution came from the Former Western Publishing site, not Duso Chemical?

RESPONSE 11: The highest concentrations of contaminants were observed off the Former Duso Chemical site, in the area below the former rail line and the MHBP property. However, as explained in Response No. 6, the topographical and hydrological gradients which exist beneath the study area support that the Former Duso Chemical site, not the MHBP property, is the origin of the contamination. See also Response No. 9.

COMMENT 12: Who is the owner of the MHBP property?

RESPONSE 12: The Department's records indicate the owner of the property immediately west of the site is Midhudson Center, LLC. However, the commenter is referred to the local municipality for a definitive answer.

COMMENT 13: Is the owner of the MHBP even on your mailing list?

RESPONSE 13: Midhudson Center, LLC is on the mailing list. The Department was also in contact with this party to arrange for access for sample collection.

COMMENT 14: Why aren't they considered a PRP?

RESPONSE 14: See Response Nos. 8 and 9.

COMMENT 15: Did you rely on the Chazen Companies' report, which I told you in August 2007 was suspect, to reach the conclusions you have reached regarding the Former Duso Chemical site?

RESPONSE 15: The Chazen Companies' report was reviewed in the development of the RI work plan. The findings, interpretations and conclusion were reviewed. The Chazen report identified

significant contamination on the MHBP property's southeast corner. The Department's RI was designed to fully delineate the nature and extent of that contamination. The RI included further assessment of subsurface conditions on both the Former Duso Chemical site and the adjacent MHBP property. The RI report prepared by the Department reached similar conclusions and largely confirmed the findings of the Chazen study. No evidence was supplied which would refute these findings.

COMMENT 16: How do you know the properties upgradient, that is north and east, of the Former Duso Chemical site aren't the real source of the contamination?

RESPONSE 16: As part of the RI, areas upgradient were investigated, and subsurface conditions were thoroughly evaluated to understand local geologic and hydrogeologic conditions. It was concluded that there was no contribution to the identified contamination from these areas. See also Response No. 9.

COMMENT 17: With regard to the alternative of bio-attenuation and groundwater monitoring, do you know how long it would take to reach remedial objectives?

RESPONSE 17: Given the concentrations of on-site and off-site contaminants in groundwater and the potential presence of DNAPL or residual source material, it would likely take more than 30 years to reach NYSDEC Class GA groundwater standards using monitored natural attenuation.

COMMENT 18: Is the main concern the concentration/levels of contamination, or that the contaminant plume is moving?

RESPONSE 18: The findings of the RI do not suggest that migration of the contamination is a significant issue. The plume appears generally confined. The levels of contamination in groundwater, however, are significantly above standards. The remediation goals for this site include removing the source of the contamination, eliminating or reducing the release of contaminants to various media (e.g., groundwater, soil vapor), and attaining to the extent practicable, ambient groundwater quality standards.

COMMENT 19: Who is Kantorer Realty?

RESPONSE 19: The Department's records indicate that Kantorer Realty was the owner of the site from 1964 until 1972.

COMMENT 20: Does the site encompass the three properties affected by the contamination: the Star Gas property, the former rail line, and the MHPB property?

RESPONSE 20: No. The site is defined in the State's Registry of Inactive Hazardous Waste Disposal Sites as the property at 33 Fulton Street (i.e., the property currently occupied by Star Gas Products, Inc.). The contamination extends beyond the site, but the properties affected are considered off-site.

COMMENT 21: If the Former Western Publishing site was delisted because it has allegedly been cleaned up, how do you explain that you have to do part of your remedy on that site?

RESPONSE 21: The Former Western Publishing site was not delisted on the basis that contamination had been removed. It was delisted for the reasons listed in Response No. 9, namely that disposal had not been documented on that property.

COMMENT 22: I complained in August 2007 that you were relying on suspect data in the Chazen report, rather than doing an independent analysis. Nothing seems to have changed since then, other than selecting a remedy and putting a price tag on the cleanup.

RESPONSE 22: See Response Nos. 9 and 15.

COMMENT 23: The presence of the 1,1,1-TCA on the MHBP property indicates to me that there are some data gaps and inconsistencies, which require more investigation before a remedy can be decided upon.

RESPONSE 23: The investigation conducted by the Department was comprehensive and has met the RI's goal of delineating the nature and extent of contamination. The FS identified, screened and evaluated remedial alternatives and served as the basis for the selected remedy, which includes a combination of actions using proven technologies to address the identified contamination. The Department believes sufficient data has been obtained to support the remedy selection, and that the remedy, when implemented, will achieve the remedial goals (See also Response No. 6).

Ms. Susan H. Sarch, attorney for Duso Chemical Company, submitted a letter dated March 27, 2008 which included the following comments:

COMMENT 24: The PRAP bases its choice of remediation on the assumption that the sole source of the contamination on both the Fulton Street property, as well as the adjacent Mid-Hudson Business Park property was a single release caused by a purported fire at Fulton Street. There is no basis for this assumption or that the alleged fire was the cause of the contamination.

RESPONSE 24: See Response No. 9.

COMMENT 25: From our review of the PRAP, it appears that Alternative 4, rather than the less expensive Alternatives 2 or 3, was chosen because of the need to remediate the contamination found at the Mid-Hudson Business Park property, not at the Fulton Street site. It is clear that the expensive, novel remedy selected would otherwise not be necessary if the Mid-Hudson Business Park is considered a source of separate release events. Given (i) the history of chemical uses by the prior owners of the Mid-Hudson Business Park (especially Western Publishing), including chlorinated solvents, (ii) that there are contaminants found on the Mid-Hudson Business Park property, which are dissimilar to those found at the Fulton Street property (including metals and TCA), and (iii) the prior history of releases at the Mid-Hudson Business Park, the fact of separate release events at Mid-Hudson and how that impacts the choice of alternatives must be considered by the Department.

RESPONSE 25: The selected remedy is not based upon where the release of the contamination occurred, Remedial Alternative 4 was chosen because the Department finds it to be the remedy best suited to deal with the contamination which has been identified. See also Response No. 6.

COMMENT 26: Based on these facts plus the information contained in the Department's environmental reports, we also question the prior de-listing of the Mid-Hudson property. There certainly seems to be sufficient new information presented in the RI, FS and PRAP to cause the Department to reconsider deleting the Mid-Hudson property from the Registry. The selected remedy is based on considering the Mid-Hudson property as part of the Fulton Street site. We contend this assumption is flawed, and the remedy selected should be sufficient to remediate the Fulton Street site only.

RESPONSE 26: See Response Nos. 6 and 9.

COMMENT 27: Further, we query the level of cleanup the Department is proposing, especially since the PRAP is unclear on that point as well. As there is a lack of sensitive receptors in the vicinity, the groundwater is not used for drinking purposes and this is an industrial area, there is no reasonable basis under the circumstances of this case to clean up the contamination to precontamination levels or remediate to a level allowing unrestricted use.

RESPONSE 27: The goal of the New York State Superfund Program is to restore contaminated sites to pre-disposal conditions, to the extent feasible (ref. 6 NYCRR Part 375-2.8). The Former Duso Chemical site has been determined to pose a significant threat to public health or the environment, and a remedial program has been selected which considered various factors, including the current, intended and reasonably anticipated future land use.

Mr. Paul H. Ciminello, of Ecosystems Strategies, Inc. on behalf of Duso Chemical Company, submitted a letter dated March 28, 2008 which included the following comments (see the Administrative Record for full text):

COMMENT 28: There is no clear representation or support for the source(s) of the contamination. There is also no documentation supporting the presumed movement of contaminants from the Site to the adjoining Mid-Hudson Business Park (MHBP) property. The various environmental reports simply assert, without relevant or supportive investigatory findings, that it is "believed" that the contamination results from a 1963 fire at the building formerly occupied by Duso. In the absence of that data, the Department's conclusions regarding the full extent of the area-wide contamination and thus the preferred remedy are apparently speculative.

RESPONSE 28: See Response Nos. 6 and 9.

COMMENT 29: The RI did not conduct any independent research into the chemical use(s) on the MHBP property, relying instead on documents previously prepared for the MHBP owners as they pursued removal of their property from the Registry. There is an established history of chemical use on the MHBP property, including the very chemicals predominantly found in groundwater at that property (TCA). It is reasonable to consider that TCA releases may have occurred at the MHBP property. Additional research is recommended to document the lateral extent of TCA contamination

on the MHBP property so that selected remedial actions reflect a complete understanding of the full extent of documented contamination.

RESPONSE 29: See Response No. 9.

COMMENT 30: The RI implies that contamination migrated from 33 Fulton Street to the MHBP property as a result of a release in 1963. Given the geologic cross sections presented in the RI, it is not clear why any contamination migrating from the Site would stop at the MHBP property. Furthermore, there are significant asymmetries in the distributions of PCE and breakdown products (primarily at the Site) and the locations of TCA and breakdown products (primarily at the MHBP property). Those Site conditions may be the result of separate releases; this condition has not been addressed in the selection of the proposed remedy. It is recommended that the NYSDEC reconsider the evidence in support of more than one release of chlorinated solvents at two or more separate locations, and reconsider whether the proposed remedy (PRAP Alternative 4) is appropriate in the case of separate release events and locations.

RESPONSE 30: See Response No. 6.

COMMENT 31: Cross-section A-A' (RI Figure 5) depicts a substantial trough in bedrock but there are no data to support the geologic formation as presented. Borings in the cross-section within the extent of the trough do not extend deep enough to support the representation as drawn. When coupled with cross section B-B' (RI Figure 6), this subgrade trough appears to extend downward in dramatic fashion from east to west. Given these elevation gradients, it is not clear why DNAPL (e.g., TCA), if it were migrating, would preferentially accumulate at the MHBP property. All data used to contour and portray the subsurface bedrock trough should be provided for external evaluation. In the absence of supporting additional data, the choice of the preferred remedy should be reevaluated (the actual depth of bedrock and, conversely, the actual thickness and characteristics of overburden soils are critical components in the proper design of the proposed remedy).

RESPONSE 31: The trough sections of the A-A' cross section are inferred. Given the top of bedrock elevations in the area of the trough; the bedrock trends that are seen to the southwest in the trough; and boring logs from previous investigations, these inferences are supported by the data.

The B-B' cross section does show a downward slope from the northeast to southwest. If the cross section map of the RI study and the top of bedrock elevation map are overlain, it shows that the western part of this cross section starts in the bottom of the trough. Then the cross section migrates diagonally up the southeastern side of the trough. This accounts for the steep east to west slope seen in the B-B' cross section. The bedrock gradients within and along the bottom of the trough are far less steep. These gradual gradients along the trough and the low conductivity of the silty clay/silt layer explain the TCA accumulation on the MHBP property.

COMMENT 32: Hydrogeologic information in the RI and FS may not be accurate and a re-evaluation of these Site characteristics is warranted. Specifically, the calculated presumed velocity of groundwater flow as stated in the Department's reports support the conclusion that contaminants released in 1963 would have traveled as far as a mile by 2008. A review of groundwater laboratory analyses and contaminant distribution indicates that no such actual movement has occurred; to the

contrary, the chemical data support the conclusion that contaminant movement has been extremely limited. PCE at the Site appears to have remained substantially within Site boundaries, and TCA associated with MHBP appears to be relatively confined to the immediate environs of buildings on that property, primarily near potential loading dock and storage areas.

A review of the graphic analyses used in hydraulic conductivity calculations is recommended with respect to using the "formation" part of the data curve after the "filter pack" response. Any additional and required hydrogeologic testing should be completed prior to the selection of a remedy.

RESPONSE 32: The hydraulic conductivity (HC) testing performed in the RI was meant to be used as an estimate of actual HC. It is not uncommon for HC testing results to vary as much as an order of magnitude from actual HC and/or from test to test. The HC testing does not take into account degradation processes, aquifer chemistry, soil absorption, flow directional changes and strata changes which have a large role in shaping the contamination plume and groundwater flow.

The screened intervals at many of the wells were not in one strata layer. Many of the screened intervals ran through three or more layers when compared with the core logs (example screened interval for OBG-1S: silty/sand, saturated, moderately compact, non-plastic to silt w/ some gravel, saturated, compacted, slightly plastic to clayey silt, saturated, plastic). Also, several of the HC tests performed were conducted in the wells installed by Chazen where the screened intervals were projected. This makes it difficult to say what types of layers were being tested.

An assessment of geological factors, including but not limited to HC, has provided an understanding of the nature and extent of the contaminant plume, which in turn has provided for an evaluation of potential remedial actions, and the selection of a remedy that will effective.

COMMENT 33: Alternative 4 (Enhanced In Situ Bioremediation and Thermal Treatment) is significantly more costly than Alternative 3 (Enhanced In-Situ Bioremediation of Groundwater), primarily because of the substantial technical requirements of heating *in situ* soil and groundwater. The RI and FS refer to unidentified source areas (DNAPL and/or grossly contaminated soil). Those unfounded source areas are apparently a determining factor in selecting the preferred alternative. The source area contributions to groundwater contamination are implied to cause remediation conducted via Alternative 3 to be unacceptably slow. The steam heating remedy was invoked to destroy any source areas, thus allowing the enhanced bioremediation to proceed in a timely manner.

If a potential source area does exist, delineation and characterization is required to determine if it will interfere with or slow down the bioremediation process, i.e. is the use of a thermal component justified. In the absence of such data, remedial design and actual costs cannot be determined and compared to other alternatives. A significant concern of the design as proposed is that injection wells may be placed in the wrong locations, leading to unnecessary costs and ineffective outcomes. It is recommended that additional testing be conducted on the MHBP property to determine the presence or absence of DNAPL or other potential source areas, and that final remedy selection be deferred until completion of those studies.

RESPONSE 33: Although DNAPL was not observed during the RI, it is considered likely that DNAPL could be present in the vicinity of the trough/bowl formation on the MHBP, based on the

concentrations of 1,1,1-TCA detected during the investigation. During the design phase of the project this area will be investigated further, including possible borings beneath the vacant building in an attempt to locate any such contamination. See also Response Nos. 5, 17 and 23.

Mr. Richard Muellerleile, President, Star Gas Properties, Inc., submitted an undated letter which included the following comments (see the Administrative Record for full text):

COMMENT 34: In the early 1990s, the adjacent property (Mid-Hudson Business Park) was environmentally tested by the Chazen Company, and it was discovered that there was pre-existing industrial contamination on the property. The contaminants are in alignment with the printing company (Western Publishing) that previously resided there. Later, the DEC performed testing and found contaminants. The property received a "Brownfield" classification. The Chazen Company hastily approached our business to blame us for the contamination. Their belief was solely based on the fact that a fire took place at 33 Fulton Street in the 1960s, and chemicals "could have been released" at that time, although no records (including fire department records) indicated a chemical spill.

In the meantime, Chazen continued to "monitor" the environmental aspects of the Mid-Hudson Business Park so that the owner could continue to build and complete their shopping mall that includes a bank, Starbucks, Staples, Home Depot, Applebee's Restaurant, a Smokeshop, and several additional stores. After completion of this work, the property was then de-listed by the DEC despite the fact that there was no cleanup-only blacktop paving. My property (at Star Gas), was then listed as a Brownfield site. At our latest meeting, the DEC no longer knew (or acknowledged) any records regarding the environmental monitoring of the Mid-Hudson Business Park property. This "monitoring" was completed and submitted weekly to the DEC by (at that time) the owners' representative of the Mid-Hudson Business Park property (which he attested to in a signed deposition statement). He also indicated in his deposition that there were collapsed underground storage tanks that had necessitated DEC mandated reporting.

The DEC recently held a meeting this month and decided upon specific remediation that will cost approximately 2.5 million dollars. We have firmly communicated to the DEC that we (as the current owners) have not contaminated any property and feel that we have been improperly blamed for someone else's issue. Additionally, the DEC has indicated agreement to this fact (as the property is listed as the former Duso Chemical property), but still listed Star Gas Products, Inc. and Star Gas Properties, Inc. as Potentially Responsible Parties or (PRPs). We have brought documentation and communicated with their lawyers but the DEC continues to look to us for remediation.

Star Gas has been attending DEC meetings diligently. As of this moment, we can foresee that we are unable to get the DEC to consider our reasonable position. Our board members are finding this difficult to comprehend and are fearful about continuing to do business while incurring this type of cost. It is our contention that the Chazen Company has looked to blame someone else for their findings on behalf of both the current and former owners of the Mid-Hudson Business Park, as well as their ability to purchase the State Hospital Property for development, and has avoided clear corporate responsibility in erecting a shopping center without doing the proper cleanup. This is unfair not just to our business but to our local community.

RESPONSE 34: The Former Duso Chemical site is listed on the State's Registry of Inactive Hazardous Waste Disposal Sites. It maintains a class 2 designation on the Registry, meaning the site poses a significant threat to public health or the environment. The site does not maintain a "Brownfield" classification. See also Response Nos. 6, 8, 9 and 21.

Mr. James M. Fedorchak, attorney for Star Gas, submitted a letter dated March 28, 2008 which included the following comments (see the Administrative Record for full text):

COMMENT 35: For the reasons set forth below we urge that, at a minimum, the present owner and all former owners of Mid-Hudson Shopping Center, Route 9, Poughkeepsie, New York (also known as the former Western Printing property), including Arthur H. Bienenstock, last known address 100 Wall Street, New York, New York 10005; Western Publishing Company, Inc., last known address 1220 Mound Avenue, Racine, Wisconsin 53404; and Starwood Ceruzzi Poughkeepsie, LLC, 1720 Post Road, Fairfield, Connecticut 06430, be included in your list of potentially responsible parties.

RESPONSE 35: See Response Nos. 8 and 9.

COMMENT 36: While ignoring the extensive hazardous waste history of the Mid-Hudson Business Park property, formerly owned by Western Publishing Company, Inc., the DEC has chosen to target Star Gas as a potential responsible party. The comments set forth below on behalf of Star Gas are made without waiving any rights that it may have with regard to seeking indemnification or contribution from any other parties for any costs inherent with the remediation of its property and any other abutting properties that may be affected by the State's determination (the letter next includes a chronology of technical and legal activities and reference to various provided attachments).

RESPONSE 36: The Former Duso Chemical site is listed on the State's Registry of Inactive Hazardous Waste Disposal Sites and the goal of the recent remedial program was to fully delineate the nature and extent of contamination and select a remedy to address that contamination. The goal has been achieved. The information provided will be reviewed in consultation with the Department's Office of General Counsel relative to liability, however, decisions relative to contribution have little or no impact on the remedy selected.

COMMENT 37: We can well appreciate the charge given to DEC at this time with regard to its findings and its proposed remediation of the subject property, which includes my client's premises as well as the former Mid-Hudson Business Park site. However, you must take into consideration the history of Bienenstock's efforts to blame others for his responsibility and evade his responsibility once assumed. My client, Star Gas, is a small business and 16 families rely upon its success. You have offered a plan for the remediation of its property as well as the Mid-Hudson property at an estimated expense of \$2.5 million. Your engineer has told us at public hearing that you are not really concerned at this phase with identifying the entity that will pay the bill. That offers no solace to Star Gas, especially in light of the sorted history of Bienenstock and his representatives as we have outlined above. We believe that the DEC has been duped and that you should open your eyes now to that which has occurred. In doing so you should take all efforts to place the responsibility for the cleanup where it belongs, which is directly on the shoulders of Mr. Bienenstock.

RESPONSE 37: See Response No. 36.

APPENDIX B

Administrative Record

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Administrative Record

Former Duso Chemical Site Poughkeepsie (T), Dutchess County, New York Site No. 3-14-103

- 1. Proposed Remedial Action Plan for the Former Duso Chemical site, dated February 2008, prepared by the Department.
- 2. "Remedial Investigation/Feasibility Study, Former Duso Chemical Site" Work Plan, dated March 2005, prepared by O'Brien & Gere Engineers, Inc.
- 3. "Remedial Investigation, Former Duso Chemical Site", dated August 2007, prepared by O'Brien & Gere Engineers, Inc.
- 4. "Feasibility Study, Former Duso Chemical Site", dated November 2007, prepared by O'Brien & Gere Engineers, Inc.
- 5. "Supplemental Remedial Investigation, MidHudson Business Park", dated February 1998, prepared by the Chazen Companies.
- 6. "Citizen Participation Plan", dated March 2005, prepared by O'Brien & Gere Engineers, Inc.
- 7. Fact Sheets/Notices:
 - "Remedial Investigation to Begin at Former Duso Chemical Site" dated May, 2005.
 - "Site Investigation to Continue at Former Duso Chemical Site" dated March 2007.
 - "Availability Session for Former Duso Chemical Site", dated August 2007.
 - "Remedy Proposed for Former Duso Chemical Site", dated February 2008.
- 8. Letter dated March 27, 2008 from Susan H. Sarch, of Zarin & Steinmetz, Attorneys at Law.
- 9. Letter dated March 28, 2008 from Paul H. Ciminello, of Ecosystems Strategies, Inc.
- 10. Letter dated March 28, 2008 from James M. Fedorchak, of Gellert & Klien, P.C., Attorneys at Law.
- 11. Letter (not dated) from Richard Muellerleile, President, Star Gas Properties, Inc.

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