SITE INVESTIGATION/REMEDIAL ALTERNATIVES (SI/RA) REPORT

Former Brown Manufacturing Site

NYSDEC Brownfields Project No. B-00024-7

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1.0 DEVELOPMENT OF GENERAL RESPONSE ACTIONS

1.1 Remedial Alternative Assessment Goals

The goal of the Remedial Alternative assessment is to identify and screen remedial technologies such that a range of remedial alternatives that protect human health and the environment are developed. A range of remedial alternatives is developed to attain site or project-specific remedial response objectives. The range of remedial response objectives developed reflects the goals of the NYSDEC to address the principal environmental threats through treatment, and consider engineering controls to address low level contaminated material and wastes for which treatment is not practical. Institutional controls are considered primarily as supplements to engineering controls.

A range of alternatives is developed to attain the remedial response objectives. The range of alternatives developed reflects the goals and methodology listed within the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) Number 4030 "Selection of Remedial Actions at Inactive Hazardous Waste Sites" (NYSDEC, May 1990). The first step in developing remedial alternatives is to identify areas or volumes of media to which general response actions might be applied. These areas or volumes are identified considering acceptable exposure levels, potential exposure routes, the nature and extent of contamination, and other site conditions.

The second step is to establish remedial action objectives. The remedial action objectives specify the contaminants and media of concern, potential exposure pathways, and remediation goals. The remedial action objectives are a general description of what the remedial action is intended to accomplish. Remediation goals are a subset of the remedial action objectives and consist of acceptable contaminant levels or a range of levels for each exposure route.

The goals specify both a contaminant level and an exposure route, rather than contaminant levels alone, because protectiveness may be achieved by reducing exposure (such as capping an area or limiting access), as well as by reducing contaminant levels. After the remedial action objectives have been established, general response actions for each medium of interest are developed.

General response actions include: treatment, containment, excavation, or other actions that may be taken to satisfy the remedial action objectives for the site. The first step in identifying technologies is to identify technology types and technology process options associated with each general response action. Technology types refer to general categories of technologies, while technology process options refer to specific processes within each specific technology type. Technology types such as capping, disposal, immobilization and thermal treatment are among those described. Process options available for each of the technologies are then described.

After the technologies and associated process options are identified, those remedial technologies and process options that cannot be implemented technically, or are deemed not viable or impractical, are screened out. At this stage of the evaluation, specific process options or entire technology types are eliminated from further consideration. Technologies and process options are evaluated and screened using the criteria of Implementability and Effectiveness. The implementability screening considers the technical feasibility of implementing the technology and is used to eliminate technologies or process options that are clearly ineffective or unworkable considering the site-specific conditions and the remedial response objectives. The effectiveness screening considers the effectiveness of the specific technology or process option and is used to eliminate technologies that are not effective in handling the site specific contaminants or areas and volumes of waste considering the remediation goals, the potential impacts to human health and the environment while implementing the technologies, and the reliability of the process with respect to the contaminants and conditions at the site.

Remedial alternatives are then developed by combining the various technologies that passed the technology screening into alternatives to achieve the remedial response objectives. Only a limited number of remedial alternatives which represent the most viable remedial actions and have a significant potential of being implemented will be developed. A no action alternative is typically developed to use as a basis for comparison with other alternatives. These remedial alternatives then undergo a detailed analysis which consists of an assessment of each individual alternative against seven evaluation criteria:

1. Short-term impacts and effectiveness
2. Long-term effectiveness and performance
3. Reduction of toxicity, mobility, or volume
4. Implementability
5. Compliance with Standards, Criteria and Guidance (SCGs)
6. Overall protection of human health and the environment
7. Cost
8. After detailed analysis, a comparative analysis is conducted that focuses on the criteria relative to each alternative.

Each of the seven evaluation criteria is further divided into specific factors and a relative weight is assigned to each factor to allow a thorough analysis of the alternatives.

1.2 Remedial Action Objectives

In order to develop the remedial action objectives for the site, the following factors were considered to address environmental and human health concerns:

- Media of Concern – petroleum contaminated construction/demolition debris, urban fill, and soil material; floating viscous oil product along building foundation walls, and buried pipes.
- Primary Contaminants of Concern – Elevated concentrations of PCBs (1 to 72 mg/kg) and polynuclear aromatic hydrocarbon (PAH) semi-volatile organic compounds (>50 mg/kg) were identified within numerous soil samples collected as part of the Site Investigation.
- Secondary Contaminants of Concern – Although a limited number of volatile organic compounds (i.e., methylene chloride, acetone, and chloroform) and/or various heavy metals (i.e. arsenic, cadmium, chromium, nickel, lead, selenium, and zinc) were identified within a number of soil samples, the concentrations of these parameters were generally only slightly above respective TAGM 4046 Recommended Soil Cleanup Objectives.
- Exposure route(s) and receptor(s) – direct contact, inhalation, and/or ingestion by humans, off-site migration via sewer systems and/or groundwater flow;
- Acceptable contaminant level or range of levels for each exposure route – risk range or specific contaminant level range, as specified in TAGM 4046.
- The following remedial action objectives have been established:

- Remediate the presence of (remove) floating oil product and associated contaminated soil intermingled with construction/demolition debris at specific site locations near building foundation walls and buried pipes.
- Remediate PAH contaminated non-native urban fill or contaminated soil intermingled with construction/demolition debris at the site to meet applicable Soil Cleanup Objectives listed within NYSDEC TAGM 4046 (<50 mg/kg).
- Remediate PCB contaminated fill/soil to concentrations <1 ppm in surface soils and <10 ppm in subsurface soils (below 18").

1.3 Identification of Contaminated Media and Volume

The following types and estimated volume of contaminated media were identified as part of the project specific Site Investigation effort:

PCB Contaminated Soils – NYSDOH Hot Spot
- Area = 1,025 square feet; Depth = 5-6 feet from grade
- Volume = 5,100 to 6,150 cubic feet (190 to 230 cubic yards)

Shallow PAH Contaminated Solids – Western Site Area
- Area = 7,475 square feet; Depth = 5-6 feet from grade
- Volume = 37,440 to 44,850 cubic feet (1,400 to 1,670 cubic yards)

Deep PAH Contaminated Solids – Building Foundation Walls
- Area = 4,240 square feet; Depth = 13 feet from grade (approximate)
- Volume = 55,120 cubic feet (2,050 cubic yards)

Floating Oil Product – Along Building Foundation Walls
- Area Encountered = 1,400 square feet; Thickness = 6-12 inches
- Estimate Pore Space = 50%
- Volume = 350 to 700 cubic feet (2,600 to 5,250 gallons)

1.4 General Response Actions

General Response Actions were developed to satisfy the remedial action objectives, specifically for each contaminated medium of concern as identified within the project Site Investigation. The contaminated media of concern for the Brown Manufacturing site include: 1) PAH and PCB contaminated soils, fill and construction/demolition debris and 2) oil product at discrete site locations, including former building foundation walls and buried pipe corridors. For each of these media, the general response actions that were developed include: no action, institutional actions, access restrictions, monitoring, containment, disposal, and treatment of the contaminated materials. The following sections describe the general response actions for this site. Each option is defined and is not contaminant-specific.

No Action

The "No Action" response includes continued maintenance of the site without implementing specific source control, management of migration, or monitoring measures. This response action is included because it provides a baseline with which to compare active alternatives.

Institutional Controls

Institutional controls are often necessary to supplement remedial actions where waste and/or contamination is left in place. It may also be necessary in circumstances where the balancing of trade offs among alternatives during the selection of a remedy process indicates no other practical way to actively remediate a site. Examples of institutional controls that limit the activity at or near the site include land and resource use restrictions, deed restrictions or notices, well drilling prohibitions, or building permit restrictions. Examples of institutional controls that physically limit the access to a site are perimeter fencing with appropriate signage or a 24-hour guard. Where institutional controls are used as the sole remedy, special precautions must be made to ensure that the controls are reliable and will remain in place after initiation of operation and maintenance. Other activities that may be considered institutional controls include groundwater monitoring or periodic site inspections.

Containment

Isolation/containment processes involve isolating the contaminated solids from the surrounding environment. Containment can be accomplished by installing a surface barrier (such as an engineered cap or other cover system) and/or a subsurface barrier containment system (such as a liner). Isolation/containment devices do not destroy contaminants, but function to prevent their migration to groundwater, the atmosphere, or the surface environment. Containment also reduces the likelihood of exposure to contaminants.

Removal and Disposal

The removal and disposal process includes excavation of contaminated soil/solids or recovery (pumping) of contaminated liquids from its current location for subsequent disposal on-site or at an appropriate off-site facility for disposal. The contaminated material may be treated prior to disposal, or it may be disposed of (with restrictions) without being treated. Typically, standard earth moving equipment is used to excavate contaminated soil/solids. Liquid contaminant recovery is completed using pumps at recovery well or sump installations.

Immobilization Treatment

The immobilization of contaminants involves processes that reduce the leachate production potential by binding contaminant(s) through a physical (solidification) and/or a chemical (stabilization) process. Immobilization technologies typically involve combining specific contaminated media with various reagents or absorbents to produce a substance, usually a hardened mass or soil-like material that effectively contains the contaminants.

Physical/Chemical Treatment

Physical/chemical treatment technologies entail a combination of physical and chemical treatment processes. Physical treatment refers to processes that, through concentration or phase change, alter the hazardous constituents of waste to a more convenient form for further processing or disposal. Typically, physical treatment methods are used to reduce the volume of hazardous materials and produce a concentrated residue that is further treated. Chemical treatment refers to processes in which the hazardous constituents are altered by chemical reactions. The goal of chemical treatment is to either destroy the hazardous constituents in the waste or to convert the contaminants to a more convenient form for further treatment or disposal.

Biological Treatment

Biological treatment includes the use of microorganisms, such as bacteria or fungi, to mediate or enhance the degradation of hazardous materials. These technologies utilize the natural abilities of bacteria and fungi to degrade hazardous contaminants, generally organic materials. Each bioremediation process is distinctly different, requiring an evaluation of different process options to determine their implementability. Biodegradation of contaminated material may result in the detoxification or destruction of the hazardous constituents, which would reduce the potential of adverse health and ecological effects.

Thermal Treatment

Thermal treatment refers to processes that use high temperature as the principal mechanism for hazardous waste destruction or detoxification. Thermal treatment includes the controlled high-temperature oxidation of primarily organic compounds in which carbon dioxide and water are produced. Thermal treatment processes, such as incineration, are highly complex and require sophisticated systems to perform the respective process.

2.0 IDENTIFICATION OF REMEDIAL TECHNOLOGIES

2.1 No Action

Under the "No Action" response, the present conditions at the site would be continued without implementing specific source control, management of migration, or monitoring measures.

2.2 Institutional Controls

Institutional controls are often necessary to supplement remedial actions where waste is left in place. It may also be necessary in circumstances where the balancing of trade offs among alternatives during the selection of the remedy process reveals limited means of actively remediating a site. Examples of institutional controls that limit the activity at or near the site are land and resource use restrictions, deed restrictions or notices, well drilling prohibitions, or building permit restrictions. Where institutional controls are used as the sole remedy, special precautions must be made to ensure that the controls are reliable and will remain in place after initiation of operation and maintenance. An important aspect of this technology is the identification of the particular authority to implement and enforce institutional controls. Other activities that may be considered institutional controls include, groundwater monitoring, periodic inspections and access restrictions. Access restrictions would limit access to the site by unauthorized personnel, or warn persons approaching the site of potential hazards at the site. Access restrictions may consist of constructing a fence around the perimeter of the site to limit access or by posting of warning signs. In some cases, a permanent guard may be the appropriate access restriction. It would be the responsibility of the Site Owner to ensure that the controls are enforced and maintained.

2.3 Containment

The remedial technology types included for purposes of the containment technology, include: 1) engineered caps; 2) composite impermeable layer caps; 3) single impermeable layer caps; and 4) covers. Capping and covering are containment technologies typically used to seal or cover waste materials, thus preventing their contact with the land surface and groundwater. Capping or covering is utilized when contaminated materials are to be left in place at the site. In general, capping or covering is performed when the volume or nature of the waste at a site precludes excavation and removal of wastes because of potential hazards and/or unrealistic costs. Capping may be performed with groundwater extraction and remediation to prevent, or significantly reduce further plume development. Groundwater monitoring wells are often used in conjunction with caps to detect unexpected migration of the capped wastes. Surface water control technologies such as ditches, dikes, and berms may also be integrated with caps to divert rainwater/runoff discharge from the cap. Grading and re-vegetation should also be incorporated into cap systems to reduce the potential for precipitation and runoff infiltration and ponding. In general, caps and covers are designed to meet the following performance standards:

- Minimize liquid migration through the wastes
- Low maintenance requirements
- Efficient site drainage
- High resistance to damage by settling or subsidence
- Reduction or elimination of vertical infiltration

The majority of cap system designs include engineered caps that are designed to conform with the previously mentioned design criteria. The design of a cap system is influenced by specific factors such as:

- Availability of cover materials
- Costs of cover materials
- Desired functions of cover materials
- The nature of the wastes being covered
- Local climate and hydrogeology
- Projected future site usage

Engineered caps include single and composite impermeable layer caps. The primary performance requirement of an engineered cap is to prevent the infiltration of precipitation and runoff water to the waste, thus preventing the generation of contaminant leachate. In order to meet the performance requirements, engineered caps are typically designed with vegetative, drainage, low permeability, and foundation layers. The low permeability layer(s) are the most important components within the composite cap design. The vegetative drainage and foundation (buffer) layers are designed to maintain the integrity of the low permeability layer. The primary difference between composite and single impermeable layer caps is the number and type of low permeability components utilized. Composite impermeable layer caps typically include a combination, or more than one type, of impermeable layers incorporating low permeability soils, synthetic liners or both. Single impermeable layer caps incorporate either low permeability soils (i.e., clay) or a synthetic liner as the impermeable layer.

The primary performance requirement of a cover is to prevent physical contact with the waste being covered. Covers may be an acceptable remedy when response objectives include the mitigation of exposure to contaminants via direct contact, inhalation, or ingestion. Covers may be applicable when a site is being temporarily covered; in an area where evapotranspiration far exceeds rainfall; there is little or no groundwater in contact with the contaminants; or when there is certainty that the integrity of a cover will be continually maintained.

2.4 Disposal

The disposal process includes excavation, recovery, or removal of the contaminated media from its current location and transporting it to an appropriate off-site facility for disposal. The contaminated material may be treated prior to disposal, or it may be disposed of (with restrictions) without being treated. Typically, standard earth moving equipment is used to excavate the contaminated material.

Liquid contaminant recovery is completed using pumps at recovery well or sump installations. Liquid contaminant recovery and separation is utilized to remove and separate light or dense non-aqueous phase liquid (LNAPL or DNAPL) contaminants from a subsurface location, typically at the water table or just above an impermeable geologic stratum.

The off-site disposal facilities considered for contaminated solids/soil include a Solid Waste Disposal Facility, a RCRA Hazardous Waste Facility, or a TSCA Chemical Landfill. Any facility selected must be in full compliance with their respective operating permits. The Solid Waste Disposal Facility would be a 6 NYCRR Part 360 Landfill. As such, it will be a secure landfill permitted to accept solid waste. Acceptance of waste from the site at such a facility would depend on the nature of the waste removed from the site. Other options for disposal locations are a RCRA or TSCA secure landfill. These two types are landfills are operated in accordance with stricter regulations than a 6NYCRR Part 360 solid waste landfill. Off-site disposal consists of the following general activities:

- Excavation of contaminated solids/soil or recovery of contaminated liquids
- Separation of the liquid contaminant from excess waters
- Placement of contaminated soils or liquid into containers or trucks
- Transportation of the contaminated media to a designated disposal location

Excavation
Excavation would be conducted using standard construction equipment such as backhoes and front-end loaders. Stockpiling of soils would be limited as much as practical so as to minimize waste handling. If large open containers such as trailer bodies or roll off containers are used, soils could be loaded directly to avoid the need to stockpile.

Liquid Recovery
Liquid product contaminant recovery is typically completed at recovery well or sump locations using pumps or skimmers (floating product). The contaminated liquid, which may be mixed with

surface or groundwater, is pumped from the recovery well or sump location into a separation tank or oil/water separator in order to isolate the liquid contaminant of concern and reduce the volume of contaminated media which requires treatment. After separation, the liquid contaminant product/residual is conveyed to a temporary storage tank while the separated water fraction is further treated on-site or is discharged to a public sewer system for subsequent municipal treatment at a wastewater treatment facility.

Transportation

Transportation of contaminated soils will be conducted by tractor-trailer, dump truck, or tanker truck to the designated disposal location. Waste haulers will be licensed and in compliance with State and Federal regulations applicable to waste transportation.

2.5 Immobilization Treatment

Immobilization methods are designed to render contaminants insoluble, to prevent leaching of the contaminants from the soil matrix, and to prevent the movement of the contaminants from the area of contamination.

Immobilization technologies incorporate the binding of contaminants in the soil through a physical and/or chemical process that will stabilize and solidify the contaminants in a matrix, thus reducing their mobility. Types of immobilization technologies include:

- Solidification/Stabilization
- In Situ Vitrification

Solidification and stabilization processes convert liquids or semi-solids into solid forms by immobilizing contaminants in the soil. In the solidification and stabilization treatment process, contaminated material is stabilized, fixated, solidified, or encapsulated into a solid material by adding a resin or other chemical (such as cements or pozzolans) to the contaminated media. This process is designed to reduce leachate generation. Solidification is a treatment process that results primarily, but not exclusively, in the production of a solid block of waste material that has a high structural integrity, often referred to as a monolith. Stabilization usually involves adding materials that ensure that the hazardous constituents are maintained in their least mobile or toxic form. The final treatment goal of most solidification and stabilization processes is to reduce the solubility of contaminants so that the material produced can be returned to its original location or disposed of at an approved landfill off-site.

In situ vitrification is a process in which contaminated soil is treated in place and is converted into a stable, glass-like material. In this process, electrical current is used to melt the area of contamination at high temperatures, binding the contaminants in the resulting vitrified matrix. The in situ vitrification process eliminates the void space in the treated soil, reducing the soil volume by 20 to 40 percent for typical soils. This will result in subsidence of the treated area, which will require backfilling with clean fill to level the area. The product that remains after treatment is a high integrity glass-like monolith.

2.6 Physical/Chemical Treatment

Physical treatment processes may be described as processes that separate the waste stream by either applying physical force or changing the physical form of the waste. Chemical treatment processes alter the chemical structure of the contaminants to produce a waste residue that is less hazardous than the original contaminated material. Physical treatment processes produce residuals that must be disposed of in an environmentally safe/acceptable manner. Material such as treatment sludges may require additional treatment (including dewatering and immobilization) either on-site or off-site, prior to disposal. Requirements for further treatment of concentrated liquids, solids, and sludges depend upon the type and level of contamination present in the material. Processes which utilize physical and chemical treatment include: Liquid Contaminant Recovery and Separation, Soil Washing, In Situ Soil Flushing, Dechlorination, and Low Temperature Thermal Stripping. Although dechlorination is a type of chemical remediation technology, this method is not effective in removing PAHs from contaminated soil.

Soil washing is a technique that treats contaminated soil by separating the contaminants from the soil by physical and/or chemical separation. The washing fluid may then be treated to remove the extracted contaminants. In situ soil flushing involves injecting or flushing contaminated soils in place with water to leach contaminants into the groundwater. Non-toxic or biodegradable surfactants may be added to the water to improve the solubility and recovery of the contaminants. The groundwater carrying the flushed contaminants is collected at a hydraulically downgradient site and is treated prior to disposal. Low temperature thermal stripping involves heating excavated soil in a closed chamber to temperatures ranging from approximately 400 to 500 degrees Fahrenheit. The temperature serves to enhance the volatilization of organic constituents present in soil. Off-gases produced in the operation are collected and passed through air pollution control equipment or a recovery system. Treated soils may then be returned to the location of excavation.

2.7 Biological Treatment

Bioremediation is a process for treating contaminated material by utilizing microorganisms for degradation of contaminants. The concept of biological treatment involves altering environmental conditions to enhance microbial breakdown and detoxification of contaminants. Research has confirmed that microorganisms are capable of breaking down numerous environmentally hazardous organic compounds in contaminated soil.

The degradation of contaminants by microorganisms can be classified into three main categories: aerobic respiration, anaerobic respiration, and fermentation. Microorganisms utilized to mediate the degradation of hazardous contaminants in soil may consist of indigenous bacteria and fungi, or may include the addition of specially cultured microorganisms. In order to create an environment beneficial to the growth of the bacteria and fungi, conditions such as pH, temperature, moisture and others are required to be in a range that is favorable for their growth. Biological treatment is a scientific intensive treatment technology. With biological remedial processes, treatability studies and pilot scale testing are essential in determining the primary process controls needed for a particular contaminant, the treatment technique to be used, and the treatment by-products generated, if any.

Additionally, treatability studies are necessary in order to determine if the concentration of any of the soil contaminants will act to inhibit bacterial growth. Biological treatment of contaminated soil may be performed either by ex situ or in situ methods. Ex situ bioremediation is a process where the contaminated material is excavated from the site and is treated. In situ bioremediation is a process where the contaminated material is treated in-place at locations where the contaminated material exists. Biological treatment processes may be coupled with other treatment techniques. The feasibility of bioremediation as a treatment technique is dependent upon the contaminant type and site characteristics. Factors that determine whether biological treatment is applicable to a site include: biodegradability of the contaminant(s), environmental factors that affect microbial activity, and site hydrogeology. Biological treatment processes include: Land Farming, Slurry Phase Bioremediation, Composting, and In Situ and Ex Situ Bioremediation.

2.8 Thermal Treatment

Thermal treatment technologies utilize high temperatures as the primary means of destroying or detoxifying contaminated wastes. There are several thermal treatment processes available for soil remediation, including:

- Rotary kiln incineration
- Fluidized bed incineration
- Infrared incineration

Incineration is the controlled high temperature oxidation of predominately organic compounds, with end products of carbon dioxide and water. Additionally, inorganic substances such as acids, salts and metallic compounds will be produced from incineration of waste materials. The key variables with an incineration process are the temperature, the duration of exposure of the contaminants to the high temperatures, and the degree of mixing between the waste and the combustion air. Residence times may vary between minutes to hours, depending upon the nature and degree of the contaminants in the soil as well as the type of incineration process used. Near-complete destruction of hazardous organic wastes is feasible with thermal treatment technologies. If an incineration process is calibrated correctly, destruction and removal efficiencies (DREs) exceeding 99.99 percent may be achieved.

Incineration of wastes is accomplished by heating the contaminated solids/soil to temperatures generally ranging from 1,500 to 2,200 degrees Fahrenheit, depending upon the process used. It is important that the solid particles remain in continuous motion during the incineration process in order to prevent vitrification of the particles from occurring. Process residuals include contaminated or decontaminated ash, treated combustion gases, and wet scrubber water (if a wet scrubber is used in the process). The ash produced from the process may be considered a hazardous waste, and if so, must be managed as such.

3.0 SCREENING OF TECHNOLOGIES

3.1 General

The purpose of the screening of technologies is to evaluate each of the individual technologies or process options and determine its ability to achieve the remedial response objectives. In the initial screening, the remedial technologies are discussed generally in terms of their ability to meet their medium-specific remedial action objectives and evaluated specifically in terms of their implementability and their short-term and long-term effectiveness. From this analysis, inappropriate or ineffective technologies can be removed from further discussion, while technologies that exhibit promise as effective means of remediation can be retained for use in the development of site-wide remedial alternatives. NYSDEC TAGM 4030 defines specific analysis factors used to screen remedial alternatives. The approach defined in TAGM, however, is also well suited for the screening of technologies. As such, those analysis factors are considered during the screening of technologies.

Effectiveness: Effectiveness screening focuses on the ability of the technology to attain the remedial response objectives through the reduction in toxicity, mobility, or volume of the specific waste present at the site. Effectiveness factors to be considered include:

- Attaining the remedial objectives
- Protecting human health and the environment during and after implementation
- Accommodating the estimated quantities of contaminated materials and waste residues
- Reliability with respect to the contaminants and site conditions

Implementability: Implementability screening focuses on the technical and administrative feasibility of implementing the technology. Implementability factors to be considered include:

- The ease or difficulty associated with constructing the technology (e.g. - the use of conventional equipment and procedures vs. the use of experts, intensive operator attention and process monitoring)
- The reliability of the technology
- Availability of equipment, labor, treatment and disposal resources
- Requirements for on- and off-site permits

3.2 No Action

Although the "No Action" alternative does not attain the remedial action objectives or site-specific cleanup goals, the "No Action" alternative will be retained as an alternative primarily for comparison purposes.

3.3 Institutional Controls

Institutional controls are actions that limit the activities at or in the vicinity of the site. Examples of institutional controls include: land and resource use restrictions, deed restrictions or notices, well drilling restrictions, or construction restrictions. Other types of institutional controls specifically limit access to the site. Access restriction may consist of re-fencing of the property perimeter, upgrading any existing fence, fencing specific site areas in addition to posting appropriate signs, or posting a 24-hour guard.

The institutional controls mentioned are implementable at the site. However, if implemented as the sole alternative, institutional controls are not effective in attaining the remedial objectives or the site-specific clean-up goals. If implemented as a supplement to other remedial actions, institutional controls are effective in contributing to a sound remedial alternative. All the institutional control technologies previously mentioned, except a 24-hour permanent guard, will be retained for development into remedial alternatives.

3.4 Containment

As previously discussed, capping and covering are containment technologies typically used to seal, isolate or cover waste materials, thus preventing their contact with the surface environment. In general, capping is performed when the response objective or performance requirement is to minimize the infiltration of precipitation and runoff water into the wastes thus reducing the generation of leachate, and when extensive subsurface contamination at a site precludes excavation and removal of wastes because of potential hazards and/or unrealistic costs. Covering is performed when the primary response objective or performance requirement is to isolate waste materials from the surface environment. Covers also serve to divert precipitation and runoff water away from the waste materials.

3.4.1 Engineered Caps

The primary performance requirement of an engineered cap is to prevent the infiltration of precipitation and runoff water into the waste, thus reducing the potential for leachate generation. Composite impermeable layer caps typically include a combination of impermeable layers incorporating low permeability soils, synthetic liners, or both, while single impermeable layer caps incorporate either low permeability soil or a synthetic liner as the impermeable layer. In order to meet performance requirements, engineered caps are designed with multiple layers including: vegetative, drainage, low permeability, and foundation layers. The low permeability layer is the most important component within the composite design. The vegetative drainage and foundation layers are designed to maintain the integrity of the low permeability layer. Single impermeable layer caps typically consist of a vegetative layer served by a topsoil layer, overlying a drainage layer, composed of coarse sand, and a low permeability layer, incorporating a synthetic liner or a layer of low permeability soil. Natural materials required for the low permeability components of various caps are readily available and synthetic materials are widely manufactured and distributed. Although contaminants remain in-place, composite and single impermeable layer capping serves to seal contaminants from surface exposure that consequently reduces associated contaminant risks to human health.

The advantages of utilizing the engineered cap technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness

- Engineered caps are extremely effective in reducing the precipitation and surface water infiltration, thus reducing the potential for leachate generation
- Engineered caps are effective in isolating contaminants from the surface environment, thus reducing risks associated with human contact
- Engineered Caps typically have a design life of between 20 years (single impermeable layer) to 50 years (composite impermeable layer)
- The impermeable layer materials (impermeable clay and/or synthetic liners) of engineered caps are compatible with the site-specific contaminants

Implementability

- Engineered cap construction requires a modest working/mobilization space/area
- Engineered cap construction may require only site-specific building or construction permits

The disadvantages associated with the effectiveness and implementability of the engineered cap technology include the following:

Effectiveness

- Although engineered capping serves to isolate subgrade contaminants from the surface environment, the primary benefit of engineered cap design and construction criteria is focused on reducing infiltrating precipitation/runoff water to reduce the potential for leachate generation

Implementability

- Project-specific engineered capping must meet detailed and complex design, construction, quality assurance criteria
- Operation/Maintenance/Monitoring of an engineered cap is difficult due to the subsurface location of the impermeable layer
- The period of time required for design, construction, and quality control tasks may be extensive
- The future use of areas that incorporate an engineered cap is typically limited to inspection and vegetative layer maintenance tasks only; development of the site would not be recommended over an area which includes an engineered cap
- The final engineered cap structure would significantly alter the site topography

3.4.2 Covers

The primary performance requirement of a cover is to prevent physical contact with the waste being covered. Covers are an acceptable remedy when response objectives include the mitigation of exposure to contaminants via direct contact or ingestion. Additionally, covers may be applicable when a site is being temporarily covered, in an area where evapo-transpiration far exceeds rainfall, when there is little or no groundwater in contact with the contaminants, or when there is certainty that the integrity of a cover will be continually maintained. In specific instances where cap performance standards are not necessary, a cover may be constructed over an area of known contamination to reduce the potential for human contact with the contaminants as well as serve to divert surface water infiltration from the wastes of concern. Geotechnical borings and analyses previously completed on a three-inch asphalt cover, applied over a 3-acre portion of a landfill, revealed vertical permeabilities ranging from 1 x 10^{7} cm/sec to 1 x 10^{10} cm/sec for the asphalt layer. Similarly, a compacted clay cover can limit vertical permeabilities from 1 x 10^{3} cm/sec to 1 x 10^{6} cm/sec.

The advantages of utilizing the cover technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness

- Covers are an effective means in isolating subgrade contaminants from the surface environment, thus reducing the risks associated with human contact
- Covers serve to divert precipitation and surface waters away from wastes of concern
- Cover materials (compacted clay or concrete/bituminous asphalt) will not be degraded by the site-specific contaminants

Implementability

- Cover monitoring/inspection/maintenance may be completed on a regular basis without complex subsurface investigation and testing methods
- The equipment required for cover construction is limited to that required for typical concrete/asphalt applications
- Limited non-invasive site activities may be completed over an area that has been covered
- The boundary/working/mobilization area required for cover construction is reasonable
- As compared to engineered capping, the period of time required for cover design and construction is short term

The disadvantages associated with the effectiveness and implementability of the cover technology include the following:

Effectiveness

- The design life of an effective cover system varies on a site-specific basis

Implementability

- Covers require consistent and periodic inspection/monitoring/maintenance;
- Future use or development over an area that incorporates a cover would be limited to above grade (slab on grade) structure; subsurface structures including basements or sub-grade living/working quarters would not be recommended due to excessive intrusion, contact with, and exposure to the covered contaminated media

Since the risks associated with exposure to contaminated soils would be similarly reduced for the concrete, bituminous asphalt, and clay covers, the bituminous asphalt and clay cover options have been selected as the primary cover technologies to be incorporated for future remedial alternatives. As such, the concrete cover has been screened out of future remedial considerations.

The following points summarize the effectiveness and implementability of engineered caps and covers:

- The remedial action objectives for the site focus on reducing contaminant exposure risks to site personnel and community residents. Although covers and engineered caps are effective in isolating contaminants from the surface environment, the primary design/construction objective of engineered caps focuses on the task of reducing infiltrating precipitation and runoff water to minimize leachate generation. The primary design function of a cover system is the separation of waste materials from the surface environment

- Application of a cover system typically incorporates construction materials, equipment and personnel that are utilized during site development applications. Conversely, application of engineered caps typically requires the incorporation of detailed and complex design/construction criteria, specialized equipment and skilled technicians that necessitate extended implementation periods

- Cap monitoring activities are difficult due to the subgrade location of the impermeable layer, and maintenance activities are limited to the vegetative layer. Although cover design life is usually site specific, periodic inspection and proper maintenance will provide isolation of the contaminated media from the surface environment

- A clay soil or asphalt cover system may be modified to be compatible with potential site development. Although an engineered cap can be modified to support lightweight vehicle traffic, it is not highly compatible with future site development including new, above grade building construction

Based on the comparison summary previously listed, covering (clay soil or bituminous asphalt) has been selected as the preferred containment technologies and engineered capping has been screened out.

3.5 Removal and Disposal

The removal and disposal process consists of excavating, pumping, or otherwise removing the contaminated material, soil, and/or liquid from its current location and transporting it to an appropriate off-site facility for disposal. The contaminated material may be treated prior to disposal, or it may be disposed of (with restrictions) without being treated. Typically, standard earth moving equipment is used to excavate the contaminated solid material or soils, while contaminated liquids can be removed by pumping for subsequent treatment and/or disposal. Off-site disposal facilities typically include a Solid Waste Disposal Facility, a RCRA Hazardous Waste Facility, or a TSCA Chemical Landfill. Any facility selected must be in full compliance with their respective operating permits. Acceptance of a waste by these facilities depends on the nature and characteristics of the waste or contaminated material. Off-site disposal consists of the following general activities:

- Excavation, pumping, and/or removal of the contaminated media
- Placement of contaminated media into containers or trucks
- Transportation of the contaminated media to the designated disposal location

The advantages of utilizing the removal and disposal technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
Off-site disposal is an effective means to attain the remedial response objectives. Contaminated solids and floating petroleum product would be removed from their present location, to a secure, controlled location. Potential impacts associated with waste removal will be limited to the immediate vicinity of the excavation area and may be easily controlled and monitored. The excavation process may be quickly implemented and will remove the contamination to the cleanup levels. An additional consideration of the effectiveness evaluation is the potential environmental impact at the final disposal site. However, the waste would be sent to a compliant disposal location and thus have acceptable impacts. Although off-site disposal is the least preferred alternative according to NYSDEC TAGM 4030, it is a reasonable technology considering the limited site area available, urban setting, and type of contaminated media (C&D debris and oil product).

Implementability
Excavation of the contaminated soil can be implemented utilizing standard earth moving equipment. The time necessary implement is reasonable and there are no site limiting

complexities that would preclude excavating the soils as all locations are accessible to equipment. The period of time required to complete excavation activities is typically short in duration. As part of the excavation activities, floating oil product would be removed via sumps, installed within the working excavations. Monitoring during the remediation activities will be conducted to confirm that remediation goals are being attained. Records and transportation manifests will remain on file. Wastes must be hauled by a licensed or permitted transport company and disposed at a permitted disposal facility subject to the approval by the State in which the facility is located.

Screening
The off-site disposal technology is an effective remedial method and is easily implemented. As part of this technology, contaminated solids and floating oil product can be concurrently removed. The nature and level of contamination in the waste will determine the appropriate location for disposal. It is possible that a Solid Waste Disposal Facility, a RCRA Hazardous Waste Facility, a TSCA Chemical Landfill, and/or a petroleum product recycling facility (oil product media) will be used as disposal locations for the site specific contaminated media. As such, the removal and disposal technology will be retained for development into alternatives.

3.6 Immobilization Treatment

As previously discussed, immobilization treatment methods are designed to render contaminants insoluble, prevent leaching, and prevent the movement of the contaminants from the area of contamination. Physical and/or chemical processes act to stabilize and solidify the contaminants within a matrix, thus reducing their mobility. Types of immobilization technologies include Solidification/Stabilization and In Situ Vitrification.

3.6.1 Solidification/Stabilization

The primary goal of solidification and stabilization processes is to reduce the solubility of contaminants to levels which will allow the material produced to be returned to its original location or disposed at an approved off-site landfill. The planned future use of the site on which the material is disposed is an important consideration for this process. The most available solidification and stabilization treatment processes include: Portland cement, Lime-fly ash pozzolan, Thermoplastic Microencapsulation, and Macroencapsulation systems.

Screening
The advantages of utilizing solidification/stabilization technologies, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
- In the cement-based processes, metals in the soil are bound due to the high pH of the binding materials
- With the thermoplastic process, the mobility of organic compounds may be limited since they are encapsulated within the solid matrix
- Treatment compounds have been developed for some specific organic materials for developing a matrix that is more stable than conventional cement solidification

Implementability
- Cement-based solidification/stabilization processes use conventional equipment that is readily available
- As compared to other immobilization technologies, the period of time required for implementation of the solidification/stabilization option is short term

The disadvantages associated with the effectiveness and implementability of the solidification/stabilization processes include the following:

Effectiveness
- Organic contaminants may interfere with the binding of a cement-based matrix
- Organics in the soil are generally not stabilized in the solidified matrix since they do not take part in the reactions of the process
- Gravelly soils may not be treatable by a cement-based process
- Fine soil particles which pass a No. 200 sieve size (0.075 mm) tend to weaken cement bonds

Implementability
- Thermoplastic encapsulation requires specialized equipment that is not readily available
- Energy is required to dry the soil prior to treatment in the thermoplastic encapsulation process

The organic materials present in the soil may interfere with the binding of the materials in the cement-based processes. In addition, the organic materials may not be stabilized in material solidified with the cement-based methods since they do not take part in the process reactions. Hydrocarbons and other contaminants not bound in the resulting solidified material have the potential to leach from the solidified material. Furthermore, since the contaminated site material includes a high percentage of coarse gravels and construction/demolition debris, the cement-based processes may not be effective for treating the contaminated solid media. Solids treated by the thermoplastic encapsulation process have the potential to leach contaminants, though the process appears to be more effective in treating the soil than cement-based processes. In addition, the process is relatively new and may not be widely accepted, and thermoplastic encapsulation requires equipment that may be difficult to locate and may require a great deal of space to set up the system. Accordingly, the solidification/stabilization soil treatment process has been screened out.

3.6.2 In Situ Vitrification

In situ vitrification is an innovative technology that has had limited field applications. The process has been performed on more than 30 different soil types and on a variety of contaminants. Destruction and removal efficiencies (DREs) for organics such as polynuclear aromatic hydrocarbons (PAHs) and PCBs have been reported to be greater than 99.99 percent. The DRE considers the destruction of organic materials by pyrolysis or combustion as well as removal of airborne organics by the off-gas treatment system. Mobilization and installation of the equipment required for an in situ vitrification system requires approximately one week. In order to meet the permitting requirements for an in situ vitrification treatment system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., water discharge and air emissions).

Screening

The advantages of utilizing the in situ vitrification technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness

- Destruction and removal efficiencies of greater than 99.99% are possible for organic materials
- In situ vitrification forms a solid matrix that is very stable
- Site specific metal concentrations are less than 16 percent of the soil weight and, therefore, the soil is treatable by this method

Implementability

- Soil removal is not necessary with in situ vitrification treatment

The disadvantages associated with the effectiveness and implementability of the in situ vitrification process include the following:

Effectiveness

- A significant volume of construction/demolition debris exists at the site, which may not be effectively treated using in-situ vitrification

- Field applications of this technology have been very limited
- Volatile metals (lead and mercury) present in the soil will likely be volatilized in the process. The resulting vaporized metals may be difficult to treat with air pollution control equipment

Implementability
- The equipment required for this system may not be readily available
- Treatment by in situ vitrification may difficult to implement and permit
- An extended period of time to treat the entire site may be required

In situ vitrification appears to very effective in treating the organic contaminants within the site soil, but several factors tend to deter recommendation for its use. A significant volume of construction/demolition debris exists at the site, which may not be effectively treated using this technology. It may be more difficult to permit an in situ vitrification treatment system with regulatory agencies than other alternative processes because of the limited number of field applications that have taken place. Furthermore, this technology is difficult to implement, and treatment of the entire site by this method would be uneconomical. Accordingly, the in situ vitrification process has been screened out of the listing of potential treatment processes.

3.7 Physical/Chemical Treatment

As discussed previously, physical treatment processes act to separate the wastestream by either applying a physical force or by changing the physical form of the waste. Chemical treatment processes act to alter the chemical structure of the contaminants in order to produce a waste residue that is less hazardous than the original contaminated material. Processes which utilize physical and chemical treatment include: Oil/Water Separation, Soil Washing, In Situ Soil Flushing, and Low Temperature Thermal Stripping.

3.7.1 Oil/Water Separation

After removal (pumping) from the surface water or groundwater environment, oil product is typically separated from the water fraction for temporary storage and subsequent treatment and/or disposal. Oil/water separation can be completed at the water table interface (within a recovery well or sump installation) using mechanical skimmers or separated after recovery from the recovery well or sump using an oil/water separator/tank. Mechanical skimmers equipped with oil sensors are the preferred means of completing oil separation when minimal soil permeability conditions exist and when minimal water recovery is desired.

In cases where permeable soil conditions and contaminated groundwater conditions exist, high-flow radial recovery (pumping) and subsequent separation within a surface-mounted oil/water separator is typically preferred.

Screening
Oil/water separation can provide effective recovery and removal of oil product. The rate of oil recovery and separation from surface waters or groundwaters can be adjusted to accommodate the physical conditions of the site and the type of oil product to be recovered and separated. Although oil/water separation using high-flow intermittent pumps and a

surface mounted oil/water separation tank can be implemented, this method of separation is requires more mechanical components than the skimming method. In addition, separation using high-flow pumps and a surface-mounted oil/water separation tank typically generates excessive quantities of water, which may require additional treatment prior to final discharge. Accordingly, (and consistent with the minimal permeability of the site soils and high viscosity of the oils present at the site) separation using the skimming technology will be retained for development into alternatives, while the surface-mounted oil/water separator tank technology has been screened out of the listing of potential treatment processes.

3.7.2 Soil Washing

Primarily a volume reduction process that does not reduce the toxicity of the contaminant, soil washing removes the contaminant from the soil and concentrates it into a washing agent that is more easily treated than soil. With water washing, a strong basic or surfactant solution is effective in extracting organics. Both hydrophobic organics (organics which have an aversion for water) and hydrophilic organics (organics having an affinity for water) are treatable with water washing. Soil washing has the potential to treat contaminants such as PCBs and semi-volatile organic compounds. Factors which can limit the effectiveness of soil washing include: media with significant clay or humic content and complex characteristic or variable size waste mixtures. Mobilization and installation of a soil washing system is site specific. Portable unit set up time may range between approximately 1 week for a small unit to 2 months for a large skid-mounted system. Soil washing treatment systems vary both in design and size. Portable models of the system, mounted on 40 foot trailer beds, have been developed. Portable units may generally process a few tons of contaminated soil per hour, while large commercial units are capable of processing greater than 10 tons of contaminated soil per hour. In order to meet the permitting requirements for soil washing system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., water discharge, air emissions, backfilling treated soil).

The advantages of utilizing the soil washing technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
- Soil washing can provide effective treatment for organic contaminants including PAHs and PCBs, however, each contaminant may require a different washing agent

Implementability
- The soil washing process is relatively simple, using readily available equipment and materials
- As compared with other physical/chemical treatment technologies, the period of time required for implementation of the soil washing process option is short term

The disadvantages associated with the effectiveness and implementability of the soil washing process include the following:

Effectiveness

- The process is primarily a volume reduction process where contaminants are transferred from the soil to the washing media.
- The effectiveness of this technology may be decreased by the complex and variable nature of the contaminated site media, which includes urban fill and construction/demolition debris

Implementability
- A great deal of equipment and area for treatment may be required
- The soil's complex physical characteristics, including a mix of urban fill and construction/demolition debris, may require additional treatment steps
- The washing media must be treated or disposed

Although soil washing is a potential method of treating the contaminated soil at the site, a high percentage of contaminated site media includes variable urban fill and construction/demolition debris. In addition, only a limited working area of space is available at the site to implement this technology. Accordingly, the soil washing technology has been screened out of the listing of potential treatment processes.

3.7.3 In Situ Soil Flushing

In situ soil flushing has remained in the experimental stages primarily because regulatory agencies are reluctant to recommend processes that involve injecting or flushing additives into the groundwater. In addition, there have been difficulties in the treatment of the extracted wastewater, with separating surfactants from petroleum products flushed from the soil. Consequently, surfactants used for treating contaminated soils may not be recyclable. In situ soil flushing may be utilized to treat soil contaminated with PAHs and PCBs. This process is most applicable when contamination has extended to the groundwater table, and is of sufficient volume or depth to exclude an alternative ex situ soil washing method. Factors that dictate which system, either forced or gravity delivery, is appropriate for a site include: the extent and nature of the contaminated soil, soil characteristics (such as porosity, permeability, stratigraphy, sorption potential, mineralogy and soil type[s]), surface drainage patterns and surface infiltration rates, and groundwater elevations and flow directions. Pilot studies of the in situ soil flushing process have been shown to be most effective on soils contaminated with only a few different chemicals, particularly petroleum hydrocarbons. For soils containing a complex mixture of contaminant types, the effectiveness of treatment may be limited and pretreatment or post-treatment may be necessary to attain the desired results. Mobilization and installation of an in situ soil flushing system may take approximately 30 days. In order to meet the permitting requirements for an in situ soil flushing system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., water discharge and air emissions).

The advantages of utilizing the in situ soil flushing technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
- The process can be used to treat organic contaminants within soil

Implementability
- Soil is not excavated from the site
- Manpower requirements are minimal for this process

The disadvantages associated with the effectiveness and implementability of the in situ soil flushing process include the following:

Effectiveness
- It is necessary to use the groundwater to retrieve washing agents that have leached through the contaminated soil
- The method is not widely accepted because of the potential of washing agents lingering in the soil matrix, some of which can be considered to be hazardous chemicals
- Pretreatment and post-treatment of the soil may be necessary
- It is necessary to have a defined groundwater flow pattern to ensure proper treatment of the soil and removal of the contaminants and washing agents

Implementability
- A complex contaminant mixture within the soil may require additional steps to treat the soil
- The groundwater extracted from the recovery wells must be treated or disposed
- As compared with other physical/chemical treatment technologies, the period of time required for implementation of the in-situ soil flushing process may be extensive

The shallow depth of the contaminants in relation to the groundwater depth, minimal groundwater hydraulic gradient, and the uncertainty of collecting the washing agent make this process option undesirable. In addition, since a high percentage of contaminated site media includes variable urban fill and construction/demolition debris, the effectiveness and implementability of this technology would likely be decreased. Accordingly, the in situ soil flushing technology has been screened out of the listing of potential treatment processes.

3.7.4 Low Temperature Thermal Stripping

Low temperature thermal stripping does not destroy contaminants, but transfers the contaminants from one waste stream to another. The process is applicable to volatile organics. The different low temperature thermal stripping technologies are most effective in treating soils contaminated with lighter petroleum hydrocarbons. Removal efficiencies for low temperature thermal treatment systems range from 55 percent to 99 percent. Some processes are effective only for highly volatile organic compounds.

Low temperature thermal stripping requires relatively expensive and specialized equipment. Only a limited number of remediation contractors possess the equipment to implement this technology.

Although implementable, low temperature thermal stripping is only partially effective in the treatment of heavier semi-volatile organic compound contaminants. The disadvantages associated with the effectiveness and implementability of the low temperature thermal stripping process include the following:

Effectiveness
- Low temperature thermal stripping is not very effective in removing semi-volatile organics (e.g. PAHs) from contaminated soil

Implementability
- The equipment may not be readily available
- Excavation of the soil is required
- The process could require a large area for setup

Low temperature thermal stripping does not appear to be effective in treating semi-volatile organic compounds in the soil. Accordingly, the low temperature thermal stripping method is screened out of the listing of potential treatment processes.

3.8 Biological Treatment

Bioremediation utilizes indigenous or cultured microorganisms to mediate the degradation of contaminants in soil. This technology involves altering environmental conditions to enhance the growth of microorganisms and subsequent breakdown of contaminants. Creating the proper environment is essential in the bioremediation process. Treatability and pilot studies are necessary factors for determining the indigenous microorganisms available in the soil, the primary controls needed to create the proper environment for optimal growth of the microorganisms, the treatment process to be used, and by-products that will be generated by the process. The treatability study is also necessary to determine if the concentrations of any of the contaminants in the soil are such that they will inhibit the growth of the microorganisms. Biological treatment processes include: Land Farming, Slurry Phase Bioremediation, Composting, and In Situ Bioremediation.

3.8.1 Land Farming

The feasibility and rate of degradation of the land farming process are determined by a number of factors, including: the type and concentration of contaminants present in the soil, soil moisture, soil grain size, soil texture, site topography, nutrients, precipitation, aeration/oxygen addition, temperature, soil pH, and microorganism population. Land farming has been found to be effective for the treatment of soils contaminated with petroleum hydrocarbons and is probably the most widely used and cost-effective biotreatment technology applied today. This process has also been shown to be effective in treating (PAHs). Mobilization and installation of a land farming system may range between 7 and 10 days and the equipment/material required for land farming is readily available.

Monitoring of the progress of the bioremediation project is essential. Land farming requires sufficient space, primarily to spread and mix the contaminated soil. Land farming is the one method of bioremediation that is the most susceptible to temperature changes. Since the site is located in an area where cold weather dominates a good portion of a year, the times where temperatures are supportive of biodegradation are limited. The remediation period for land farming may be expected to take between one and two years to degrade the majority of the contaminants present in the soil. In order to meet the permitting requirements for a land farming biological treatment system, it may be required to obtain permits from the New York

State Department of Health and the New York State Department of Environmental Conservation (i.e., water discharge and air emissions).

The advantages of utilizing the land farming technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness

- Land farming is proven to be effective in treating hydrocarbons such as PAHs
- This method is the most widely used and cost effective biological treatment method

Implementability

- The land farming technique is simplistic and required equipment is readily available
- Varying soil permeability does not pose a problem with this treatment process
- Leachate from the system can be re-circulated in the irrigation of the treatment area

The disadvantages associated with the effectiveness and implementability of the land farming process include the following:

Effectiveness

- Land farming is not an effective method in treatment of variable size solids, including construction/demolition debris
- Degradation of the hydrocarbon contaminants to lower levels may not be possible
- A land farming system is not able to capture and treat air emissions

Implementability

- Continuous monitoring of the contaminant degradation is necessary
- Land farming requires a large treatment area
- Land farming is susceptible to problems arising from temperature changes
- As compared to other biological treatment technologies, the time period required for implementation of the land farming process option may be extensive

Overall, bioremediation options are becoming a more popular option to treat contaminated soils, primarily because it is a natural remediation process that can be very cost-effective to implement.

However, existing site conditions make biotreatment by land farming difficult to implement and non-effective. The variable nature of the contaminated urban fill material (including a high percentage of construction/demolition debris) would likely be detrimental to the effectiveness and implementability of the land farming technology. In addition, the process would require the excavation of soil from the site, and a large area will be required for constructing the treatment area. This technology is susceptible to weather conditions, including temperatures and precipitation, that can greatly affect the degradation rate. Additionally, land farming is typically a slow treatment process and the desired lower limits of contamination removal may not be attainable. For these reasons, land farming does not appear to be a viable remediation method for treating the contaminated soil at the site, and is screened out from further consideration.

3.8.2 Slurry Phase Bioremediation

Factors which determine the overall effectiveness and degradation rate of slurry phase biological treatment include: contaminants present in the soil and their concentrations, soil physical characteristics, grain size, nutrients, soil moisture content, temperature, soil pH, and microorganism population. Slurry phase bioremediation provides for significantly more control of these factors compared to the other methods of bioremediation. It has been successfully used to treat contaminated soils containing a variety of organic compounds, including volatile and semi-volatile organic compounds (including PAHs).

Slurry phase bioremediation is generally capable of achieving non-detectable limits with most petroleum hydrocarbons within 30 to 60 days. Mobilization and installation of a slurry phase system may take less than 30 days to complete, and the equipment and materials necessary for this technology (some which are specialized) can usually be obtained in a reasonable timeframe. The slurry phase treatment process is the most controlled method of biological treatment. The process can be equipped with liquid and air emissions controls to limit the potential threat to water and air quality in the surrounding environment. In order to meet the permitting requirements for a slurry phase biological treatment system, it may be necessary to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e, water discharge and air emissions).

The advantages of utilizing the slurry phase biological treatment process, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness

- Slurry phase biotreatment is noted to be effective in treating petroleum related hydrocarbons and PAHs
- This method is one of the most effective and efficient biological treatment methods
- A slurry phase biotreatment system can capture and treat air emissions

Implementability

- A slurry phase biological treatment system requires a relatively small treatment area
- This biotreatment process is likely to be the most controlled method of biological treatment and may not be affected by external environmental conditions
- Slurry phase biotreatment may be used in conjunction with other treatment systems to eliminate materials that may inhibit bacterial growth
- As compared to other biological treatment technologies, the period of time required for implementation of a slurry phase biological treatment process option is short term

The disadvantages associated with the effectiveness and implementability of the slurry phase biological treatment process include the following:

Effectiveness

- The effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material

- The PAH concentrations present within the site soils may not be elevated to the extent where slurry phase bioremediation will be sufficiently effective in achieving contaminant removal

Implementability
- Continuous monitoring of the contaminant degradation is necessary
- The implementability of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material

Although slurry phase biological treatment is probably the most controlled method of bioremediation, the physical variability of the contaminated fill and construction/demolition debris will likely decrease the effectiveness and implementability of this bioremediation technology. In addition, the PAH concentrations present within the site soils may not be elevated to an extent where slurry phase bioremediation will be effective in achieving contaminant removal. For these reasons, the Slurry Phase Bioremediation process has been screened out of future remedial considerations.

3.8.3 Composting

The efficiency of degrading the contaminants using compositing is dependent upon maintaining proper environmental conditions, as with all biological treatment processes. Factors which determine the overall effectiveness, degradation rate, and efficiency of composting include: contaminants present in the soil and their concentrations, soil characteristics, nutrients, soil moisture content, temperature, pH control, microorganism population, mixing and aeration, and bulking agent addition. Composting exhibits significantly more control of these factors than the processes of in situ bioremediation and land farming, but less control than slurry phase bioremediation. Composting has been successfully utilized to treat contaminated soils containing a variety of organic compounds, including volatile and semi-volatile organic compounds. Composting bioremediation generally requires between 60 days to several months to treat a batch of contaminated soil. Remediation to levels below 1,000 ppm total petroleum hydrocarbons (TPH) may require more time. Remediation at or below 100 ppm TPH may not be possible for all contaminants with this treatment process. Mobilization and installation of a composting system may require less than 30 days to complete and the equipment and materials necessary for this technology (some which are specialized) can usually be obtained in a reasonable timeframe. The composting process may be controlled by utilizing a contained composting method. The process can be equipped with liquid and air emissions controls to limit the potential threat to water and air quality in the surrounding environment. In order to meet the permitting requirements for a composting treatment system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., water discharge and air emissions).

The advantages of utilizing the composting technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
- Composting is known to be effective in treating semi-volatile organic compounds

- This method may be a very effective biological treatment method, requiring relatively limited treatment times

Implementability
- Depending on the system setup, composting can provide good control of the system environment regarding temperature, moisture, and air emissions capture and treatment

The disadvantages associated with the effectiveness and implementability of composting include the following:

Effectiveness
- Remediation of petroleum hydrocarbons to levels below 100 ppm of total petroleum hydrocarbons may not be possible
- The effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material
- Depending on the type of composting system used, low ambient temperatures and precipitation may slow the degradation rate

Implementability
- The implementability of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material
- Continuous monitoring of the contaminant degradation is necessary
- Depending on the type of composting system used, the space requirements could be excessive
- As compared to other biological treatment technologies, the period of time required for implementation of the composting process option may be extensive

Composting can be a well-controlled method of bioremediation if the system is located in an enclosed building and has systems to monitor and control temperature, soil moisture content and air emissions. However, the physical variability of the contaminated fill and construction/demolition debris will likely decrease the effectiveness and implementability of this bioremediation technology. In addition, the PAH concentrations present within the site soils may not be elevated to an extent where composting will be an effective means of achieving contaminant removal. The compositing technology has accordingly been screened out from further consideration.

3.8.4 In Situ Bioremediation

The feasibility and degradation rate of in situ biological treatment are determined by factors including: contaminants present in soil, site hydrology, soil characteristics, oxygen content, nutrients present in soil, moisture content, soil temperature, soil pH, and bacteria population in soil. Organic materials, including petroleum hydrocarbons, are susceptible to in situ biodegradation. Lighter petroleum hydrocarbons, such as gasoline, diesel and heating oils degrade at a faster rate than heavier petroleum hydrocarbons. Volatile and semi-volatile organic compounds have been successfully removed using in situ biological treatment. During the first 60 to 90 days of the in situ bioremediation project, the degradation of the contaminants may be quite significant. However, as the quantity of available hydrocarbons

decreases, the rate of degradation slows significantly decreases. The entire biodegradation process may take between one and two years to remediate the majority of the contamination. This technology is still relatively new and actual field applications have been limited. In addition, extensive monitoring is necessary during the implementation of this technology in order to ensure effective treatment and minimal contaminant migration. Some specialized equipment and material are typically required to implement for in situ bioremediation. Mobilization and system installation time is generally less than 30 days. Space requirements for the above-ground components needed in the in situ bioremediation system are minimal, consisting primarily of a mixing tank and pumps. Injection and extraction wells would be installed at the site at the boundaries of the contamination. In order to meet the permitting requirements for an in situ biological treatment system, it may be necessary to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., soil/groundwater injection, water discharge, and air emissions). Due to the fact that there is limited experience with in situ bioremediation, regulatory agencies may be unwilling to issue permits for operation of this system.
The advantages of utilizing the in situ bioremediation technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
- In situ biological treatment has been demonstrated to be effective in treating various types of organic contaminants.

Implementability
- This treatment method has low maintenance requirement
- Soil excavation is not necessary
- Equipment required for the system may be minimal

The disadvantages associated with the effectiveness and implementability of the in situ biological treatment process include the following:

Effectiveness
- Remediation of petroleum hydrocarbons and PAHs to low levels may not be possible
- Low climate temperatures and precipitation may have an effect on the contaminant degradation rate
- The effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material

Implementability
- Continuous monitoring of the contaminant degradation is necessary
- In situ bioremediation is likely to take approximately two years or more to treat the contaminated soil at the site
- This method requires the use of the groundwater to capture leachate from the treatment zone. The groundwater is extracted, re-circulated, and is ultimately treated or disposed

A combination of factors indicates that in situ biological treatment is not an acceptable option for soil remediation at the site. This treatment method includes the use of the groundwater to treat the soil. Since the location of soil contamination is above the local water table, treatment by in situ bioremediation would thus involve a media (groundwater) that is currently not impacted. In addition, contaminants could be leached from the current area of contamination to zones of greater depth or adjacent neighboring residential properties that are currently not impacted. For these reasons, this option has been screened out from further consideration.

3.9 Thermal Treatment

Thermal treatment technologies utilize high temperatures as the primary means of detoxifying contaminated materials. Incineration primarily oxidizes organic compounds under controlled high temperatures, with end products of carbon dioxide and water. Byproducts such as acids, salts and metallic compounds will be produced from incinerating waste materials containing inorganic substances. The key variables with an incineration process include temperature, the duration of contaminated media exposure to the high temperatures, media size consistency, and the degree of mixing between the waste and the combustion air. If an incineration process is correctly calibrated, destruction and removal efficiencies (DREs) of greater than 99.99 percent may be achieved. There are several thermal treatment processes available for soil remediation, including: rotary kiln incineration, fluidized bed incineration, and infrared incineration.

3.9.1 Rotary Kiln Incineration

Rotary kiln incineration has been found to be effective in treating volatile and semi-volatile organic compounds in soil. Factors that can be detrimental to the effectiveness of the rotary kiln incineration process include: elevated soil moisture content, elevated metal and halogenated organic concentrations, and large or variable particle sizes. Specialized equipment is required to complete rotary kiln incineration. The permitting process for a high temperature thermal treatment system may be very lengthy and costly. In order to meet the permitting requirements for a rotary kiln incineration system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., system construction and operation, water discharge, and air emissions).

The advantages of utilizing the rotary kiln incineration technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
- A rotary kiln incinerator is noted to be effective in treating organic compounds, including volatile and semi-volatile organic compounds
- High contaminant DREs are possible with a rotary kiln incinerator

Implementability

- Rotary kiln incineration is an efficient soil treatment method and is the most available and widely used incineration process

The disadvantages associated with the implementability of the rotary kiln incineration process include the following:

Effectiveness

- The effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material

Implementability

- Because the site is located within an urban residential area, on-site thermal treatment may not appropriate for implementation
- The implementability of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material
- Permits for operating an on-site rotary kiln incineration unit may be difficult to attain from regulatory agencies
- Air emissions control equipment is required
- Ash disposal is necessary, and stabilization of the ash may be necessary prior to disposal if metals in the ash exceed TCLP parameters

Although rotary kiln incineration has been demonstrated to be effective in treating soil organic compounds, the effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/ demolition material. Implementation of this technology would require that the contaminated fill material be crushed or broken into consistently smaller sizes in order to achieve satisfactory contaminant treatment efficiency. In addition, since the site is located within an urban residential setting, on-site thermal treatment may not appropriate or approvable for implementation. For these reasons, the rotary kiln incineration option has been screened out from further consideration.

3.9.2 Fluidized Bed Incineration

Fluidized bed incineration has been demonstrated to be effective in treating volatile and semi-volatile organic contaminants in soil. Fluidized bed incinerators may be operated at lower temperatures than other high temperature thermal treatment systems because of the high levels of mixing involved in the process. This mixing provides a high thermal efficiency while minimizing auxiliary fuel requirements and volatile metals emissions. Factors that limit the effectiveness of fluidized bed incineration include: high soil moisture content, elevated concentrations of halogenated organics and metals, oversized particles, and high waste stream density. Mobilization and installation of the specialized fluidized bed incineration unit may take approximately 3 or 4 weeks to complete. A fluidized bed incineration unit available through Ogden Environmental Services, Inc. is capable of processing between 100 and 150 tons of contaminated soil per day. The permitting process for a high temperature thermal treatment system may be very lengthy and costly. In order to meet the permitting requirements for a fluidized bed incineration system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., system construction and operation, water discharge, air emissions).

The advantages of utilizing the fluidized bed incineration technology, with respect to an effective and implementable means of attaining the remedial action objectives, include the following:

Effectiveness
- A fluidized bed incinerator is noted to be effective in treating organic compounds
- High DREs are attainable with a fluidized bed incinerator
- This process is noted to have a high thermal efficiency and may be operated at lower temperatures than a rotary kiln incinerator

Implementability
- Fluidized bed incineration has relatively rapid treatment times
- Operating temperatures in a fluidized bed incinerator are generally between 1,500 and 1,600 degrees Fahrenheit, which results in the process having less potential to volatize metals with low boiling points

The disadvantages associated with the effectiveness and implementability of the fluidized bed incineration process include the following:

Effectiveness
- The effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material
- Additional air emission control equipment may be needed to control the emission of acid gases, caused by the incineration of halogenated hydrocarbons

Implementability
- The implementability of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material
- Because the site is located within an urban residential area, on-site thermal treatment may not appropriate for implementation
- Permits for operating an on-site incineration unit are difficult to attain from regulatory agencies
- A large area is required for the setup of a fluidized bed incineration system
- Equipment required for this system is extensive, and maintenance requirements are high
- As compared to other thermal treatment technologies, the period of time required for implementation of the fluidized bed incinerator process option may be extensive
- Air emissions control equipment is required
- Ash disposal is necessary, and stabilization of the ash may be necessary prior to disposal if metals in the ash exceed TCLP parameters

Although incineration with a fluidized bed incinerator is shown to be effective in treating organic contaminants in soil, the effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/

demolition material. Implementation of this technology would require that the contaminated fill material be crushed or broken into consistently smaller sizes in order to achieve satisfactory contaminant treatment efficiency. In addition, since the site is located within an urban residential setting, on-site thermal treatment may not appropriate or approvable for implementation. For these reasons, the fluidized bed incineration option has been screened out from further consideration.

3.9.3 Infrared Incineration

Infrared incineration has been found to be effective in treating soils containing volatile and semi-volatile organic compounds. Factors that limit the effectiveness of the infrared incineration process include: elevated soil moisture content, elevated volatile metal and halogenated organic concentrations, and large particle size.

Mobilization and installation of an infrared incineration system will take approximately one week. An infrared incineration system is capable of treating approximately 100 tons of contaminated soil per day. Specialized equipment is required to implement the infrared incineration system. The permitting process for a high temperature thermal treatment system may be very lengthy and costly. In order to meet the permitting requirements for an infrared incineration system, it may be required to obtain permits from the New York State Department of Health and the New York State Department of Environmental Conservation (i.e., system construction and operation, water discharge, air emissions).

Effectiveness

- An infrared incinerator is noted to be effective in treating organic compounds, including PAHs

Implementability

- The temperatures attained in an infrared thermal treatment system are generally between 1,400 to 1,600 degrees Fahrenheit in the primary and secondary chambers, respectively. Thus, an infrared incineration system has a lower potential to volatize with low boiling point metals.

The disadvantages associated with the implementability of the infrared incineration process include the following:

Effectiveness

- The effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material

Implementability

- The implementability of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/demolition material
- Because the site is located within an urban residential area, on-site thermal treatment may not appropriate for implementation
- Permits for operating an incineration unit are difficult to attain from regulatory agencies
- A large area is required for the setup of a the incineration system

- As compared to other thermal treatment technologies, the period of time required for implementation of the infrared incinerator process option may be extensive
- Air emissions control equipment is required
- Ash disposal is necessary, and stabilization of the ash may be necessary prior to disposal if metals in the ash exceed TCLP parameters

Although infrared incineration has been demonstrated to be effective in treating organic compounds, the effectiveness of this technology will be decreased by the variable physical characteristics of the contaminated urban fill and construction/ demolition material.

Implementation of this technology would require that the contaminated fill material be crushed or broken into consistently smaller sizes in order to achieve satisfactory contaminant treatment efficiency. In addition, since the site is located within an urban residential setting, on-site thermal treatment may not appropriate or approvable for implementation. For these reasons, the infrared incineration has been screened out from further consideration.

4.0 DEVELOPMENT OF REMEDIAL ALTERNATIVES

4.1 General

As previously delineated under Section 3, Screening of Remedial Technologies, the following candidate technology types or technology process options have been retained as part of the remedial technology screening process:

General Response Action	Technology Type	Process Options
Limited Action	Institutional Control	Deed Restrictions, Fencing, Groundwater Monitoring
Remove/Disposal	Off-Site Landfill	Solid Waste/RCRA/TSCA Landfill
		Oil Product Recovery
Containment	Covers	Soil or Bituminous Asphalt
Treatment	Physical Treatment	Oil/Water Separation

These technologies have been combined into the following remedial alternatives

Alternative #1:	No-Action
Alternative #2:	Limited Actions
Alternative #3:	Floating Oil Product Recovery/Separation and Cover PCB and PAH Contaminated Soils (Site Cover)
Alternative #4:	Floating Oil Product Recovery/Separation and Excavate/Dispose PCB and PAH Contaminated Soils

The No-Action Alternative, which consists of maintaining the current conditions at the site, will be evaluated as a means of comparison with the Action Alternatives. For purposes of this Remedial Alternatives Report, a limited number of applicable institutional controls will also be included as part of Alternatives #3 and #4. The Development of Alternatives section will focus on the areas and volumes for alternative consideration and alternative process descriptions.

4.2 Areas and Volumes Under Alternative Consideration

The actual volumes of soil that will be remediated are directly dependent upon the determination of a specific remedial cleanup scenario. This determination will be completed as a function of the detailed analysis of the remedial alternatives, which encompasses the analysis of effectiveness, implementability, and cost. The following types and estimate of volumes of contaminated soils were identified as part of the project-specific Site Investigation effort.

PCB Contaminated Soils – NYSDOH Hot Spot
- Area = 1,025 square feet; Depth = 5-6 feet from grade
- Volume = 5,125 to 6,150 cubic feet (190 to 230 cubic yards)

Shallow PAH Contaminated Solids - Western Site Area
- Area = 7,475 square feet; Depth = 5-6 feet from grade
- Volume = 37,375 to 44,850 cubic feet (1,385 to 1,660 cubic yards)

Deep PAH Contaminated Solids - Building Foundation Walls
- Area = 4,240 square feet; Depth = 13 feet from grade (approximate)
- Volume = 55,120 cubic feet (2,040 cubic yards)

Floating Oil Product – Along Building Foundation Walls
- Area Encountered = 1,400 square feet; Thickness = 6-12 inches
- Estimate Pore Space = 30% to 50%
- Volume = 210 to 700 cubic feet (1,575 to 5,250 gallons)

The description of the areas and volumes requiring remedial attention for each Remedial Alternative have been delineated in accordance with the applicable contaminant coincidence information. For purposes of defining the general areas with contaminant concentrations greater than respective remedial action objectives, the general site areas (i.e. southwest site) have been listed for each contaminant. The alternative descriptions will include a detailed analysis of the processes associated with implementation. General subjects including mobilization, preparation, application, quality control measures, and design/treatment specifications will be included as part of the alternative description.

4.3 Description of Remedial Alternatives

4.3.1 Alternative #1: No-Action

Under the "No-Action" alternative, the present conditions at the site would continue into the future. The No-Action alternative does not include operations to reduce existing contaminant exposure risks. Trespassers can access the site from one or more sides of the property without restriction and as such, the potential exists for contact with site contaminants.

4.3.2 Alternative #2: Limited Actions

The "Limited Actions" alternative consists of combining the institutional control technologies into an alternative. The limited action alternative does not specifically address waste areas with a specific remedial action. The goal of the limited action alternative is to provide protection of human health by primarily implementing procedural activities. The limited action alternative would leave contaminants in-place at the site. The limited action alternative may be implemented as the sole remedy, or one or a combination of the institutional control technologies may be used to supplement one of the other remedies. If used to supplement a remedy, the description of the limited action components is not repeated in the discussion of each alternative; however, differences in their planned implementation are identified where appropriate.

The limited action alternative consists of the following components:

Land Use Restrictions – The City of Syracuse, or the authority with jurisdiction of local land use, will propose the placement of land use restrictions on portions of the site that would prohibit soil excavation and construction of buildings on any part of the site where contaminants are present upon completion of the remedy.

The City of Syracuse may propose to record a notation on the deed to the property, or some other instrument that is normally examined during title search, that will perpetually notify any potential purchaser of the property that contaminated media are present at the property. Additionally, a record of the contaminants, as identified in the Site Investigation, may be filed with the local zoning authority, or the authority with jurisdiction over local land use.

Facility Use Restrictions – The City of Syracuse will develop and implement facility use restrictions consistent with the presence of contaminated materials. The exact facility use restrictions will be mutually agreed upon by all concerned parties. These restrictions may consist of limited future development to include only surface structures (slab on grade) with only minimal subsurface intrusion so as not to disturb or otherwise come in contact with contaminated materials.

Sign Posting – A sufficient number of signs will be posted in the vicinity of the portions of the site where contaminated materials remain. The exact wording on the signs will be determined during design of the remedy and will include a message indicating that only authorized personnel are allowed to enter the area and that entry to the area may be dangerous. Signs will be readable from a distance of at least 25 feet.

Fence Construction – The intent of fence construction is to restrict entry to the site. Based on the dimensions of the site property, it is estimated that approximately 1,300 linear feet of site fencing would be needed to completely enclose the property.

Instruction – Future land developers will be informed of the presence and location of contaminated material on the site. They will be informed of the procedures such that future development does not disturb the areas where contaminated materials exist or disturb the integrity of the institutional controls implemented at the site.

Groundwater Monitoring - A long-term groundwater monitoring program may be developed during design of the remedy. It is anticipated that this plan will delineate a frequency of monitoring (semi-annual/annual), the specific wells to be monitored, and the specific analyses to be conducted during each monitoring event.

4.3.3 Alternative #3: Floating Oil Product Recovery/Separation and Cover PCB and PAH Contaminated Soils (Site Cover)

Alternative #3 includes the following three components: 1) floating oil product recovery/separation and removal, 2) construction of an asphalt cover over the site, including PCB and PAH contaminated areas, and 3) a limited number of installation controls. Details regarding these alternative components are listed below.

Floating Oil Product Recovery/Removal
As part of the floating oil product recovery/removal component, a limited series of excavations will be completed in order to install oil product recovery sumps, recovery piping, and electrical conduit. Consistent with characteristics of the oil product identified at the site, it is anticipated that oil product can effectively be recovered using low-flow skimmers. Recovered oil product will be temporarily stored within a waste oil storage tank, staged within a prefabricated remediation shed. The tasks associated with implementation of this alternative component include:

- Identify floating oil product recovery locations
- Complete limited excavation to install 5 to 10 oil product recovery sumps
- Install HDPE or PVC slotted sumps (6-12 inch diameter) piping
- Backfill adjacent to sump piping with crushed (permeable) stone
- Install HDPE or PVC recovery piping and electrical conduit
- Stage one 550 or 1,000 gallon temporary oil storage tank within pre-fabricated remediation shed along southern portion of site
- Initiate system startup and perform routine monthly removal of recovered oil product for recycling/separation and removal

Asphalt Cover Construction Over Site Soils
The tasks associated with construction of an asphalt cover over the site, including PCB and PAH contaminated soils, include:

- Preparation – Plans and Specifications for the construction of an asphalt cover shall be prepared. A reconnaissance of the area to be covered will be completed prior to the commencement of active field work. Oversized wood, glass, metal, and stone material shall be manually removed from the area.

- Grade Preparation – The specified area may be brought to level grade with the addition of gravel material consisting of a well-blended fine gravel. All high spots will be blended and the final contours set. A limited thickness of surface soil removal will be completed to allow space for asphalt cover construction. To reduce the potential for contaminant air emissions, grade leveling will not be completed. Prior to the addition of an intermediate buffer, the area will be rolled with a smooth (10 ton minimum) roller.

- Geotextile/Subbase Layers – Upon completing the rolling of the area, a polyester (PET) or polypropylene (PP) geotextile with a minimum weight of 3.0 oz./yard will be applied over the area with manufacturers recommended overlaps. A minimum of three to four-inches of crushed limestone sub-base course shall then be placed and compacted to serve as a stable base for the asphalt cover. PET or PP geotextile with a minimum weight of 3.0 oz./yard will then be applied over the area with manufacturers recommended overlaps.

- Bitumen Layer Application - The first layer of bitumen will consist of a three-inch layer of NYSDOT Type 1 Base Course. Prior to applying supplemental layers of bitumen, the first layer will be rolled. Rolling of the first layer of bitumen will serve to obtain a voids content of four percent or less, thus achieving a minimum permeability of less than 1.0×10^{-7} cm/sec within the bitumen-asphalt layer. A layer of one and one-half inch NYSDOT Type 3 Binder Course followed by one and one-half inch top layer of NYSDOT Type 7 Top Course, consisting of NYSDOT Type 7 or 7F, will then be applied and rolled as the top asphalt layers of the cover.

- Storm Drainage and Asphalt Cover Gradation - As part of the cover application, installation of a storm drainage system will be necessary to divert precipitation and runoff waters from the site. Subsequent cover system grading will incorporate sloping of the asphalt cover to the storm drainage system. Installation of a storm drainage system and sloping of the applied asphalt cover will serve to minimize the areas in which standing precipitation or runoff water may exist, thus minimizing the potential for vertical infiltration. Given asphalt cover vertical permeabilities ranging from 1×10^{-7} cm/sec to 1×10^{-10} cm/sec, subsequent infiltration rates should be insignificant for areas in which a sloped cover is applied.

- Sealant Application - Upon allowing the asphalt seal to dry, the area would be suitable for automobile parking. To provide optimum contact with the existing pavement, a bead of liquid asphalt will be placed between the edges of the asphalt cover and the existing pavement. After a period of two years, an asphalt sealer may be applied over the entire span of the cover. Activities on-site which may lead to penetration or degradation of the asphalt-bitumen cover would not be recommended.

Remedial design efforts will include the preparation of plans and specifications for remedial contractor bidding. As part of these efforts, underground utilities will be identified within the mapping, plans, and specifications. The site will be prepared for the remediation activities by delineating sump installation locations, soil/debris removal areas, exit and entry routes for personnel and equipment, soil staging areas, and decontamination zones for personnel and equipment. Soil/debris staging areas, if required, will be properly contained during the time of staging to prevent contaminant release. Dust monitoring and control measures will be implemented to protect site workers and the surrounding community from airborne contaminants.

As part of this remedial alternative, it is anticipated that a limited volume of soil and/or construction/demolition debris will be generated for subsequent off-site disposal. The disposal process will consist of excavating the contaminated soil from its current location and transporting it to an appropriate off-site facility for disposal. The contaminated material will be disposed, with restrictions, without being treated. Off-site disposal facilities that will be considered include a Solid Waste Disposal Facility, a RCRA Hazardous Waste Facility, and/or a TSCA Chemical Landfill. Any facility selected will be in full compliance with their respective operating permits. The Solid Waste Disposal Facility will be a 6 NYCRR Part 360 Landfill. Acceptance of waste from the site at a 6 NYCRR Part 360 landfill will depend on the nature of the waste removed from the site. RCRA and TSCA landfills are operated in accordance with stricter regulations than a 6 NYCRR Part 360 landfill.

Excavation and earthwork will be conducted using standard construction and earth moving equipment such as backhoes and front-end loaders. Stockpiling of soils/debris will be limited to minimize waste handling and the release of contaminated airborne particulates. If large open containers such as trailer bodies or roll-off containers are used, soils may be loaded directly to avoid the need to stage and stockpile. Transportation of contaminated soils will be conducted by tractor trailer or dump truck to the designated disposal location. Waste haulers will be licensed and in compliance with State and Federal regulations applicable to waste transportation. Manifests for each transport vehicle will be prepared to document the contaminated soil throughout its passage from the point of origin to the point of disposal.

Institutional Controls

Since this remedial alternative includes the containing contaminated soils at the site, limited actions will be needed to ensure maintenance and monitoring of the remedial alternative. Institutional Controls, including maintenance and monitoring of the oil product recovery system and groundwater monitoring, shall be incorporated as remedial components of Alternative #3.

4.3.4 Alternative #4: Floating Oil Product Recovery/Separation and Excavate/Dispose PCB and PAH Contaminated Soils

Alternative #4 includes the following three components: 1) floating oil product recovery/removal, 2) excavation and disposal of PCB and PAH contaminated soils, and 3) a limited number of institutional controls. Details regarding these alternative components are listed below.

Floating Oil Product Recovery/Removal

As part of the floating oil product recovery/removal component, a limited series of excavations will be completed in order to install oil product recovery sumps, recovery piping, and electrical conduit. Consistent with characteristics of the oil product identified at the site, it is anticipated that oil product can effectively be recovered using low-flow skimmers. Recovered oil product will be temporarily stored within a waste oil storage tank, staged within a prefabricated remediation shed constructed at the site. The tasks associated with implementation of this alternative component include:

- Identify floating oil product recovery locations
- Complete limited excavation to install five to ten oil product recovery sumps
- Install HDPE or PVC slotted sumps (6-12 inch diameter) piping
- Backfill adjacent to sump piping with crushed (permeable) stone
- Install HDPE or PVC recovery piping and electrical conduit
- Stage 550 to 1,000 gallon temporary oil storage tank within pre-fabricated remediation shed along southern perimeter of the site
- Initiate system startup and perform routine monthly removal of recovered oil product for recycling/treatment

Excavation and Disposal of PCB and PAH Contaminated Soils

The excavation and disposal component of this alternative would include the following general steps:

- Isolate contaminated soil areas to be removed
- Excavate contaminated soils
- If necessary, contain and stage excavated soils on-site prior to shipment off-site
- Place contaminated soils in containers or trucks for shipment
- Transport all excavated soils from the site to a compliant landfill for disposal
- Place imported fill in the areas at the site where contaminated soil has been removed

Remedial design efforts will include the preparation of plans and specifications for remedial contractor bidding. As part of these efforts, underground utilities will be identified within the mapping, plans, and specifications. The site will be prepared for the remediation activities by delineating sump installation locations, soil/debris removal areas, exit and entry routes for personnel and equipment, soil staging areas, and decontamination zones for personnel and equipment. Soil/debris staging areas, if required, will be properly contained during the time of staging to prevent contaminant release. Dust monitoring and control measures will be implemented to protect site workers and the surrounding community from airborne contaminants.

Disposal tasks will include excavating the contaminated soil from its current location and transporting it to an appropriate off-site facility for disposal. The contaminated material will be disposed, with restrictions, without being treated. Off-site disposal facilities that will be considered include a Solid Waste Disposal Facility, a RCRA Hazardous Waste Facility, and/or a TSCA Chemical Landfill. Any facility selected will be in satisfactory compliance with their respective operating permits. The Solid Waste Disposal Facility will be a 6 NYCRR Part 360 Landfill. Acceptance of waste from the site at a 6 NYCRR Part 360 landfill will depend on the nature of the waste removed from the site. RCRA and TSCA landfills are operated in accordance with stricter regulations than a 6 NYCRR Part 360 landfill.

Excavation and earthwork will be conducted using standard construction and earth moving equipment such as backhoes and front-end loaders. Stockpiling of soils/debris will be limited to minimize waste handling and the release of contaminated airborne particulates. If large open containers such as trailer bodies or roll-off containers are used, soils may be loaded directly to avoid the need to stage and stockpile. Transportation of contaminated soils will be conducted by tractor trailer or dump truck to the designated disposal location. Waste haulers will be licensed and in compliance with State and Federal regulations applicable to waste transportation. Manifests for each transport vehicle will be prepared to document the contaminated soil throughout its passage from the point of origin to the point of disposal. In order to verify cleanup of the contaminated areas to acceptable levels, confirmation sampling of the areas in which excavation has taken place will be performed. Once removal of contaminated soils is verified to be complete, imported fill will be placed in the areas where excavation has been completed.

Institutional Controls
Although this remedial alternative will include excavation and removal of contaminated soils/debris from the site, a limited number of institutional actions will be needed to ensure maintenance and monitoring of the oil product recovery system. Furthermore, groundwater monitoring shall also be incorporated as a remedial component of Alternative #4.

5.0 DETAILED ANALYSIS OF ALTERNATIVES

5.1 Introduction

The purpose of this detailed analysis of alternatives is to analyze and present relevant information needed to select a site remedial alternative. The methodology utilized herein is in accordance with the Revised May 15, 1990 Technical and Administrative Guidance Memorandum (TAGM) HWR-90-4030 for the Selection of Remedial Actions at Inactive Hazardous Waste Sites. During the detailed analysis, each alternative is assessed against the seven evaluation criteria described in this section.

The specific requirements that must be addressed in the RA Report are as follows:

- Be protective of human health and the environment
- Attain New York State Standards, Criteria and Guidelines (SCGs)
- Satisfy the preference for treatment that significantly and permanently reduces toxicity, mobility, or volume of hazardous wastes as a principal element
- Be cost-effective

Seven evaluation criteria have been developed to address the requirements and considerations listed above. These evaluation criteria serve as the basis for conducting the detailed analyses and for subsequently selecting an appropriate remedial action. The evaluation criteria are:

1. Compliance with SCGs
2. Short-term impacts and effectiveness
3. Long-term effectiveness and performance
4. Reduction of toxicity, mobility, or volume
5. Implementability
6. Overall protection of human health and the environment
7. Cost

The detailed analysis of alternatives follows the development and screening of alternatives and precedes the actual selection of a remedy. The evaluations conducted herein build on the previous evaluations completed. The results of the detailed analysis serve to document the evaluation of alternatives and provide the basis and rationale for a remedy selection. The seven evaluation criteria listed encompass technical, cost, and institutional considerations, in addition to compliance with specific statutory requirements.

The level of detail necessary to analyze each alternative against these evaluation criteria has been based on the type of technologies and alternatives being evaluated considering the complexity of the site and other project-specific considerations. The analysis has been conducted in sufficient detail such that decision-makers can understand the significant aspects of each alternative and any uncertainties associated with their evaluation.
Each of the seven evaluation criteria has been further divided into specific factors to allow a thorough analysis of the alternatives. These factors are shown for each of the alternatives and discussed in the following sections. The purpose of this section is to provide a quantitative basis to evaluate each alternative with respect to the listed factors. The weight for each factor and criteria is also noted in the following section.

5.1.1 Compliance with Applicable New York State Standards, Criteria and Guidelines (SCGs) (Relative Weight: 10)

This evaluation criterion is used to determine how each alternative complies with applicable or relevant and appropriate New York State Standards, Criteria and Guidelines (SCGs). There are three general categories of SCGs: chemical-, location-, and action-specific. The detailed analysis has summarized which requirements are applicable or relevant and appropriate for each alternative and describes the requirements. The following has been addressed for each alternative under the detailed analysis of SCGs:

1. Compliance with chemical-specific SCGs.
2. Compliance with action-specific SCGs.
3. Compliance with location-specific SCGs.

The final determination of which requirements are applicable or relevant and appropriate will be made by the DEC in consultation with the DOH. If an alternative complies with all SCGs, it has been assigned a full score of 10. If an alternative complies with none of the above-mentioned three specific aspects of the SCGs, it has received a score of 0.

5.1.2 Short-Term Impacts and Effectiveness (Relative Weight: 10)

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial response objectives are met. Under this criterion, alternatives have been evaluated with respect to their effects on human health and the environment during implementation of the remedial action. The following factors of this analysis criterion are addressed for each alternative.

(i) Protection of the community during remedial actions - This aspect of short-term effectiveness addresses any risk that results from implementation of the proposed remedial action, such as dust from excavation activities.

(ii) Environmental impacts - This factor addresses the potential of adverse environmental impacts that may result from the implementation of an alternative and evaluates how effective available mitigation measures would be in preventing or reducing the impacts.

(iii) Time until remedial response objectives are achieved - This factor includes an estimate of the time required to achieve protection for either the entire site or individual elements associated with specific site areas or threats.

(iv) Protection of workers during remedial actions - This factor assesses threats that may be posed to workers and the effectiveness and reliability of protective measures that could be taken.

5.1.3 Long-Term Effectiveness and Performance (Relative Weight: 15)

This evaluation criterion addresses the results of a remedial action in terms of its performance and quantity/nature of waste or residual remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of the controls that may be required to manage the waste or residual remaining at the site, and operation and maintenance necessary for the remedy to remain effective. The following components of the criterion have been addressed for each alternative:

- Permanence of the remedial alternative.
- Magnitude of remaining risk - The potential remaining risk may be expressed quantitatively as cancer risk levels, or margins of safety over NOELs for non-carcinogenic effects, or by the volume or concentration of contaminants in waste, media, or treatment residuals remaining at the site. The characteristics of the residuals that should be considered, to the degree that they remain hazardous, taking into account their toxicity, mobility, and propensity to bio-accumulate.
- Adequacy of controls - This factor assesses the adequacy and suitability of control, if any, that are used to manage treatment residuals or untreated wastes that remain at the site. It includes an assessment of containment systems and institutional controls to determine if they are sufficient to ensure that exposure to human and environmental receptors is within protective levels.
- Reliability of controls - This factor assesses the long-term reliability of management controls for providing continued protection from residuals. It includes the assessment of the potential need to replace components of the alternative, such as: a cap; the potential exposure pathway; and the risks posed, should the remedial action need replacement.

5.1.4 Reduction of Toxicity, Mobility and Volume (Relative Weight: 15)

This evaluation criterion assesses the remedial alternative's use of treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous wastes as their principal element.

This evaluation focuses on the following specific factors for a particular remedial alternative:

- The amount of hazardous materials or contaminants that will be destroyed or treated, including how the principal threat(s) will be addressed.
- The degree of expected reduction in toxicity, mobility, or volume measured as a percentage of reduction (or order of magnitude).
- The degree to which the treatment will be irreversible.
- The type and quantity of treatment residuals that will remain following treatment.

5.1.5 Implementability (Relative Weight: 15)

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. This criterion involves analysis of the following factors:

Technical Feasibility

- Construction and operation - This relates to the technical difficulties and unknowns associated with the ability to construct the alternative.
- Reliability of technology - This focuses on the ability of a technology to meet specified process efficiencies or performance goals and the likelihood that technical problems will lead to schedule delays.
- Ease of undertaking additional remedial action - This includes a discussion of what, if any, future remedial actions may need to be undertaken and how difficult it would be to implement such additional actions.
- Monitoring considerations - This addresses the ability to monitor the effectiveness of the remedy and includes an evaluation of the risks of exposure should monitoring be insufficient to detect a system failure.

Administrative Feasibility

This criterion addresses the required extent of coordination with other agencies.

Availability of Service and Materials

- Availability of adequate off-site treatment, storage capacity, and disposal services.
- Availability of necessary equipment, specialists, and skilled operators and provisions to ensure any necessary additional resources.
- Availability of services and materials, plus the potential for obtaining competitive bids, which may be particularly important for alternative remedial technologies.

Of the total weight of 15, the technical feasibility shall receive a maximum score of 10 while administrative feasibility and availability of services and materials shall be assigned a combined maximum score of 5.

5.1.6 Cost (Relative Weight: 15)

The application of cost estimates to evaluation of alternatives is discussed in the following paragraphs.

(1) Capital Costs. Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs and are based on 2001-2002 rates. Direct costs include expenditures for the equipment, labor, and materials necessary to install remedial actions. Indirect costs include expenditures for engineering and other services that are not part of actual installation activities but are required to complete the installation of remedial alternatives. Capital costs that must be incurred in the future as part of the remedial action alternative are identified and noted for the years in which they will occur.

Direct capital costs may include the following:

- Survey costs - Expenses associated with delineating the site for remediation. Cost estimates were calculated using Means Cost Data reports supplemented with a 10 percent increase for hazardous waste site work.

- Mobilization/demobilization - Costs of materials, labor (including fringe benefits and workers' compensation), and equipment required to install a remedial action. Also includes costs of construction trailer rentals and utilities. Cost estimates were calculated using Means Cost Data reports supplemented with a 10 percent increase for hazardous waste site work.
- Air monitoring - Costs of monitoring the air quality at the site during remediation operations for site worker and community safety. Costs estimates were taken from contractor information.

- Excavation - Costs of removing contaminated soils and residues from the site for treatment or disposal alternatives. Cost estimates were provided by a survey of contractors.

- Stockpile and maintenance - Costs of staging contaminated materials that have been excavated from the site. Cost estimates were calculated using Means Cost Data reports supplemented with a 10 percent increase for hazardous waste site work.

- Loading - Costs of loading contaminated materials that have been excavated from the site into vehicles or containers for transport from the site. Cost estimates were calculated using Means Cost Data reports supplemented with a 10 percent increase for hazardous waste site work.

- Transportation - Costs of transporting contaminated materials such as soils and residues from the site to a landfill or incineration facility. Cost estimates were provided by a survey of contractors.

- Landfill costs - Costs of disposing of contaminated materials that have been removed from the site, including soils and residues. Cost estimates were provided by Chemical Waste Management of New Jersey.

- Site restoration - Costs of placing clean fill, backfilling and compaction, and seeding areas at the site where soil excavation has taken place. Cost estimates were calculated using Means Cost Data reports supplemented with a 10 percent increase for hazardous waste site work.

Indirect capital costs may include:

- Engineering fees - Costs of administration, design, construction supervision, drafting, and treatability testing. Costs were estimated using a standard fee of 20 percent of remedial construction costs.

- Legal fees - Administrative and technical costs necessary to obtain licenses and permits for installation and operation. Costs were estimated to be 5 percent of earthwork costs.

- Contractor overhead and profit - Costs were estimated using a standard fee of 25 percent of earthwork costs.

- Bonds and insurance - Costs were calculated using a Means Cost Data estimate supplemented with a 10 percent increase for hazardous waste site work.

(2) Operation and Maintenance Costs. Annual post-construction costs necessary to maintain the continued effectiveness of the asphalt cover option. The following annual cost components were considered:

- Annual maintenance - Costs for labor, parts, and other resources required for routine annual maintenance.

- Administrative costs - Costs associated with the administration of maintenance operations.

- Costs of periodic site reviews - Costs for periodic site reviews (to be conducted every five years) if a remedial action leaves any hazardous substances, pollutants, or contaminants at the site.

(3) Future Capital Costs. Future maintenance costs for remedial actions such as an asphalt pavement cover (assuming a service life of 30 years) would include replacement of the asphalt cover after 15 years, and periodic sealant application over the asphalt cover.

(4) Cost of Future Land Use. Any remedial action that leaves contaminants at a site may affect future land use and perhaps groundwater use. Restricted access or use of such sites will result in loss of business activities, residential development, and taxes to the local, State and Federal governments. During the remedial alternatives assessment, potential future land use of the site should be considered. Based on this potential land use, economic loss attributable to such use should be calculated and included as a cost of the remedial alternative. In addition, the continuing presence of contaminants at the site, even though remediated, may have a negative effect on surrounding property values. This loss in value should also be considered as a cost of the remedial program developed for the site.

Cost of restricted future land use should be determined for sites only when such cost is deemed appropriate and significant. When cost of land surrounding a contaminated site is determined to be significant in relation to the cost of a remedial alternative, then cost of restricted future land use as described above should be determined for inclusion in the present worth analysis of the remedial alternative. Economic loss due to the future land use should be derived based on comparison with a neighboring community not affected by site contaminants.

Accuracy of Cost Estimates. Costs estimate information was gathered from a number of different sources, including: construction contractors, remedial cleanup companies, environmental service companies, and Means Cost Data estimates. Cost estimates were developed using information from the Site Investigation and should be accurate within 50 percent.

Present Worth Analysis. A present worth analysis was used to evaluate expenditures that occurred over different time periods by discounting all future costs to a common base year - 2002. This allows the cost of remedial action alternatives to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover costs associated with the remedial action over its planned life. Present worth analyses were performed for the various alternatives using an interest rate of 8 percent for a period of 30 years.

5.1.7 Overall Protection of Human Health and the Environment (Relative Weight: 20)

This evaluation criterion provides a final check to assess whether each alternative meets the requirement that it is protective of human health and the environment. The overall assessment of protection is based on a composite of factors assessed under other evaluation criteria, including long-term effectiveness and performance, short-term effectiveness, and compliance with SCGs. Evaluation of the overall protectiveness of an alternative during the SI/RA focuses on how a specific alternative achieves protection over time and how site risks are reduced. The analysis indicates how each source of contamination is to be eliminated, reduced, or controlled for each alternative.

5.1.8 Presentation of Individual Analysis

The analysis of individual alternatives against the seven criteria is presented in the RA report as a narrative discussion accompanied by a summary table. This information will be used to compare the alternatives and support a subsequent analysis of the alternatives made by the decision-maker in the remedy selection process. The narrative discussion for each alternative provides (1) a description of the alternative and (2) a discussion of the individual criteria assessment. The alternative description provides data on technology components (use of innovative technologies should be identified), quantities of hazardous materials handled, time required for implementation, process sizing, implementation requirements, and assumptions. These descriptions will also serve as the basis for selecting the SCGs. Therefore, the key SCGs for each alternative are identified and integrated into these discussions. The narrative discussion of the analysis for each alternative presents the assessment of the alternative against each of the seven criteria. This discussion focuses on how, and to what extent, the various factors within each of the seven criteria are addressed.

5.1.9 Comparative Analysis of Alternatives

Once the alternatives have been individually assessed against the seven criteria, a comparative analysis should be conducted to evaluate the relative performance of each alternative in relation to each specific evaluation criterion. This analysis is in contrast to the preceding analysis in which each alternative was analyzed independently without the consideration of interrelationships between alternatives. The purpose of this comparative analysis is to identify the advantages and disadvantages of each alternative relative to one another so that the key trade-offs can be identified by the decision-maker.

The first five criteria (short-term effectiveness; long-term effectiveness and permanence; reduction of toxicity, mobility, and volume; implementability; and cost) will generally require more discussion than the remaining criteria because the key trade-offs or concerns among alternatives will most frequently relate to one or more of these five criteria. The overall protectiveness and compliance with SCGs criteria will generally serve as threshold determinations, in that they either will or will not be met. Community preference will not be evaluated because such information is frequently not available until the SI/RA report and proposed remedial action plan have been received, and a final remedy selection decision is being made.

5.1.10 Presentation of Comparative Analysis

The comparative analysis includes a narrative discussion describing the strengths and weaknesses of the alternatives relative to one another with respect to each criterion, and how reasonable variations of key uncertainties could change the expectations of their relative performance. If destruction and treatment technologies are being considered, their potential advantages in cost or performance and the degree of uncertainty in their expected performance (as compared with conventional/isolation technologies) are also discussed. The comparative analysis summarizes the total sizing for each alternative.

The presentation of differences between alternatives can be measured either qualitatively or quantitatively, as appropriate, and should identify substantive differences (e.g. - greater short-term effectiveness concerns, greater cost, etc.) between alternatives, differences in total scores, etc. Quantitative information that was used to assess the alternatives (e.g. - levels of residual contamination) is included in these discussions. The Final SI/RA or the Proposed Remedial Action Plan (PRAP) should present the remedial alternative recommended for the site and clear rational for the recommendations.

5.1.11 Community Assessment

This assessment incorporates public comment into the selection of a remedy. The NYSDEC will solicit public comments on the remedial alternatives and the recommended remedial alternative.

5.2 Detailed Analysis of Alternative #1: No-Action

5.2.1 General

Under the No-Action Alternative, the present conditions at the site would continue into the future. Property trespassers could access the site from one or more sides and the potential for contact with site contaminants would exist.

5.2.2 Compliance with Applicable or Relevant and Appropriate New York State Standards, Criteria and Guidelines

The Standards, Criteria and Guidelines (SCGs) pertaining to this alternative are summarized in Table 1-1.

5.2.3 Short Term Effectiveness

Protection of Community/Site Personnel During Remedial Action
The No-Action Alternative does not incorporate the completion of remedial actions. Although additional human exposure risks resulting from the on-site completion of soil remediation activities would not occur, the risks associated with exposure to existing site contaminants would persist.

Environmental Impacts During Remedial Action
As the No-Action Alternative does not incorporate the completion of remedial construction activities, adverse environmental impacts originating from such activities would not occur.

Timetable for Achieving Remedial Objectives
As the No-Action Alternative does not incorporate the completion of remedial activities, a timetable for achieving the objective of No-Action is not applicable.

Protection of Workers During Remedial Actions
As the No-Action Alternative does not incorporate remedial construction, the need for remedial contractor-worker protection is not applicable.

5.2.4 Long-Term Effectiveness and Permanence

Remedial Permanence
The No-Action alternative will not provide remedial permanence.

Quantity and Nature of Wastes Remaining On-Site After Remediation
Under the No-Action/Limited Action Alternative, remediation of site specific soil contamination would not be completed. Identified floating oil product and soil contamination, including elevated concentrations of PCBs and PAHs, would remain unchanged upon implementation of this alternative. A listing of the contaminant specific soil concentrations and volumes which would remain on-site and unremediated under this alternative are included in the following Table.

Quantity and Nature of Soil Contamination
Remaining On-Site After Remediation
ALTERNATIVE #1

PCB Contaminated Soils – NYSDOH Hot Spot
- Area = 1,025 square feet; Depth = 5-6 feet from grade
- Volume = 5,125 to 6,150 cubic feet (190 to 230 cubic yards)

Shallow PAH Contaminated Solids - Western Site Area

- Area = 7,475 square feet; Depth = 5-6 feet from grade
- Volume = 37,375 to 44,850 cubic feet (1,385 to 1,660 cubic yards)

Deep PAH Contaminated Solids - Building Foundation Walls

- Area = 4,240 square feet; Depth = 13 feet from grade (approximate)
- Volume = 55,120 cubic feet (2,040 cubic yards)

Floating Oil Product – Along Building Foundation Walls

- Area Encountered = 1,400 square feet; Thickness = 6-12 inches
- Estimate Pore Space = 30% to 50%
- Volume = 210 to 700 cubic feet (1,575 to 5,250 gallons)

Long Term Reliability and Adequacy of Remedy
The concept of alternative reliability and adequacy does not apply under the No-Action alternative.

Long Term Monitoring/Maintenance
Under the No-Action alternative, no remedial monitoring or maintenance will be completed.

5.2.5 Reduction of Mobility, Toxicity or Volume

Volume of Waste Reduction
The volumes of on-site contaminated soil and existing floating oil product that have been identified will remain unchanged for the No-Action alternative.

Degree of Expected Waste Reduction
Under the No-Action alternative, there will be no reduction in the volume of on-site contaminated soils/media.

Irreversibility of the Remedy
The concept of remedial irreversibility does not apply under the No-Action alternative.

5.2.6 Implementability

Technical Feasibility
Under the No-Action alternative, remedial activities incorporating innovative technologies will not be completed. Implementation of the No-Action alternative will maintain site conditions as they presently exist.

Administrative Feasibility
Under the No-Action alternative, no remedial activities, monitoring, or maintenance will be completed; and as such, no administrative correspondence will be necessary.

Availability of Personnel and Materials
Technology specific personnel and materials are not required for the No-Action alternative.

5.2.7 Protection of Human Health and the Environment

Future Site Use
Although the future use of the site is presently unknown, the City would prefer to develop the site for commercial, business, or residential use.

Protection of Human Health After Remediation
The No-Action Alternative does not incorporate the completion of remedial actions. Although additional human exposure risks resulting from the on-site completion of soil remediation activities would not occur, the risks associated with exposure to existing site contaminants would persist.

Magnitude of Risks After Remediation
As the No-Action Alternative does not incorporate the remediation of site contaminants, the magnitude of risks associated with the No-Action Alternative would be equal to those risks associated with existing contaminant (PCBs and PAHs) exposure. Currently, PAH contaminated soils exist along the southern and western portions of the site, while PCB contaminated soils exist in the west-central site area known as the NYSDOH Hot-Spot.

5.2.8 Cost

Other than legal fees associated with alternative implementation, no costs are anticipated for the No-Action Alternative.

5.3 Detailed Analysis of Alternative #2: Limited Actions

5.3.1 General

The limited action alternative consists of combining institutional control technologies into an alternative which may be implemented as the sole remedy, or it may be used to supplement other remedial alternatives. The goal of the limited action alternative is to provide protection of human health by implementing a limited action primarily consisting of procedural activities. The limited action alternative does not specifically address waste areas with a specific remedial action.

5.3.2 Compliance with Applicable or Relevant and Appropriate New York State Standards, Criteria and Guidelines

The Standards, Criteria and Guidelines (SCGs) pertaining to this alternative are summarized in Table 1-2.

5.3.3 Short Term Effectiveness

Protection of Community/Site Personnel During Remedial Action
The Limited Action alternative does not incorporate the completion of remedial actions. Although additional human exposure risks resulting from the on-site completion of soil remediation activities would not occur, the risks associated with exposure to existing site

contaminants would persist. The goal of the Limited Action alternative is to provide protection of human health by implementing a limited action consisting of one or a combination of the following components: land use restrictions, facility use restrictions, sign posting, fence installation, and groundwater monitoring.

Environmental Impacts During Remedial Action

As the Limited Action alternative does not incorporate the completion of remedial construction activities, other than sign posting, fence installation, or groundwater monitoring, significant adverse environmental impacts originating from such activities would not be expected to occur.

Timetable for Achieving Remedial Objectives

As the Limited Action Alternative does not incorporate the completion of detailed remedial activities, a respective timetable for achieving limited actions would be equal to the time necessary to complete any or a combination of the limited action components, which is estimated to range from several weeks to 6 months from the date of component implementation.

Protection of Workers During Remedial Actions

As part of the qualifications for the completing limited action tasks (such as sign posting, fence installation, or groundwater monitoring well installation), contractors performing remedial activities at the site shall demonstrate compliance with 29 CFR 1910.120. A project specific Remedial Action Health and Safety Plan shall be prepared by a Certified Industrial Hygienist or ***Professional Engineer*** prior to the initiation of remedial cleanup activities. During remedial site activities, workers within the immediate vicinity of PCB or PAH soil contamination shall be equipped with personal protection equipment to prevent exposure to the contaminants of concern. A project health and safety officer will be present on-site during the completion of remedial cleanup activities.

5.3.4 Long-Term Effectiveness and Permanence

Remedial Permanence

The Limited Action alternative will provide for the protection of human health by implementing land and facility use restrictions, limiting site access, instruction of exposure risks, and monitoring local groundwaters for contaminant migration. Although the Limited Action Alternative is not considered a permanent remedy by the NYSDEC, the incorporation of limited actions with other active remedial alternatives may be useful.

Quantity and Nature of Wastes Remaining On-Site After Remediation

Under the Limited Action Alternative, remediation of site specific soil contamination would not be completed. Identified floating oil product and soil contamination, including elevated concentrations of PCBs and PAHs, would remain unchanged upon implementation of this alternative. A listing of the contaminant specific soil concentrations and volumes, which would remain on-site and unremediated under this alternative, is included in the following Table.

Quantity and Nature of Soil Contamination
Remaining On-Site After Remediation
ALTERNATIVE #2

PCB Contaminated Soils – NYSDOH Hot Spot

- Area = 1,025 square feet; Depth = 5-6 feet from grade
- Volume = 5,125 to 6,150 cubic feet (190 to 230 cubic yards)

Shallow PAH Contaminated Solids - Western Site Area

- Area = 7,475 square feet; Depth = 5-6 feet from grade
- Volume = 37,375 to 44,850 cubic feet (1,385 to 1,660 cubic yards)

Deep PAH Contaminated Solids - Building Foundation Walls

- Area = 4,240 square feet; Depth = 13 feet from grade (approximate)
- Volume = 55,120 cubic feet (2,040 cubic yards)

Floating Oil Product – Along Building Foundation Walls

- Area Encountered = 1,400 square feet; Thickness = 6-12 inches
- Estimate Pore Space = 30% to 50%
- Volume = 210 to 700 cubic feet (1,575 to 5,250 gallons)

Long Term Reliability and Adequacy of Remedy

Components included within the Limited Action alternative have been shown to be a reliable and adequate means of restricting site usage and access, instituting contaminant awareness, and monitoring the migration status of contaminants.

Long Term Monitoring/Maintenance

Under the Limited Action alternative, long-term groundwater monitoring would be implemented to maintain the protection of on-site and off-site human health.

5.3.5 Reduction of Mobility, Toxicity or Volume

Volume of Waste Reduction
The volumes of on-site contaminated media (floating oil product and soil) that have been identified will remain unchanged under the Limited Action alternative.

Degree of Expected Waste Reduction
Under the Limited Action alternative, there will be no reduction in the volume of on-site contaminated soils.

Irreversibility of the Remedy
The concept of remedial irreversibility does not apply under the Limited Action alternative.

5.3.6 Implementability

Technical Feasibility
Under the Limited Action alternative, one or a combination of non-technical limited action components would be completed to limit site access, limit site usability, and monitor for the potential migration of on-site contaminants. The completion of limited action tasks (including restricting land and site usage, installation of site perimeter fencing, and groundwater monitoring) can be accomplished in a relatively short time frame with few technical difficulties, delays or problems.

Administrative Feasibility
Under the Limited Action alternative, a minimal degree of administrative communication including the completion of status reports and annual monitoring reports may be necessary to maintain appropriate correspondence.

Availability of Personnel and Materials
Personnel required for the completion of the Limited Action alternative components include legal counsel, OSHA instruction personnel, construction contractors, subsurface drilling contractors, and engineering and analytical testing consultants. Personnel capable of performing the tasks associated with the Limited Action alternative components are readily available and minimal technical specialists will be required. More than one vendor will be available to provide a competitive bid for the Limited Action components tasks. The labor and materials required to complete any of the Limited Action tasks are locally and readily available.

5.3.7 Protection of Human Health and the Environment

Future Site Use
Although the future use of the site is presently unknown, the City would prefer to develop the site for commercial, business, or residential use.

Protection of Human Health After Remediation
The Limited Action alternative does not incorporate the completion of remedial actions. Although additional human exposure risks resulting from the on-site completion of soil remediation activities would not occur, the risks associated with exposure to existing site contaminants would persist. The goal of the Limited Action alternative is to provide protection of human health by implementing a limited action consisting of one or a combination of the following: land use restrictions, facility use restrictions, sign posting, perimeter fence installation, and groundwater monitoring.

Magnitude of Risks After Remediation
As the Limited Action alternative does not incorporate the remediation of site contaminants, the magnitude of risks associated with the Limited Action Alternative would be equal to those risks associated with existing contaminant (PCBs and PAHs) exposure. Currently, PAH contaminated soils exist along the southern and western portions of the site, while PCB contaminated soils exist in the west-central site area known as the NYSDOH Hot-Spot.

5.3.8 Cost

As a conservative estimate, the maximum costs associated with land/facility use restrictions, sign posting, and perimeter fence installation, will be utilized as the minimum total costs for the Limited Action Alternative. The general costs for the various components within the Limited Action Alternative are listed as follows:

Land Use Restrictions
The costs associated with the application of land use restriction primarily incorporate attorney fees associated with the implementation of site deed restrictions, and filing a record of notation with the local zoning authority. Time and cost estimates for this Limited Action subcomponent range from 10 to 20 hours, at rates of $ 150.00 per hour, with totals ranging from $1,500 to $3,000.

Sign Posting
Average costs for the construction and the posting of signs (at 65 foot intervals surrounding the site), which reveal site hazards to the adjacent community are as follows.

Sign Posting	Unit Price	Units	Total Price
Stock 24"x 24" Aluminum Reflecting, High Intensity Signs, Posted on Fence	$ 70 ea.	20	$ 1,400

Fence Installation
Installation of a new site fence will serve to restrict entry to the site. The cost to implement fence installation for the site is listed in the following table.

Task	Unit Price	Units	Total Costs
Fence Installation	$ 80	1,300 l.f.	$104,000
Gate Installation	$800	1 gate	$ 800

Groundwater Monitoring
The Groundwater Monitoring Limited Action component may be incorporated as a complementary task. A groundwater monitoring program proximate to contaminated soils that have been contained on-site would serve to provide detection of potential contaminant migration proximate to the soils of concern. The preferred Limited Action groundwater monitoring scenario includes annual monitoring of the five existing groundwater monitoring wells for volatile and semi-volatile organic compounds.

The annual costs and present worth costs over a 30-year period associated with the groundwater sampling, groundwater analysis, and data interpretation incorporated within this groundwater monitoring scenario is included in the following Table.

Summary of Annual Groundwater Monitoring Tasks and Estimated Costs

Task	**Total Annual Costs**
a. Sampling (12.5 hours @ $80/hr.)	$ 1,000
b. VOC and Semi-VOC Analyses ($300/sample)	$ 1,500
c. Reporting	$ 3,000
Annual Costs	$ 5,500
30 years of Semi-Annual Monitoring (Present Worth 30 years at 8% Interest)	**$673,000**

The total costs for implementation of the previously listed limited action tasks are estimated as follows:

Task	**Estimated Cost**
Land Use Restrictions	$ 3,000
Sign Posting	$ 1,400
Fence and Gate Installation	$104,000
Annual Groundwater Monitoring (Present Worth – 30 years)	$673,000
Total Cost – Limited Actions	**$781,400**

5.4 Detailed Analysis of Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils (Site Cover)

5.4.1 General

This alternative includes the recovery of floating oil product and construction of an asphalt cover over the site (including PCB and PAH contaminated soils). The asphalt cover will consist of a geotextile layer, gravel subbase layer, and bituminous asphalt layers.

5.4.2 Compliance with Applicable or Relevant and Appropriate New York State Standards, Criteria and Guidelines

The Standards, Criteria and Guidelines (SCGs) pertaining to this alternative are summarized in Table 1-3.

5.4.3 Short-Term Effectiveness

Protection of Community During Remedial Action
For this alternative, on-site remedial tasks will include limited excavation and sump installation efforts, as well as construction of an asphalt cover over the site. The completion of these on-site tasks will result in the disturbance of soils, and the potential creation of contaminated airborne particulates. To suppress the potential for airborne particulate contaminant migration, dust control measures such as calcium chloride or water application will be utilized to maintain elevated moisture contents within surface soils, thus inhibiting airborne transport. Periodic air testing will also be performed in an effort to monitor the air quality during the most intrusive on-site remedial activities.

Environmental Impacts During Remedial Action
For this alternative, adverse impacts to the environment via groundwater or surface water during on-site remedial actions are not expected. On-site remedial tasks will include the excavation and removal of incidental PAH contaminated soils and C&D debris so as to allow for installation of floating oil product recovery sumps. Grade preparation will also be completed at the site prior to cover application. The completion of these on-site tasks will result in the disturbance of soils and the potential creation of contaminated airborne particulates. To suppress the potential for airborne particulate contaminant migration, dust suppressants such as calcium chloride or water will be utilized to maintain elevated moisture content within surface soils, thus reducing adverse environmental impacts to the local air quality. Periodic air testing will also be performed in an effort to monitor the air quality during on-site remedial activities. Since the maximum depth extent of on-site contamination exists above or at the local water table interface, adverse impacts to the local groundwater or local surface waters are not expected during implementation of this alternative.

Timetable for Achieving Remedial Objectives
The time that may be required for implementation of this alternative is estimated to be approximately 16 weeks. Mobilization and demobilization of equipment and personnel will take approximately 1 week to complete. Limited excavation and removal of incidental contaminated soil and C&D debris for transport and disposal within an approved solid waste

landfill will require about 4 weeks. Approximately 4 weeks will be needed to construct the bituminous asphalt cover over the PCB and PAH contaminated soil areas.

A list of the time required to implement the primary tasks of this alternative is shown in the following Table.

Timetable Alternative #3: Floating Oil Product Recovery and Site Asphalt Cover	
Task	Time To Implement (weeks)
Survey	3
Mobilization/demobilization	1
Clear/grub and spoil removal	1
Limited soil excavation and transport to landfill	5
Sump installation and backfill	1
Limited site grading	1
Asphalt cover	4
Total	16

Protection of Workers During Remedial Actions
As part of the qualifications for remedial cleanup excavation and construction, contractors performing remedial activities shall be required to comply with OSHA regulations as contained in 29 CFR 1910.120. A project specific Remedial Cleanup Health and Safety Plan shall be prepared by a Certified Industrial Hygienist or Professional Engineer prior to the initiation of remedial cleanup activities. During remedial cleanup activities, workers within the immediate vicinity of excavations or predetermined cover areas shall be equipped with personal protection equipment applicable to the contaminants of concern. An on-site decontamination zone will be maintained for personnel and equipment decontamination during the completion of remedial tasks. A project health and safety officer will be present on-site during the completion of remedial cleanup activities. Ambient air quality monitoring shall be completed on a scheduled basis in accordance with the Remedial Cleanup Health and Safety Plan.

5.4.4 Long-Term Effectiveness and Permanence

Remedial Permanence
Under this alternative, a combination of off-site disposal, on-site recovery, and on-site containment technologies will be utilized. In accordance with the Technical and Administrative Guidance Memorandum (TAGM) "Selection of Remedial Actions at Inactive

Hazardous Waste Sites", the classification of the technologies utilized within this alternative encompass Control and Isolation Technologies and Off-site Land Disposal.

Upon completing oil recovery sump installation and construction of the site asphalt cover, the community, site personnel, and the environment will be protected from exposure to PCB and PAH contaminants. In addition to reducing the risks associated with exposure to the PCB and PAH contaminated soils, the asphalt-bitumen cover will serve to limit the infiltration of precipitation and runoff waters through the respective soils, thus limiting contaminant migration via rainwater, runoff, and groundwater.

Quantity and Nature of Wastes Remaining On-Site After Remediation
Under this alternative, remediation of site-specific soil contamination would be completed in accordance with a contaminant specific cleanup scenario for PCBs and total PAHs. A listing of the site soil volumes which exceed contaminant specific action levels are included in the following Table. It is estimated that as much as 230 cubic yards of site soil are currently contaminated with PCBs in excess of 1 ppm.

Quantity and Nature of Remediated Contamination
Alternative #3

Contaminated Media To Be Covered (Site Area = 33,280 square feet), Including:
PCB Contaminated Soils – NYSDOH Hot Spot
- Area = 1,025 square feet; Depth = 5-6 feet from grade
- Volume = 5,125 to 6,150 cubic feet (190 to 230 cubic yards)

Shallow PAH Contaminated Solids - Western Site Area
- Area = 7,475 square feet; Depth = 5-6 feet from grade
- Volume = 37,375 to 44,850 cubic feet (1,385 to 1,660 cubic yards)

Deep PAH Contaminated Solids - Building Foundation Walls
- Area = 4,240 square feet; Depth = 13 feet from grade (approximate)
- Volume = 55,120 cubic feet (2,040 cubic yards)

Contaminated Media To Be Recovered
Floating Oil Product – Along Building Foundation Walls
- Area Encountered = 1,400 square feet; Thickness = 6-12 inches
- Estimate Pore Space = 30% to 50%
- Volume = 210 to 700 cubic feet (1,575 to 5,250 gallons)

Remedial Life, Reliability and Adequacy
Recovery and removal of floating oil product (over a period of 2 to 5 years) will eliminate respective site exposure and contaminant migration concerns. Application of a cover over the site (including PCB and PAH contaminated soil areas) will provide a means of isolating these contaminants from the community and the environment. The typical longevity of an asphalt-bitumen cover with proper maintenance ranges from an approximate period of 20 to 50 years. The actual longevity of the area specific cover will be dependent upon the cover monitoring and maintenance plan formulated, as well as future use of the covered site area.

Long Term Monitoring/Maintenance

Floating oil product will be recovered from subsurface sumps installed at the site. Long-term operation, monitoring, and maintenance of the recovery system (including recovery skimmers, piping, and temporary oil storage tank) will be completed at the site. Prior to the installation of a cover over the PCB and PAH contaminated site soils, a long term operation and maintenance plan will be prepared. Necessary long term operation and maintenance tasks that will be addressed within the cover operation and maintenance plan include: scheduled inspections, scheduled preventative maintenance tasks such as sealant applications, cover repair criteria, and limiting the use of heavy or penetrative equipment over the surface of the cover. Although application of a cover over the PCB and PAH contaminated soils will serve to mitigate direct infiltration of precipitation and runoff waters through the contaminated soils, it is assumed that long term groundwater monitoring will be required to assess the potential for off-site migration of the PCBs and PAHs.

5.4.5 Reduction of Mobility, Toxicity or Volume

Volume and Degree of Waste Reduction

Recovery of floating oil product will serve to eliminate the risks associated with the migration and exposure to the oil related organic compounds. Application of a cover over the site (including specific PCB and PAH contaminated soil areas) will serve to substantially reduce risks associated with the exposure to PCB and PAH concentrations greater than respective PCB and PAH action levels. In addition to reducing the risks associated with exposure to the PCB and PAH contaminated soils, the asphalt cover will serve to limit the infiltration of precipitation and runoff waters through the respective soils, thus limiting contaminant migration via rainwater, runoff, and groundwater.

Reduction in Mobility of the Contaminants

Upon initiating floating oil product recovery efforts, the potential for oil and associated organic compound migration to the groundwater, surface water, and surrounding soils will be continually reduced as recovery efforts are sustained. Although the primary goal of cover application over PCB and PAH contaminated soils is to reduce the potential for human exposure and contact, the cover will also serve to reduce the potential mobility of PCBs and PAHs by limiting the infiltration of precipitation and runoff water within the respective contaminated soils, thus reducing migration via groundwater and runoff water transport.

5.4.6 Implementability

Technical Feasibility

The relative ability to complete this alternative is not difficult, and as such, alternative uncertainties are not expected during implementation. The reliability of the floating oil product recovery and cover technologies to be implemented under this alternative is acceptable in meeting specific performance goals. The PCB and PAH contaminated soil cover will be constructed using conventional construction equipment and common techniques utilized for the application of stable asphalt roadways. The site topography is amenable to the application of a cover over the respective PCB and PAH contaminated soil areas. The equipment to be utilized for implementation of this alternative is readily available. Since conventional technological methods will be employed under this alternative, project delays resulting from technical problems are not anticipated. Other than semi-annual groundwater monitoring and scheduled operation and maintenance of the cover and oil recovery system, no future remedial actions will be anticipated upon implementation of this alternative.

Administrative Feasibility
A minimal amount of coordination will be required prior to and during the completion of this alternative. At a minimum, the following parties or agencies will be involved during alternative implementation: City of Syracuse Department of Engineering, City of Syracuse Office of Corporation Counsel, New York State Department of Environmental Conservation, and the New York State Department of Health.

Availability of Services and Materials
The majority of excavation, transportation, and construction work associated with this alternative will utilize conventional and readily available earth moving and asphalt application/construction equipment. More than one vendor will be available to provide a competitive bid for excavation and cover application tasks. Qualified personnel capable of operating the previously mentioned equipment are also readily available and technical specialists will not be required. All phases of on-site remediation associated with excavation and construction will be completed in accordance with approved specifications and under the guidance of a Project Quality Control Officer.

5.4.7 Protection of Human Health and the Environment

Future Site Use
Although the future use of the site is presently unknown, the City would prefer to develop the site for commercial, business, or residential use. After construction of the site asphalt cover, development of the site for commercial or business use, including slab on grade building construction, could be accomplished with minimal modification to the site cover. Since PCB and PAH contaminated soil will remain at the site (beneath the cover) as part of this alternative, use of the site for future residential development would not be recommended.

Protection of Human Health and Environment After Remediation
Under this alternative, it is estimated that floating oil product will be recovered over a period of 2 to 5 years. Accumulated product will be temporarily stored within an on-site storage tank and periodically removed for treatment and/or recycling at an approved waste oil treatment/recycling facility. As floating product recovery is completed, the risks associated with direct exposure to these the oil and oil related organic constituents will be reduced. An asphalt cover will be placed over those soils that exhibit elevated concentrations of PCBs and PAHs. Upon containment of the PCB and PAH contaminated soils, the risks associated with exposure to these contaminants will be significantly reduced. In addition to reducing the risks associated with exposure to the PCB and PAH contaminated soils, the asphalt cover will serve to limit the infiltration of precipitation and runoff waters through the respective soils, thus limiting contaminant migration via rainwater, runoff, and groundwater transport.

Magnitude of Risks After Remediation

Currently, PAH contaminated soils exist along the southern and western portions of the site, while PCB contaminated soils exist in the west-central site area known as the NYSDOH Hot-

Spot. Construction of an asphalt cover over the PCB and PAH contaminated site soils would significantly reduce the risks associated with direct or secondary contact with these contaminated soils. As floating oil product recovery is completed, the risks associated with exposure to oil related constituents will be continually reduced. Upon installation of an asphalt-bitumen cover over the soils that exhibit elevated concentrations of PCBs and PAHs, the risks associated with human exposure to these contaminants will be significantly reduced. Application of a cover over PCB and PAH contaminated soils will also serve to significantly reduce the infiltration of precipitation and runoff water through the contaminated soils, thus minimizing contaminant migration risks to the environment. Future monitoring and maintenance of the cover will be necessary to maintain isolation from the covered PCB and PAH contaminated soils, thus significantly reducing future risks associated with exposure.

5.4.8 Cost

The cost to implement this Alternative #3, including engineering design and inspection, remedial construction, and contingencies is estimated to be approximately $600,000 as shown in the following table.

Estimate of Remedial Construction Costs
Alternative #3 – Floating Oil Product Recovery and Cover PCB/PAH Contaminated Soils (Site Cover)

Task	Estimated Cost
1. Site Cover Land Use Restrictions	$ 3,000
Mobilization	$ 5,000
Site Preparation	$ 5,000
Survey and Stakeout	$ 5,000
Environmental Monitoring, Maintenance and Sampling Analysis	$ 10,000
Surface Soil Removal and Disposal (6-inches) (33,280 ft3 x 0.5 ft. depth= 620 c.y. = 930 ton x $75/ton)	$ 69,750
Sub-base Gravel Installed and Compacted (3 inch layer = 310 c.y. x $25/c.y.)	$ 7,750
Storm Catch Basin (4) and Drainage Piping Installed	$ 12,000
Asphalt Cover Installed (33,280 sq. ft. = 3,700 sq. yd.) (3,700 sq. yd. x $18 sq. yd.)	$ 66,600
2. Oil Removal Sump and Recovery System	
Excavation and Disposal (estimate 200 ton x $75/ton)	$ 15,000
Sump and Backfill Installation (8)	$ 8,000
Oil Product Recovery Skimmers (8)	$ 12,000
500 gal. Waste Oil Tank	$ 1,000
Treatment Shed	$ 5,000
Electrical and Recovery Piping	$ 20,000
System Installation	$ 10,000

Estimated Remedial Construction Cost	**$255,100**
Engineering Design and Inspection (20% of Construction Cost)	$ 51,020
Subtotal Estimated Remedial Engineering and Construction Cost	**$306,120**
Contingencies (20% of Engineering and Construction Cost)	$ 61,224
Subtotal Remedial Engineering, Construction, Contingency Cost	**$367,344**

3. Post-Remediation Operation, Maintenance, and Monitoring

Oil Recovery System Operation and Maintenance 5-years (estimate $25,000/year); Present Worth = $158,000	$158,000
Annual Shallow Groundwater Monitoring 10-years (estimate $5,500/year); Present Worth= $86,000	$ 86,000
Subtotal Operation, Maintenance, and Monitoring Costs	**$244,000**
Total Estimated Alternative #3 Remediation Cost	**$611,344**

5.5 Detailed Analysis of Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils

5.5.1 General

This alternative incorporates the recovery of floating oil product and excavation, transport and disposal of specific PCB and PAH contaminated site soils. Recovered oil product will be periodically removed from an on-site waste oil storage tank and transported to an approved waste petroleum treatment/recycling facility. Designated contaminated soils will be disposed at regulated off-site Solid Waste, RCRA Hazardous Waste, or TSCA Chemical Waste disposal facilities.

5.5.2 Compliance with Applicable or Relevant and Appropriate New York State Standards, Criteria and Guidelines

The Standards, Criteria and Guidelines (SCGs) pertaining to this alternative are summarized in Table 1-4.

5.5.3 Short-Term Effectiveness

Protection of Community During Remedial Action

For this alternative, on-site remedial tasks will include the excavation and removal of those soils that exhibit PCB and PAH concentrations above the project specific remedial cleanup action levels. During the completion of excavation tasks at specific site locations, floating oil product recovery sumps and piping will be installed. The completion of on-site excavation tasks will result in the disturbance of soils and potential creation of contaminated airborne particulates. To suppress the potential for airborne particulate contaminant migration, dust suppressants such as calcium chloride and water will be utilized to maintain elevated moisture content within surface soils. Periodic air testing will also be performed in an effort to monitor the air quality during on-site remedial activities.

Environmental Impacts During Remedial Action

For this alternative, adverse impacts to the environment via groundwater or surface water during on-site remedial actions are not expected. On-site remedial tasks will include the excavation and removal of specific PCB and PAH contaminated soils that will result in the disturbance of soils and potential creation of contaminated airborne particulates. To suppress the potential for airborne particulate contaminant migration, dust suppressants such as calcium chloride and water will be utilized to maintain elevated moisture contents within surface soils. Periodic air testing will also be performed in an effort to monitor the air quality during on-site remedial activities. Since the maximum depth of on-site contamination generally exists above the local water table, adverse impacts on the local groundwater are not expected during implementation of this alternative.

Timetable for Achieving Remedial Objectives

Implementation of the excavation and disposal alternative is estimated to require approximately 40 weeks. Mobilization and demobilization of equipment and personnel will require approximately one week to complete. Excavation and hauling of the contaminated soils from the site to a secure, regulated off-site landfill will require approximately 32 weeks to complete. A list of the estimated time required to implement the primary tasks of this alternative is shown in the following Table.

Timetable
Alternative #4:
Excavation/Disposal of PCB, Hg, Pb, and PAH Soils

Task	Time To Implement (weeks)
Survey	3
Mobilization/demobilization	1
Clear/grub and spoil removal	1
Soil excavation and hauling to landfill	32
Sump Installation, backfill and compaction	2
Grading and restoration	1
Total	40

Protection of Workers During Remedial Actions

As part of the qualifications for remedial cleanup excavation and construction, contractors performing remedial activities shall be required to comply with OSHA regulations contained in 29 CFR 1910.120. A project specific Remedial Cleanup Health and Safety Plan shall be prepared by a Certified Industrial Hygienist or ***Professional Engineer*** prior to the initiation of remedial cleanup activities. During remedial cleanup activities, contracted workers within the immediate vicinity of excavations or predetermined cover areas shall be equipped with personal protection equipment appropriate to the contaminants of concern. An on-site decontamination zone will be maintained for personnel and equipment decontamination upon completing daily remedial tasks. A project health and safety officer will be present on-site during the completion of remedial cleanup activities. Ambient air quality monitoring shall be completed on a scheduled basis in accordance with the Remedial Cleanup Health and Safety Plan.

5.5.4 Long-Term Effectiveness and Permanence

Remedial Permanence
Under this alternative, off-site disposal technologies will be utilized. In accordance with the NYSDEC TAGM "Selection of Remedial Actions at Inactive Hazardous Waste Sites", this alternative is classified as Off-site Land Disposal. Upon completing excavation, removal, and disposal of the specified contaminated soils, exposure risks to the community and the environment will be eliminated, thus providing remedial permanence.

Quantity and Nature of Wastes Remaining On-Site After Remediation
Under this alternative, remediation of site specific soil contamination would be completed in accordance with a contaminant specific cleanup scenario for PCBs and total PAHs. A listing of the site soil volumes that exceed contaminant specific action levels are included in the following Table. It is estimated that as much as 230 cubic yards of soil may be contaminated with PCBs in excess of 1 ppm.

Quantity and Nature of Remediated Soil Contamination
Alternative #4

Contaminated Media To Be Excavated and Disposed

PCB Contaminated Soils – NYSDOH Hot Spot
- Area = 1,025 square feet; Depth = 5-6 feet from grade
- Volume = 5,125 to 6,150 cubic feet (190 to 230 cubic yards)

Shallow PAH Contaminated Solids - Western Site Area
- Area = 7,475 square feet; Depth = 5-6 feet from grade
- Volume = 37,375 to 44,850 cubic feet (1,385 to 1,660 cubic yards)

Deep PAH Contaminated Solids - Building Foundation Walls
- Area = 4,240 square feet; Depth = 13 feet from grade (approximate)
- Volume = 55,120 cubic feet (2,040 cubic yards)

Contaminated Media To Be Recovered

Floating Oil Product – Along Building Foundation Walls
- Area Encountered = 1,400 square feet; Thickness = 6-12 inches
- Estimate Pore Space = 30% to 50%
- Volume = 210 to 700 cubic feet (1,575 to 5,250 gallons)

Remedial Life, Reliability and Adequacy

For this alternative, excavation and regulated disposal of the specified PCB and PAH contaminated soils will permanently eliminate public exposure to the soils, as well as reduce existing contaminant exposures to the environment. All excavations will be backfilled using imported granular materials.

Long Term Monitoring/Maintenance

PCB and PAH contaminated soils that exhibit concentrations above the respective specific contaminant action levels will be excavated from the site and disposed within a regulated off-site landfill. As a result of contaminant removal from the site, no long term operation, maintenance or monitoring tasks are applicable for this alternative.

5.5.5 Reduction of Mobility, Toxicity or Volume

Volume and Degree of Waste Reduction

Excavation and off-site disposal of up to 230 cubic yards of PCB contaminated soils will serve to eliminate the risks associated with contaminant migration and exposure related to PCBs. Excavation and off-site disposal of PAH contaminated soils/debris will serve to eliminate the risks associated with exposure to PAHs.

Reduction in Mobility of the Contaminants

With the excavation and disposal of specific PCB and PAH contaminated site soils, the potential for respective contaminant migration to the air, groundwater, surface water, and surrounding areas from these soils will be eliminated for the site and local area.

5.5.6 Implementability

Technical Feasibility

The relative ability to complete this alternative is not difficult, and as such, alternative uncertainties are not expected during implementation. The reliability of the floating oil product recovery and excavation/disposal technologies to be implemented under this alternative is acceptable with respect to meeting specific performance goals. Excavation of contaminated soils and associated earthwork will be completed using conventional excavation equipment. Backfill materials are readily available and will be obtained locally. Although the working areas around the major PCB and PAH contaminated areas are minimal, the equipment to be utilized for implementation of this alternative is often used within areas where workspace is limited. Since the earthwork and excavation methods to be employed under this alternative are simplistic and readily available, project delays resulting from technical problems are not anticipated. No future remedial actions will be anticipated after completion of this alternative.

Administrative Feasibility
A minimal amount of coordination will be required prior to and during the completion of this alternative. At a minimum, the following parties or agencies will be involved during alternative implementation: City of Syracuse Department of Engineering, City of Syracuse Office of Corporation Counsel, New York State Department of Environmental Conservation, and the New York State Department of Health.

Availability of Services and Materials
The majority of excavation, earthwork, and transportation work associated with this alternative will utilize conventional and readily available earth moving equipment. More than one vendor will be available to provide a competitive bid for excavation and disposal tasks. Qualified personnel capable of operating the previously mentioned equipment are also readily available and technical specialists will not be required. All phases of remediation associated with the excavation and transport of contaminated soils will be completed in accordance with specifically approved specifications and under the guidance of a Project Quality Control Officer.

5.5.7 Protection of Human Health and the Environment

Future Site Use
Although the future use of the site is presently unknown, the City would prefer to develop the site for commercial, business, or residential use. After excavation of the PCB and PAH contaminated soil, development of the site for commercial, business, or residential use could be accomplished without risk to human health or the environment. Appropriate planning would be necessary to maintain the operation and maintenance of the floating oil product recovery system for the limited time period that oil product recovery and separation is implemented at the site.

Protection of Human Health and Environment After Remediation
Soils that exhibit elevated concentrations of PCBs and PAHs, above project cleanup action levels will be excavated from their respective areas and transported to a TSCA, RCRA, or Solid Waste landfill facility. Upon excavation and disposal of the PCB and PAH contaminated soils, the risks associated with direct exposure to these soils by community residents, trespassers, or future occupants will be eliminated. The excavation and disposal of PCB and PAH contaminated soils will additionally serve to minimize the contaminant exposure potential to wildlife that may stray onto the site.

Magnitude of Risks After Remediation
Currently, the PAH contaminated soils exist along the southern and western portions of the site, while PCB contaminated soils exist in the west-central site area known as the NYSDOH Hot-Spot. Excavation, removal and disposal of the PCB and PAH contaminated site soils would eliminate the risks associated with PCBs and PAHs. As floating oil product recovery is completed, the risks associated with exposure to oil related constituents will be continually reduced. Since PCB and PAH contaminated soils will be removed from the site as part of this alternative, only short term (2 to 5 years) of oil product recovery system maintenance and shallow groundwater monitoring will be required.

5.5.8 Cost

The cost to implement Alternative #4, including engineering design and inspection, remedial construction, and contingencies are estimated to be approximately $1,150,000 as shown in the following Table.

Estimate of Remedial Construction Costs
Alternative #4 – Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils

Task	**Estimated Cost**
1. Contaminated Soil Removal	
Mobilization	$ 5,000
Site Preparation	$ 5,000
Survey and Stakeout	$ 5,000
Environmental Monitoring, Maintenance, Sampling, and Analysis	$ 15,000
Excavate and Dispose PCB Contaminated Soil (230 c.y. = 345 ton x $150/ton)	$ 51,750
Excavate and Dispose PAH Contaminated Soil (3,700 c.y. = 5,550 ton x $75/ton)	$ 416,250
Place and Compact Backfill Material (3,930 c.y. x $25/c.y.)	$ 98,250
2. Oil Removal Sump and Recovery System	
Excavation and Disposal (estimate 200 ton x $75/ton)	$ 15,000
Sump and Backfill Installation (8)	$ 8,000
Oil Product Recovery Skimmers (8)	$ 12,000
500 gal. Waste Oil Tank	$ 1,000
Treatment Shed	$ 5,000
Electrical and Recovery Piping	$ 20,000
System Installation	$ 10,000
Subtotal Estimated Remedial Construction Cost	**$ 667,250**
Engineering Design and Inspection (20% of Construction Cost)	$ 133,450
Subtotal Estimated Remedial Engineering and Construction Cost	**$ 800,700**
Contingencies (20% of Engineering and Construction Cost)	$ 160,140
Subtotal Remedial Engineering, Construction and Contingency Cost	**$ 960,840**
3. Post Remediation Limited Actions	
Oil Recovery System Operation and Maintenance 5-years (estimate $25,000/year); Present Worth = $158,000	$ 158,000
Annual Shallow Groundwater Monitoring 5-years (estimate $5,500/year); Present worth= $35,000	$ 35,000

Subtotal Limited Actions Cost	**$ 193,000**
Total Estimated Alternative #4 Remediation Cost	**$1,153,840**

6.0 COMPARATIVE ANALYSIS OF ALTERNATIVES

6.1 Introduction

After the alternatives have been evaluated with respect to the seven evaluation criteria, a comparative analysis is conducted to assess the relative performance of each alternative. The purpose of the analysis is to identify the relative advantages and disadvantages or strength and weaknesses of each alternative relative to others so that trade-offs may be considered and balanced. Particular attention has been given in this comparative analysis to the cost of remedial alternatives that provide similar levels of protection. This comparative analysis of alternatives was conducted consistent with the NYSDEC Technical and Administrative Guidance Memorandum (TAGM 4030 revised May 15, 1990) entitled *Selection of Remedial Actions at Uncontrolled Hazardous Waste Sites.*

The narrative description of relative advantages and disadvantages or strength and weaknesses of each alternative based on the seven evaluation criteria is presented below. After each narrative description, a relative numerical ranking is presented based on approximate scoring. Appendix B includes the quantitative scoring data for each alternative evaluated. Table 2 – *Comparative (Quantitative) Analysis of Alternatives* presents a summary of the Remedial Alternative Evaluation scores.

6.2 Comparative Analysis

6.2.1 Compliance with Standards, Criteria, and Guidance (SCG)

Alternative #1 (No-Action) and Alternative #2 (Limited Actions) would not attain the SCGs of cleaning up PCB contamination to between 1 and 10 ppm. Alternatives #3 and #4 would attain the listed SCGs.

Compliance with Standards, Criteria, and Guidance (SCGs) Ranking (10 points maximum)

#1 Rank	Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils (10 points)
#2 Rank	Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils- Site Asphalt Cover (10 points)
#3 Rank	Alternative #2: Limited Actions (0 points)
#4 Rank	Alternative #1: No Action (0 points)

6.2.2 Short-Term Effectiveness

This criterion addresses the effect of the alternative during the construction and implementation phases until remedial response objectives are attained. In general, none of the alternatives pose a significant threat to human health or the environment during the implementation of the alternative.

(i) Protection Of The Community During The Remedial Action

There are no construction related impacts to the community associated with Alternative #1 (No-Action) and Alternative #2 (Limited Actions). Alternatives #3 and #4 include minor, short-term impacts associated with on-site excavation, handling, containerizing, or treatment of contaminated materials. These include fugitive dust and air impacts from potential volatilization of contaminants to the atmosphere that may expose the off-site community. These impacts are manageable with engineering controls, are localized and of short duration, and thus, are not considered significant. Alternatives that involve off-site transport of waste have slightly increased impacts to the local community due to an increase in truck traffic associated with transportation of wastes. Furthermore, the increase in local traffic associated with transporting cover construction material to the site may contribute to a short-term increase in traffic. However, these impacts are of a short duration, and can be coordinated so as to minimize impacts. Therefore, these impacts are not considered significant.

(ii) Environmental Impacts

There are no environmental impacts associated with the implementation of Alternative #1 (No-Action) and Alternative #2 (Limited Actions). Alternatives #3 and #4 include minor, short-term impacts associated with on-site excavation, handling, containerizing, or treatment of contaminated materials. These include fugitive dust and air impacts from potential volatilization of contaminants to the atmosphere. These impacts are manageable with engineering controls, are localized and of short duration, and thus, are not considered significant.

(iii) Time Until The Remedial Response Objectives Will Be Achieved.

Alternatives #1 and #2 will not attain the remedial response objectives. Alternatives #3 and #4 will attain the response objectives at the completion of the remedy. It is anticipated that Alternatives #3 and #4 can be completed in one construction season (1 year).

(iv) Protection of Workers During The Remedial Action

With the proper implementation of the site Health and Safety Plan, on site workers will be protected while implementing each of the alternatives. Protective measures such as personal protective equipment (PPE) and implementing proper engineering controls are effective and reliable. Specialized health and safety training for all workers involved in implementing the remedial alternative would be required for all of the alternatives except Alternative #1 (No-Action).

(iv) Time To Implement The Remedy

Alternative #1 (No-Action) can be considered to be already implemented. It is anticipated that Alternatives #2, #3, and #4 can be implemented in one construction season (1 year).

Short-Term Effectiveness Ranking (10 points maximum)

#1 Rank	Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils (10 points)
#2 Rank	Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils - Site Asphalt Cover (8 points)
#3 Rank	Alternative #2: Limited Actions (4 points)
#4 Rank	Alternative #1: No Action (0 points)

6.2.3 Long-Term Effectiveness and Permanence

This evaluation criterion evaluates the remedial action in terms of its performance and the quantity or nature of the waste or residual remaining at the site after the response objectives are met, with a primary focus on the extent and effectiveness of the engineering controls that may be required to manage the waste remaining at the site, and operation and maintenance necessary for the remedy to remain effective.

(i) Permanence of the Remedial Alternative

Alternative #1 (No Action) and Alternative #2 (Limited Actions) do not meet the permanence criteria contained in TAGM 4030 because they do not utilize on-site or off-site destruction, on-site or off-site separation/treatment, or solidification/chemical fixation of inorganic wastes. Although Alternatives #3 and #4 utilize on-site oil product recovery and separation (via skimming), these alternatives do not meet the permanence criteria contained in TAGM 4030 for PCB and PAH contaminated soils because they do not utilize on-site or off-site destruction, on-site or off-site separation/treatment, or solidification/chemical fixation of inorganic wastes.

(ii) Magnitude Of Residual Risk

Alternative #1 (No Action) and Alternative #2 (Limited Actions) do not reduce the potential risks at the site. Under both of these alternatives, the cumulative risk to PCBs and PAHs would remain unchanged. As part of Alternative #3, construction of an asphalt cover over the PCB and PAH contaminated site soils would significantly reduce the risks associated with direct or secondary contact with PCB and PAH contaminated soils. Upon application of an asphalt-bitumen cover over the soils that exhibit elevated concentrations of PCBs and PAHs, the risks associated with human exposure to these contaminants will be significantly reduced. Application of a cover over PCB and PAH contaminated soils will serve to significantly reduce the infiltration of precipitation and runoff water through the contaminated soils, thus minimizing contaminant migration risks to the environment. As floating oil product recovery is completed, the risks associated with exposure to oil related constituents will be continually reduced. As part of Alternative #4, excavation, removal and disposal of the PCB and PAH contaminated site soils would eliminate the risks associated with direct or secondary contact with PCBs and PAHs.

(iii) Adequacy and Reliability of Controls

Under Alternative #1 (No-Action) there are no engineering controls utilized. The components of Alternative #2 (Limited Actions), including fencing and monitoring wells, have been proven and are reliable over the long term to restrict access and monitor site contaminants. Alternative #3 will rely on engineering controls (cover system and oil product recovery/separation components) to reduce exposure to contaminants. This cover system and oil product recovery separation system will require operation and maintenance over the life of the remedy. With proper operation and maintenance, the cover system and product recovery/separation system are proven and reliable at reducing exposure to contaminated media. Alternative #4 will include the removal of contaminated soil from the site. Engineering controls will only be needed to maintain the oil product recovery system. A reduced level of engineering controls will be required for Alternative #4 as compared to Alternative #3.

Long Term Effectiveness and Permanence Ranking (15 points maximum)

#1 Rank	Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils (15 points)
#2 Rank	Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils - Site Asphalt Cover (10 points)
#3 Rank	Alternative #2: Limited Actions (4 points)
#4 Rank	Alternative #1: No Action (0 points)

6.2.4 Reduction of Mobility, Toxicity and Volume

The focus of the reduction of mobility, toxicity or volume evaluation is the extent the reduction is achieved by using treatment as a principal element.

(i) Amount of Contaminated Media Destroyed Or Treated

Alternative #1 (No Action) and Alternative #2 (Limited Actions) would not destroy or treat any of the contaminated soil present at the site. Although Alternatives #3 and #4 would not include the destruction or treatment of contaminated PCB and/or PAH contaminated soils, oil product would be recovered from subsurface locations, separated, and subsequently transported and treated (off-site) as part of these alternatives.

(ii) Degree Of Expected Reduction In Toxicity, Mobility or Volume

Alternatives #1 (No-Action) and #2 (Limited Actions) would not reduce the mobility, toxicity or volume of contaminants. Alternatives #3 and #4 do not utilize treatment as a principal element to reduce mobility, toxicity or volume. Alternative #3 would reduce the mobility of PCBs and PAHs from the contaminated soil media. Similarly, Alternative #4 would reduce the volume of PCB and PAH contaminated soil through excavation and removal from the site.

(iii) Degree To Which The Treatment Will Be Irreversible

Alternatives #1 and #2 do not utilize treatment processes. Alternatives #3 and #4 both include oil product recovery and separation for subsequent off-site treatment.

(iv) Type And Quantity Of Treatment Residuals

Alternatives #1 and #2 do not utilize a treatment process, and as such, no treatment residuals are generated as part of these. Alternatives #3 and #4 both include the recovery and separation of oil product that will be temporarily stored on-site for subsequent transport and treatment off-site. The site covering component of Alternative #3 and contaminated soil excavation/disposal component of Alternative #4 do not incorporate treatment processes. As such, no other treatment residuals would be generated as part of these alternatives.

Reduction of Mobility, Toxicity and Volume Relative Ranking (15 points maximum)

#1 Rank	Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils (10 points)
#2 Rank	Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils- Site Asphalt Cover (6 points)
#3 Rank	Alternative #2: Limited Actions (2 points)
#4 Rank	Alternative #1: No Action (0 points)

6.2.5 Implementability

The implementability criterion evaluates the technical and administrative feasibility of implementing the alternative and the availability of various services and material required.

(i) Technical Feasibility
Alternative #1 (No-Action) does not include construction activities. Alternative #2 (Limited Actions) includes minor construction activities, including perimeter fence installation, groundwater monitoring, and posting of warning signs. Each of these activities is simple to conduct. Alternatives #3 and #4 can be accomplished with standard construction labor and equipment. Adequate space is available on site for construction operations, such as temporary storage of equipment and materials. Construction operations would be conducted under the supervision of personnel experienced in each operation. Prior to construction activities, it may be necessary for workers to complete health and safety training.

(ii) Administrative Feasibility
Alternative #1 (No-Action) and Alternative #2 (Limited Actions) will require the least amount of administrative coordination with other agencies and/or entities. Alternatives #3 and #4 will require substantial coordination to implement. Each of the four alternatives will require coordination with the City of Syracuse.

(ii) Availability Of Services And Materials

The services and materials for Alternative #2 (Limited Actions) are readily available, require minimal specialized services and can draw upon the local conventional labor pool to perform a majority of the work. Although Alternatives #3 and #4 require substantial construction effort, the services and materials for these alternatives are also readily available and can draw upon the local conventional labor pool to perform a majority of the work. For Alternatives #3 and #4, contractors licensed to transport hazardous waste materials would be required. These contractors are also readily available. Off-site disposal facility capacities would be a limiting variable for Alternative #4. Continuous monitoring will be necessary for effective and safe operation during the implementation of Alternatives #3 and #4.

Implementability Relative Ranking (15 points maximum)

#1 Rank	Alternative #1: No Action (15 points)
#2 Rank	Alternative #2: Limited Actions (13 points)
#3 Rank	Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils- Site Asphalt Cover (8 points)
#4 Rank	Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils (6 points)

6.2.6 Overall Protection of Human Health and the Environment

Alternative #1 (No-Action) provides no protection of human health and the environment, while Alternative #2 (Limited Actions) provides minimal protection of human health and the environment. Alternatives #3 and #4 provide a similar level of protection of human health and the environment. Since removal of PCB and PAH contaminated soils from the site would offer the best scenario for protection of human health and the environment, Alternative #4 is viewed as more protective than Alternative #3. Thus, the relative ranking of alternatives is as follows:

Overall Protection of Human Health and the Environment Ranking (20 points maximum)

#1 Rank	Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils (18 points)
#2 Rank	Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils - Site Asphalt Cover (15 points)
#3 Rank	Alternative #2: Limited Actions (8 points)
#4 Rank	Alternative #1: No Action (0 points)

6.2.7 Cost

The costs to complete alternative specific engineering design, remedial construction, and long-term maintenance and monitoring are listed in Section 5 (Detailed Analysis of Alternatives). The relative cost for each alternative is a function of cleanup goals developed in Section 2. The relative ranking, based on each alternative range of costs, is shown below.

Cost Relative Ranking (15 points maximum)

#1 Rank	Alternative #1: No Action (15 points)
#2 Rank	Alternative #3: Floating Oil Product Recovery and Cover PCB and PAH Contaminated Soils (Site Asphalt Cover) (8 points)
#3 Rank	Alternative #2: Limited Actions (10 points)
#4 Rank	Alternative #4: Floating Oil Product Recovery and Excavate/Dispose PCB and PAH Contaminated Soils (5 points)

6.2.8 Community Acceptance

Community acceptance will be assessed after the public comment period. Upon receipt of public comments, the preferred alternative may be re-evaluated with regard to community acceptance.

6.2.9 Remedial Alternative Assessment Conclusions

As shown in the attached Table 2, of the four alternatives compiled and analyzed, Alternative #4 cumulatively scored the highest. Although more difficult to implement and approximately two times as costly than Alternative #3, Alternative #4 appears to offer the maximum level of:

- Compliance with Soil Cleanup Objectives
- Short-term effectiveness
- Long-term effectiveness
- Reduction in toxicity, mobility, and volume of the hazardous wastes
- Overall protection of human health and the environment

TABLES

TABLE 1-1
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #1 - No Action

SCG	SCG Synopsis	Consideration to Attain SCG
STATE REQUIREMENTS		
NYSDEC Guideline Cleanup of PCB Contamination	NYSDEC maintains a guideline of cleaning up PCB contamination to a level of 1 to 10 ppm	Under the no action alternative, the PCB contamination will not be cleaned-up to a level of 1 to 10 ppm.
5-Year Review when Waste is Left in Place	If wastes at levels that are not protective of human health and the environment are left in place, NYSDEC embraces the approach outlined in CERCLA which requires a 5-year review of site conditions to determine if the remedial action is still protective of public health and the environment.	Under the no action alternative, the PCB wastes would be left in place. When waste is left in place at levels which are not protective of human health and the environment, a 5-Year Review will be conduced to determine if the overall remedy is protective.
LOCAL REQUIREMENTS		
None	Not Applicable	Under the no action alternative, there are no applicable local requirements to be followed.
FEDERAL REQUIREMENTS		
None	Not Applicable	Under the no action alternative, there are no applicable federal requirements to be followed.

TABLE 1-2
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #2 - Limited Action

SCG	SCG Synopsis	Consideration to Attain SCG
STATE REQUIREMENTS		
NYSDEC Guideline Cleanup of PCB Contamination	NYSDEC maintains a guideline of cleaning up PCB contamination to a level of 1 to 10 ppm	Under the limited action alternative, the PCB contamination will not be cleaned-up to a level of 1 to 10 ppm.
5-Year Review when Waste is Left in Place	If wastes at levels that are not protective of human health and the environment are left in place, NYSDEC embraces the approach outlined in CERCLA which requires a 5-year review of site conditions to determine if the remedial action is still protective of public health and the environment.	Under the limited action alternative, the PCB wastes would be left in place. When waste is left in place at levels which are not protective of human health and the environment, a 5-Year Review will be conduced to determine if the overall remedy is protective.
LOCAL REQUIREMENTS		
None	Not Applicable	Under Alternative #2, there are no applicable Local regulations to be followed.

TABLE 1-2
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #2 - Limited Action

SCG	SCG Synopsis	Consideration to Attain SCG
FEDERAL REQUIREMENTS		
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section covers activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. It includes requirements for the development of, among other things, a Safety and Health Program, and a Site Control Program including engineering controls and safe work practices.	Under Alternative #2, on-site monitoring activities will occur. These monitoring activities include the occasional collection of groundwater samples. All on site monitoring activities will be conducted under an approved site specific Health and Safety Plan. Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances. This will include engineering controls, safe work practices, personal protective equipment, or a combination of these.

TABLE 1-3
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #3 – Recover Oil Product and Cover Contaminated Site Soils

SCG	SCG Synopsis	Consideration to Attain SCG
STATE REQUIREMENTS		
6 NYCRR Part 371.1 - 371.4 Identification and Listing of Hazardous Wastes	These Parts establish the procedures for identifying solid wastes which are subject to regulation as hazardous wastes. Waste may be hazardous due to characteristic or listing.	Wastes excavated under a certain remedy have been or will be tested to determine if they are a hazardous waste. It is anticipated that certain wastes will be designated as hazardous waste containing PCBs, DEC hazardous Waste number B007. The testing procedures identified in this Part will be followed to determine if the waste is a hazardous waste.
6 NYCRR Part 373-1.1 Hazardous Waste Storage Permitting Requirements	This Subpart contains requirements regarding hazardous waste storage permitting requirements. This Part contains specific exemptions for owners and operators of storage facilities if waste generated on-site is stored in containers or tanks for a period not exceeding 90 days.	During excavation activities, it may be necessary to temporarily store hazardous waste on site. However, if wastes are stored in containers or tanks for less than 90 days and meet certain requirements, they are exempted from permitting requirements. All hazardous waste associated with any remedy will not be stored on site for longer than 90 days. If hazardous waste must remain on-site for longer than 90 days due to unforeseen, temporary and uncontrollable circumstances, the City will apply for an extension of up to 30 days.

TABLE 1-3
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #3 – Recover Oil Product and Cover Contaminated Site Soils

SCG	SCG Synopsis	Consideration to Attain SCG
6 NYCRR Part 364.1 - 364.7 Waste Transporter Permits	This part covers the transport of Hazardous Waste within the State of New York. It requires transporter of hazardous waste to apply for and obtain a permit to transport such waste and comply with operating procedures. Additional transport permits may be required should disposal out of State be required.	Any Transporter of hazardous waste off-site will possess a permit in accordance with this Part. The transporter of hazardous waste will have vehicles appropriately marked and placarded in a matter consistent with section 14-f of the New York State Transportation Law. The Transporter will have all wastes properly contained during transport and will remain with the vehicle while it is being filled or discharged. The Transporter will comply with applicable requirements of 6 NYCRR Part 372 for the manifesting of hazardous waste.
6 NYCRR Part 372.3 Standards Applicable to Transporters	Transporters are required to use the manifest system and follow the record keeping requirements. The manifest documents shall accompany all shipments of hazardous waste while in transit. The manifest document serves as a multipurpose instrument to be used as a tracking, auditing and enforcement device.	Any transporter will not transport hazardous waste without having received an EPA identification number. The transporter will comply with the manifest requirements. The transporter will determine that the generators portions of the manifest are completed and that the generator has signed the generator's certification of the manifest. Manifests will accompany the waste, as required, at all times.
6 NYCRR Section 373-2.14 Secure Landburial Facilities	This Section contains regulations that apply to owners and operators of facilities that dispose of hazardous waste in landfills.	The City will select a secure landfill that is in compliance with this section for disposal of the PCB hazardous waste.

TABLE 1-3
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #3 – Recover Oil Product and Cover Contaminated Site Soils

SCG	SCG Synopsis	Consideration to Attain SCG
6 NYCRR Part 376 Land Disposal Restrictions	This part identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may be land disposed. It also indicates certain waste analysis and record keeping procedures that must be followed.	If the PCB waste to be disposed of off-site contains halogenated organic compounds HOCs as listed under Appendix 37 of Title 6 in total concentration greater than or equal to 1,000 mg/kg or are identified as hazardous by some other property that does not involve HOCs, the waste will be incinerated in accordance with the requirements of section 373-2.15 or 373-3.15. If the waste is disposed of off-site and out of state, the federal requirements of 40 CFR Section 761.60 which regulate the disposal of non-liquid PCBs at concentrations of 50 ppm or greater in the form of contaminated soil, rags or other debris, the waste will be disposed of in an incinerator which complies with federal 40 CFR Section 761.70 or a chemical waste landfill which complies with 40 CFR Section 761.75. If the soil to be disposed of off-site exhibits a characteristic of hazardous waste, it will be disposed of in accordance with Section 376.4. Appropriate waste analysis and record keeping requirements will be followed as necessary.

TABLE 1-3
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #3 – Recover Oil Product and Cover Contaminated Site Soils

SCG	SCG Synopsis	Consideration to Attain SCG
New York State Air Guide - 1 Guidelines for the Control of Toxic Ambient Air Contaminants	Air Guide - 1 provides guidance for the control of toxic ambient air contaminants in New York State. Its purpose is to describe the NYSDEC Division of Air Resources basic guidelines for making air toxics related permitting decisions. Under Air Guide - 1, a source is evaluated on an individual contaminant basis. That is, the total impact of each chemical contaminant from a source is individually assessed and either compared to the ambient air quality standard or guideline value to determine the appropriate regulatory action.	During PCB excavation activities, the ambient air will be monitored for PCBs and Particulates.
NYSDEC Guideline Cleanup of PCB Contamination	NYSDEC maintains a guideline of cleaning up PCB contamination to a level of 1 to 10 ppm	PCB contamination will be cleaned-up to a level of 1 to 10 ppm.
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP or EPA CLP methods)	This document contains the State procedures and protocols for sample analyses.	During implementation of this alternative, periodic groundwater monitoring will be conducted. Samples collected and analyzed will follow ASP (or EPA CLP) procedures. Furthermore, samples collected will be appropriately validated if required.
6 NYCRR Part 621 Uniform Procedures	This part describes general requirements for applications for permits. This procedure will be followed for a permit if one is necessary.	The City will submit a properly completed NYSDEC application form, supporting documentation (a location map or plan at an appropriate scale showing the point of discharge into the receiving wasters), and other supplemental information that NYSDEC notifies the City is necessary to review the application.

TABLE 1-3
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #3 – Recover Oil Product and Cover Contaminated Site Soils

SCG	SCG Synopsis	Consideration to Attain SCG
6 NYCRR Part 624 Permit Hearing Procedures	This Part applies to hearings conducted by the NYSDEC on applications for permits or on denials of permits.	If a hearing is conducted for the purpose of issuing a permit, the City will participate in the hearing and follow the procedures associated with this Part.
LOCAL REQUIREMENTS		
County of Onondaga Department of Drainage and Sanitation - Rules and Regulations Relating to the Use of the Public Sewer System	These Rules and Regulations set uniform requirements for the discharges into the wastewater collection and treatment system of the County and provides a means for determining wastewater volume, constituents and characteristics, the setting of industrial waste surcharges and fines and the issuance of permits to certain users.	If remediation wastewaters are discharged into the County sewer system, the City of Syracuse will apply for, obtain and follow the permit conditions for an industrial waste discharge permit in accordance with these Rules and Regulations.

TABLE 1-3
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #3 – Recover Oil Product and Cover Contaminated Site Soils

SCG	SCG Synopsis	Consideration to Attain SCG
FEDERAL REQUIREMENTS		
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section covers the clean-up activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. It includes requirements for the development of, among other things, a Safety and Health Program, and a Site Control Program including engineering controls and safe work practices.	On site work will be conducted under an approved site specific Health and Safety Plan. Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances. This will include engineering controls, safe work practices, personal protective equipment, or a combination of these.

TABLE 1-4
Potential Standards, Criteria, Guidelines (SCGs) for the Brown Manufacturing Site

Alternative #4 – Recover Oil Product and Excavate/Dispose of PCB and PAH Contaminated Soils

SCG	SCG Synopsis	Consideration to Attain SCG
STATE REQUIREMENTS		
6 NYCRR Part 371.1 - 371.4 Identification and listing of Hazardous Wastes	This Part establishes the procedures for identifying solid wastes which are subject to regulation as hazardous wastes. Waste may be hazardous due to characteristic or listing. This Part also specifically indicates other environmental statutes to be followed. Specifically, this part indicates that PCBs are also regulated under 40 CFR Part 761, and that a person must comply with that part.	Wastes excavated under a certain remedy have been or will be tested to determine if it is a hazardous waste. It is anticipated that certain wastes will be listed as hazardous waste containing PCBs, DEC hazardous Waste number BOO7. The testing procedures identified in this Part will be followed to determine if the waste is a hazardous waste.
6 NYCRR Part 373-1.1 Hazardous Waste Storage Permitting Requirements	This Subpart contains requirements regarding hazardous waste storage permitting requirements. This Part contains specific exemptions for owners and operators of storage facilities if waste generated on-site is stored in containers or tanks for a period not exceeding 90 days.	During excavation activities, it may be necessary to temporarily store hazardous waste. However, if wastes are stored in containers or tanks for less than 90 days and meet certain requirements, they are exempted from permitting requirements. All hazardous waste associated with any remedy will not be stored on site for longer than 90 days. If hazardous waste must remain on-site for longer than 90 days due to unforeseen, temporary and uncontrollable circumstances, the City will apply for an extension of up to 30 days.

TABLE 1-4
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #4 – Recover Oil Product and Excavate/Dispose of PCB and PAH Contaminated Soils

SCG	SCG Synopsis	Consideration to Attain SCG
6 NYCRR Section 373-2.14 Secure Landburial Facilities	This Section contains regulations that apply to owners and operators of facilities that dispose of hazardous waste in landfills.	The City will only select a secure landfill that is in compliance with this section for disposal of the PCB hazardous waste.
6 NYCRR Part 360-1 General Provisions for Solid Waste Management Facilities	The purpose of this part is to regulate solid waste management facilities other than hazardous waste management facilities. This Part defines solid wastes and outlines operational requirements for all solid waste management facilities.	The excavated soil containing PAH is a non-hazardous solid waste. This soil will be disposed of in a solid waste management facility permitted under Part 360. Only facilities in full compliance with their operating permit will be considered as appropriate location for disposal.
6 NYCRR Part 364.1 - 364.7 Waste Transporter Permits	This part covers the transport of Hazardous Waste within the State of New York. It requires transporter of hazardous waste to apply for and obtain a permit to transport such waste and comply with operating procedures.	Any Transporter of hazardous waste off-site will possess a permit in accordance with this Part. The transporter of hazardous waste will have vehicles appropriately marked and placarded in a matter consistent with section 14-f of the New York State Transportation Law. The Transporter will have all wastes properly contained during transport and will remain with the vehicle while it is being filled or discharged. The Transporter will comply with applicable requirements of 6 NYCRR Part 372 for the manifesting of hazardous waste.

TABLE 1-4
Potential Standards, Criteria, Guidelines (SCGs) for the Brown Manufacturing Site

Alternative #4 – Recover Oil Product and Excavate/Dispose of PCB and PAH Contaminated Soils

SCG	SCG Synopsis	Consideration to Attain SCG
6 NYCRR Part 372.3 Standards Applicable to Transporters	Transporters are required to use the manifest system and follow the record keeping requirements. The manifest documents shall accompany all shipments of hazardous waste while in transit. The manifest document serves as a multipurpose instrument to be used as a tracking, auditing and enforcement device.	Any transporter will not transport hazardous waste without having received an EPA identification number. The transporter will comply with the manifest requirements. The transporter will determine that the generators portions of the manifest are completed and that the generator has signed the generator's certification of the manifest. Manifests will accompany the waste at all times as required.
6 NYCRR Part 376 Land Disposal Restrictions	This part identifies hazardous wastes that are restricted from land disposal and defines those limited circumstances under which an otherwise prohibited waste may be land disposed. It also indicates certain waste analysis and record keeping procedures that must be followed.	If the PCB waste to be disposed of off-site contains halogenated organic compounds (HOCs as listed under Appendix 37 of Title 6) in total concentration greater than or equal to 1,000 mg/kg or are identified as hazardous by some other property that does not involve HOCs, the waste will be incinerated in accordance with the requirements of section 373-2.15 or 373-3.15. If the waste is disposed of off-site and out of state, the federal requirements of 40 CFR Section 761.60 which regulate the disposal of non-liquid PCBs at concentrations of 50 ppm or greater in the form of contaminated soil, rags or other debris, the waste will be disposed of in an incinerator which complies with federal 40 CFR Section 761.70 or a chemical waste landfill which complies with 40 CFR Section 761.75.

TABLE 1-4
Potential Standards, Criteria, Guidelines (SCGs) for the Brown Manufacturing Site

Alternative #4 – Recover Oil Product and Excavate/Dispose of PCB and PAH Contaminated Soils

SCG	SCG Synopsis	Consideration to Attain SCG
		If the soil to be disposed of off-site exhibits a characteristic of hazardous waste, it will be disposed of in accordance with Section 376.4. Appropriate waste analysis and record keeping requirements will be followed as necessary.
New York State Air Guide - 1 Guidelines for the Control of Toxic Ambient Air Contaminants	Air Guide - 1 provides guidance for the control of toxic ambient air contaminants in New York State. Its purpose is to describe the NYSDEC Division of Air Resources basic guidelines for making air toxics related permitting decisions. Under Air Guide - 1, a source is evaluated on an individual contaminant by contaminant basis. That is, the total impact of each chemical contaminant from a source is individually assessed and either compared to the ambient air quality standard or guideline value to determine the appropriate regulatory action.	During PCB excavation activities, the ambient air will be monitored for PCBs and Particulates.
NYSDEC Guideline Cleanup of PCB Contamination	NYSDEC maintains a guideline of cleaning up PCB contamination to a level of 1 to 10 ppm	PCB contamination will be cleaned-up to a level of 1 to 10 ppm.

TABLE 1-4
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #4 – Recover Oil Product and Excavate/Dispose of PCB and PAH Contaminated Soils

SCG	SCG Synopsis	Consideration to Attain SCG
NYSDEC Guidelines NYSDEC Analytical Services Protocols (NYSDEC ASP or EPA CLP methods)	This document contains the State procedures and protocols for sample analyses.	Excavation closure soil sampling (confirmation) and periodic groundwater monitoring will be conducted. Samples collected and analyzed will follow ASP or CLP procedures. Furthermore, samples collected will be appropriately validated if required.
6 NYCRR Part 621 Uniform Procedures	This part describes general requirements for applications for permits. This procedure will be followed for the permit if one is necessary.	The City of Syracuse will submit a properly completed department application form, supporting documentation that may include a location map or plan at an appropriate scale showing the point of discharge into the receiving wasters, and other supplemental information which NYSDEC notifies the City is necessary to review the application.
6 NYCRR Part 624 Permit Hearing Procedures	This Part applies to hearing conducted by the NYSDEC on applications for permits or on denials of permits.	If a hearing is conducted for the purpose of issuing a permit, the City will participate in the hearing and follow the procedures associated with this Part.

TABLE 1-4
Potential Standards, Criteria, Guidelines (SCGs)
for the Brown Manufacturing Site

Alternative #4 – Recover Oil Product and Excavate/Dispose of PCB and PAH Contaminated Soils

SCG	SCG Synopsis	Consideration to Attain SCG
LOCAL REQUIREMENTS		
County of Onondaga Department of Drainage and Sanitation - Rules and Regulations Relating to the Use of the Public Sewer System	These Rules and Regulations set uniform requirements for the discharges into the wastewater collection and treatment system of the County and provides a means for determining wastewater volume, constituents and characteristics, the setting of industrial waste surcharges and fines and the issuance of permits to certain users.	If remedial construction waters are discharged into the County sewer system, the City of Syracuse will apply for, obtain and follow the permit conditions for an industrial waste discharge permit in accordance with these Rules and Regulations.
FEDERAL REQUIREMENTS		
40 CFR 1910.120 Hazardous Waste Operations and Emergency Response	This section covers the clean-up activities at hazardous waste sites in which the operations involve employee exposure or the reasonable possibility of exposure to safety and health hazards. It includes requirements for the development of, among other things, a Safety and Health Program, and a Site Control Program including engineering controls and safe work practices.	All on site work will be conducted under an approved site specific Health and Safety Plan. Under this plan, site control procedures will be implemented to control employee exposure to hazardous substances. This will include engineering controls, safe work practices, personal protective equipment, or a combination of these.

Table 2
Comparative (Quantitative) Analysis of Alternatives
Brown Manufacturing Site - Syracuse, New York
Brownfield Site Investigation/Remedial Alternatives (SI/RA) Report

Evaluation Criteria	Alternative #1 No Action	Alternative #2 Limited Actions	Alternative #3 Oil Product Recovery & Site Asphalt Cover	Alternative #4 Oil Product Recovery & Remove Contaminated Soils
1. Compliance with SCGs	0	0	10	10
2. Short Term Effectiveness	0	4	8	10
3. Long Term Effectiveness and Permanence	0	4	10	15
4. Reduction of Mobility, Toxicity, and Volume	0	2	6	10
5. Implementability	15	13	8	6
6. Overall Protection of Human Health and the Environment	0	8	15	18
7. Cost	15	8	10	5
Total Quantitative Ranking	**30**	**39**	**67**	**74**