McKESSON ENVIROSYSTEMS SITE
Operable Unit No. 2
Saturated Soils and Groundwater

Syracuse (C), Onondaga County, New York
Site No. 7-34-020

PROPOSED REMEDIAL ACTION PLAN

January 1997

Prepared by:

Division of Environmental Remediation
New York State Department of Environmental Conservation

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SECTION 1: PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) is proposing in-situ anaerobic bioremediation of contaminated saturated soils and groundwater at the McKesson Envirosystems Site. The saturated soils and groundwater are referred to as Operable Unit No. 2. This remedy is proposed to address the threat to human health and the environment created by the presence of various volatile and semi-volatile contaminants in these media.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the rationale for this preference. The NYSDEC will select a final remedy for the site only after careful consideration of all comments submitted during the public comment period.

The NYSDEC has issued this PRAP as a component of the citizen participation plan developed pursuant to the New York State Environmental Conservation Law (ECL) and 6 NYCRR Part 375. This document summarizes the information that can be found in greater detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports available at the document repositories.

The NYSDEC may modify the preferred alternative or select another alternative based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here.

To better understand the site, and the alternatives evaluated, the public is encouraged to review the project documents which are available at the following repositories:

NYSDEC Central Office
50 Wolf Road - Rm 242
Albany, New York 12233-7010
Michael J. Ryan, P.E. - Project Manager
(518) 457-4343 - hrs: 8:30-4:45 Mon.-Fri.

NYSDEC Regional Headquarters
615 Erie Boulevard West
Syracuse, New York 13204-2400
Charles Branagh, P.E. - Regional Engineer
(315) 426-7551 - hrs: 8:30-4:45 Mon.-Fri.

Written comments on the PRAP can be submitted to Michael J. Ryan, Project Manager at the above address.

DATES TO REMEMBER:

January 31, 1997 - March 5, 1997: Public comment period on RI/FS Report, PRAP, and preferred alternative.

February 18, 1997 at 7:00 pm - 9:00 pm: Public meeting at the NYSDEC Office, 615 Erie Boulevard West, Syracuse, New York

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SECTION 2: SITE LOCATION AND DESCRIPTION

The McKesson Envirosystems Site is located in the City of Syracuse to the south of Onondaga Lake, adjacent to the west bank of the New York State Barge Canal Terminal channel. The site was formerly used for bulk storage of petroleum products and in later years, as storage for a variety of chemical waste streams. The site is approximately 8.8 acres in size and is separated by Van Rensselaer Street into two parcels (Figure 1). The parcel north of Van Rensselaer Street is within 150 feet of the Barge Canal. The largest of the former aboveground storage tanks (Tank 7) was located on this portion of the site. The majority of previous material storage and handling took place in the area south of Van Rensselaer Street, where ten former aboveground storage tanks were located.

The site is within one-quarter mile of Onondaga Lake, which is a major surface water body in the greater Syracuse area. Land use in the surrounding area is characterized as industrial/light industrial, being on the edge of the "Oil City" area of Syracuse, although there are current plans for significant non-industrial development in this area. Like the surrounding land, the McKesson property is zoned for industrial use.

The site is generally flat with a grass cover. It is fenced and access is restricted to authorized persons only.

Investigations have revealed that past site operations resulted in significant soil and groundwater contamination. Operable Unit No. 2, which is the subject of this PRAP, consists of the saturated soils (soils located below the groundwater table) and the groundwater beneath areas of the site. An Operable Unit represents a portion of the site remedy which for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the site contamination. Another operable unit, Operable Unit No. 1 (OU-1) - the Unsaturated Soils, was the subject of a 1994 Record of Decision. The remedial work for OU-1 was completed in 1995 (ref. Section 3.2).

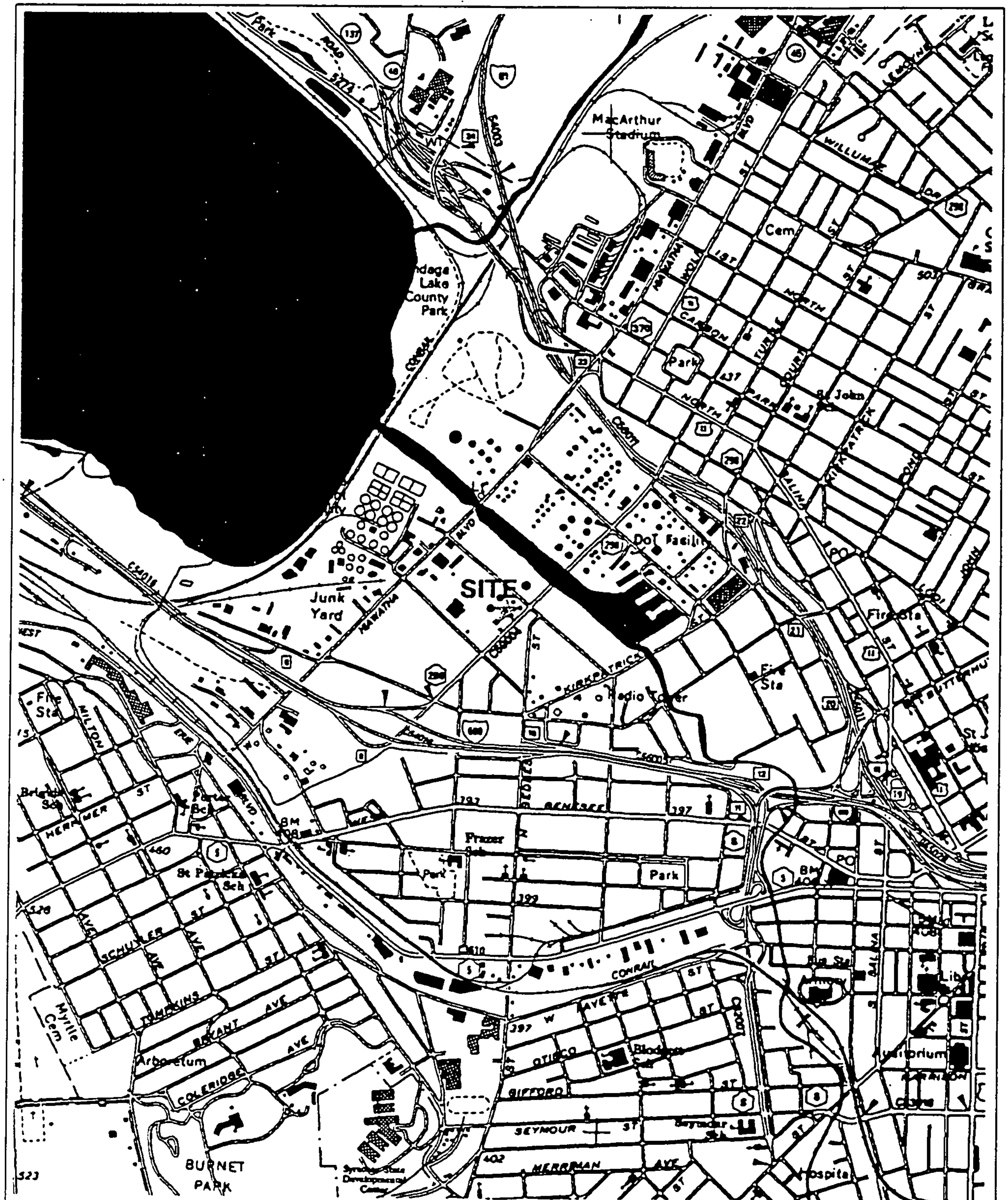
SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

1920's: Occupied by various salt companies.

1928-1969: Petroleum Storage Facility (ARCO), Tanks 1-6 (South Parcel)

1951: Tank 7 installed (North Parcel)



Site Location Map

734020 McKesson Envirosystems (Inland Site)

NYSDOT Planimetric Quadrangle(s):

N

0 500 1000 1500 2000

FEET

FIGURE 1

1969- 1973: Petroleum Storage Facility BP Oil Company (BP)

1973: Inland Chemical Corporation (ICC) purchases site from BP Oil Company for recycling waste streams and chemical storage including: methanol, methylene chloride and other solvents.

1982: ICC operations discontinued.

3.2: Remedial History

1980: ICC filed a Part A Permit Application for Interim status as a hazardous waste storage facility under the Resource Conservation Recovery Act (RCRA).

1987: Revised part A application for closure submitted to NYSDEC. Remediation Consent Order signed 6/10/87.

1988: McKesson Corporation submitted a RCRA closure plan entitled "Verification of Aboveground Storage Tank Decontamination Protocol" to NYSDEC.

1989: RCRA Closure certification is submitted to NYSDEC. Aboveground tanks removed from the site.

1990: Notification from NYSDEC that facility was officially closed and that corrective actions would proceed under the Remediation Consent Order which was amended to include both McKesson Corporation and Safety-Kleen Environsystems Company as Respondents.

The Final Remedial Investigation Report was issued in April 1990. The RI revealed significant soil and groundwater contamination. A PAH Distribution Report was issued at the same time.

1992: A residential Risk assessment and FS Screening of Alternatives were completed.

1993: A Soil Bioremediation Pilot study was conducted at the site using both in-situ and ex-situ techniques. A Feasibility Study and results of the Pilot Study were completed for OU-1, the Unsaturated Soils.

March 1994: A Record of Decision for Operable Unit No. 1 (OU-1), the Unsaturated Soils, was issued by the NYSDEC. The selected remedy was In-Situ Aerobic Bioremediation.

May 1994: An RD/RA Work Plan was developed and approved and remedial work was initiated for OU-1.

September 1995: The NYSDEC approved the RD/RA Report and declared the remedy for OU-1 complete.

September 1996: The PRP completed a "Supplemental Saturated Soil and Groundwater Investigation" in anticipation of the FS for OU-2.

December 1996: The NYSDEC approved the FS for OU-2.

SECTION 4: CURRENT STATUS

In response to a determination that the presence of hazardous waste at the site presents a significant threat to human health and the environment, the McKesson Corporation has completed a Remedial Investigation/Feasibility Study (RI/FS).

4.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site.

The RI was conducted in 1988 and 1989. A report entitled *Final Remedial Investigation Report, April 1990,* has been prepared describing the field activities and findings of the RI in detail. To update existing data regarding the distribution of COCs in the saturated soil and groundwater, a supplemental investigation of saturated soil and groundwater was planned and initiated in 1995. This work was conducted as a preliminary component of the FS for Operable Unit No. 2. A report entitled *Supplemental Saturated Soil and Groundwater Investigation Report, Operable Unit No. 2 - Saturated Soil and Groundwater, September 1996,* has been prepared describing the field activities and findings of the investigation in detail. The investigation tasks and findings are discussed below.

The RI activities consisted of the following:

- Installation of 136 soil borings
- Installation of 13 piezometer clusters
- Installation of 22 monitoring wells and related groundwater sampling
- Collection of 159 soil samples

The Supplemental Investigation field activities consisted of the following:

- Installation of 31 temporary well points and related groundwater sampling
- Installation of 7 monitoring wells and related groundwater sampling
- EM-39 geophysical "downhole" logging of 4 monitoring wells

To determine which media (soil, groundwater, etc.) contain contamination at levels of concern, the RI analytical data was compared to environmental Standards, Criteria, and Guidance (SCGs). Groundwater, drinking water and surface water SCGs identified for the McKesson Site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. NYSDEC TAGM 4046 soil cleanup guidelines for the protection of groundwater, background conditions, and risk-based remediation criteria were used as SCGs for soil.

Based upon the results of the remedial investigation in comparison to the SCGs and potential public health and environmental exposure routes, certain areas of the site require remediation. These are summarized below. More complete information can be found in the RI Report and the Supplemental Investigation Report.

Chemical concentrations are reported in parts per billion (ppb) and parts per million (ppm). For comparison purposes, SCGs are given for each medium.

4.1.1 Nature of Contamination:

As described in the RI Report and Supplemental Report, many soil and groundwater samples were collected at the site to characterize the nature and extent of contamination.

The primary contaminants detected at this site are those associated with past storage activities. These include various volatile and semi-volatile compounds. The investigations have identified that the contaminants of concern (COCs) at this site are: methylene chloride, trichloroethene, benzene, toluene, ethylbenzene, xylene, N,N-dimethylaniline, aniline, methanol and acetone.

4.1.2 Extent of Contamination

Table 1 summarizes the extent of contamination for the contaminants of concern and compares the data with the proposed remedial action levels (SCGs) for the site. The following is a summary of the findings of the investigations for these media.

Soils

The soil stratigraphy is relatively consistent across the site. The surface fill material consists of the unsaturated soil addressed by the OU-1 remedy and the overlying sand and gravel cover placed as a component of the remedy. The surface fill is underlain by silt and clay ranging in depth from approximately 8 to 15 feet below ground surface (bgs), followed by a layer of sand and silt from approximately 15 to 22 feet bgs. A silt and clay lacustrine deposit is present across the entire site at approximately 22 to 24 feet bgs. Underlying the lacustrine silt and clay are varying compositions of sand and gravel to approximately 62 feet bgs.

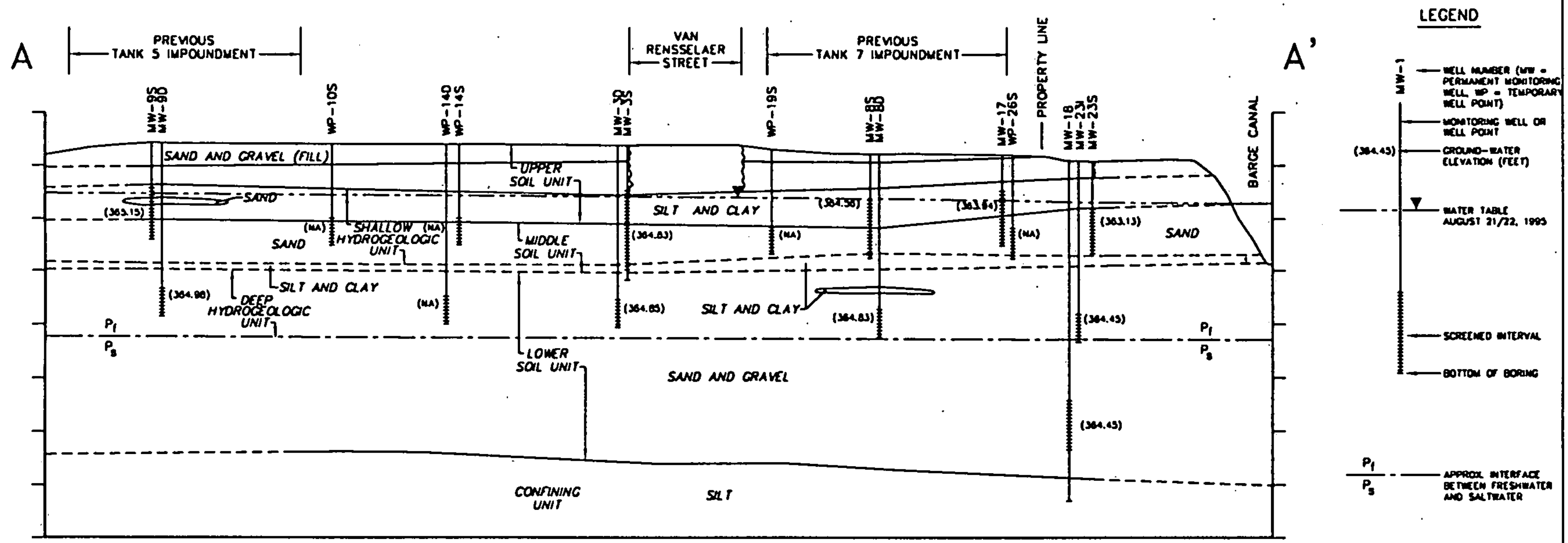
Sampling of the site soils during the RI revealed the presence of the above-mentioned COCs. In general, the COCs were detected near the former materials loading area and the former locations of the aboveground storage tanks. The RI sampling program, however, focused on the unsaturated soils which, as discussed, have since been remediated.

The investigation of the saturated zone, the subject of this operable unit, relied on analysis of groundwater. Since the groundwater and any associated contamination are coincident with the saturated soils, the findings of the investigation of this zone are discussed below.

Groundwater

Two hydrogeological units have been identified at this site. The lacustrine deposit separates a shallow hydrogeologic unit (15-22 feet bgs) from a deep hydrogeologic unit (24-62 feet bgs). This deposit appears to be a semi-confining unit which limits the vertical migration of groundwater between the two hydrogeologic units. Both the shallow and deep horizontal groundwater flow directions are generally to the northeast, toward the Barge Canal. Figure 2 illustrates the site hydrogeology.

The groundwater quality results indicate the presence of chemical compounds at concentrations above groundwater quality standards (ref. Table 1). The identified chemicals in groundwater are: methylene



NOTE:

1. WATER LEVEL MEASUREMENTS CONDUCTED ON AUGUST 21-22, 1995. WATER ELEVATION IN THE BARGE CANAL WAS MEASURED NOVEMBER 15, 1989.
2. STRATIGRAPHY BASED ON DATA GATHERED DURING THE SUPPLEMENTAL INVESTIGATION (1995) AND THE REMEDIAL INVESTIGATION (1989).
3. GROUND-WATER ELEVATION AT MW-18 IS CORRECTED FOR SALTWATER DENSITY.

SCALE: 80' 0 80'

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FEASIBILITY STUDY

GEOLOGIC CROSS SECTION

BBL BLASLAND, BOUCK & LEE, INC. engineers & scientists

FIGURE 2

chloride, trichloroethene, benzene, toluene, ethylbenzene, xylenes, N,N-dimethylaniline, aniline, trans-1,2-dichloroethene, methanol, and acetone. Groundwater data from the RI, the Supplemental Sampling program and semi-annual monitoring events indicate that COCs, though present in on-site groundwater have not, with only one exception (aniline at 7 ppb), migrated beyond the site property boundaries. This off-site contaminant "hit" was detected during the August 1996 semi-annual sampling event.

While recent information may indicate limited migration of contamination toward the Barge Canal, recent groundwater information (Supplemental Investigation) also supports that the concentration and areal distribution of COCs in groundwater appears to have decreased in comparison to historic (RI) data. Also, the data supports that contamination is generally confined to the shallow hydrogeologic unit. This was evidenced by the lack of groundwater standard contravention in samples from the deep well points installed during the Supplemental Investigation. Furthermore, within the deeper hydrogeologic unit there is a freshwater/saltwater interface. This interface exists at a depth of approximately 35 feet bgs. The groundwater in this deeper unit has historically been unusable for drinking because of its high chloride concentrations.

The shallow hydrogeologic unit, therefore, is the subject of this operable unit. As described above, this unit consists of two distinct soil layers, a silt and clay layer and an overlying sand layer.

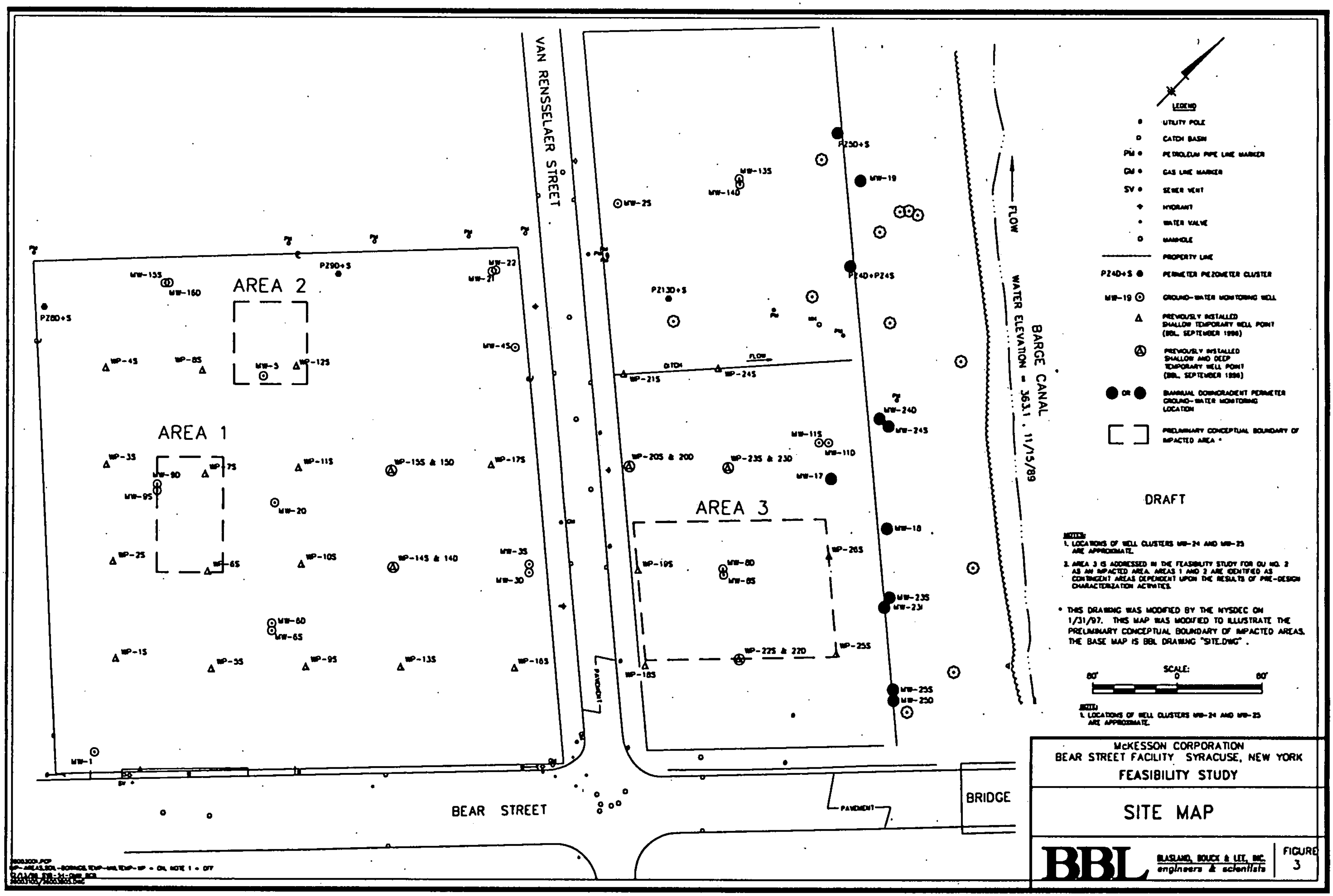
Investigations have identified that the highest concentration and areal distribution of COCs in saturated soil and groundwater at this site are associated with three distinct on-site areas within the shallow hydrogeologic unit. Two of these "impacted areas" are located on the south parcel, in the vicinity of temporary well point locations WP-7S and WP-12S ("Area 1" and "Area 2", respectively). A third area is located on the north parcel in the vicinity of monitoring well cluster MW-8 ("Area 3"). Based on these findings, the potential remedies evaluated in the FS focused on these "impacted areas" (ref. Figure 3).

Groundwater data for the chemicals of concern are presented in Table 1 (page 20).

4.2 <u>Summary of Human Exposure Pathways</u>:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the potential health risks can be found in the RI Report.

An exposure pathway is the route by which an individual comes into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental medium and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.


VAN RENSSELAER STREET
AREA 1
AREA 2
AREA 3
BARGE CANAL
WATER ELEVATION = 363.1, 11/15/89
FLOW
BEAR STREET
BRIDGE
DRAFT
LEGEND
UTILITY POLE
CATCH BASIN
PETROLEUM PIPE LINE MARKER
GAS LINE MARKER
SEWER VENT
HYDRANT
WATER VALVE
MANHOLE
PROPERTY LINE
PERIMETER PIEZOMETER CLUSTER
GROUND-WATER MONITORING WELL
PREVIOUSLY INSTALLED SHALLOW TEMPORARY WELL POINT (BBL, SEPTEMBER 1996)
PREVIOUSLY INSTALLED SHALLOW AND DEEP TEMPORARY WELL POINT (BBL, SEPTEMBER 1996)
BIANNUAL DOWNGRADIENT PERIMETER GROUND-WATER MONITORING LOCATION
PRELIMINARY CONCEPTUAL BOUNDARY OF IMPACTED AREA *
NOTES:
1. LOCATIONS OF WELL CLUSTERS MW-24 AND MW-25 ARE APPROXIMATE.
2. AREA 3 IS ADDRESSED IN THE FEASIBILITY STUDY FOR OU NO. 2 AS AN IMPACTED AREA. AREAS 1 AND 2 ARE IDENTIFIED AS CONTINGENT AREAS DEPENDENT UPON THE RESULTS OF PRE-DESIGN CHARACTERIZATION ACTIVITIES.
* THIS DRAWING WAS MODIFIED BY THE NYSDEC ON 1/31/97. THIS MAP WAS MODIFIED TO ILLUSTRATE THE PRELIMINARY CONCEPTUAL BOUNDARY OF IMPACTED AREAS. THE BASE MAP IS BBL DRAWING "SITE.DWG".
SCALE:
80' 0 80'
McKESSON CORPORATION
BEAR STREET FACILITY SYRACUSE, NEW YORK
FEASIBILITY STUDY
SITE MAP
BBL
BLASLAND, BOUCK & LEE, INC.
engineers & scientists
FIGURE
3

Completed pathways which are known to or may exist at the site in the future include:

- Dermal contact with groundwater by construction workers during possible future excavation activities;

- Inhalation of COCs volatilized from groundwater or potential ingestion of groundwater, should the site be redeveloped;

4.3 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site. The Habitat Based Assessment included in the RI presents a more detailed discussion of the potential impacts from the site to fish and wildlife resources. The following pathways for environmental exposure have been identified:

- Potential for contaminants leaching into groundwater and then discharging into Barge Canal/ Onondaga Creek and thence to Onondaga Lake.

SECTION 5: ENFORCEMENT STATUS

The NYSDEC and the McKesson Corporation entered into a Consent Order on June 10, 1987. The Order obligates the responsible parties to implement a full remedial program. The order was amended on May 9, 1990 to incorporate Safety Kleen Environsystems Company as a PRP. Under the terms of the order, the PRPs will implement the remedy selected for this operable unit by the Record of Decision.

The following is the chronological enforcement history of this site.

Date	Index No.	Order Subject
6/10/87	R7-0766-84-03	Remedial Program
5/09/90	R7-0766-84-03	Amended Rem. Prog.

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. The overall remedial goal is to meet all Standards, Criteria, and Guidance (SCGs) and be protective of human health and the environment.

At a minimum, the remedy selected should eliminate or mitigate all significant threats to public health and to the environment presented by the hazardous waste disposed at the site through the proper application of scientific and engineering principles.

The goals selected for this site are:

- Reduce, control, or eliminate the concentrations of COCs present within the saturated soils and the groundwater at the McKesson Corporation Bear Street Facility; and

- Mitigate the potential for migration beyond the site boundary of groundwater that contains concentrations of COCs in excess of their respective NYSDEC Class GA Ground Water Quality Standard.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

The selected remedy should be protective of human health and the environment, be cost effective, comply with other statutory laws and utilize permanent solutions, alternative technologies or resource recovery technologies to the maximum extent practicable. Potential remedial alternatives for the McKesson Envirosystems site were identified, screened and evaluated in a Feasibility Study. This evaluation is presented in the report entitled *Feasibility Study for Operable Unit No. 2 - Saturated Soils and Groundwater, January 1997.*

A summary of the detailed analysis follows. As used in the following text, the time to implement reflects only the time required to implement the remedy (e.g. estimated duration of system operation), and does not include the time required to design the remedy, procure contracts for design and construction or to negotiate with responsible parties for implementation of the remedy.

7.1: Description of Alternatives

The potential remedies are intended to address the contaminated saturated soils and groundwater at the site.

Alternative 1
No Action

The no action alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state. This alternative would leave the site in its present condition and would not provide any additional protection to human health or the environment.

Alternative 2
Limited Action

Present Worth:	$257,000
Capital Cost:	$3,000
Annual O&M:	$16,500
Time to Implement	6 months

This alternative also would not include remedial actions to address the COCs present within the saturated soils and groundwater at the site, and would rely on natural attenuation processes to attain the remedial goal and RAOs identified for OU No. 2. This alternative, however, would include long-term groundwater monitoring to document groundwater quality.

Alternative 3
In-Situ Anaerobic Bioremediation

Present Worth:	$1,401,000
Capital Cost:	$844,000
Annual O&M:	$107,900
Time to Implement	5 years

This alternative would involve enhancing the naturally occurring anaerobic biodegradation process at Area Nos. 1, 2 and 3. This would be accomplished by adding nutrients to stimulate and increase the anaerobic biodegradation of the COCs present in each area. The process would function in a hydraulically-contained system, thus eliminating the potential for migration of contaminants from these areas.

To evaluate the feasibility of implementing bioremediation techniques to address the COCs present in the saturated soils and groundwater at the site, bench-scale biological treatability studies were conducted as a component of the Supplemental Investigation. The primary objective of these studies was to evaluate the effectiveness of aerobic and anaerobic bioremediation treatment in reducing the concentration of COCs present in these media. Each of the techniques involves stimulating the natural biological/microbial activity that is occurring in the saturated soils and groundwater on site. The treatability study involved chemical and biological characterization of these media by evaluating the effects of various amendments (methane, hydrogen peroxide, phosphorous, nitrogen, etc.) under both aerobic and anaerobic conditions. The study concluded that both aerobic and anaerobic treatment techniques could be effective at reducing the mass of COCs present, under appropriate conditions.

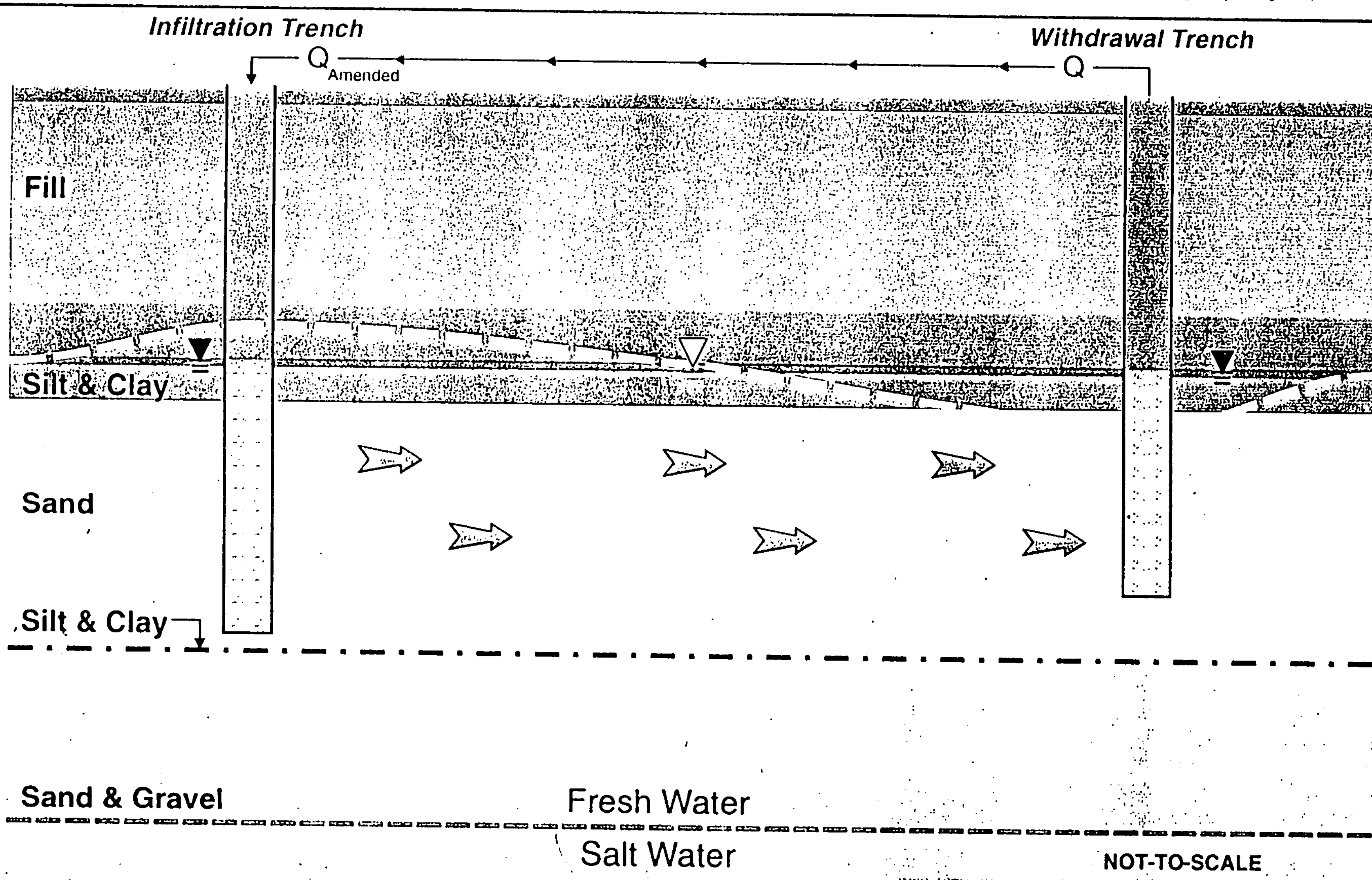
The specific components which would be included in this alternative, In-Situ Anaerobic Bioremediation, are as follows:

- Installing an infiltration trench and a withdrawal trench upgradient and downgradient, respectively, in Area Nos. 1, 2 and 3. These trenches would be installed within the shallow hydrogeologic unit, but would not penetrate the underlying silt and clay lacustrine deposit, which appears to separate the shallow and deep hydrogeologic units. The infiltration trench would be installed in the sand layer (lower portion of the shallow hydrogeologic unit) to facilitate distribution of the amended groundwater to enhance the naturally occurring anaerobic biodegradation of COCs. The actual locations and configurations of these trenches would be determined based on the data obtained from pre-design activities (ref. Figure 4).

- Withdrawing groundwater from the withdrawal trenches and amending the recovered groundwater, as necessary, with macro-nutrients (e.g., phosphorous, nitrogen) and Revised Anaerobic Mineral Media (RAMM) micro-nutrients (i.e., sulfate, iron(III)) prior to infiltration into the shallow hydrogeologic unit. These nutrients are among those which were evaluated and shown to be effective at stimulating biological growth during the bench-scale treatability study.

- Installing shallow well points in the silt and clay layer of the impacted areas (upper portion of the shallow hydrogeologic unit), for the purposes of distributing small quantities of amended groundwater and to provide locations to monitor the effectiveness of the groundwater withdrawal/infiltration system.

This alternative would also include long-term groundwater monitoring to document groundwater quality, monitor biological activity, and determine any migration of



Note:
The upper portion of the silt and clay layer was addressed during the remediation of OU No. 1.

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FEASIBILITY STUDY

Conceptual Closed-Loop Hydraulic Cell

BBL BLASLAND, BOUCK & LEE, INC. *engineers & scientists*

FIGURE 4

10/96 SYR-D54-DJH
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COCs beyond the downgradient perimeter at concentrations in excess of the NYSDEC Class GA Groundwater Quality Standards.

Alternative 4
In-Situ Aerobic and Anaerobic Bioremediation

Present Worth:	$1,922,000
Capital Cost:	$995,000
Annual O&M:	$193,000
Time to Implement	5 years

This alternative would involve the enhancement of naturally occurring microorganisms present in the saturated soils/groundwater of the sand layer located within the shallow hydrogeologic unit. While the permeable nature of the sand layer is conducive to an aerobic system, the relatively "tight" nature of the silt and clay layer is undesirable for such a system. Therefore, this alternative would consist of a dual aerobic/anaerobic approach. This would be accomplished by adding nutrients and dissolved oxygen to stimulate the degradation of COCs in the impacted areas of the site, to change the anaerobic system that currently exists within the sand (lower portion of the shallow hydrogeologic unit) unit into an aerobic system. In addition, nutrient-enriched groundwater would be introduced into the silt and clay layer (upper portion of the shallow hydrogeologic unit) to enhance the naturally occurring anaerobic biodegradation of the COCs in each impacted area. The specific components of In-Situ Aerobic and Anaerobic Bioremediation would include:

- Installing an infiltration trench and a withdrawal trench upgradient and downgradient, respectively, in the impacted areas similar to the trenches described under Alternative 3. As with Alternative 3, the actual locations and configurations of these trenches would be determined based on the data obtained from pre-design activities;

- Withdrawing groundwater from the withdrawal trenches and amending the recovered groundwater with macro-nutrients (e.g., phosphorous, nitrogen) and hydrogen peroxide (a source for dissolved oxygen) prior to infiltration into the sand layer (only) of the shallow hydrogeologic unit. Hydrogen peroxide had a demonstrated effectiveness during the treatability study, in supplying the oxygen necessary for aerobic bioremediation.

- Installing shallow well points in the silt and clay layer of the impacted areas for the purpose of distributing small quantities of RAMM-amended groundwater to promote anaerobic degradation of the COCs as well as and to provide locations to monitor the effectiveness of the anaerobic bioremediation system.

This alternative would also include long-term groundwater monitoring to document groundwater quality, monitor biological activity, and determine any migration of COCs beyond the downgradient perimeter at concentrations in excess of the NYSDEC Class GA Groundwater Quality Standards.

Alternative 5
Ex-Situ Aerobic Soil Bioremediation and In-Situ Anaerobic Bioremediation

Present Worth:	$3,155,000
Capital Cost:	$2,741,000
Annual O&M:	$78,400
Time to Implement	5 years

This alternative would involve excavating impacted soils from within the silt and clay layer (upper portion of the shallow hydrogeologic unit) at the impacted areas. The estimated average depth of the excavations would be approximately 18 feet bgs. Excavated soils would be treated on site using aerobic biological techniques to reduce the concentrations of COCs to less than the NYSDEC site-specific soil cleanup guidelines. In conjunction with the ex-situ treatment program, to address the COCs present in the sand layer (lower portion of the shallow hydrogeologic unit), naturally occurring anaerobic biodegradation processes would be enhanced. This would be accomplished by adding nutrients to stimulate and increase the biodegradation of the COCs as described above for Alternative 3. The specific components of this remedial approach would include:

- Excavating impacted soils from within the silt and clay layer (shallow hydrogeologic unit) at the impacted areas. The estimated average depth of the excavations would be approximately 18 feet bgs. Excavated soils would be treated on site using aerobic biological techniques to reduce the concentrations of COCs to less than the NYSDEC approved soil cleanup levels used for OU No. 1 - the Unsaturated Soils;

- The aerobic biological treatment technique would consist of mechanically blending the excavated soils to enhance the growth and activity of naturally occurring microorganisms that use the COCs as a source of carbon and energy, to convert the COCs to carbon dioxide and water. The soils would be blended in a treatment unit that would be constructed on site. Upon confirmation that soil cleanup levels had been met, treated soils would be backfilled on site.

- To address the COCs present in the sand layer (lower portion of the shallow hydrogeologic unit) this alternative would involve enhancing the naturally occurring anaerobic biodegradation processes at each of the impacted areas. Enhancement of the naturally occurring anaerobic biodegradation processes would be accomplished by adding nutrients to stimulate and increase the biodegradation of the COCs present in these areas. This could be accomplished by adding nutrients directly into the open excavation or by implementing the specific components for in-situ bioremediation, as described above for Alternative 3, with the following exceptions: The infiltration and extraction trenches would not be installed in the impacted areas, because the silt and clay layer within the shallow hydrogeologic unit would be addressed by the excavation and ex-situ bioremediation treatment activities described above. Instead, vertical extraction and infiltration wells would be installed downgradient and upgradient, respectively, of the impacted areas. These wells would be screened in the sand layer. Groundwater from the sand layer would be extracted from the downgradient vertical extraction wells and amended with anaerobic nutrients (e.g., RAMM) prior to infiltration into the sand layer using the upgradient wells. The specific method(s) for enhancing the naturally occurring anaerobic biodegradation process would be determined during the remedial design using the information obtained during the pre-design characterization activities.

This alternative would also include long-term groundwater monitoring to document groundwater quality and to determine any migration of COCs beyond the downgradient perimeter at concentrations in excess of the NYSDEC Class GA Groundwater Quality Standards.

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6NYCRR Part 375). For each of the criteria, a brief description is provided followed by an evaluation of the alternatives against that criterion. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

All of the remedial alternatives would be designed and implemented to meet action-specific SCGs, however, the no-action and limited action alternatives include no measures to address contravention of pertinent standards, should this occur. The remaining remedial alternatives would comply with pertinent SCGs.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

All of the alternatives would provide for a reduction in the concentrations of COCs present in OU No.2, though no-action and limited-action would rely on natural attenuation. Natural attenuation would take years and off-site migration, which has now been evidenced, could impose increased threats to public health and the environment. The in-situ bioremediation alternatives (Alternatives 3 and 4) and the ex-situ soil bioremediation and in-situ anaerobic bioremediation alternative (Alternative 5) would provide better protection of the environment by providing a greater reduction in the total mass of COCs present in OU No. 2. However, implementation of Alternative 5 would pose greater potential impacts during the excavation and ex-situ treatment of impacted soils.

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

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and/or implementation are evaluated. The length of time needed to achieve the remedial

objectives is also estimated and compared against the other alternatives.

All of the remedial alternatives, except for the no-action alternative and the limited-action alternative, involve the excavation and handling of impacted soils. However, the excavation activities that would be implemented under Alternative 5 are much more extensive and present a higher potential for short-term risks to on-site workers and the community during implementation. For this alternative, a greater degree of mitigative measures would need to be implemented to control potential short-term environmental impacts to ambient air quality associated with off-site dust migration and volatilization of the chemicals of concern.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of the remedial alternatives after implementation. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

The no-action alternative and limited-action alternative may not meet the RAOs for OU No. 2. Neither of these alternatives include any remedial activities to address the COCs present within OU No. 2. These alternatives rely on natural attenuation processes to meet the RAOs. The remaining remedial alternatives would meet the RAOs for the site within an estimated five year period. In the interim, the groundwater treatment system(s) would serve to contain the contaminated groundwater, mitigating the potential for off-site migration.

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

The no-action and limited-action alternatives rely on natural attenuation processes to reduce the toxicity, mobility, or volume of the COCs present within OU No. 2. The remaining remedial alternatives would reduce the toxicity, mobility, and volume of the COCs through treatment. In addition, because the treatment system(s) would be hydraulically contained, concerns relative to off-site migration of contamination (i.e. contaminant mobility) during the remedy, would be allayed.

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

All of the remedial alternatives are technically feasible and can be implemented at the site. Alternatives 4 and 5 require a greater degree of coordination than Alternative 3, however, which relies on a single, in-place treatment system. Alternative 4 involves two distinct biological systems. This would entail additional monitoring and maintenance and therefore, increased cost. Alternative 5, likewise, in light of the in-situ and ex-situ technologies, would require greater engineering, monitoring and maintenance. Further, implementation of the ex-situ aerobic bioremediation component of Alternative 5 would present numerous issues due to the potential site of the excavations, including volatilizing COCs during excavation activities, maintaining the stability of the excavation sidewalls, and potentially spreading the distribution of COCs (e.g. during the installation of sheet piling).

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 2.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is focused upon after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance - Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated. A "Responsiveness Summary" will be prepared that describes public comments received and how the Department will address the concerns raised. If the final remedy selected differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PREFERRED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is proposing **Alternative 3, In-Situ Anaerobic Bioremediation,** as the remedy for this site.

This selection is based upon the comparative analysis of alternatives. In-situ Anaerobic Bioremediation (Alternative 3) would be the most effective remedial alternative capable of meeting the RAOs for the site. This is supported by the bench-scale treatability study which demonstrated the ability of this technology to address the contamination present. Further, this alternative, which involves a single anaerobic system, would also be best suited to address the physical characteristics of the zone of contamination (i.e. the silt layer overlying the sand layer). Biological treatment using in-situ anaerobic bioremediation techniques would be a destructive technology which has been proven effective at addressing the COCs present. When implemented at the site, this alternative would result in a permanent and significant reduction of the total mass of the COCs in the soil and groundwater in the impacted areas of OU No.2. The remedy would have the added benefit of providing hydraulic containment during the time required to biologically treat the COCs. Accordingly, In-Situ Anaerobic Bioremediation is the recommended remedial alternative.

The estimated present worth cost to implement the remedy would be $1,401,000. The cost to construct the remedy is estimated to be $844,000 and the estimated average annual operation and maintenance cost for 5 years would be $107,900.

The elements of the selected remedy would be as follows:

1. A remedial design program to verify the components of the conceptual design and

provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program. Any uncertainties identified during the RI/FS would be resolved.

2. Installation of an infiltration trench and a withdrawal trench upgradient and downgradient, respectively, of Areas 1, 2 and 3 (ref. Figure 3). These trenches would be installed within the sand unit, but would not penetrate the underlying silt and clay lacustrine deposit. The infiltration trench would be installed in the sand layer to facilitate distribution of the amended groundwater to enhance the naturally occurring anaerobic biodegradation of COCs.

3. Groundwater from the withdrawal trenches would be amended, as necessary, with macro-nutrients (e.g., phosphorous, nitrogen) and Revised Anaerobic Mineral Media (RAMM) micro-nutrients (i.e., sulfate, iron(III)) prior to discharge to the upgradient trench for infiltration back into the shallow hydrogeologic unit.

4. Installation of shallow well points in the silt and clay layer of the impacted areas for the purpose of distributing small quantities of amended groundwater and to provide locations to monitor the effectiveness of the groundwater withdrawal/infiltration system.

5. Since the remedy results in untreated hazardous waste remaining at the site, a process control monitoring program would be instituted which would allow the effectiveness of the selected remedy to be monitored and would be a component of the operation and maintenance for the site. Upon discontinuation of system operations, estimated to be about five years subsequent to system initiation, a post-remedial monitoring program will be established.

6. Upon completion of the remediation, as demonstrated by the monitoring programs, the site would be considered for delisting from the New York State Registry of Inactive Hazardous Waste Disposal Sites. Once the remedy is in place, the site would be reclassified as a class 4, indicating that the remedial action is in place and only operation and maintenance would be required.

Table 1
Nature and Extent of Contamination

MEDIA	CLASS	CONTAMINANT OF CONCERN	CONCENTRATION RANGE (ppb)	FREQUENCY of EXCEEDING SCGs	SCG* (ppb)
Groundwater	Volatile Organic Compounds (VOCs)	Benzene	ND-2,000	19 of 175	0.7
		Toluene	ND-430(JD)	12 of 175	5
		Ethylbenzene	ND-610	14 of 175	5
		Xylene	ND-2,800	14 of 175	5
		Trichloroethylene	ND-60,000(JD)	4 of 175	5
		Methylene Chloride	ND-7,700,000(D)	22 of 175	5
		Methanol	ND-430,000	NA	NA
		Acetone	ND-470,000	4 of 175	50
	Semivolatile Organic Compounds (SVOCs)	Aniline	ND-39,000(D)	31 of 175	5
		N,N-dimethylaniline	ND-380,000(D)	21 of 175	5

* NYS Ambient Water Quality Standards and Guidance Values (TOGS 1.1.1)
D - Sample Diluted
J- Estimated Concentration

Table 2
Remedial Alternative Costs

Remedial Alternative	Capital Cost	Annual O&M	Total Present Worth
No Action	$0	$0	$0
Limited Action	$3,000	$16,500	$257,000
In-Situ Anaerobic Bioremediation	$844,000	$107,900	$1,401,000
In-Situ Aerobic and Anaerobic Bioremediation	$995,000	$193,000	$1,922,000
Ex-Situ Aerobic and In-Situ Anaerobic Bioremediation	$2,741,000	$78,400	$3,155,00

File on eDOCs _______________ Yes _______________ No
Site Name _______________
Site No. _______________
County _______________
Town _______________
Foilable _______________ Yes _______________ No
File Name _______________
Scanned & eDOC _______________

NOTICE TO PUBLIC 1/24

McKESSON ENVIROSYSTEMS
Inactive Hazardous Waste Site

Syracuse (C), Onondaga, County, New York
Site No. 07-34-020

PROPOSED REMEDIAL ACTION PLAN

January 1994

Prepared by:

New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation

PROPOSED REMEDIAL ACTION PLAN

Operable Unit No. 1 - Unsaturated Site Soils
McKESSON ENVIROSYSTEMS (INLAND SITE)
Syracuse, Onondaga County, New York
Site No. 07-34-020
January 1994

SECTION 1: PURPOSE OF THE PROPOSED PLAN

The New York State Department of Environmental Conservation (NYSDEC) in consultation with the New York State Department of Health (NYSDOH) is proposing bioremediation of contaminated unsaturated soils and groundwater monitoring for this operable unit of the McKesson Envirosystems (Inland Site). The remediation proposed for this operable unit is intended to prevent further contaminant migration from the unsaturated soils into the groundwater by addressing this source of contamination at the site.

The saturated soils and groundwater will be addressed as part of a separate operable unit for this site. The site will remain on the NYS Registry of Inactive Hazardous Waste Sites, as a class 2 site, until this second operable unit and any other identified problems are addressed through the remedial process.

This Proposed Remedial Action Plan (PRAP) identifies the preferred remedy, summarizes the other alternatives considered, and discusses the rationale for this preference. The NYSDEC will select a final remedy for the first operable unit of this site only after careful consideration of all comments submitted during the public comment period.

This PRAP is issued by the NYSDEC as an integral component of the citizen participation plan responsibilities provided by the New York State Environmental Conservation Law (ECL), 6 NYCRR Part 375. This document is a summary of the information that can be found in greater detail in the Remedial Investigation (RI) and Feasibility Study (FS) reports on file at the document repositories.

The NYSDEC may modify the preferred alternative or select another response action presented in this PRAP and the RI/FS Report based on new information or public comments. Therefore, the public is encouraged to review and comment on all of the alternatives identified here and the documents at the repositories to gain a more comprehensive understanding of the site and the investigations conducted there. The project documents can be reviewed at the following repositories:

A. Joseph White, Project Manager
NYSDEC, 50 Wolf Road - Room 222
Albany, New York 12233-7010
(518) 457-4343

Charles Branagh, Regional Engineer
NYSDEC, 615 Erie Boulevard West
Syracuse, New York 13204-2400
(315) 426-7551

DATES TO REMEMBER:
January 24, 1994 to February 26, 1994: Public comment period on the PRAP. Written comments will be received until February 26, 1994.

February 16, 1994 at 7:00 p.m., Public meeting at the **NYSDEC Region 7 Office,** 615 Erie Blvd. West, Syracuse

Written comments on the PRAP can be submitted to Mr. A. Joseph White, at the Albany Office address.

SECTION 2: SITE LOCATION AND DESCRIPTION

The McKesson Envirosystems (Inland Site) is located in the city of Syracuse to the south of Onondaga Lake. The site is approximately 8.2 acres in size and is separated by Van Rensselaer Street into two parcels (Figure 1). The parcel north of Van Rensselaer Street is within 150 feet of the New York State Barge Canal Terminal channel, most of which is well-vegetated with grasses, shrubs, and some trees. The largest of the former aboveground storage tanks (Tank 7) was located on this portion of the site.

The bulk of previous material storage and handling took place in the area south of Van Rensselaer Street, where ten former aboveground storage tanks were located. A paved parking area and buildings account for approximately ten percent of this southern parcel. The remainder supports vegetation consisting of weeds, grasses and the primary vegetation on the south parcel, wetland-associated species. The wetland plants are confined to areas near the locations of the former aboveground storage areas. Berms surround these former tank areas resulting in standing water which is present within the berms for significant periods of time. The site is also within one-quarter mile of Onondaga Lake, which is a major surface water body in the greater Syracuse area.

Land use in the surrounding area may be characterized as industrial/light industrial, being on the edge of the "Oil City" area of Syracuse, although there are current plans for significant non-industrial development in this area. The McKesson property also has an industrial zoning classification.

The former storage areas of the site are secured against trespass with chain link fence and barbed wire. A soil berm is also present along most of the site perimeter, and berms surround the former tank areas.

Operable Unit No. 1, which is the subject of this PRAP, consists of the unsaturated soils at the site.

An Operable Unit represents a discrete portion of the remedy for a site which for technical or administrative reasons can be addressed separately to eliminate or mitigate a release, threat of release or exposure pathway resulting from the contamination present at a site. The remaining operable unit for this site will address the saturated soils and the groundwater, which will be the second operable unit at this site. Any remediation necessary to address this remaining contamination will be the subject of a future PRAP.

SECTION 3: SITE HISTORY

3.1: Operational/Disposal History

1920's: Occupied by various salt companies.

1928-1969: Petroleum Storage Facility (ARCO), Tanks 1-6 (South Parcel)

1951: Tank 7 installed (North Parcel)

1969- 1973: Petroleum Storage Facility BP Oil Company (BP)

1973: Inland Chemical Corporation (ICC) purchases site from BP Oil Company for recycling waste streams and chemical storage including: methanol, methylene chloride and other solvents.

1982: ICC operations discontinued.

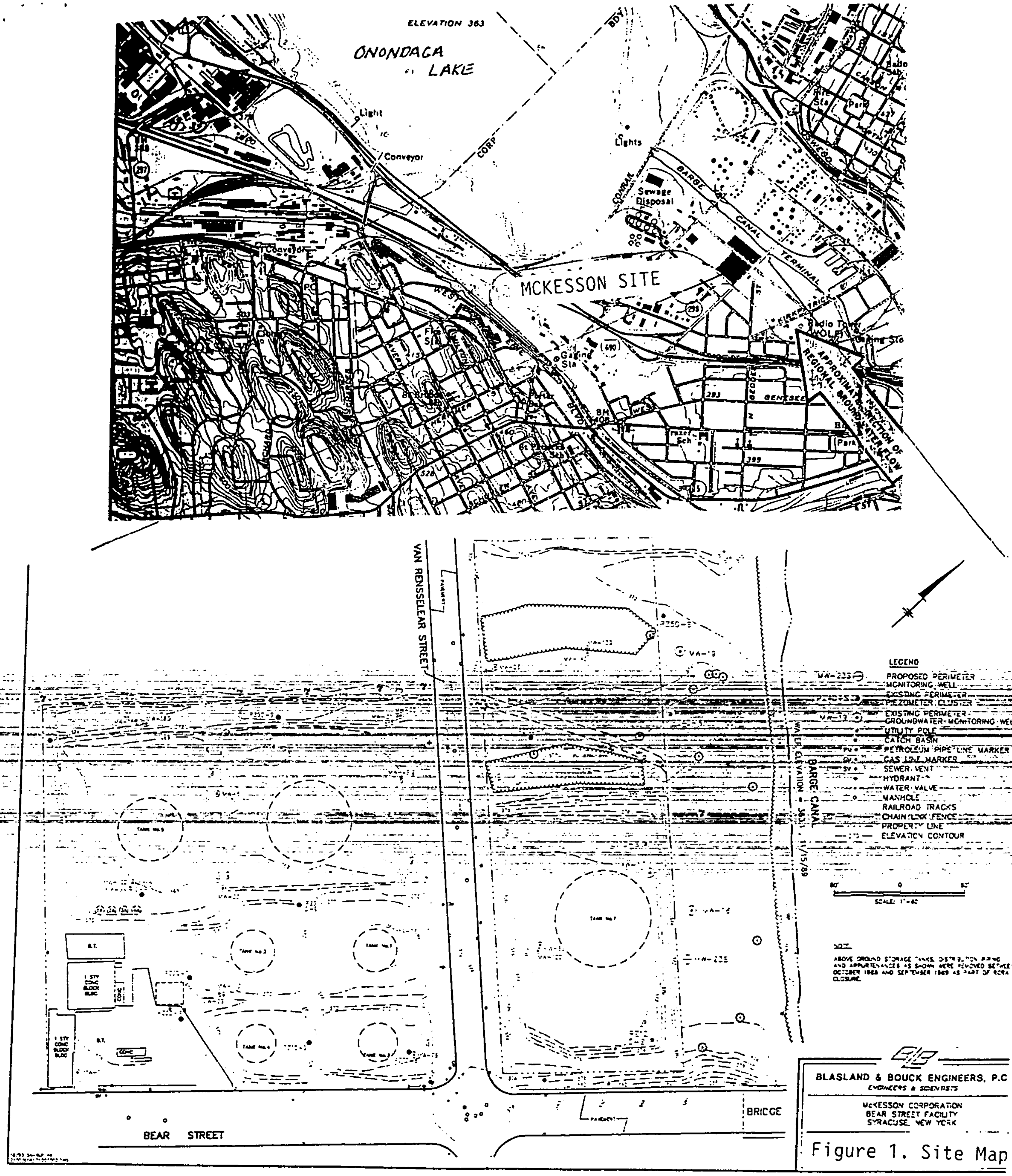


Figure 1. Site Map

3.2: Remedial History

1980: ICC filed a Part A Permit Application for Interim status as a hazardous waste storage facility under the Resource Conservation Recovery Act (RCRA).

1987: Revised part A application for closure submitted to NYSDEC. Remediation Consent Order signed 6/10/87.

1988: McKesson Corporation submitted a RCRA closure plan entitled "Verification of Aboveground Storage Tank Decontamination Protocol" to NYSDEC.

1989: RCRA Closure certification submitted to NYSDEC Aboveground tanks removed from the site.

1990: Notification from NYSDEC that facility was officially closed and that corrective actions would proceed under the Remediation Consent Order which was amended to include both McKesson Corporation and Safety-Kleen Environsystems Company as Respondents.

The Final Remedial Investigation Report was issued in April 1990. A PAH Distribution Report was issued at the same time.

1992: A residential Risk assessment and FS Screening of Alternatives were completed.

1993: A Soil Bioremediation Pilot study was conducted at the site using both in-situ and ex-situ techniques. A Feasibility Study and results of the Pilot Study were completed.

SECTION 4: CURRENT STATUS

In response to a determination that the presence of hazardous waste at the Site presents a significant threat to human health and the environment, the McKesson Corporation has recently completed a Remedial Investigation/Feasibility Study (RI/FS).

4.1: Summary of the Remedial Investigation

The purpose of the RI was to define the nature and extent of any contamination resulting from previous activities at the site.

The RI was conducted in 1988 and 1989. A report entitled *Final Remedial Investigation Report, April 1990,* has been prepared describing the field activities and findings of the RI in detail. A summary of the RI follows:

The RI activities consisted of the following:

- Installation of 136 soil borings
- 13 piezometer clusters
- 22 monitoring wells and related groundwater sampling
- 159 soil samples

The analytical data obtained from the RI was compared to environmental Standards, Criteria, and Guidance (SCGs). Groundwater, drinking water and surface water SCGs identified for the McKesson Corporation site were based on NYSDEC Ambient Water Quality Standards and Guidance Values and Part V of NYS Sanitary Code. Soil and sediment analytical results where evaluated against NYSDEC soil cleanup guidelines for the protection of groundwater, background conditions, and risk-based remediation criteria were used to develop remediation goals for soil.

Soil cleanup values were obtained by evaluating the technology based limits of bioremediation and evaluating these limits during an on-site treatability study. The site specific conditions were taken into account during this evaluation, in particular the nature of the groundwater aquifer.

Based upon the results of the remedial investigation in comparison to the SCGs and potential public health and environmental exposure routes, certain areas and media of the site require remediation. These findings are summarized below. More complete information can be found in the RI Report.

Chemical concentrations are reported in parts per billion (ppb) and parts per million (ppm). For comparison purposes, where applicable, SCGs are given for each medium.

Soils

The unsaturated soils to be addressed by this operable unit at this site are those approximately four feet in depth which lie above the groundwater elevation, which corresponds to an elevation of 365 feet for the southern portion of the site and 364 feet for the northern portion of the site. These soils have been contaminated with materials previously stored in tanks at the site. The following 14 chemicals have been observed at the site during the RI: benzene, toluene, ethylbenzene, xylenes, tetrachloroethene, trichloroethene, trans-1,2-dichloroethene, methylene chloride, vinyl chloride, aniline, N,N-dimethylaniline, acetone, methanol, and chlorobenzene and represent the Chemicals of Concern (COCs). For evaluation purposes, the Chemicals of Concern were grouped into four classes based on similar chemical characteristics and are identified as follows in the text: non-halogenated aromatics, chlorinated aliphatics, dimethylaniline-related compounds, and "other chemicals" which do not fit into the three stated classes. The specific compounds in each class are listed on Table 1.

Non-halogenated aromatics (benzene, toluene, ethylbenzene, and xylenes) are frequently detected in association with petroleum products (primarily gasoline). Chlorinated aliphatic compounds are commonly used as solvents. They include the following compounds detected at this site: tetrachloroethene (TeCE), trichloroethene (TCE), trans-1,2-dichloroethene (t-1,2-DCE), methylene chloride, and vinyl chloride. The dimethylaniline-related compounds observed at the site are aniline and N,N-dimethylaniline. Acetone, methanol, and chlorobenzene are "other chemicals" present at the site which do not fit into the other classes of chemicals.

In general, the chemicals of concern were detected near the former materials loading area and the former locations of the aboveground storage tanks. Maximum observed soils concentrations of the chemicals of concern and the borings from which the samples were taken are presented in Table 1.

<u>Non-Halogenated Aromatics</u>: The maximum observed concentrations of each of the BTEX compounds in soils above the water table were observed in soil boring B-83. This soil boring is located within 100 feet of the former main tanker truck materials loading area. These concentrations were: 11.5 ppm benzene, 17 ppm toluene, 49 ppm ethylbenzene, and 218 ppm xylenes. These concentrations were detected 2.5 to 3.5 feet below the surface in soil boring 83. Lower concentrations were detected at a more shallow depth (1.5 to 2.5 feet) in the same soil boring.

<u>Chlorinated Aliphatics</u>: The maximum observed concentrations of two of the four chlorinated aliphatics were detected in soil boring B-135, which was installed in November 1989 at the former location of Tank 1. Trichloroethene and methylene chloride were detected at 140 ppm and 827 ppm, respectively, in this boring at a depth of 2.5 to 3.5 feet. The maximum soils concentration of TeCE (0.34 ppm) was observed in soil boring B-63 which is located at the eastern perimeter of Tank 5. This concentration was detected at a depth of 1.5 to 2.5 feet. Trans-1,2-DCE was detected at a

Table 1

MCKESSON CORPORATION
BEAR STREET FACILITY

CHEMICALS OF CONCERN
MAXIMUM CONCENTRATIONS OBSERVED
IN SOILS[1] AND GROUND WATER[2]

	Ground-Water Concen. (mg/l)	Monitoring Well Location	Soils Concen. (mg/kg)[3]	Soil Boring Location
Non-Halogenated Aromatics				
Benzene	1.8	MW-2	11.5	B83
Toluene	0.025	MW-9	17.	B83
Ethylbenzene	0.36	MW-2	49.	B83
Xylenes	0.81	MW-2	218.	B83
Chlorinated Aliphatics				
Tetrachloroethene	ND	---	0.34	B63
Trichloroethene	0.1	MW-3	140.	B135*
t-1,2-dichloroethene	1.8	MW-3	0.22	B92
Methylene Chloride	2800.	MW-8	827.	B135*
Vinyl Chloride	0.45	MW-3	ND	---
Dimethylaniline-Related Compounds				
Aniline	8.5	MW-8	282.	B137*
N,N-dimethylaniline	52.	MW-8	1,830.	B139*
Other				
Acetone	470	MW-8	833	B132*
Methanol	300	MW-8	13,072	B139*
Chlorobenzene	0.001	MW-5	4.2	B61

Notes:

ND = Not Detected.
[1] = Soil samples collected December 1988 and October 1989
[2] = Ground-water samples collected November 1989.
[3] = Soil concentration units are dry weight basis.
* = Soil borings installed in October 1989 after tank removal.

Table 2

MCKESSON CORPORATION
BEAR STREET FACILITY

DRINKING WATER STANDARDS
CHEMICALS OF CONCERN

Chemical	EPA-MCL[a] (mg/l)	NYS Quality Standards For Ground Water (mg/l)[b]	NYS Ground-Water Quality Guidance Values[c]
Benzene	0.005	NA	
Toluene	2.*		0.05
Ethylbenzene	0.7*		0.05
Xylenes	10.*		0.05
Tetrachloroethene	0.005*		0.0007
Trichloroethene	0.005	0.01	
t-1,2-Dichloroethene	0.1*		0.05
Methylene Chloride	NA		0.05
Vinyl Chloride	0.002	0.005	
Aniline	NA		0.001
N,N-dimethylaniline	NA		0.001
Acetone	NA	NA	
Methanol	NA	NA	
Chlorobenzene	0.1*		0.02

Notes:

NA = Not available.

* = Proposed MCL (Federal Register, May 22, 1989).

a = MCL - Maximum Contaminant Level (EPA, 1986b).

b = (NYSDEC 1986).

c = NYS Ambient Water Quality Guidance Values for Class GA Ground Water (6NYCRR, Part 703)(T.O.G.S.).

maximum concentration of 0.22 ppm in soil boring B-92. This soil boring is located in the area immediately adjacent to the former location of Tank 1. Vinyl chloride was not detected in any soil samples from the site.

<u>Dimethylaniline-Related Compounds</u>: The highest concentrations of aniline and N,N-dimethylaniline detected in soils were observed at former aboveground storage tank locations. Aniline was detected at 282 ppm in soil boring B-137 from the former Tank 4 area. N,N-dimethylaniline was detected at 1,830 ppm in soil boring B-139 from the former Tank 2 area. Both of these samples were obtained at a depth of 0.5 to 1.5 feet.

<u>Other Compounds</u>: Maximum observed concentrations of acetone and methanol were detected in soil samples collected at former aboveground storage tank locations. Acetone was found at a concentration of 833 ppm in soil boring B-132 in the area where Tank 3 was formerly located. Methanol was found at a concentration of 13,072 ppm in soil boring B-139 in the area where Tank 2 was formerly located. The maximum concentration of chlorobenzene (4.2 ppm) was detected in soil boring B-63 which is located at the perimeter of the area where Tank 5 was formerly located.

<u>Groundwater</u>

The stratigraphy beneath the site consists of four soil units having different hydraulic conductivities. The hydraulic conductivities range from the low hydraulic conductivity of the upper silt and clay soil unit and lower confining unit to moderate to high hydraulic conductivity of the middle and lower soil units. The low hydraulic conductivity of the upper silt and clay soil unit limits the amount of surface water infiltration from precipitation and snow melt runoff; which contributes to ponding water in the former tank impoundment areas. The silt and clay confining unit has a low hydraulic conductivity, and would act as a barrier to groundwater movement between the materials above the confining unit to those materials below the confining unit.

The three flow systems identified beneath the Bear Street site are: a deep flow system in the unconsolidated deposits beneath the confining layer, an intermediate flow system in the lower soil unit, and a shallow flow system in the upper and middle soil units. The intermediate flow system, in the lower soil unit, can be separated into a freshwater zone and saltwater zone. Both the shallow and intermediate flow systems are strongly influenced by seasonal or transient conditions including precipitation, ponding water and subsequent infiltration within the impoundments, and the water elevation of the Barge Canal. The discharge point for the shallow and intermediate flow systems is the Barge Canal, and the discharge point for the deep flow system appears to be Onondaga Lake.

The groundwater quality results indicate the presence of chemical compounds at concentrations above either groundwater quality standards or the background concentrations as measured at monitoring well MW-1. The identified chemicals in groundwater are: methylene chloride, trichloroethene, benzene, toluene, ethylbenzene, xylenes, N,N-dimethylaniline, aniline, trans-1,2-dichloroethene, methanol, and acetone. None of the identified chemicals appear to have migrated beyond the site property boundaries.

Maximum concentrations of the chemicals of concern observed in groundwater are presented in Table 1. Groundwater standards or guidance values are provided in Table 2 for comparison purposes.

The naturally high sodium chloride content of the groundwater detected in the intermediate flow system exceeds the New York State groundwater quality standards, limiting the potable use of the site groundwater. No other exceedences of inorganic compounds were identified by the RI.

4.2 Summary of Human Exposure Pathways:

This section describes the types of human exposures that may present added health risks to persons at or around the site. A more detailed discussion of the health risks can be found in the RI Report.

An exposure pathway is the route by which an individual comes into contact with a contaminant. The five elements of an exposure pathway are 1) the source of contamination; 2) the environmental medium and transport mechanisms; 3) the point of exposure; 4) the route of exposure; and 5) the receptor population. These elements of an exposure pathway may be based on past, present, or future events.

Completed pathways which are known to or may exist at the site in the future include:

* dermal contact with inhalation and ingestion of soils and dust.

* dermal contact with groundwater at the site

* inhalation of chemicals volatilized from groundwater or ingestion of groundwater in a residential setting

* inhalation of contaminants volatilized from soils during construction activities

This proposed plan deals with the source of contamination in the unsaturated surface soils at the site. Hence, the soil contamination routes of exposure will be addressed but the groundwater will only be dealt with to the extent that the source in the unsaturated soils will be eliminated and further degradation of the groundwater should not occur.

The saturated soils and groundwater are the second operable unit at this site and remediation of that operable unit will occur in the future.

4.3 Summary of Environmental Exposure Pathways:

This section summarizes the types of environmental exposures which may be presented by the site. The Habitat Based Assessment included in the RI presents a more detailed discussion of the potential impacts from the site to fish and wildlife resources. The following pathways for environmental exposure have been identified:

* potential for contaminants leaching into groundwater and then possibly discharging into Barge Canal/ Onondaga Creek and thence to Onondaga Lake.

* contaminants leaching into ponded surface water and reaching wildlife.

* contaminants affecting surface and subsurface wildlife through direct contact, ingestion, or inhalation.

SECTION 5: ENFORCEMENT STATUS

The NYSDEC and the McKesson Corporation entered into a Consent Order on June 10, 1987. The Order obligates the responsible parties to implement a full remedial program. The order was amended on May 9, 1990 to incorporate Safety Kleen Environsystems Company as a PRP.

The following is the chronological enforcement history of this site.

Date	Index No.	Order Subject
6/10/87	R7-0766-84-03	Remedial Program
5/09/90	R7-0766-84-03	Amended Remedial Program

SECTION 6: SUMMARY OF THE REMEDIATION GOALS

Goals for the remedial program have been established through the remedy selection process stated in 6 NYCRR Part 375-1.10. These goals are established under the guideline of meeting all standard, criteria, and guidance (SCGs) and protecting human health and the environment.

At a minimum, the remedy selected for the unsaturated surface soils should eliminate or mitigate all significant threats to the public health and to the environment presented by the hazardous waste disposed and remaining in the surface soils at the site through the proper application of scientific and engineering principles. The potential for exposure due to groundwater will be addressed by a second operable unit.

The goals selected for the unsaturated soils operable unit of this site are:

- Reduce, control, or eliminate the contamination present within the unsaturated soils on site.
- Eliminate a threat to surface waters by eliminating any future contaminated surface run-off from the contaminated soils on site.
- Eliminate the potential for direct human or animal contact with the contaminated soils on site.
- Monitor the impacts of contaminated groundwater to the environment.

SECTION 7: SUMMARY OF THE EVALUATION OF ALTERNATIVES

Potential remedial alternatives for the unsaturated soils at the McKesson Corporation site were identified, screened and evaluated in a Feasibility Study. This evaluation is presented in the report entitled **Feasibility Study, November 1993.** A summary of the detailed analysis follows.

7.1: Description of Alternatives

The potential remedies are intended to address the contaminated unsaturated soils at the site and they are:

1. No Action

The no action alternative is evaluated as a procedural requirement and as a basis for comparison. It requires continued monitoring only, allowing the site to remain in an unremediated state.

The site would remain in its present condition, and human health and the environment would not be provided any additional protection.

2. Low Permeability Cap

Present Worth:	$1,900,000
Capital Cost:	$1,900,000
Annual O&M:	$18,000
Time to Implement:	1 year

Construction of a low-permeability cap over a five-acre portion of the site would minimize the infiltration of precipitation through the soils containing the chemicals of concern. The cap would be constructed of a low-permeability material such as natural clay, geosynthetics, asphalt or combinations of these materials, and would include drainage and top soil layers to achieve a well drained, vegetated surface upon completion. Limiting the amount of precipitation that percolates through the soils would reduce the leaching of the chemicals of concern into the groundwater beneath the site.

Prior to cap construction, impacted soils from the portion of the site located north of Van Rensselaer Street would be excavated and placed on the portion of the site to be covered by the cap (south side of Van Rensselaer Street). The resulting excavations would be backfilled with imported select clean fill material and compacted, and the site would be graded to promote drainage. Storm water run-off from the cap would drain to a storm water collection system located around the perimeter of the cap, which would discharge into the Barge Canal.

3a. On-Site High-Temperature Incineration

Present Worth:	$10,600,000
Capital Cost:	$10,600,000
Annual O&M:	$18,000
Time to Implement:	1 year

This alternative consists of excavating the estimated 10,000 cubic yards of impacted site soils and treating them in an on-site incinerator. This treatment technology has proven effective in treating soils containing organic constituents.

Incineration is a process that utilizes high temperature (typically between 1,400 and 2,200 degrees Fahrenheit) to thermally destruct organic compounds present in soils. Three types of mobile incinerators commonly utilized include fluidized bed, rotary kiln, and infrared incinerators. The most common of these is the rotary kiln incinerator, which is described in this evaluation.

Site soils would be excavated, stockpiled, and screened to remove debris greater than two inches in diameter. Soil and debris with diameters greater than two inches would either be crushed prior to being fed into the high-temperature incinerator (HTI) with the smaller soil particles, or stockpiled and cleaned by another method such as steam cleaning. The screened soils would be fed directly into the HTI's rotating refractory-lined kiln. Lifters attached to the inside of the kiln are used to agitate the soils to improve heat transfer.

The combustion gases, which contain volatilized organic compounds, exit the kiln and pass through a hot cyclone for removal of relatively large particulates. The gases then pass from the cyclone into a secondary combustion chamber where any remaining organic vapors, carbon monoxide, and particulates are destroyed at temperatures of 1,800 to 2,200 degrees Fahrenheit. Any remaining combustion gases pass through an evaporative cooler to cool the gases, a bag house to collect particulates, and a paced-bed alkaline scrubbing unit to remove acid gases. The treated gases are then discharged to the atmosphere.

The HTI would be operated continuously until the site soils were satisfactorily treated. Continuous operation of the HTI would also increase the efficiency of the unit over the duration of the project.

After treatment, the resulting flyash (treated soils) is discharged from the incinerator into a pugmill, where filtered process water is added to cool the flyash and control dust. The treated soils would be analyzed for the chemicals of concern to verify that the soil cleanup levels had been achieved.

The treated soils may also require solidification to ensure that the soils meet TCLP requirements for inorganic constituents that may be concentrated by incineration. The solidified soils would then be directly backfilled on-site. The site would require a CAMU designation so that the incinerated and solidified soils could be backfilled directly without requiring the construction of a RCRA landfill cell.

Air monitoring would insure that on-site workers as well as the surrounding community are not exposed to volatilized contaminants during remediation.

3b. On-Site Low-Temperature Thermal Desorption (LTTD)

Present Worth:	$4,240,000
Capital Cost:	$4,240,000
Annual O&M:	$18,000
Time to Implement:	1 years

This alternative consists of excavating 10,000 c.y. of impacted site soils and treating them on-site using a mobile LTTD unit. This treatment technology has proven effective at treating soils containing organic constituents.

LTTD is a process by which soils containing organic compounds are heated, and the organic compounds are volatilized from the soils into an induced air flow.

Site soils would be excavated, stockpiled, and screened to remove debris greater than two inches in diameter. Soil and debris with diameters greater than two inches would either be crushed prior to being fed into the LTTD with the small soil particles, or stockpiled and cleaned by another method, such as steam cleaning. The screened soils would be fed directly into the LTTD's rotating kiln, where the soil would be heated to 500 to 1,200 degrees Fahrenheit. The rotation of the kiln mixes the soils and conveys them through the unit. The moisture and organics vaporize due to the elevated temperature, and are released from the soil. The off-gases, which contain volatile organics and some particulates, are collected and treated further with a combustion after-burner or by passing the gases through a system consisting of a cyclone, baghouse, wet scrubber and activated carbon bed. In the combustion after-burner, the collected gases are incinerated at 1,800 to 2,200 degrees Fahrenheit. In the alternate system, the cyclone and baghouse remove the soil particulate, the wet scrubber removes the acid gases, and the activated carbon removes any remaining organics.

After processing is complete, the treated soils are transferred from the kiln into a pugmill, where water is added to cool the soils and reduce dust production. The treated soils are then stockpiled for backfill pending analytical testing.

Air monitoring would insure that on-site workers as well as the surrounding community are not exposed to volatilized contaminants during remediation.

4a. Biological Treatment Using In-Situ Soil Blending

Present Worth:	$1,340,000
Capital Cost:	$1,340,000
Annual O&M:	$18,000
Time to Implement:	1 year

Biological treatment of soils is accomplished through the stimulation of indigenous or cultured microorganisms that use the biodegradable chemical constituents present in the soils as a source of carbon and energy, while converting them into carbon dioxide and water. Biological treatment through in-situ soil blending consists of mixing soils in place to improve the mass transfer of oxygen and nutrients which in turn enhances the growth and activity of aerobic bacteria.

In-situ biological treatment using soil blending at the site would require that the impacted soils be mixed and aerated using a hydraulic implement installed on an excavator.

Surface water would have to be pumped to areas of the site where the soils do not require treatment and used as needed during the treatment process to maintain the desired moisture content within the soils being treated.

Air monitoring for total organic vapors, methylene chloride, and dust daily during the mixing activities would ensure that on-site workers and potential off-site receptors were not exposed to unacceptable levels of the chemicals of concern. Fertilizer would be added to the plot as required to maintain optimum nutrient levels.

Volatilization of chemical constituents can be controlled by adjusting the soil mixing rate to meet the NYSDEC air emissions requirements for remedial processes.

4b. Ex-Situ Liquid/Solid Phase Bioremediation

Present Worth:	$1,880,000
Capital Cost:	$4,200,000
Annual O&M:	$233,000
Time to Implement:	16 years

Ex-situ liquid/solid phase bioremediation of soils involves treating excavated soils in a vessel. The estimated 10,000 c.y. of impacted soils would be excavated and would then be mixed with nutrient-amended water in a tank reactor to produce a slurry of 10 to 30 percent solids by weight.

In order to increase the level of dissolved oxygen, the slurry would be continuously aerated. In addition, the slurry is continuously mixed to maintain the solids in suspension and to ensure that the microorganisms make contact with the chemicals of concern. The bioremediation process can be operated in either a batch or continuous mode.

Once biodegradation is complete, the solids would be settled out from the treated slurry and residual water would be recycled back into the bioreactor. The treated, settled solids would then be sampled to ensure that the Remedial Action Objectives (RAO) had been achieved. Once the RAO is achieved, the solids would be backfilled into the excavated areas.

Air monitoring would insure that on-site workers as well as the surrounding community are not exposed to volatilized contaminants during remediation.

4c. Ex-Situ Solid-Phase Bioremediation

Present Worth:	$2,160,000
Capital Cost:	$2,160,000
Annual O&M:	$18,000
Time to Implement:	1 year

The ex-situ solid-phase bioremediation technique consists of biologically treating the 10,000 c.y. of soils containing the chemicals of concern on a constructed land treatment cell. The treatment cell would consist of a polyethylene geomembrane liner covered with a one-foot-thick drainage layer of clean sand. The treatment cell would be surrounded by a lined storm water collection system to collect leachate and runoff from the cell. The system would be sloped to a lined sump where the collected liquids would remain until the soils on the cell required additional moisture. The liquids would then be reapplied to the treatment cell.

The cell would be loaded with a single layer of impacted soils approximately 12 to 15 inches deep. The soils on the cell would then be mixed with a chisel plot to enhance the mass transfer of gaseous oxygen. Fertilizer and water would be added, as needed, to maintain optimum conditions for bioremediation.

Once the RAO had been achieved, the treated soils would be placed back into the areas that they were excavated from.

Air monitoring would insure that on-site workers as well as the surrounding community are not exposed to volatilized contaminants during remediation.

5. Off-Site Disposal at a RCRA-Permitted Landfill

Present Worth:	$21,060,000
Capital Cost:	$21,060,000
Annual O&M:	$18,000
Time to Implement:	1 year

This alternative would consist of excavating site soils that contain the chemicals of concern with concentrations above the soil cleanup levels and disposing of these soils off-site at a RCRA-permitted landfill facility.

The soils that contain the chemicals of concern with concentrations that exceed the cleanup levels would be excavated and placed into lined roll-offs. The roll-offs would then be loaded onto trucks and exterior surfaces decontaminated prior to leaving the site. Because the site soils are considered a hazardous waste, each roll-off would be sampled to characterize the soils prior to transport off site. If the soils meet the requirements of the LDRs contained in 40 CFR 268, they would be taken directly to a RCRA-permitted hazardous waste landfill. If the soils are identified as not meeting the LDR requirements, they would have to be pre-treated prior to disposal at a RCRA-permitted landfill. For purposes of evaluating this alternative, incineration has been considered. Therefore, soils not meeting the LDR requirements would be transported to an off-site RCRA-permitted incinerator and incinerated prior to final landfill disposal. Based on existing site data, it has been estimated that approximately 80 percent of the site soils would require pre-treatment prior to land disposal.

The excavated areas of the site would be backfilled with imported select fill material and compacted. Upon completing the backfilling activities, the site would be graded to promote drainage.

Air monitoring would insure that on-site workers as well as the surrounding community are not exposed to volatilized contaminants during remediation.

6. Off-Site Incineration

Present Worth:	$23,640,000
Capital Cost:	$23,640,000
Annual O&M:	$18,000
Time to Implement:	1 year

This alternative would involve excavating site soils that contain the chemicals of concern with concentrations above the soil cleanup levels and transporting them off site to a RCRA-permitted incinerator for treatment.

The soils that contain the chemicals of concern with concentrations that exceed the cleanup levels identified in the RAO would be excavated and placed into lined roll offs. The roll offs would then be loaded onto trucks and exterior surfaces decontaminated prior to leaving the site. A licensed hazardous waste hauler would transport the filled roll offs off site to a RCRA-permitted incinerator for treatment.

The excavated areas of the site would be backfilled with imported select fill material and compacted. After the backfilling activities were complete, the site would be graded to promote drainage.

Air monitoring would insure that on-site workers as well as the surrounding community are not exposed to volatilized contaminants during remediation.

7.2 Evaluation of Remedial Alternatives

The criteria used to compare the potential remedial alternatives are defined in the regulation that directs the remediation of inactive hazardous waste sites in New York State (6 NYCRR Part 375). For each of the criteria, a brief description is provided. A detailed discussion of the evaluation criteria and comparative analysis is contained in the Feasibility Study.

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

1. Compliance with New York State Standards, Criteria, and Guidance (SCGs). Compliance with SCGs addresses whether or not a remedy will meet applicable environmental laws, regulations, standards, and guidance.

At this site the source of contamination in the unsaturated soils is being addressed by the remedy and the cleanup goals for the site are based on the NYSDEC, Technical and Administrative Guidance Memoranda (TAGM), HWR-92-4046.

The bioremediation remedy proposed for the site meets the alternative technology based cleanup levels determined by the Department as acceptable due to the site-specific conditions and the overall mass reduction of contaminants at the site.

The site-specific conditions of the site which influence the cleanup objectives are the groundwater use and migration of contaminants into Onondaga Lake.

The naturally high salinity and total dissolved solids concentration make and have made the groundwater unsuitable as a potable water supply. Concentrations of chloride in groundwater beneath the site range from 32,000 to 77,000 mg/l. The NYSDEC Class GA water quality standard for chloride is 250 mg/l.

Based on the presence of naturally-high salinity and total dissolved solids concentration, remediating the chemicals of concern present in groundwater beneath the site will not be sufficient to make the groundwater suitable for potable use.

Based on these conclusions, the Remedial Action Objectives (RAO) for the site is to reduce the concentration of the chemicals of concern in unsaturated soils to levels which will eliminate the potential leaching of these chemical constituents to groundwater, annual groundwater monitoring to verify that the chemicals of concern are not migrating past the site boundary and deed restrictions to prevent future use of and potential human exposure to site groundwater.

This RAO, can be met by technology-based soil cleanup levels. The soil cleanup levels are based on the use of bioremediation as the remedial alternative for soils at the site and the practical limit of the technology in attaining groundwater protection cleanup levels. The cleanup levels are presented in Table 3 below.

Table 3

Methylene chloride	10 ppm
Trichloroethylene	10 ppm
Benzene	10 ppm
Toluene	10 ppm
Ethylbenzene	10 ppm
Xylene	10 ppm
N,N-dimethylaniline	10 ppm
Aniline	10 ppm
Methanol	10 ppm
Acetone	10 ppm

Alternatives 1 and 2 do not meet the cleanup guidance criteria. The alternatives 3, 5, and 6 meet the RAOs and the guidance criteria. Any discharges of water and / or gas made necessary by these technologies would also be able to comply with State regulations.

2. Protection of Human Health and the Environment. This criterion is an overall evaluation of the health and environmental impacts to assess whether each alternative is protective.

Alternatives 1 and 2 do nothing to mitigate the source of contamination at this site and allow further contaminant migration from the unsaturated soils at the site, although alternative 2 would serve to slow the rate of migration by limiting the amount of precipitation infiltrating the waste at the site. The remainder of the alternatives are protective of human health and the environment through either removal or destruction of the contaminant source.

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

3. Short-term Effectiveness. The potential short-term adverse impacts of the remedial action upon the community, the workers, and the environment during the construction and implementation are evaluated. The length of time needed to achieve the remedial objectives is also estimated and compared with the other alternatives.

All alternatives can be implemented within a two year time period. One of the three bioremediation options (i.e. 4c) would take an estimated sixteen years to implement and has been eliminated for that reason.

The adverse short term impacts, due to the remediation, are a function of contaminant volatilization during material handling of the soils. Alternative 4a with in-situ soil blending would have controllable emissions by virtue of the ability to slow down mixing or stop if emissions occur and use mitigation measures to minimize volatilization. Alternatives 3, 5, and 6 also involve extensive material handling with 5 and 6 including off-site trucking and contaminant volatilization would be a concern during this handling.

4. Long-term Effectiveness and Permanence. This criterion evaluates the long-term effectiveness of alternatives after implementation of the response actions. If wastes or treated residuals remain on site after the selected remedy has been implemented, the following items are evaluated: 1) the magnitude of the remaining risks, 2) the adequacy of the controls intended to limit the risk, and 3) the reliability of these controls.

Alternatives 1 would not be effective because it does not remove contaminants from the unsaturated soils. Alternative 2 would not remove contaminants from the soils, but it would slow the potential migration by reducing the infiltration of precipitation into the site waste. All the remaining are effective in that the source of contamination is removed from the site. The residual contaminants remaining on site would be less than 5 ppm in undisturbed areas and less than 10 ppm in treated areas. These concentrations are below the acceptable human health guidelines contained in the guidance HWR-92-4046 and the environmental concerns associated with leaching into the groundwater would be minimized.

5. Reduction of Toxicity, Mobility or Volume. Preference is given to alternatives that permanently and significantly reduce the

toxicity, mobility or volume of the wastes at the site.
Alternative 1 would have no effect on the mobility, toxicity or volume. Alternative 2 would have no reduction in toxicity or volume but would reduce mobility by preventing rainwater and surface water from entering the contaminant mass and transporting contaminants off site.

Incineration via alternatives 3 and 6 would destroy the contaminants at the site, however, the material handling would result in some volatilization of contaminants into the atmosphere.

Alternative 3 would destroy most of the contaminant mass at the site and volatilization would be minimized by in-situ blending of the soils. The ex-situ biotreatment would require more material handling and result in greater volatilization of contaminants.

Alternative 5 would remove the material from the site and is not a contaminant destruction technology. The material handling would result in volatilization of some of the contaminants.

Alternative 3a appears to be the most effective choice to maximize destruction of the contaminant mass while minimizing the loss of contaminants due to volatilization.

6. Implementability. The technical and administrative feasibility of implementing each alternative is evaluated. Technically, this includes the difficulties associated with the construction, the reliability of the technology, and the ability to monitor the effectiveness of the remedy. Administratively, the availability of the necessary personal and material is evaluated along with potential difficulties in obtaining specific operating approvals, access for construction, etc..

All of the alternatives can be implemented at this site. Alternatives 1 and 2 are the easiest to implement due to the fact that they do not move or treat the contaminant mass at the site.

The on-site destruction technologies, alternatives 3 & 4 are more technically challenging and would require air monitoring and soil sampling for verification that remediation has occurred. Nevertheless, these alternatives can be implemented. Although the bioremediation alternative would be the most difficult to implement due to the necessary growth of microorganisms and insuring that they consume the contaminants, a treatability study completed in 1993 has documented the success of this technology at this site. The difficult administrative task of verifying that the remediation has been completed satisfactorily would require more detail during design to insure a performance criteria as well as a sampling methodology to verify that the cleanup levels have been obtained throughout the site.

The off-site technologies, alternatives 5 & 6 would require monitoring and sampling during the excavation of the contaminated soils.

7. Cost. Capital and operation and maintenance costs are estimated for each alternative and compared on a present worth basis. Although cost is the last balancing criterion evaluated, where two or more alternatives have met the requirements of the remaining criteria, cost effectiveness can be used as the basis for the final decision. The costs for each alternative are presented in Table 4.

The cost varies with the amount of material handling required and the amount of chemical processing required. Capping requires no handling of the contaminants and no chemical processing and the costs are the lowest of those which could be implemented at the site.

Bioremediation has minimal material handling in order to aerate the soils and to grow the microorganisms. The chemical processing is done by the microorganisms as they consume the chemical contaminants. The cost associated with bioremediation is the lowest of the treatment technologies.

Thermal desorption requires more chemical processing to destroy the chemical contaminants and the cost is roughly twice that of bioremediation.

The off-site destruction technologies have high costs associated with transportation and ultimate disposal, which is typical for these technologies. These costs are so high as to eliminate these technologies from consideration. Bioremediation is roughly one-tenth the cost of off-site treatment.

This final criterion is considered a modifying criterion and is taken into account after evaluating those above. It is focused upon after public comments on the Proposed Remedial Action Plan have been received.

8. Community Acceptance. Concerns of the community regarding the RI/FS reports and the Proposed Remedial Action Plan are evaluated. A " Responsiveness Summary" will be prepared that describes public comments received and how the Department will address the concerns raised. If the final remedy selected differs significantly from the proposed remedy, notices to the public will be issued describing the differences and reasons for the changes.

SECTION 8: SUMMARY OF THE PREFERRED REMEDY

Based upon the results of the RI/FS, and the evaluation presented in Section 7, the NYSDEC is proposing 4a. Biological Treatment Using In-Situ Soil Blending, as the remedy for this site.

This selection is based upon the following: Alternative 1 was not selected because it was not protective of the environment and would allow continued exposure to contaminants both through surface exposure routes and groundwater exposure routes. Alternative 2 would eliminate the route of exposure to surface soil contaminants but was not chosen because it would not eliminate the source of contamination, and would allow continued migration of the contaminants into the groundwater, although at a lesser rate than alternative 1. Alternatives 3, 5 and 6 are capable of meeting all the pertinent criteria, however, the cost of remediation is not justified for the off-site technologies given that alternative 4 can achieve equal or better results. Alternative 4 was chosen because it would meet all the criteria and does so at a reasonable cost.

Alternative 4a was chosen over 4b and 4c due to the practical consideration that more of the mass of contaminants would be bioremediated versus volatilized in this technology. The implementation of in-situ bioremediation lessens the handling of the soils and hence reduces the loss of contaminants due to volatilization. This technology would attain the technology-based cleanup levels and would result a greater destruction of contaminant mass than any other technology.

The present worth cost to implement the remedy is $1,340,000.

The saturated soils and groundwater will be addressed as part of a separate operable unit for this site. Until the contaminated groundwater is dealt with, the possibility of recontamination of the saturated soils will still exists, therefore these media must be addressed together. The site will remain on the NYS Registry of Inactive Hazardous Waste Sites, as a class 2 site, until this second operable unit, and any other identified problems, are resolved through the remedial process.

The elements of the selected remedy are as follows:

1. A remedial design program to verify the components of the conceptual design and provide the details necessary for the construction, operation and maintenance, and monitoring of the remedial program.. Uncertainties identified during the RI/FS would be resolved.

2. In-situ bioremediation of all areas of the site where the contaminants of concern are greater than 5 ppm (see Figure 2.

3. Attainment of technology-based cleanup levels and performance of bioremediation for a minimum 60 days as measured by a performance standard to be developed during the design phase of remediation and accepted by the Department. Should technology-based levels not be achieved in 60 days bioremediation would continue to a minimum 90 days duration and continue thereafter until the cleanup levels are achieved.

4. Final contouring with a minimum of 12 inches of clean soil, grading and seeding of the site to promote surface water runoff and limit the infiltration of rain and surface water into the remediated areas.

5. Installation of additional monitoring well(s) to supplement the existing site perimeter groundwater monitoring network.

6. Conducting a program of groundwater sampling and analysis to verify that contamination has not migrated off the

Table 4

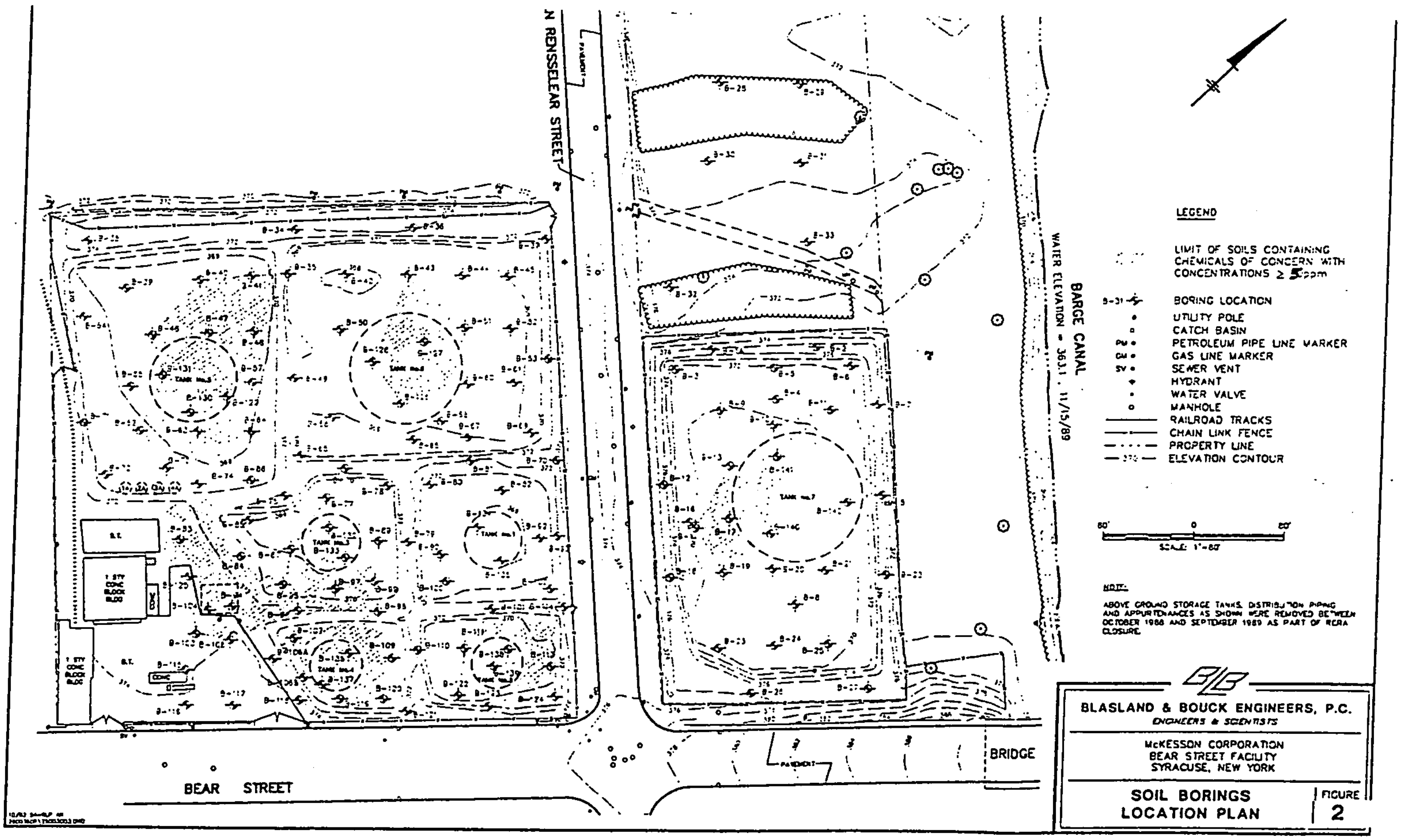
ALTERNATIVE	ESTIMATED PRESENT WORTH COST
No Action	-
Low Permeability Cap	$1,900,000
On-Site High Temperature Incineration	$10,630,000
On-Site Low Temperature Thermal Desorption (LTTD)	$4,240,000
Biological Treatment Using In-Situ Soil Blending	$1,340,000
Ex-Situ Liquid-/Solid-Phase Bioremediation	$4,200,000
Ex-Situ Solid Phase Bioremediation	$2,160,000
Off-Site Disposal at a Permitted Landfill	$21,060,000
Off-Site Incineration	$23,640,000

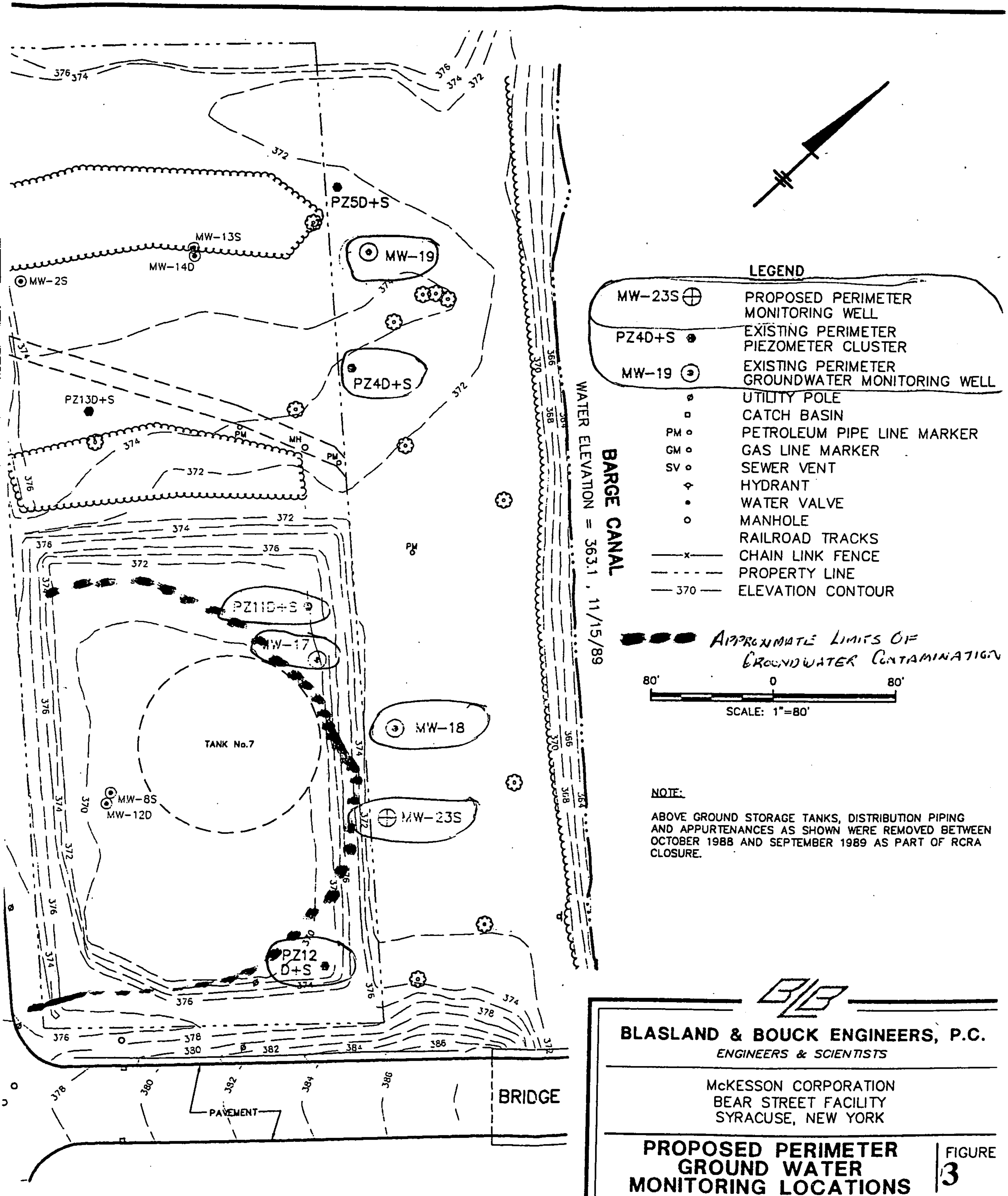
site. The present worth cost of this program is $275,000.

The groundwater at the site and the contaminants in the saturated soils would be monitored by McKesson to verify to the NYSDEC that no off-site migration is occurring.

However, should evidence of off-site migration be discovered, the PRP would be required to implement remedial actions to prevent contaminant migration from leaving this site. A map showing the extent of groundwater contamination and the proposed monitoring network is attached as Figure 3.

Figure 2.





BLASLAND & BOUCK ENGINEERS, P.C.
ENGINEERS & SCIENTISTS

McKESSON CORPORATION
BEAR STREET FACILITY
SYRACUSE, NEW YORK

PROPOSED PERIMETER GROUND WATER MONITORING LOCATIONS

FIGURE 3

File on eDOCs X Yes ______ No
Site Name McKesson
Site No. 734020
County Onondaga
Town Syracuse
Foilable X Yes ______ No
File Name 1994-01-01. PRAP
Scanned & eDOC ______