FEASIBILITY STUDY REPORT

THE COLUMBIA MILLS INCORPORATED
Minetto, New York
NYSDEC Site No. 7-38-012

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1.0 INTRODUCTION

This volume describes the Feasibility Study (FS) process undertaken by Malcolm Pirnie, Inc. (MPI) under contract to the law firm of Bond, Schoeneck & King, for the former owners of The Columbia Mills Incorporated. All work was conducted under the New York State Department of Environmental Conservation (NYSDEC) Consent Orders A7-0167-89-02 and A7-0161-88-12. The purpose of the FS is to address the contaminated media at the site formerly owned by The Columbia Mills Incorporated in Minetto, New York. This is intended as a companion volume to the Remedial Investigation (RI) Report - Columbia Mills Site, Minetto, New York, submitted by MPI in October of 1991 with an Addendum dated April 1992. The RI describes the field investigation techniques employed, the details of contamination discovered and the Interim Remedial Measures (IRMs) completed to date. The extent of contamination is resummarized and remedial units are defined in Section 2 of this FS.

This FS is divided into four (4) components: three (3) phases of the FS plus the conceptual design of the selected remedial action. The first FS phase defines the problem and develops the framework within which the contamination problems will be addressed. Through a thorough screening of applicable remedial technologies, remedial action alternatives are formulated. In Phase II, the alternatives are screened to reduce the number to be subjected to detailed analysis in Phase III. Based on the analysis in Phase III, preferred remedial actions will be selected. The three phases of the FS are contained separately in Sections 2, 3 and 4, respectively. In Section 5, a conceptual design of the selected remedial action is presented.

2.0 PHASE I: DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

2.1 DEFINITION OF REMEDIAL UNITS

2.1.1 General Approach to the Site

Columbia Mills site location details are shown in Figure 2-1. Contamination at the site is present in a wide variety of media, including soil, ground water, surface water, sediments, sewers and general building debris.

Information gathered during the RI and results of the Baseline Human Health Risk Assessments conducted for the Drum Disposal Area and Main Plant Area were utilized to determine the extent of contamination at the site as well as identify the contaminated media requiring remediation.

In order to address the contaminated media at the site in the FS, each medium was divided into remedial units based on location and contaminants present or risk posed. As shown in Figures 2-2 and 2-3, the Columbia Mills site, therefore, will be addressed according to the following hierarchy.

- Remedial Areas - Two defined.
- Contaminated Medium - In each remedial area.
- Remedial Units - Specific sites containing the contaminated medium.
- Specific Contaminants - Found in each remedial unit - present at concentrations requiring remediation.

The two remedial areas include:

- Drum Disposal Area including the downgradient creek.
- Main Plant Area.

FIGURE 2-2
DRUM DISPOSAL AREA

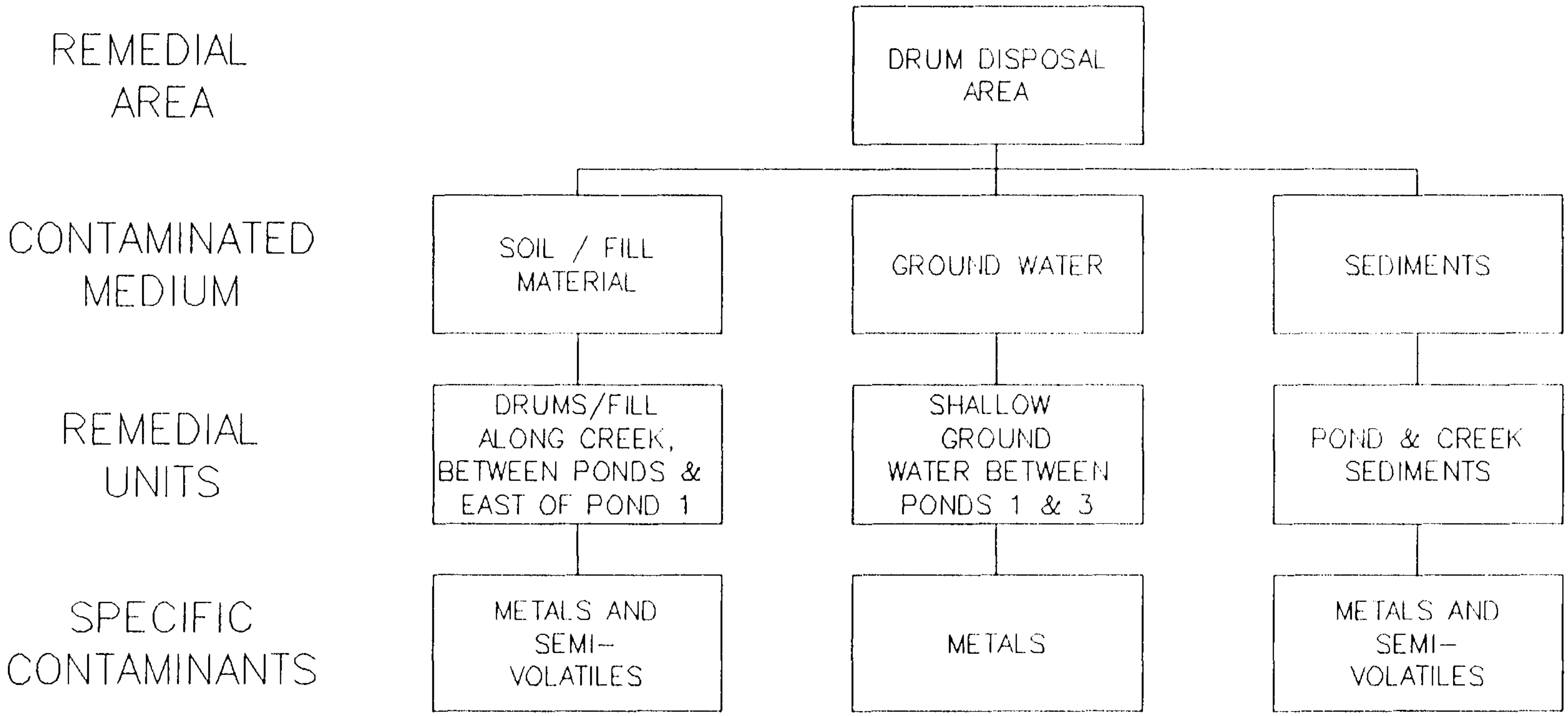
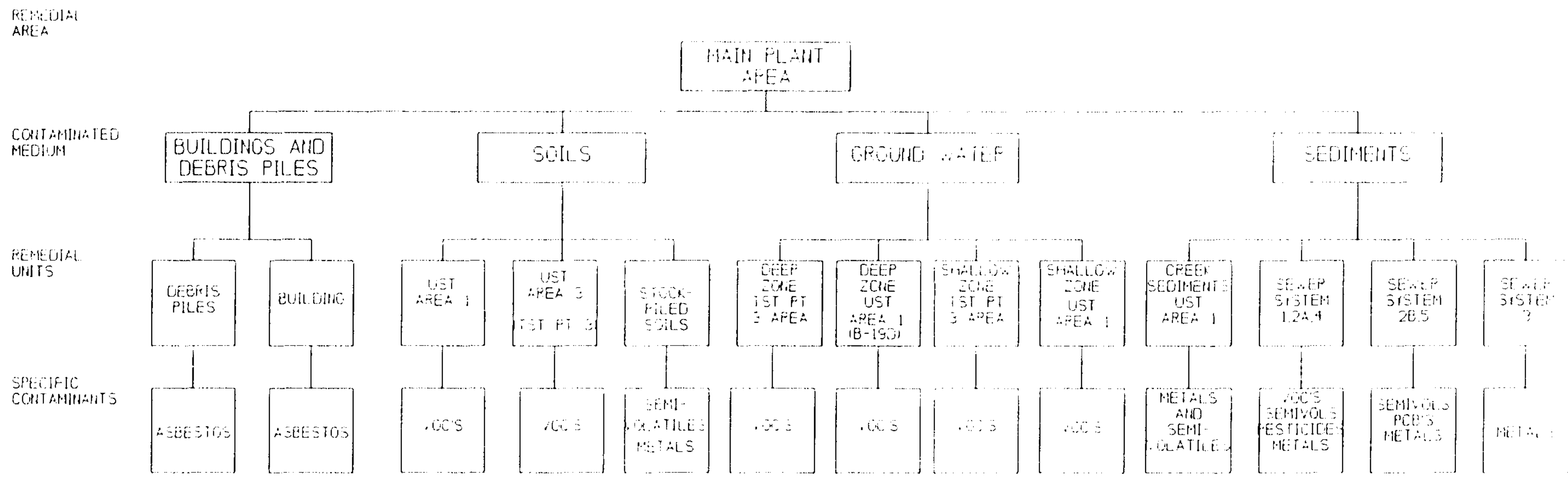


FIGURE 2-3

MAIN PLANT AREA



The contaminated media associated with these remedial areas include one or more of the following:

- Soil
- Ground Water
- Sediment
- Industrial and Storm Sewer Piping
- Building and Debris Piles

The remedial units are listed in Table 2-1.

TABLE 2-1

REMEDIAL UNITS
COLUMBIA MILLS SITE

- **Drum Disposal Area Remedial Units**

  Drums/fill between ponds, along creek and east of Pond 1;
  Shallow ground water between Ponds 1 and 3;
  Pond and creek sediments.

- **Main Plant Area Remedial Units**

  Debris piles and building interiors;
  Underground Storage Tank (UST) Areas 1 and 3 (soils) and excavated soil piles;
  Test Pit 3 Area shallow and deep ground water zones;
  UST Area 1/B-19D Area shallow and deep ground water zones;
  UST Area 1 creek sediments;
  Sewer systems 1, 2A, 2B, 3, 4 and 5 (sediments).

The Main Plant Area Risk Assessment indicated that elevated risks were associated with surface soil outside the Building 8 boiler room (based on PCB levels) and surface soil near former chemical storage areas (benzene). The PCB contamination was addressed during implementation of the IRM program. Clean up was to levels specified by the NYSDEC. Additional soil sampling for volatile organic compound (VOC) analysis was conducted in the areas which had previously showed high levels of benzene. No VOCs (including benzene) were detected in the samples. Therefore, further remediation of these areas is not planned.

The streams and ponds on site are classified as NYSDEC Class D waters. Although some metals have been detected in the surface water at the site at concentrations above New York State Standards, Criteria and Guidelines (SCGs), direct remediation of the surface water is not currently planned. The sources of the contamination sporadically detected in the surface water are believed to be contaminated sediments and adjacent soils, mainly in the Drum Disposal Area. Since remediation of these media is currently planned and is addressed in this report, the probable sources of surface water contamination will be alleviated. Thus, surface water contamination will be indirectly addressed by source remediation.

A brief summary of the specific contaminants, quantities or volumes of contaminated units and the extent of contamination for each of the designated remedial units is provided in the following sections.

2.1.2 Drum Disposal Area

2.1.2.1 Drums/Fill Between Ponds, Along Creek, and East of Pond 1

Soils in the Drum Disposal Area are heavily laden with ash material, which is in turn contaminated with elevated levels of metals including cadmium, chromium, copper, lead and zinc. Semivolatiles have also been detected. The Human Health Risk Assessment indicated that two pathways for the fill may require remediation: dermal contact with the fill material (bis(2-ethylehexyl)phthalate) and incidental ingestion of the fill (lead).

Since much of the sampling conducted in the Drum Disposal area has been for metals, the extent of contamination in the Drum Disposal Area has been determined by using lead as an indicator parameter. Lead has been analyzed for more frequently than other inorganics in this area and is one of the contaminants of concern for human health risks, making it a fairly reliable indicator of the extent of contamination. Figure 2-4 shows the extent of fill material containing elevated levels of lead as determined by previous sampling. However, confirmatory sampling will be required to fully delineate the area requiring remediation during design/construction. The areas containing elevated concentrations of cadmium, chromium, copper and zinc are covered by the area shown.

Based on the results of sampling as part of the supplemental RI, high levels of metals are present in the full thickness of the fill for a depth ranging up to approximately eleven feet. The area south of Pond 1, which shows the highest levels of lead, was covered with soil as an IRM during June 1988 to limit possible exposure. However, this area is still considered as part of the remedial unit for soil in the Drum Disposal Area.

The semivolatile compounds that have been detected in the Drum Disposal Area soil include bis(2-ethylhexyl)phthalate, pyrene, fluoranthene and phenanthrene. These compounds have been found in the highest concentrations southeast of Pond 1. The incidence of semivolatile contamination is within the bounds of the lead contaminated areas, therefore, the extent of contamination of lead serves as the area of remediation for both semivolatile organics and metals contamination. The estimated quantity of contaminated soil/fill in need of remediation in the Drum Disposal Area is approximately 57,000 cubic yards.

2.1.2.2 Pond and Creek Sediments

Sediment sampling has shown that high levels of metals are present in Ponds 1, 2 and 3 and along the intermittent creek exiting Pond 1. Semivolatile contamination is also present in the creek sediments. The Human Health Risk Assessment conducted for the Drum Disposal Area indicated that the pathway of dermal contact with the sediment may require remediation because of the levels of arsenic, nickel and zinc.

Most drums that are partially or totally exposed along the creek and adjacent to or in Pond 1 are rusted to the point that they are no longer intact enough for removal. Small amounts of sediments have collected in the bottom of some drums.

The extent of metals contamination in Pond 1 is the top one foot layer of sediment extending from the southeast quarter to the outlet. Metals detected in this area at concentrations greatly exceeding their sediment guidance criteria (as contained in the NYSDEC Sediment Criteria Guidance Document, December 1989) include cadmium, chromium, copper, lead, nickel and zinc. In Ponds 2 and 3, cadmium, copper, lead and zinc were found at consistently elevated levels.

The sediment in the intermittent stream beginning at the outlet of Pond 1 and extending toward Evert's Creek was found to contain a number of inorganics at levels exceeding the sediment guidance criteria. Elevated levels of cadmium, manganese and zinc appear to be concentrated in a 450 foot section of the intermittent stream east of the concrete "tunnel". Semivolatile contaminants, specifically chrysene and phenol, were also detected at levels that exceed the guidance values for sediments at the outlet of Pond 1. In the area between the outlet of Pond 1 and the eastern end of the concrete "tunnel", the stream flows mostly underground. During the wetter months of the year, the water does surface in the depressed area next to the bank of exposed drums. From here it flows through a buried clay pipe into the open stream east of the "tunnel". Although no sediment samples have been obtained from the depressed area or the pipe (due to the lack of flowing water during the November 1989 RI sampling), it is likely these areas are contaminated since they are connected to the stream.

The extent of sediment contamination can be seen on Figure 2-4. The total quantity of sediment to be remediated in the Drum Disposal Area is estimated to be approximately 3,100 cubic yards.

2.1.2.3 Shallow Ground Water Between Ponds 1 and 3

Results of shallow ground water sampling conducted in the Drum Disposal Area prior to 1988 indicated the presence of some metals (cadmium, chromium, copper, lead, and zinc) at elevated concentrations (above respective SCGs) in the shallow ground water. All of these elevated concentrations were detected in unfiltered samples which were analyzed for total metals. The historical data indicate that the majority of the metals are sorbed onto particulate matter and not dissolved in the ground water in the Drum Disposal Area. Low levels of VOCs were also detected sporadically.

Sampling in 1988 indicated that no organics were present in the shallow ground water. The only inorganics detected at concentrations exceeding their respective GA standards were iron, manganese and cyanide. The sample obtained for metals analysis was filtered in the field.

Analytical results of the RI sampling indicated that no VOC contamination is present in the shallow aquifer in the Drum Disposal Area. Semivolatiles were detected in the shallow ground water at B-10S during the February 1990 sampling. Semivolatiles found to be present at concentrations above their Class GA values were: benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene and benzo(a)pyrene. Estimated semivolatile concentrations ranged from 0.9 ug/l to 3 ug/l. These semivolatiles were not detected in B-10S in October 1990, but four unknowns were. Inorganics detected at elevated concentrations in B-10S during supplemental RI sampling in February 1990 and October 1990 include iron, lead, manganese, zinc and cyanide. Also detected at elevated concentrations in October 1990 were antimony and chromium. Ingestion of the shallow ground water was determined to be a pathway of concern in the Drum Disposal Area Human Health Risk Assessment due to the lead levels. The location of the Drum Disposal Area shallow ground water remedial unit is shown in Figure 2-5.

The deep ground water in the Drum Disposal Area was determined not to require remediation. The only inorganic detected at elevated concentrations in the deep aquifer has been iron, which has also been detected at elevated concentrations in all site monitoring wells. Some VOCs, including toluene, trichloroethylene (TCE) and methyl ethyl ketone (MEK), were detected at location B-10D, which is between Ponds 1 and 3. All concentrations detected were below the respective GA standard/Maximum Contaminant Limit (MCL) for each compound. Although a risk could be posed by the volatilization of TCE if the ground water were used for showering (as determined through the risk assessment process), this parameter is not associated with the Drum Disposal Area. In fact, it has only been detected once, and it was not detected in the duplicate of the sample it was detected in. Thus, no remediation of the deep aquifer is planned.

2.1.3 Main Plant Area

2.1.3.1 Building Interiors and Debris Piles

Soil samples were collected for PCB analysis from the Power Supply Relay Building (No. 10A), the boiler room in Building No. 8 and several locations around the Building No.8 perimeter and between the former oil storage tank foundations. PCB contamination was found at one location outside the southern end of Building 8 and in the Building 8 Boiler Room basement floor soil. The contaminated soils were removed and disposed of under the IRM program.

During the Fall of 1987, a total of 113 chemical containers, scattered throughout the various Main Plant Area buildings, were removed and taken to an approved disposal facility. Recently, six 55-gallon drums partially or totally filled with liquids were discovered in Building 8. These drums were removed as a follow-up IRM activity during February 1991.

Asbestos contamination is widespread throughout the buildings at the Columbia Mills site. During an inspection conducted by C & S Environmental Laboratory, Inc. in August 1987, asbestos was found to be present in pipe insulation, wire insulation, transite board, boiler insulation and floor sweepings. All buildings inspected were found to contain some amount of asbestos, including Buildings 8, 10A, 11, 12, 30, 31 and 32. Asbestos is also present in the debris piles located on the grounds of the site outside the buildings. The inhalation of airborne contaminants (asbestos fibers) was determined to be a pathway which may require remediation in the Main Plant Area Human Health Risk Assessment. Contaminant levels have been defined as a part of the RI and alternative remedial techniques will be evaluated in this FS. Columbia Mills, however, denies any responsibility for the asbestos and remediation will be the responsibility of others.

The Columbia Mills site also has a crumbling radial brick chimney which must be demolished during future remediation efforts. While no contaminants are expected to be found, this chimney is badly cracked. Brick/mortar chunks have fallen from near the top of the chimney which may endanger site workers and their equipment. If the chimney were to fall in an uncontrolled manner, it is likely that it would fall across Route 48 since the prevalent wind direction is from the west-southwest. This stack should be demolished before it collapses on its own.

It is estimated that the asbestos contaminated debris piles account for approximately 34,000 cubic yards of waste and the asbestos in the buildings account for approximately 6,000 cubic yards of the total asbestos contaminated material.

2.1.3.2 Soil in UST Areas and Excavated Soil Piles

Soil in the Test Pit 3 Area and near UST Area 1 in the Main Plant is contaminated with VOCs. Semivolatile organic compounds have also been detected in the Test Pit 3 (Building 69) Area soil, but do not pose a risk and do not appear to be migrating into the ground water. VOC contaminants detected most recently in Test Pit 3 Area soils were toluene, xylenes and methyl isobutyl ketone (MIBK). However, most VOCs present are tentatively identified compounds (TICs), mainly alkanes and cycloalkanes. Although most of the soil was removed from below UST Area 1, evidence suggests that slight residual VOC contamination is present in the area.

The stockpiled soils which had previously been excavated from the UST Areas have shown elevated levels of polynuclear aromatic hydrocarbons (PAHs) and some metals. The levels of carcinogenic PAHs (cPAHs) and arsenic in the soil piles could cause a risk to be posed through dermal contact with the stockpiled soil, while the pathway of incidental ingestion of the stockpiled soil may require remediation due to the cPAHs and lead. The VOC contamination previously detected in the soil excavated from the UST areas has been remediated through completion of an IRM.

Figure 2-6 shows the stockpiled soil locations and the extent to which contamination exists near UST Area 1 and in the Test Pit 3 Area. VOC residually contaminated soils in the immediate UST Area 1 were determined not to require remediation since they do not pose a risk and are not causing contravention of ground water standards. Although a slightly elevated risk may be associated with dermal contact to surface soil in this area (due to the presence of arsenic), the level used to quantify the risk was not significantly higher than background soil levels. The UST Area 1 soil remedial unit shown in Figure 2-6 actually comprises soil overlying the VOC-contaminated ground water area, located southeast of UST Area 1. The approximate volume of soil in need of remediation in each area is as follows: UST Area 1 -12,500 cubic yards, Test Pit 3 Area - 12,700 cubic yards, Stockpiled Soils - 1,000 cubic yards.

2.1.3.3 Shallow and Deep Ground Water

The Main Plant Area shallow ground water contains high levels of iron and manganese, as does nearly all ground water sampled on the site. Corrosion of the black iron risers used at all site wells is a possible cause of the higher levels of these metals. Elevated levels of lead have been detected in unfiltered samples obtained from the shallow ground water in UST Area 1. Slight VOC contamination is present in two areas: the Test Pit 3 Area and southeast of UST Area 1. Vinyl chloride was detected once in UST Area 1. Toluene and TCE are present in both areas while xylenes are present in the Test Pit 3 Area. It appears that the majority of VOCs present in the shallow ground water in the Test Pit 3 Area are TICs, mainly cycloalkanes.

Iron and manganese are also present at high concentrations in the deeper wells (screened in shallow bedrock). VOC contamination, mainly toluene, is present below the two areas where VOC contamination is present in the shallow aquifer. In the area southeast of UST Area 1, well B-19D has also been found to contain benzene and toluene at levels that exceed NYSDEC Class GA ground water standards. The locations of the UST Area 1 and Test Pit 3 Area ground water remedial units are shown in Figure 2-5.

2.1.3.4 UST Area 1 Creek Sediments

Sediment sampling has indicated the presence of metals at elevated concentrations in the ponded water area of Benson Creek, adjacent to (and north of) UST Area 1. VOC contamination is very slight in Benson Creek sediments, and semivolatiles have only been detected at moderate concentrations. The sediments in the ponded area of the creek adjacent to UST Area 1 exceed the criteria for arsenic, copper, lead and zinc. Cadmium, chromium, iron and manganese were also detected at elevated concentrations. In the 50 foot section of Benson Creek extending upstream from the area of ponded water, copper, lead and zinc are present at elevated concentrations. Results of the Main Plant Area Human Health Risk Assessment indicated that the pathway of dermal contact with the sediment may require remediation due to the elevated levels of cPAHs and arsenic. The extent of the sediment contamination in UST Area 1 is shown on Figure 2-6. The quantity of contaminated sediment in need of remediation is estimated to be approximately 230 cubic yards.

2.1.3.5 Plant Sewer Systems

Semivolatile contaminants are present in sediments in nearly all Main Plant Area storm sewers which were sampled. The highest concentrations are contained in the Test Pit 3 Area sewer sediments. Toluene was detected in the Test Pit 3 Area sewer sediment at an elevated concentration. Of the sewers which were sampled, those in this area also contained the highest metals concentrations. Low pesticide or PCB levels were also present in nearly all sewer sediments which were sampled. In general, much lower contaminant levels exist in the sewer water. It appears that the sediment contamination present is relatively immobile and very little is presently migrating into the water. However, during high flows, these sediments could potentially be scoured out into the Oswego River. Figure 2-7 shows the various plant sewer systems.

Sediment samples from Sewer System 1 have indicated the presence of VOCs, semivolatiles, pesticides and metals. Sewer sediment samples collected from Sewer System 2B have indicated the presence of semivolatiles, PCBs and metals. Samples from Sewer System 2A have demonstrated the presence of VOCs, semivolatiles, pesticides and metals. Metals were detected in the sediment collected from Sewer System 3. Semivolatiles , PCBs and metals were detected in the sediment collected from Tank 2 in Sewer System 5.

The estimated quantities of sediments in the plant sewer systems are listed in Table 2-2 below.

TABLE 2-2
ESTIMATED VOLUMES OF SEDIMENT
IN THE MAIN PLANT AREA SEWER SYSTEMS

SEWER SYSTEM	LENGTH OF PIPE (FEET)	SEDIMENTS (CUBIC YARDS)
1	600	4.2
2A	200	3.5
2B	800	36.3
3	600	30
4	270	2.8
5	(2 TANKS)	1.1
	---------	Total 77.9 CUBIC YARDS

2.2 REMEDIAL ACTION OBJECTIVES

Remedial action objectives are established under the broad guidelines of meeting all SCGs and for protecting human health and the environment. Human health risks are based on comparison to health remediation goals, which are cancer risks below 10^{-6} (one in a million risk of cancer) and a noncancer hazard index of 1.0.

2.2.1 Soils and Sediments

The remedial action objective for contaminated site soils and sediments, including sewer sediments, is the reduction of VOCs, semivolatiles, pesticides, PCBs and metals to prevent unacceptable risks to human health and the environment and to prevent releases that would result in ground water or surface water contaminant levels in excess of SCGs. The Sediment Criteria Guidance Document and the soil background levels may also be used as guidelines for the remediation of pond and creek sediments and soils. The Sediment

Criteria guidance document and a list of the soil background levels can be found in Appendix A.

Based on the results of the RI, the Baseline Human Health Risk Assessment and preliminary review of results of the tissue sampling, the basis for remediation of the Drum Disposal Area soil/fill is to reduce the risk of human exposure to lead and bis(2-ethylhexyl)phthalate and to reduce the environmental exposure for some metals to acceptable levels. It is believed that the fill between Ponds 1 and 3 is the source of contamination in the shallow ground water in that area. Therefore, contact between the fill and the ground water must be eliminated or minimized to decrease the effect of the fill on the ground water quality. Lead has been established as the indicator parameter to determine the boundaries for remediation in the Drum Disposal Area fill material. The clean-up level for lead will be determined during the remedial design phase.

The results of the Baseline Human Health Risk Assessment also indicate that there is a possible risk associated with dermal contact with the sediments in the drum disposal area for arsenic, nickel and zinc and in the Main Plant Area for cPAHs and arsenic. Preliminary review of the tissue sampling results indicate that elevated levels of lead may be of concern in the creek chub samples collected. However, the analytical results are highly variable in both the control and contaminated area samples and further review of the data is required. Remediation based on the sediment criteria is thought to be protective of ecological receptors.

The VOCs in the Test Pit Area 3 soils are being remediated under the IRM program by vapor extraction. Based on the results of the RI, VOCs near UST Area 1 soils must be remediated also as they are believed to be contributing to contamination of the ground water in that area. The Baseline Risk Assessment indicated that a slightly elevated risk (2×10^{-6}) may be associated with dermal contact to soil in UST Area 1 for arsenic. Remediation of this soil for arsenic is not planned since dermal contact with soil in this area is not considered a significant exposure pathway and the level used to quantify this risk is not significantly higher than background soil levels detected. Maintenance of a vegetative cover in this area, however, will aid in stabilizing the surface soil and any metals present.

The Baseline Human Health Risk Assessment indicated that there were elevated risks associated with the stockpiled soils in the Main Plant Area due to either possible dermal contact or incidental ingestion of the soil. Therefore, the remedial action objective for the stockpiled soil is to either eliminate the pathways of concern or to reduce the levels of contaminants (cPAHs, arsenic and lead) which contribute to the elevated risk to acceptable concentrations.

2.2.2 Ground Water

The remedial action objectives for the ground water contaminated medium are defined by the Class GA ground water standards listed in Section 703.5 of the Water Quality Regulations of New York State, Title 6, Chapter X. Although the site aquifers are not used as a drinking water source, the NYSDEC considers all ground water as a potential resource for future use as a potable water source.

Both the ground water standards and reduction of health risks define the remedial action objectives for the ground water in the Drum Disposal Area. The ground water in the Drum Disposal Area must also be remediated to reduce the possible risk of exposure due to ingestion of lead. Although, the risk assessment indicated that volatilization of TCE during showering may be of concern, this parameter was only detected once, and on that occasion not in the associated duplicate sample. Remediation for TCE is presently not planned.

If the ground water is extracted and treated, several action-specific SCGs may apply. Depending on the point of discharge either Class D stream standards for surface discharge or Class GA ground water standards for reinjection may be applicable. The SCGs for Class GA ground water and Class D surface water can be found in Appendix A.

2.2.3 Buildings and Debris Piles

The remedial action objectives for the buildings and debris piles are designed to eliminate exposure of potential receptors. Although not quantitatively evaluated, carcinogenic risks associated with airborne asbestos are also of concern. Most of the debris piles on-site were found to be contaminated with asbestos. Building 11 still has intact asbestos. Furthermore, the remedial action objectives should address all applicable SCGs.

These wastes are subject to the following SCGs:

- **Asbestos:** The Asbestos Regulations of the National Emission Standard for Hazardous Air Pollutants (40 CFR 61 Subpart M) require that disposed asbestos must be processed into a nonfriable form or be removed to a landfill satisfying the requirements of these regulations.

2.3 GENERAL RESPONSE ACTIONS

Based upon chemical and geological information gathered during the RI, general response actions, or classes of response, were identified for each medium of concern. The applicable response actions address the site contamination problems, as defined and discussed in Sections 5 and 6 of the RI Report, so as to meet the remedial action objectives.

The general response actions can be considered as conceptual alternatives for each specific medium of concern. The "no-action" alternative was included in each alternative category as a baseline comparison with other potential response actions. Also, the "no-action" alternative is mandated by the Superfund Amendments and Reauthorization Act (SARA) to be included. Table 2-3 presents a summary of the general response actions for each medium of concern.

2.3.1 General Response Actions for Soils and Sediments

The general response actions for soil and sediments contaminated by VOCs, semivolatiles, pesticides, PCBs and metals address the pathways of direct contact, leaching and air transport. Containment would prevent direct contact with receptors, reduce leaching resulting from percolation and eliminate contaminant transport by air. Soil excavation, removal, treatment and disposal would immobilize or separate soil contaminants while removing the contamination source.

The general response actions for the Drum Disposal Area sediments and soils address the pathway of direct contact and include drainage control measures and sediment removal, disposal and/or treatment. Drainage control measures would minimize further contamination of stream sediments. Removal and disposal or sediment encapsulation treatment would remove or immobilize sediment contaminants.

2.3.2 General Response Actions for the Ground Water

General response actions appropriate for ground water contamination are containment, in-situ ground water treatment or ground water recovery with treatment, disposal and monitoring. These actions would prevent contaminant plume migration, remove the contaminants from the ground water and provide data on ground water quality.

TABLE 2-3

SUMMARY OF GENERAL RESPONSE ACTIONS

Main Plant Area		
Contaminated Medium	Contamination Concern	General Response Action
Soils	VOCs Semivolatiles Metals	No Action/Access Restrictions Excavation/Treatment/Disposal In-Situ Treatment Containment
Sediments (including sewers)	VOCs Semivolatiles Pesticides/PCBs Metals	No Action/Access Restrictions/Monitoring Removal/Treatment/Disposal In-Situ Treatment Containment
Shallow and Deep Ground Water	VOCs	No Action/Monitoring Containment Collection/Treatment/Discharge In-Situ Ground Water Treatment
Building and Debris Piles	Asbestos	No Action/Access Restrictions Containment Removal/Treatment/Disposal
Drum Disposal Area		
Contaminated Medium	Contamination Concern	General Response Action
Soil/Fill Material	Metals Semivolatiles	No Action/Access Restrictions Containment Excavation/Treatment/Disposal In-Situ Treatment
Sediments	Metals Semivolatiles	No Action/Access Restrictions/Monitoring Excavation/Treatment/Disposal In-Situ Treatment Containment
Shallow Ground Water	Metals	No Action/Monitoring Containment Collection/Treatment/Disposal In-Situ Ground Water Treatment

2.3.3 General Response Actions for Abandoned Buildings and Debris

General response actions identified for the asbestos contaminated buildings and debris piles include containment, partial or complete removal, off-site disposal and on-site encapsulation. These actions would prevent direct contact with receptors, prevent asbestos from becoming airborne, remove the contamination source and decontaminate building surfaces.

2.4 IDENTIFICATION AND SCREENING OF APPLICABLE TECHNOLOGIES

Several applicable remedial technologies were identified for each general response action. The various remedial technologies were screened based upon site familiarity and taking into account:

- Site conditions and characteristics that may affect implementability;
- Physical and chemical characteristics of contaminants that determine the effectiveness of various technologies; and
- Performance and operating ability.

Table 2-4 lists and screens remedial technologies for each medium of concern and general response action. Cost criteria were not considered in the identification of applicable remedial technologies. The following describes each of the identified applicable technologies and briefly discusses their applicability to the Columbia Mills site.

2.4.1 Contaminated Soil and Sediments

Contaminated soil control technologies are used to contain, remove or treat the site area soil and sediments. The contaminated soil and sediment remedial technologies discussed below have initially been considered for the Columbia Mills site.

2.4.1.1 Containment

A. Capping

Capping, or surface sealing, is applicable to all land disposal sites. The necessity to control air mobilization of contaminated soils, rainwater infiltration into soils and contaminated soils movement into the surface water and drainage system through erosion, requires consideration of this technology. In general, capping isolates wastes from contact

TABLE 2-4
SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Soils

General Response Action	Applicable Remedial Technology	Process Options	Applicable	
			Main Plant Area	Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
	No Action		Yes	Yes
No action.	Deed restrictions.		Yes	Yes
Access restrictions.	Fencing.		Yes	Yes
Containment Actions:	Containment Technologies:			
Containment.	Capping.	Clay cap, synthetic membrane, multi-layer.	Yes	Yes
	Vertical Barriers.	Slurry wall, sheet piling.	Yes	Yes
	Horizontal barriers.	Liners, ground injection.	Yes	Yes
	Surface controls.	Diversion/collection, grading, soil stabilization.	Yes	Yes
	Sediment control barriers.	Coffer dams, curtain barriers.	Yes	Yes
	Dust controls.	Revegetation, capping.	Yes	Yes
Excavation/Treatment Actions:	Removal Technologies.			
Excavation/treatment/disposal.	Excavation.	Solids excavation.	Yes	Yes
	Treatment Technologies:			
	Solidification, fixation, stabilization, immobilization	Lime Stabilization, Sorption, pozzolanic agents, encapsulation	Yes	Yes
	Dewatering	Belt filter press, dewatering and drying beds.	Yes	Yes
	Physical treatment.	Water/solvent leaching (with subsequent liquids treatment).	Yes	Yes
	Chemical treatment.	Lime neutralization	Yes	Yes
	Biological treatment	Cultured microorganisms	Yes	No
In-situ treatment.	In-situ treatment	Surface bioreclamation	Yes	No
	Thermal treatment	Incineration, pyrolysis.	Yes	No
Disposal excavation.			Yes	Yes

TABLE 2-4
SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Sediments

General Response Action	Applicable Remedial Technology	Process Options	Applicable Main Plant Area	Applicable Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
	No Action		Yes	Yes
No action.	Deed restrictions		Yes	Yes
Access restrictions to monitoring.	Fencing.		Yes	Yes
Excavation Actions:	Removal Technologies:			
Excavation.	Excavation.	Sediments excavation.	Yes	Yes
	Containment Technologies:			
	Capping.	Removal with clay cap, multi layer, asphalt.	Yes	Yes
	Vertical barriers	Slurry wall, sheet piling.	Yes	Yes
	Horizontal barriers.	Liners, grout injection.	Yes	Yes
	Sediment control barriers.	Coffer dams, curtain barriers, capping barriers.	Yes	Yes
Excavation/Treatment Actions:	Treatment Technologies.			
Removal/disposal.	Solidification, fixation, stabilization.	Sorption, pozzolanic agents, encapsulation,	Yes	Yes
Removal/treatment/disposal.	Dewatering.	Lime Stabilization, dewatering and drying beds.	No	Yes
	Physical treatment	Sedimentation, dewatering and drying beds.	Yes	Yes
		Water/solids leaching (with subsequent treatment).	Yes	Yes
	Chemical treatment.	Neutralization, oxidation, electrochemical reduction.	No	No
	Biological treatment.	Landfarming.	Yes	No
	Thermal treatment	Incineration pyrolysis	Yes	No

TABLE 2-4
SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Ground Water

General Response Action	Applicable Remedial Technology	Process Options	Applicable Main Plant Area	Applicable Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
	No Action		Yes	Yes
No action.	Deed restrictions.		Yes	Yes
Alternative residential water supply.	Fencing.		Yes	Yes
Monitoring.				
Containment Actions:	Containment Technologies:			
Containment.	Capping.	Clay cap, synthetic membrane, multi-layer.	Yes	Yes
	Vertical barriers.	Slurry wall, sheet piling.	Yes	Yes
	Horizontal barriers.	Liners, groun injection.	Yes	Yes
Collection Treatment Actions:	Extraction Technologies			
Collection/treatment discharge.	Ground water collection/pumping.	Wells, subsurface or leachate collection.	Yes	Yes
	Enhanced removal.	Solution mining, vapor extraction, enhanced oil recovery.	Yes	No
	Treatment Technologies:			
	Physical treatment.	Coagulation/flocculation, oil-water separation, air stripping, adsorption	Yes	No
	Chemical treatment.	Neutralization, precipitation, ion exchange oxidation/reduction.	Yes	Yes
	Disposal Technologies:			
	Discharge to WWTP (after treatment).		Yes	Yes
	Discharge to surface water (after treatment).		Yes	Yes
In-situ ground water treatment.	In-situ treatment	Subsurface bioreclamation	Yes	No

TABLE 2-4
SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Contaminated Structures

General Response Action	Applicable Remedial Technology	Process Options	Applicable Main Plant Area	Applicable Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
	No Action		Yes	N/A
No action.	Deed restrictions.		Yes	N/A
Access restrictions.	Fencing.		Yes	N/A
Treatment Actions:	Removal Technologies:			
Removal/Disposal.	Excavation.	Excavation, debris removal	Yes	N/A
	Removal	Asbestos removal	Yes	N/A
Containment Actions:	Containment Technologies:			
	Barriers.	Encapsulation	Yes	N/A
		Seal Buildings	Yes	N/A

N/A - Not Applicable - No contaminated strutures in Drum Disposal Area.

TABLE 2-4
SUMMARY OF APPLICABLE REMEDIAL TECHNOLOGIES

Drums and Debris

General Response Action	Applicable Remedial Technology	Process Options	Applicable: Main Plant Area	Applicable: Drum Disposal Area
No Action/Institutional Actions:	No Action/Institutional Options:			
	No Action		Yes	Yes
No action.	Deed restrictions.		Yes	Yes
Access restrictions to (location).	Fencing.		Yes	Yes
Containment Actions:	Containment Technologies:			
	Capping.	Clay cap, synthetic membranes, multi-layer.	Yes	Yes
	Vertical barriers.	Slurry wall, sheet piling.	No	Yes
	Horizontal barriers.	Liners, grout injection.	No	Yes
		Dust controls.	Yes	Yes
Excavation/Treatment Actions:	Removal Technologies:			
Removal/disposal.	Excavation.	Solids excavation.	Yes	Yes
	Drum/Debris Removal.	Drum and debris removal	Yes	Yes
Removal/treatment/disposal.	Treatment Technologies:			
	Physical treatment.	Water/solvent leaching (with subsequent liquids treatment).	No	No
	Chemical treatment.	Neutralization.	No	No
	Biological treatment.	Cultured microorganisms.	No	No
	Thermal treatment.	Incineration, pyrolysis, gaseous incineration.	No	No
	Solids processing.	Crushing and grinding, screening, classification.	No	No
	Disposal.	On-site landfill.	Yes	Yes
		Off-site landfill.	Yes	Yes

with surface runoff and infiltration, controls off-site contaminated sediments transport and prevents leachate surface leaks. Capping techniques utilize such materials as clay soils, synthetic membranes, slabs, asphalt, concrete and chemical sealant.

Capping is performed when site subsurface contamination precludes excavation and wastes removal because of potential hazards and/or unrealistic costs. The main disadvantages of capping are uncertain design life and the need for long-term maintenance. However, long-term maintenance requirements can be considerably more economical than excavation and waste removal. Concrete covers may have a design life of about 50 years.

Capping techniques under consideration include single-layered and multi-layered caps. Single-layered caps are usually not acceptable unless the cap will be continually maintained. For example, an asphalt cap that can be inspected on a frequent basis may be acceptable. The most effective single-layered caps are composed of concrete or asphalt. Periodic application or surface treatments for asphalt and concrete caps can greatly improve their life and effectiveness.

Multi-layered caps are most common and are required for RCRA land disposal facilities by regulations 40 CFR 264, Subparts K through N. These caps can be composed of natural soils, mixed soils, a synthetic liner or any combination of these materials. Standard design practices specify permeabilities of less than or equal to 10^{-7} cm/sec for the soil liner.

Environmental, public health and institutional impacts of the various capping technologies would all be similar. During construction, short-term impacts would include noise, dust and increased truck traffic through neighborhoods. Long-term ground water pollution would be lessened because of reduced infiltration and leaching. Soil contaminants would remain on the site and be a potential source of future ground water contamination and public exposure. Future site development would have to be strictly controlled and perhaps the site would have to be designated a hazardous waste facility. Portland cement concrete and bituminous concrete caps would permit selective future surface site usage. Revegetation that would be possible with soil caps would provide an aesthetic benefit.

1. Single-layered caps

The following are examples of single-layered caps.

- **Sprayed Asphalt Membrane:** This technology involves clearing and grubbing, surface grading and spray application of a 1/4 - 1/2 inch thick layer of asphalt to reduce infiltration and limit particulates air mobilization from the soil surface. This technology requires little material handling, a small labor force and is easy to implement. However, the membrane is not very durable. It is photosensitive, has poor weathering resistance, becomes brittle with age and is susceptible to severe progressive cracking. The fragile nature of the cap may prohibit future site usage for other purposes.

- **Portland Cement Concrete:** This technology involves clearing and grubbing, surface grading and placement of a 6-inch thick base course and a 4- to 6-inch thick concrete slab (with minimum steel mesh) to minimize infiltration and eliminate particulates emissions from the surface soil. The technology is durable and resistant to chemical and mechanical damage. However, concrete is susceptible to cracking from settlement, shrinkage and frost heave. Installation requires the placement of forms and steel and construction of expansion joints. Proper design and installation generally produces relatively low maintenance costs.

- **Bituminous Concrete:** This technology involves clearing and grubbing, surface grading and placement of a 6-inch thick base course and a 2- to 4-inch thick asphalt pavement to minimize infiltration and eliminate particulates emissions from the soil surface. This technology has proven effectiveness. However, like most rigid materials, asphalt is susceptible to cracking from settlement and shrinkage, is photosensitive and tends to weather more rapidly than concrete. This weathering generally contributes to operation and maintenance expenses that are greater than for concrete.

2. Multi-layered caps

The following are examples of multi-layered caps.

- **Loam Over Clay:** This technology involves clearing and grubbing, grading and the placement and compaction of 24 inches of clay to minimize infiltration and eliminate particulate emissions from the soil surface. The clay is covered with 12 inches of loam (top soil) to control moisture, protect the clay layer integrity and allow revegetation. This technology is effective; it has longevity and durability, assuming proper design, installation and maintenance. It is effective because it is less susceptible to cracking from settlement and frost heave, and tends to be self-repairing. Long-term maintenance would be required to prevent growth of deep rooting trees and shrubs that could penetrate the clay seal.

- **Loam Over Sand Over Synthetic Membrane Over Sand:** This technology involves clearing and grubbing, surface grading and covering site soils with a 12 inch thick blanket of sand overlain with an impermeable synthetic membrane that is covered by a 12 inch sand drainage layer. This sequence of materials is covered by 8 inches of loam (topsoil) to allow revegetation. This technology is effective, but installation is time consuming and difficult. Six operations are required to complete construction plus the membrane seams require careful installation and sealing. Membrane flexibility makes this technology relatively less susceptible to cracking from influences such as settlement and frost heave. The self-repairing capability of clay however is lost. There is limited long-term experience with synthetic membranes.

- **Loam Over Sand Over Synthetic Membrane Over Clay (RCRA Cap):** This technology involves clearing and grubbing, grading and covering site soils with 24 inches of compacted clay and an impermeable synthetic membrane covered by 24 inches of compacted sand. The compacted clay and synthetic membrane act as barriers to water infiltration, while the top sand layer provides a drainageway for percolating water. Overlying this sequence of materials is 12 inches of loam (topsoil) to allow revegetation. This sequence of materials meets RCRA requirements for capping at a new facility. This technology takes advantage of the self-repairing properties of clay, along with the impermeable nature of a synthetic membrane. Six operations are required to complete the cap construction. Seams in the membrane require careful installation and sealing.

Capping is an applicable technology for the Drum Disposal Area at Columbia Mills and could be applicable to certain portions of the Main Plant Area in order to contain contaminants such as VOCs and asbestos.

2.4.1.2 Partial or Complete Removal

Contaminated soils excavation and removal are usually followed by land disposal or treatment. Treatment is required for those wastes classified as hazardous. There are no absolute limitations on the types of waste which can be excavated and removed. Factors to be considered while evaluating the usefulness of this technology include an assessment of the waste's mobility, comparison with the feasibility of on-site containment or in-situ treatment and the cost of disposing or treating the waste once it has been excavated. It is often possible to excavate and remove contaminant "hot spots" and use other remedial measures for less contaminated soils. Such technologies are applicable to certain areas at the Columbia Mills site.

2.4.1.3 On-Site or Off-Site Disposal

A) On-Site Disposal

On-site disposal of contaminated soils and sludges generated by contaminated material excavation or on-site treatment/pretreatment processes, would require the construction of a secure landfill that ideally meets RCRA and state requirements. Criteria associated with the construction of a RCRA hazardous waste landfill, includes the following:

- The landfill should be designed so that the local ground water table will not be in contact with the facility;
- The landfill should be constructed of, or lined with, natural or synthetic material of low permeability to inhibit leachate migration;
- An impermeable cover is required to minimize infiltration and leachate production;
- A leachate and runoff collection system must be provided; and
- Periodic monitoring of surface water, ground water and soils adjacent to the facility must be conducted to determine the integrity of the liner and leachate collection system.

At the Columbia Mills site, construction of a landfill meeting these requirements would be possible utilizing an elevated area in the back central portion of the site which is separated from both ground water and bedrock. Monitoring wells would be required for installation around this facility to enable ground water monitoring.

B) Off-Site Disposal

Off-site contaminated soil/waste disposal involves excavated soil/waste hauling to a commercial sanitary or secure landfill for disposal. Several factors influence the effectiveness of off-site disposal in secure or sanitary landfills. The primary factor is whether the excavated soil is classified as hazardous by RCRA. Soil can be so classified either by virtue of its source, as with the soils contaminated by waste, or through the exhibition of a hazardous characteristic, such a reactivity, corrosiveness, ignitability or Toxicity Characteristic Leaching Procedure (TCLP) toxicity. For the soils remedial unit, the only hazard characteristic that may be exhibited is TCLP toxicity. Those soils that are not hazardous can be disposed of in a sanitary landfill. Hazardous wastes may only go to a secure landfill. However, certain hazardous wastes are banned from secure landfills unless they are treated to specific standards. Certain wastes currently must meet TCLP standards for lead (as listed in 40 CFR 268) before they can be landfilled.

Off-site disposal is applicable to wastes at Columbia Mills but may not be practical due to the large quantities of some wastes and the shortage of space at many facilities.

2.4.1.4 On-Site or Off-Site Treatment

On-site or off-site contaminated soils treatment includes techniques falling into the following three major categories:

- Thermal treatment;
- Chemical treatment; and
- Physical treatment.

A discussion of each of the available technologies follows:

A) Thermal Treatment

Thermal treatment uses high-temperature oxidation under controlled conditions to degrade a substance into products that generally include carbon dioxide, water vapor, sulfur dioxide, nitrogen oxides, gases and ash. Thermal destruction methods can be used to destroy organic contaminants in liquid, gaseous and solid waste streams. Several thermal treatment technologies are listed below:

- Incineration
- Smelting
- Pyrolysis
- Calcination
- Wet air oxidation
- Distillation
- Steam stripping
- Molten salt treatment
- Plasma arc pyrolysis
- Microwave discharge systems

Several types of incinerators are technically feasible and have been used to treat hazardous waste. In general, only multiple hearth, fluidized bed and rotary kiln incinerators are applicable for solids incineration. Each of these systems require high capital and energy costs.

B) Chemical Treatment

Generally, organic and inorganic contaminants can be (1) immobilized, (2) mobilized for removal via leaching (e.g., soil washing), or (3) detoxified. Immobilization (chemical fixation) includes precipitation, reduction, chelation and polymerization. Several methods exist for mobilizing contaminants for use with soil washing. Detoxification techniques that chemically destroy the contaminant include oxidation, reduction, neutralization and hydrolysis.

- **Stabilization:** Stabilization methods are designed to render contaminants insoluble to prevent contaminants leaching from the soil matrix and their environment. Little is known about the long-term effectiveness and reliability of stabilization techniques. Stabilization does not remove the direct-contact threats of contaminants.

- **Soil Washing:** Inorganic and organic contaminants can be washed from contaminated soils by means of an extraction process termed "soil washing." These processes extract contaminants from a soil matrix using a liquid medium washing solution. This washing solution is then treated for contaminants removal via a conventional wastewater treatment system.

  Solutions with the greatest potential for use in soil washing include water, acids/bases, complexing and chelating agents, surfactants and certain reducing agents.

- **Detoxification:** Chemical detoxification techniques include those which destroy, degrade or reduce the toxicity of contaminants. Typical processes are neutralization, hydrolysis, oxidation/reduction, permeable treatment beds, etc. These methods are applicable to specific chemical contaminants; and therefore have limited use for contaminated soil remediation.

C) Physical Treatment

Several physical treatment methods are currently being developed which involve physical manipulation of the soil to immobilize or remove waste constituents. Some of the most promising technologies include: solidification/stabilization, encapsulation, volatilization and aeration.

- **Solidification/Stabilization** methods used for chemical soil consolidation can immobilize contaminants. Most of the techniques involve a thorough mixing of the solidifying agent and the waste. Waste solidification produces a monolithic block with high structural integrity. The contaminants do not necessarily interact chemically with the solidification reagents but are mechanically locked within the solidified matrix. Stabilization methods usually involve the addition of materials which limit waste constituent solubility or mobility even though the physical handling characteristics of the waste may not be improved. Remedial actions involving combinations of solidification and stabilization techniques are often used.

- **Encapsulation** methods physically microencapsulate wastes by sealing them in an organic binder or resin. These methods can be used for both organic and inorganic waste constituents. The major advantage of this process is that the waste material is completely isolated from leaching solutions. The feasibility of this process must be determined on a case-specific basis.

- **Volatilization** can be accomplished through thermal treatment or mechanical aeration. The direct heat rotary dryer is a proven thermal treatment unit and has been used for many years by the asphalt industry. Because this unit is best suited for use with free flowing granular solids, the presence of debris and bulk materials scattered throughout the Columbia Mills site would complicate the operation of such a system.

- Depending upon the nature of the soil contaminants, natural soil aeration is another potential technique. Here the soil is excavated, spread out on polyethylene sheeting and then aerated either naturally or by mechanical means.

Various forms of treatment are applicable for certain wastes at Columbia Mills. Low-temperature incineration, soil washing and volatilization are applicable to organic contaminated soils while soil washing and solidification/stabilization are applicable for the metal-laden waste source areas.

2.4.1.5 In-Situ Treatments

A number of methods are currently being developed which involve physical subsurface manipulation to immobilize or detoxify waste constituents. These technologies include vitrification, in-situ heating, soil flushing, bioreclamation and vapor extraction.

- **In-situ Vitrification** was developed for the stabilization of transuranic-contaminated wastes and is conceivably applicable to other hazardous waste. The technology is based upon electric melter technology. Its principle of operation is joule heating, which occurs when an electrical current is passed through a molten mass. Contaminated soil is converted into durable glass, and wastes are pyrolyzed or crystallized. The waste depth is a significant limiting factor in the application of this technology. Uncontaminated overburden of 1 to 1.5 meters lowers release functions considerably.

- **In-situ Heating** has been proposed to destroy or remove organic contaminants in the subsurface through thermal decomposition, vaporization and distillation. Methods recommended for in-situ heating are steam injection and radio frequency heating. However, these technologies are inappropriate to the metals contamination found at the Columbia Mills site.

- **Soil Flushing** Organic and inorganic contaminants can be washed from contaminated soils by means of extraction process termed "in-situ soil flushing." An aqueous solution is injected into the area of contamination and the contaminant elutriate is pumped to the surface for removal, recirculation or on-site treatment and reinjection. During elutriation, sorbed contaminants are mobilized into solution by reason of solubility, emulsion formation or chemical reaction with the flushing solution.

  Solutions with the greatest potential for metal mobilization in soil flushing include the following:

  - Dilute acids and
  - Complexing and chelating agents.

  Dilute acid solutions have been widely used in industrial processes to extract metal ions. Because of the toxicity of many acids, it is desirable to use weak acids for in-situ treatment. Sodium dihydrogen phosphate (NaH_2PO_4) and acetic acid (CH_3COOH) have low toxicity and are reasonably stable. A stronger acid such as sulfuric acid would be used if the soil contained sufficient alkalinity to neutralize it. Acidic solutions may also serve to flush some basic organics such as amines, ether and anilines.

  Complexing and chelating agents may also find use in a solution mining removal system for heavy metals. Some commonly employed substances are citric acid, ethylenediamine tetracetic acid (EDTA) and diethylenetriamine pentacetic acid (DTPA). Chelating agents used for in-situ treatment must result in a stable metal-chelate complex which is resistant to decomposition and degradation. This may complicate subsequent flushing solution treatment.

If the waste is amenable to this technique and distribution/collection/treatment costs are relatively low, the advantages of soil flushing processes are that solution mining can present an economical alternative to waste excavation and treatment. However, soil flushing would not be appropriate for the Columbia Mills site for geologic reasons.

- **Bioreclamation** is a method that has been most developed and is most feasible for in-situ treatment and is one that relies on aerobic (oxygen requiring) microbial processes. This method involves optimizing environmental conditions by providing an oxygen source and nutrients, which are delivered to the subsurface through an injection well or infiltration system to enhance microbial activity. Indigenous micro-organisms can generally be relied upon to degrade a wide range of compounds, given proper nutrients and sufficient oxygen. Specially adapted or genetically manipulated micro-organisms are also available and may be added to the soil/ground water zone. Although the organic compounds found at the site are biodegradable, this technology is inappropriate to the metals contamination found at the Columbia Mills site.

- **Vapor extraction** is a process that is probably the simplest of all in-situ methods. A series of wells are installed at various site locations in the contaminated soil area. These wells are then connected by above ground piping which is manifolded together. The manifolded piping is then connected to an induced draft extraction fan which is in turn connected to the vapor treatment unit. When in use, the volatile components of the vapor extracted soil gas are cleaned as they pass through the vapor treatment unit (usually activated carbon).

Both vapor extraction and bioreclamation are applicable to those Main Plant areas containing organic contamination. They may be applicable either separately or in a series of arrangements where extraction is used to handle high concentrations and bioreclamation is then utilized to accomplish the final cleanup to low levels.

Soil flushing may be applicable to certain parts of the site as well, especially in areas with low metal concentrations.

2.4.2 Contaminated Ground Water

Ground water remedial technologies can be applied to contain, collect, divert or remove the site ground water to prevent further contaminant migration from the site and manage the contaminated ground water occurring below the site.

2.4.2.1 Containment

Ground water containment consists of constructing subsurface barriers to restrict ground water movement. Typical technologies applied include slurry walls, grouting and sheet piling. These technologies are often used in conjunction with capping (see Section 2.4.1.1).

A) Slurry Walls

Slurry walls are impervious barriers constructed through the subsurface soils. Construction of these walls creates a ground water flow barrier. This barrier can be used both to redirect the ground water flow upgradient of the site and to contain ground water leaving the site on the downgradient side. These slurry walls are constructed with either a soil-bentonite or a cement-bentonite slurry. Most commonly, a vertical trench of limited width is excavated with a backhoe or other appropriate equipment. In a soil-bentonite slurry wall, the trench sides are supported by hydrated bentonite slurry during excavation. The trench is subsequently filled with a mixture of select soil and bentonite slurry, thus creating a continuous wall. In a cement-bentonite slurry, a properly designed cement-bentonite slurry is introduced into the trench during excavation. This slurry provides support to the trench sides during excavation and is allowed to harden to form the wall.

B) Grouting

Grouting is a process whereby one of a variety of fluids is injected into a rock or soil mass. Once injected, it sets in place to reduce water flow and strengthen the formation. Because of costs, grouted barriers are seldom used for containing ground water flow in unconsolidated materials around hazardous sites. Grouting is best suited for sealing voids in rock. Cement, clays, bentonite, alkali silicates, silicates and some organic polymers have been used as grouts.

C) **Sheet Piling**

In addition to slurry wall and grouted cutoffs, sheet piling can be used to form a ground water barrier. Sheet piles can be made of wood, precast concrete or steel. Steel sheet piling is most effective in terms of ground water cutoff and cost compared to other materials that can be used.

Containment of ground water may be applicable to certain isolated portions of the Columbia Mills site to minimize the volume of water to be treated.

2.4.2.2 Ground Water Recovery

Ground water pumping is used to control contaminant plumes through adjustment of the water table elevation. Pumping methods are most effective at sites where underlying aquifers have high hydraulic conductivities and contaminants move readily in water. Ground water from shallow aquifers can also be recovered through the use of recovery trenches.

Plume removal implies a complete purging of the ground water system. Removal techniques are often suitable when contaminant sources have been removed and aquifer restoration is desired. Extraction wells or extraction and injection wells in combination are used in plume removal. Extraction and injection techniques can also be used in concert with flushing to accelerate contaminant removal. As with containment strategies, treatment of extracted ground water may be necessary.

2.4.2.3 Ground Water Treatment

Potential ground water treatment technologies can be accomplished either on-site or off-site using one of the following four general approaches:

- On-site treatment using mobile treatment systems;
- On-site construction and operation of treatment systems;
- On-site pretreatment followed by discharge to a municipal wastewater treatment facility; and
- Hauling of waste to an off-site treatment facility.

Treatment processes that may be incorporated into any of these approaches include:

- Biological treatment, and
- Physical/chemical treatment

A discussion of each of the available technologies follows:

A) Biological Treatment

All biological treatment systems are designed to expose ground water containing biologically degradable organic compounds to a suitable mixture of microorganisms in a controlled environment which contains sufficient essential nutrients for the biological reaction to proceed. Under these conditions, the reduction of biologically assimilable pollutants will take place in a reasonably predictable manner. Biological treatment is based on the ability of microorganisms to utilize organic carbon as a food source. The treatment is classified as either aerobic, anaerobic or facultative. Aerobic treatment requires the availability of free dissolved oxygen for waste bio-oxidation. Anaerobic treatment is intolerant of free dissolved oxygen. It utilizes "chemically bound" oxygen (such as sulfates), or energy inherently present in the organic substances, in breaking down the organic material. Facultative organisms can function under aerobic or anaerobic conditions as oxygen availability dictates.

Biological treatment processes are widely used. If properly designed and operated, they are capable of achieving high organic removal efficiencies. Such systems are given sufficient reaction time so that they can reduce the concentration of any degradable organic material to a very low concentration. Typical biological treatment systems include activated sludge, sequencing batch reactor, aerobic or anaerobic fluidized bed, rotating biological contractor (RBC), fixed film bioreactor, aerated lagoon, etc.

This technology would be applicable for ground water in the Main Plant Area but inappropriate at the Columbia Mills Drum Disposal Area where metals constitute the only ground water contaminants of concern.

B) Physical/Chemical Treatment

Physical and chemical treatment processes are utilized to treat inorganic and organic hazardous waste which are either nonbiodegradable or biodegradation resistant. Some of the more common physical/chemical treatment technologies follow.

- **Gravity Separation** is used to treat two-phased aqueous wastes. It can be used to separate free gasoline or fuel oil from a fuel-contaminated aquifer. It has also been used to separate PCB oils from contaminated ground water. This process offers a simple, effective means of phase separation provided the oil and water phases separate adequately within the tank residence time.

- **Filtration** is a well-established unit operation for achieving supplemental removal of residual suspended solids from ground water. Filtration may be employed prior to air stripping or activated carbon adsorption, to reduce the potential for biological growth, clogging and the suspended solid loads on these units. Filtration could also be used as part of a polishing unit to remove residual floc from the effluent of a precipitation, flocculation and sedimentation process.

- **Precipitation/Coagulation/Flocculation:** This process removes heavy metals, colloidal and dissolved solids from wastewater. Precipitation is a chemical (or electrochemical) process by which soluble metallic ions and certain anions are converted to an insoluble form for subsequent removal from the wastewater stream. Various coagulants and coagulant aids such as alum, ferric chloride, sodium sulfide, organic polymers and sodium hydroxide are selected, depending on the specific waste material to be removed. They are rapidly mixed with the wastewater to cause the colloidal particles to agglomerate into a floc large enough to be removed by a subsequent clarification process. Process performance is affected by chemical interactions, temperature, pH, solubility variances and mixing effects.

- **Flotation** is used to remove oils and other suspended substances with densities less than that of water. In the case of dissolved air flotation, particles may be slightly heavier than water. As with conventional clarifiers, flocculants are frequently employed to enhance the efficiency of flotation units. Although flotation is often referred to in the context of dissolved air flotation, other technologies such as oil/liquid skimming and solids skimming are also flotation operations and are sometimes an integral part of standard clarification.

- **Sedimentation** is designed to let wastewater flow slowly and quiescently, permitting solids denser than water to settle to the bottom and materials less dense than water (including oil and grease) to flow to the surface. Polymers may be added to the wastewater to enhance liquid-solid separation. Settled solids form a sludge at the bottom of the clarifier which is usually pumped out continuously and intermittently. Oil, grease and other floating materials may be skimmed off the surface.

- **Neutralization** is utilized in industry to raise or lower the a wastewater stream pH. Alkaline wastewater may be neutralized with hydrochloric acid, carbon dioxide, sulfur dioxide and most commonly, sulfuric acid. Acidic wastewaters may be neutralized with limestone or lime slurries, soda ash, caustic soda or anhydrous ammonia. Often a suitable pH can be achieved through the mixing of acid and alkaline process wastewaters. Selection of neutralizing agents is based on cost, availability, ease of use, reaction byproducts, reaction rates and quantities of sludge formed.

- **Ion Exchange** is a process which removes toxic ions from the waste stream and replaces them with relatively harmless ions held by ion exchange material. This technology is well established for heavy metals removals.

- **Membrane Separation** technologies separate solutes or contaminants from liquids through the use of semi-permeable membranes. Semi-permeable membranes function by selectively rejecting contaminants based on pore size, charge or through co-precipitation. Membrane separation technologies include reverse osmosis, ultrafiltration and electrolysis.

- **Phase Separation** is used primarily for separating solid/liquid or liquid/liquid suspensions with different specific gravities. It includes oil separation, centrification and dissolved air flotation.

- **Chemical Oxidation** is used primarily for detoxification of cyanide and for treatment of dilute waste streams containing oxidizable organics. Aldehyde, mercaptans, phenols, benzidine, unsaturated acids and certain pesticides have been treated by this method. Chemical oxidizers utilized include hydrogen dioxide, potassium permanganate, chlorine, ozone and chlorine dioxide.

- **Chemical Reduction** involves addition of a reducing agent which lowers the oxidation of a substance to reduce toxicity or solubility; or to transform it to a form which can be easily handled.

- **Activated Carbon Adsorption** removes organics from aqueous waste streams by adsorbing the compounds onto the large internal pore surface area of activated carbon. The process has been demonstrated on a variety of organics, particularly those exhibiting low solubility and high molecular weight. Activated carbon can be used in a treatment column or by adding powdered activated carbon directly to the contaminated water.

  Carbon adsorption can be readily implemented at hazardous waste sites and can remove dissolved organics from aqueous wastes to levels below 1 ppb. Cleanup efficiency can be reduced if there are high concentrations of suspended solids.

- **Resin Sorption** is a process similar to carbon adsorption in which a contaminant is transferred from a dissolved state in an aqueous solution to the resin surface. The type of resin depends on the type of contaminants and corresponding resin bed. This system is used to remove organics and must be designed on a case-by-case basis.

- **Wet-Air Oxidation** is a process whereby elevated temperature and high pressure are applied to the waste to oxidize the organic compounds completely. A major disadvantage associated with this process is the high-strength recycle liquor produced.

- **Liquid Injection Incineration** can destroy virtually any pumpable waste. It has been used in the destruction of PCBs, solvents, polymer waste and pesticides. It is not effective for destruction of heavy metal wastes and other wastes high in inorganics. It is also very expensive.

- **Air Stripping/Steam Stripping** includes mass transfer processes in which volatile organic contaminants in water are transferred to gas. Stripping processes maximize contact between contaminated aqueous solutions and air and transfer volatile organics to the air to form a gaseous effluent.

  Air stripping is effective for dilute waste streams containing highly volatile organics. Steam stripping and elevated temperature air stripping are effective for more concentrated waste streams containing less volatile organics. Steam stripping is a variation of distillation whereby steam is used as both the heating medium and the driving force for the removal of volatile materials. When using steam stripping, the steam is introduced into the bottom of a tower. As it passes through the wastewater, the steam vaporizes and removes volatile materials from the waste and then exits via the top of the tower. Although commonly employed as an in-plant technology for solvent recovery, steam stripping is also used as a wastewater treatment process.

- **Ultraviolet Photolysis/Ozonation** uses a combination of ultraviolet (UV) and ozone to chemically oxidize organic compounds present in water. Complex organic molecules are broken down into a series of less complex molecules, eventually terminating with carbon dioxide and water. UV/ozonation treatment is effective in treating a wide variety of chlorinated hydrocarbons and other toxic organics. Ozone dosage and retention time can be adjusted to enhance degradation of certain organics. The treatment is only effective on clear water, so pretreatment filtering would be necessary for water containing high suspended solids concentrations.

- **Powdered Activated Carbon Treatment (PACT)/Activated Sludge Process** refers to the addition of powdered carbon to the aeration basin in the activated sludge process. It is an innovative technology that has been shown to upgrade effluent quality in conventional activated sludge plants. In the PACT treatment process, the carbon concentration in the mixed liquor is generally equal to or greater than the mixed liquor volatile suspended solids level. The carbon and adsorbed substances are removed as part of the waste biological sludge.

Ground water recovery and treatment is considered to be applicable to the ground water in the Main Plant Area and in the Drum Disposal Area at Columbia Mills. Treatment and/or pretreatment may be required for volatile organics and possibly for metals in certain areas of the site.

2.4.2.4 Ground Water Disposal

Four technologies were identified for ground water disposal: routing the water to the publicly owned treatment works, deep well injection, reinjection to shallow ground water and surface water discharge.

A) Wastewater Treatment Plant (WWTP)

Contaminated ground water from the site may be pretreated on-site and then discharged to a nearby WWTP for final disposal or it may be routed directly to the WWTP for treatment. Ground water disposal to the WWTP is an applicable technique at Columbia Mills.

B) Deep Well Injection

Deep well injection is a method frequently used for disposal of highly contaminated or very toxic wastes not easily treated or disposed of by other methods. Deep well injection is limited geographically because of geological requirements of the system. There must be a substantial and extensive impervious caprock stratum overlying a porous stratum which is not used as a water supply or for other withdrawal purposes.

Deep wells are drilled through impervious caprock layers into such unusable strata as brine aquifers. The wells are usually more than 3,000 feet deep and may reach depths of more than 15,000 feet. Waste pretreatment for corrosion control and especially for suspended solids removal is normally required to avoid plugging of the receiving stratum. Additional chemical conditioning could be required to prevent the waste and the constituents comprising the receiving stratum from reacting and plugging the well.

C) Reinjection to Ground Water

Treated ground water may be re-injected into the aquifer from which it was withdrawn. This approach can be used to help direct the flow of contaminated ground water toward the extraction wells or recovery trenches. Reinjection might be applicable in very limited areas of the facility.

D) Surface Water Discharge

Treated ground water may be discharged to a nearby surface water body. A State Pollution Discharge Elimination System (SPDES) permit might be required for the discharge. Ground water disposal to the Oswego River or other surface water bodies is seen as an applicable technology at Columbia Mills.

2.4.2.5 In-Situ Treatment

In-situ treatment entails the use of physical, chemical or biological methods to degrade or remove contaminants in place. The most frequently used in-situ technology is bioreclamation.

Bioreclamation of ground water is a technique for treating zones of contamination by microbial degradation. The basic concept involves altering environmental conditions to enhance microbial metabolism of organic contaminants, resulting in breakdown and detoxification of contaminants.

This technique is not applicable to the metals contamination present in the Columbia Mills ground water but it is applicable to organic contaminants in the Main Plant Area.

2.4.3 Abandoned Buildings and Debris Piles

2.4.3.1 Abandoned Buildings

Abandoned building control technologies involve enclosing, removing, disposing of or treating the contaminated contents of such structures on-site.

A) Containment (Encapsulation/Enclosure)

Contaminants within abandoned structures are physically separated from the ambient environment by a barrier. An encapsulating or enclosing physical barrier may take different forms; among them are plaster, epoxy resins and concrete casts and walls. Acting as an impenetrable shield, a barrier keeps contaminants inside and away from clean areas, thereby alleviating the hazard.

For asbestos-contaminated buildings, the following encapsulation/enclosure technologies can be applied:

- **Asbestos Encapsulation:** A chemical penetrant or bridge-type sealant is spray-applied to asbestos-containing materials to bind together asbestos fibers and other material components for reduction of asbestos fiber release into the air.

- **Asbestos Enclosure** is a permanent barrier erected between the asbestos-containing material and all outlets of the building. Release of asbestos fibers is contained behind the barrier.

B) Landfill Disposal

Removing the asbestos from the buildings and disposing of it in an on-site or off-site secure landfill is a viable technique. Release of asbestos fibers is prevented by the cover material.

Containment of the entire building with or without the immediate removal of asbestos-bearing materials are viable technologies for use in the remaining intact buildings at the Columbia Mills site.

2.4.3.2 Debris Piles

Potential on-site or off-site methods of handling demolished or dismantled building materials and existing debris piles containing asbestos include landfilling and covering. These methods are discussed in the following paragraphs.

A) Landfilling of the existing debris (which is laden with asbestos) is a viable technique. Off-site disposal might be impractical since the debris would have to be placed in a secure landfill and many facilities may be unwilling to accept such a large volume of this waste.

B) Consolidating the asbestos contaminated debris and covering it with 18 inches of loam (top soil) to allow vegetation would also be a viable alternative.

2.5 DEFINITION OF REMEDIAL ACTION ALTERNATIVES

Following identification and screening of potentially applicable technologies, these technologies were combined into alternatives comprehensively addressing the contamination problems at each of the individual Columbia Mills site remedial units previously outlined in Figures 2-2 and 2-3.

The alternatives, which were developed for each of the specific plant areas, include the no-action alternative which will be evaluated in each case. Definitions of the feasible remedial action alternatives for each of the remedial units are presented in the following subsections.

2.5.1 Definition of Alternatives for the Contaminated Soils

Alternatives for contaminated soil remediation for remedial units located in both the Drum Disposal Area and the Main Plant Area are dependent upon the contaminant in each individual area. Therefore, separate lists of alternatives have been developed for the following areas with distinctive contaminant characteristics.

Drum Disposal Area Soils

A) Drums and Fill Between Ponds and East of Pond 1 (metals and semivolatiles)

Main Plant Area Soils

A) UST Area 1 Soils (VOCs)
B) Test Pit 3 Area Soils (VOCs)
C) UST Excavated Soil Piles (Semivolatiles and metals)

The remedial alternatives for each of these separate areas are defined in the following paragraphs.

2.5.1.1 Drum Disposal Area Soils/Fill

Table 2-5 lists the remedial alternatives for the contaminated soil/fill in the Drum Disposal Area. These are discussed in more detail in the following paragraphs.

TABLE 2-5

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF DRUM DISPOSAL AREA SOILS/FILL MATERIAL
METALS AND SEMIVOLATILE ORGANICS

1. No-Action

2. Institutional-Access Restrictions

3. Drain Ponds & Reroute Creek/Cap in Place

4. Drain Ponds & Reroute Creek/Lime Stabilization/Cap in Place

5. Drain Ponds & Reroute Creek/Excavate/Cap in Railroad Right-of-Way

6. Drain Ponds & Reroute Creek/Excavate/Stabilize/Cap in Railroad Right-of-Way

7. Drain Ponds & Reroute Creek/Excavate/Dispose in On-site Landfill

8. Drain Ponds & Reroute Creek/Excavate/Dispose in Off-site Landfill

Since this area contains by far the largest amount of soil requiring remediation, the choice of an alternative remediation method for this area may well influence the choice of remedial alternatives for other areas with contaminated soils also.

The key alternatives for this area are as follows.

Alternative #1 No action would be taken.

Alternative #2 A secure fence would be constructed to prevent contact with the wastes, and monitoring of the ground water and surface water would be continued.

Alternative #3 The influent water would be permanently diverted away from the ponds which would result in their drainage and the subsequent depression of the ground water table in the fill between the ponds. Leachate collection and treatment would also be required at least in the initial stages of construction. The wastes present in this area would then be capped in-place, with or without other wastes being placed in the areas, by the construction of a RCRA cap.

Alternative #4 Stabilization is added to Alternative #3 by application of lime to the soils before the RCRA cap is constructed.

Alternative #5 The contaminated soil and drums in this area would be excavated and transported a short distance to be deposited on top of other drums and ashes in the railroad right-of-way between Ponds 1 and 3, where it would be covered with an impermeable cap along with other wastes. Catchment areas would be constructed prior to disturbing of the contaminated media so that contaminants will not migrate down stream and to prevent future contact of the ground water with the contaminated fill.

Alternative #6 The stabilization of contaminants in the fill prior to capping in the railroad right-of-way is added to Alternative #5.

Alternative #7 The water entering the ponds are again diverted and the ponds are subsequently drained. However, the area between the ponds is excavated and deposited in a new RCRA lined landfill that would be constructed in the west central portion of the Columbia Mills site on high ground separated from ground water and bedrock. This waste and other wastes from the site would then be covered, graded and capped with a RCRA cap prior to revegetation and fencing.

Alternative #8 The influent water to the ponds would be diverted and the ponds drained, the contaminated area between the ponds would be excavated and the contaminated material would be loaded onto trucks or railcars for transport to a RCRA permitted commercial landfill for final disposal.

2.5.1.2 Main Plant Area

A) UST Area 1 Soils

Table 2-6 shows the remedial alternatives proposed for the remediation of the volatile organic and metals contamination in this area.

TABLE 2-6

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF UST AREA 1 SOILS
VOLATILE ORGANICS

1. No-action
2. Limit Access
3. Slurry Wall/Capping
4. Excavation/On-Site Disposal
5. Excavation/Off-Site Disposal
6. Soil Washing (In-Situ)
7. Vapor Extraction

The remedial alternatives to address the soil contamination in UST Area 1 are defined as follows.

Alternative #1 No-action would be taken.

Alternative #2 The existing fence would be maintained and monitoring continued.

Alternative #3 A slurry wall and a cap would be constructed for this area to contain the contaminated soils in-place.

Alternative #4 Soils from this area would be excavated and placed in a RCRA landfill to be constructed at the rear of the Columbia Mills site.

Alternative #5 Soils from this area would be excavated and trucked for disposal at a permitted off-site landfill. For this slightly contaminated soil, the Oswego County landfill in Volney is assumed to be the destination.

Alternative #6 Soils in this area would be washed in place and water would be disposed of after pretreatment at the Minetto WWTP.

Alternative #7 The volatile organics in this area would be extracted as vapors which would be passed through activated carbon.

B) Test Pit 3 Area Soils (Volatiles)

Test Pit 3 Area volatile organic contaminated soils could be handled utilizing the alternatives listed in Table 2-7 and defined in the subsequent paragraphs.

TABLE 2-7

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF TEST PIT 3 AREA SOILS
VOLATILE ORGANICS

1. No-action
2. Vertical Barrier/Slurry Wall
3. Excavation/On-Site Disposal
4. Excavation/Off-Site Disposal
5. Vapor Extraction/Ground Water Extraction
6. Bioremediation (In-Situ)
7. Soil Washing (In-Situ)
8. Excavation/Spread Out (Aerate)
9. Excavation/Low Temperature Incineration

Alternative #1 No-action would be taken.

Alternative #2 A slurry wall would be installed to bedrock and tied into the existing concrete slab in this area to isolate the contaminants in-place.

Alternative #3 Soil from this area would be excavated and disposed at a RCRA landfill on the Columbia Mills site.

Alternative #4 Soils from this area would be excavated and disposed at the Oswego County landfill in Volney.

Alternative #5 The volatile organics in this area would be extracted as vapors which would be passed through activated carbon. The ground water table would need to be depressed in this area prior to vapor extraction to permit the extraction of vapors from a greater thickness of unsaturated soil. The ground water extracted would be pretreated prior to discharge to the Minetto WWTP or to surface water.

Alternative #6 Microbes and nutrients would be utilized to treat the soil in this area in-place. Ground water containing microbes would be withdrawn and recycled back into the soil in the area.

Alternative #7 Soil in this area would be treated in-place with the water withdrawn and treated via carbon prior to reapplication into the soil.

Alternative #8 The soil in this area would be excavated and spread out in thin layers on top of the concrete slab to facilitate natural volatilization of the organics.

Alternative #9 Soil from this area would be excavated and treated by low temperature incineration with the treated soil stockpiled and utilized to fill in the excavation.

C) UST Excavated Soil Piles

The soils excavated from UST Areas 1 and 2 under a previous IRM were aerated to remove VOC contamination. Semivolatile organics and metals remain in the soils and may be remediated by using one of the alternatives listed in Table 2-8. The alternatives are described in the following paragraphs.

TABLE 2-8

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF UST EXCAVATED SOIL PILES
METALS AND SEMIVOLATILE ORGANICS

1. No Action
2. Institutional - Access Restrictions
3. Dispose in On-Site Landfill
4. Dispose in Off-Site Landfill
5. Cap in Railroad Right-of-Way
6. Lime Stabilization/Cap in Railroad Right-of-Way

Alternative #1 No action would be required.

Alternative #2 The existing fence would be maintained and monitoring continued.

Alternative #3 The soils would be removed and placed in a RCRA landfill to be constructed on the Columbia Mills site.

Alternative #4 The soils would be disposed of in a permitted off-site landfill.

Alternative #5 The soils would be removed and place in the railroad right-of-way with other wastes and covered with an impermeable cap.

Alternative #6 Lime would be applied to the soils prior to capping ir the railroad right-of-way.

2.5.2 Definition of Alternatives for Contaminated Sediments

Alternatives for the remediation of contaminated sediments closely parallel the alternatives for remediation of soils, since in many cases, they deal with the same contaminants in the same general areas. As with the soils, these alternatives are broken into areas in the Drum Disposal Area and in the Main Plant Area.

2.5.2.1 Sediments in the Drum Disposal Area

Table 2-9 below lists the alternatives for the pond and creek sediments in the Drum Disposal Area.

TABLE 2-9

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF DRUM DISPOSAL AREA POND AND CREEK SEDIMENTS
METALS AND SEMIVOLATILES

1. No-action
2. Limit Access
3. Excavation/On-Site Disposal
4. Excavation/Off-Site Disposal
5. Excavation/Treatment/On-Site Disposal (Landfill)
6. Excavation/Treatment/Off-Site Disposal
7. Excavation/Lime Stabilization/Cap in Railroad Right-of-Way

The pond and creek sediments contain both metals and semivolatile organics. The alternatives are defined as follows.

Alternative #1 No action would be taken.

Alternative #2 Both the ponds and the creek would be surrounded with a secure fence to prohibit trespassers from contacting the contaminated creek sediments.

Alternative #3 The sediments would be excavated and transported for disposal in a lined RCRA landfill to be constructed on Columbia Mills property.

Alternative #4 The excavated material would be loaded onto trucks or rail cars and transported to an off-site RCRA landfill for final disposal.

Alternative #5 The excavated sediments would be treated prior to disposal in the on-site landfill.

Alternative #6 The excavated sediments would be treated prior to transport to an off-site landfill.

Alternative #7 The sediments would be excavated and placed in the railroad right-of-way where lime would be incorporated into the sediments to stabilize the contaminants before being capped along with the contaminated soils in that area.

2.5.2.2 Sediment in the Main Plant Area

The contaminated creek sediments in the Main Plant Area are found in the ponded area of Benson Creek next to UST Area 1 and in the adjacent 50 foot section which extends upstream. The remedial alternatives for this area are, as shown below in Table 2-10, the same as those listed for the Drum Disposal Area sediments. In this case, the ponded area of Benson Creek would be temporarily dammed to allow removal of the sediments without contaminating the creek water itself.

TABLE 2-10

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF UST AREA 1 CREEK SEDIMENTS
METALS AND SEMIVOLATILES

1. No-action

2. Limit Access

3. Excavation/On-Site Disposal

4. Excavation/Off-Site Disposal

5. Excavation/Treatment/On-Site Disposal

6. Excavation/Treatment/Off-Site Disposal

7. Excavation/Lime Stabilization/Cap in Railroad Right-of-Way

Alternative #1 No action would be required.

Alternative #2 The creek in the UST 1 Area would be surrounded by a secure fence or wall to prohibit trespassers from contacting the contaminated creek sediments.

Alternative #3 The excavated creek sediments would be placed in a RCRA landfill to be constructed on Columbia Mills property.

Alternative #4 The excavated sediments would be transported to an off-site RCRA landfill for disposal.

Alternative #5 The excavated sediments would be treated prior to disposal in an on-site landfill.

Alternative #6 The excavated sediments would be treated before being transported to an off-site landfill for disposal.

Alternative #7 The creek sediments would be excavated and placed in the railroad right-of-way. The contaminants would be stabilized by the introduction of lime prior to being capped along with the contaminated soils in that area.

2.5.3 Definition of Alternatives for Contaminated Ground Water

2.5.3.1 Drum Disposal Area Shallow Ground Water

Table 2-11 below lists the alternatives for remediation of the shallow ground water in the Drum Disposal Area. The alternatives are subsequently defined.

TABLE 2-11

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF SHALLOW GROUND WATER IN DRUM DISPOSAL AREA
BETWEEN PONDS 1 AND 3
METALS

1. No-action
2. Containment
3. Extraction/Discharge to Sanitary Sewer
4. Extraction/Pretreatment/Discharge to Sanitary Sewer
5. Extraction/Treatment/Discharge to Surface Water
6. Divert Pond Water/Lower GW Table/Discharge to Surface Water

Alternative #1 No action would be taken.

Alternative #2 Containment would be utilized in this alternative to isolate the ground water in the area and prevent it from migrating.

Alternative #3 The shallow ground water in the area would be pumped and discharged to the sanitary sewer for treatment at the Minetto WWTP.

Alternative #4 The ground water is pretreated for metals removal prior to discharge to the WWTP.

Alternative #5 The metals contaminated ground water is treated and discharged to surface waters in the immediate vicinity.

Alternative #6 The water entering Pond 1 would be diverted by the construction of trenches away from the Drum Disposal Area fill. Likewise, the water in Pond 2 and 3 would be drained into the storm sewer near the area (System 2B) which will be rerouted to discharge into Benson creek. The diversion of these waters will prevent contact with the sources of contamination and act to depress the ground water in that localized area.

2.5.3.2 Main Plant Shallow Ground Water

Shallow ground water contamination in the Main Plant Area is limited to two areas. The area near Test Pit 3 is contaminated with volatile organics including largely TICs. The area near former UST Area 1 also contains volatile organics. Table 2-12 lists the alternatives for remediation of these two areas.

TABLE 2-12

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF SHALLOW GROUND WATER IN MAIN PLANT AREA

UST AREA 1 AND TEST PIT 3 AREA (VOLATILE ORGANICS)

1. No-action
2. Containment
3. Extraction/Discharge to Sanitary Sewer
4. Extraction/Pretreatment/Discharge to Sanitary Sewer
5. Extraction/Treatment/Discharge to Surface Water
6. In-Situ Treatment (Bioremediation)

The alternatives for the two areas are the same. A definition of these alternatives is as follows.

Alternative #1 In this case, no-action would be taken.

Alternative #2 Slurry walls and an impervious cap would be utilized to contain the ground water and prevent contaminant migration.

Alternative #3 Includes pumping of the ground water from the two areas and discharging the water to the Minetto WWTP for treatment.

Alternative #4 The ground water is pretreated for removal of volatile organics prior to discharge to the POTW.

Alternative #5 In this case, the ground water is pumped and treated to a level necessary for direct discharge to the receiving waters via the storm sewer system.

Alternative #6 The ground water would be pumped to the surface, seeded with bacteria and nutrients plus dissolved oxygen, and then injected back into the ground where the bacteria degrades the organics.

2.5.3.3 Main Plant Area Deep Ground Water

Two areas in the Main Plant have deeper ground water contaminated with volatile organics including both priority pollutants and TICs. These areas are the Test Pit 3 Area and the area southeast of UST Area 1 in the vicinity of well B-19D. As in the shallow ground water, the alternatives for both areas are the same. Table 2-13 lists these alternatives. The alternatives are defined after Table 2-13.

TABLE 2-13

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF DEEP GROUND WATER IN MAIN PLANT AREA

TEST PIT 3 AREA AND B-19D AREA (VOLATILE ORGANICS)

1. No-action
2. Extraction/Discharge to Sanitary Sewer
3. Extraction/Pretreatment/Discharge to Sanitary Sewer
4. Extraction/Treatment/Discharge to Surface Water
5. In-Situ Treatment (Bioremediation)

Alternative #1 No-action would be taken.

Alternative #2 The water would be pumped from recovery wells and discharged to the sanitary sewer leading to the Minetto WWTP.

Alternative #3 The water would be pumped and pretreated for volatile organics removal prior to discharge to the WWTP.

Alternative #4 The ground water would be extracted from recovery wells and treated for volatile organics to low levels for discharge to Benson Creek, the pond or to the Oswego River via site storm sewers. This could be done in conjunction with vapor extraction of the soils in this area.

Alternative #5 The ground water is extracted, seeded with bacteria, nutrients and oxygen and reinjected into the aquifer where the bacteria degrade the organic matter.

2.5.4 Definitions of Alternatives for Sewer Sediments

The alternatives for remediation of sediments in the sewer system vary as a function of the contaminants in the sewer sediment and the necessity of maintaining the particular sewer in continuing operation as a part of the local drainage system. Figure 2-7 shows the Main Plant sewer systems and the numbers assigned to each. The sewer systems are evaluated on an individual basis in the following paragraphs.

2.5.4.1 Sewer System 1 Sediments

The sediments in this sewer are contaminated with metals, pesticides, semivolatile organics and VOCs. The sewer has not shown any flows in past inspection and does not seem to be necessary for continued drainage. Table 2-14 lists the remedial alternatives for this sewer system which are defined in the following paragraphs.

TABLE 2-14

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF MAIN PLANT AREA SEWER SYSTEM 1 SEDIMENTS
VOLATILE AND SEMIVOLATILE ORGANICS, PESTICIDES AND METALS

1. No-action
2. Institutional-Monitoring, Access Restrictions
3. Excavation/Off-Site Disposal
4. Excavation/On-Site Disposal
5. Excavation/Stabilize and Cap in Railroad Right-of-Way
6. Flush Sediments/Treat/Cap in Railroad Right of Way/Cap & Close Line
7. Flush Sediments/Treat/Cap in Railroad Right of Way/Return Line to Service
8. Close Sewer Line In Place

Alternative #1 No-action would be required.

Alternative #2 A secure fence would enclose the system to prohibit trespassers from coming in contact with contaminated sediments. Regular monitoring would also be required.

Alternative #3 Excavate the accessible portion of the sewer and dispose of the sewer and sediments at an off-site landfill. The inaccessible portion of the sewer would be sealed.

Alternative #4 Same as Alternative #2, but the sewer and sediment would be disposed at a landfill to be constructed on-site at Columbia Mills.

Alternative #5 Excavate the sewer and sediment as above, flush the sediments from the sewer and stabilize the sediment chemically before disposing of it in the railroad right-of-way in the Drum Disposal Area where it would be capped with other wastes.

Alternative #6 Flush and clean the sewer with disposal of the sediments as in Alternative #4. Seal off the line against further use.

Alternative #7 Same as Alternative #5 except that the sewer line would be retained for use after cleaning.

Alternative #8 Close the sewer line in-place by capping the ends and pumping the line full of grout.

2.5.4.2 Sewer System 2A Sediments

Sewer System 2A is a branch of the main storm Sewer System 2 and was found to contain VOCs, semivolatiles, metals and pesticides. Table 2-15 lists the alternatives for this sewer system.

TABLE 2-15

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF MAIN PLANT AREA SEWER SYSTEM 2A SEDIMENTS
SEMIVOLATILE ORGANICS, METALS AND PESTICIDES

1. No-action

2. Institutional-Monitoring, Permitting

3. Close Line in Place

4. Flush Sediments/On-Site Landfill

5. Flush Sediments/Off-Site Landfill

6. Flush Sediments/Treat/Cap in Railroad Right-of-Way

The alternatives are defined as follows.

Alternative #1 No-action would be taken.

Alternative #2 A storm water permit would be acquired for System 2 and regular monitoring would be required.

Alternative #3 The sewer line would be filled with grout and all accessible inlets/outlets plugged.

Alternative #4 Sediments would be flushed from the system and disposed of in an on-site landfill.

Alternative #5 Sediments would be flushed from the system and disposed of in an off-site landfill.

Alternative #6 Sediments would be flushed and treated prior to disposal in railroad right-of-way where they would be capped with other wastes.

2.5.4.3 Sewer System 2B Sediments

This sewer is the main storm sewer running though the Columbia Mills facility and emptying into the Oswego River. It serves to collect drainage from within the Main Plant and also from catch basins in the back part of the facility and along the peripheral roadway. For this reason, it can not be taken out of service completely.

Table 2-16 lists the remedial alternatives for this area. Those alternatives are defined in the paragraphs following Table 2-16.

TABLE 2-16

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF MAIN PLANT AREA SEWER SYSTEM 2B SEDIMENTS
SEMIVOLATILE ORGANICS, METALS AND PCBS

1. No-action
2. Monitoring/Permitting
3. Flush/Clean Sewer - Sediments to On-Site Landfill
4. Flush/Clean Sewer - Sediments to Off-Site Landfill
5. Flush/Treat/Disposal of Sediments in Railroad Right-of-Way
6. Close Main Plant section of Line in Place/Divert Upstream Flow into Benson Creek

Alternative #1 No-action would be taken.

Alternative #2 A storm water permit would be acquired for System 2 and regular monitoring would be required.

Alternative #3 The sewer would be cleaned by flushing and sediments would be collected, dewatered and trucked for disposal at an on-site landfill.

Alternative #4 The same sewer flushing as for Alternative #3 would be accomplished but the dewatered sediments would be trucked for disposal at an off-site landfill.

Alternative #5 The sediments flushed from the sewers would be stabilized/treated to minimize leaching and deposited in the Drum Disposal Area for capping with other wastes.

Alternative #6 A new section of line would be installed to connect the upstream flow of sewer system 2B into Benson Creek. The Main Plant section of the line would then be sealed in place by injecting grout or similar inert material into the line.

2.5.4.4 Sewer System 3 Sediments

This storm sewer system consists of a narrow concrete trench in the Main Plant Area tunnel, which passes under Route 48 and discharges to the Oswego River. Visual inspections have certified that little or no flow occurs in the system. Table 2-17 lists the alternatives for remediation of this system.

TABLE 2-17

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF MAIN PLANT AREA SEWER SYSTEM 3 SEDIMENTS
METALS

1. No-action
2. Institutional-Monitoring, Permitting
3. Close Line in Place
4. Flush Sediments/Off-Site Disposal/Fill Trenches
5. Flush Sediments/On-Site Disposal/Fill Trenches
6. Flush Sediments/Treat/Cap in Railroad Right-of-Way/Fill Trenches

The alternatives are defined as follows.

Alternative #1 No-action would be taken.

Alternative #2 A storm water permit would be acquired; regular monitoring would be required.

Alternative #3 All accessible inlets/outlets to System 3 would be sealed and plugged.

Alternative #4 Sediments would be flushed and disposed of in an off-site landfill. Trenches would be filled with inert material.

Alternative #5 Same as Alternative #4 except disposal would occur at an on-site landfill.

Alternative #6 Same as Alternative #5 except sediments would be treated prior to disposal in railroad right-of-way where they would be capped with other wastes.

2.5.4.5 Sewer System 4 Sediments

This sewer system serves to collect rainwater along Route 48 and also drains a portion of the Columbia Mills plant near the former coal storage area. The contaminants of concern are metals, pesticides, semivolatile compounds and VOCs. The portion of the sewer paralleling the highway contains catch basins which must be kept in operation to maintain storm water drainage. Table 2-18 lists the remedial alternatives for this area which are defined below.

TABLE 2-18

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF MAIN PLANT AREA SEWER SYSTEM 4 SEDIMENTS
VOLATILE AND SEMIVOLATILE ORGANICS, PESTICIDES, AND METALS

1. No-action
2. Institutional-Monitoring/Permitting
3. Close Plant Line in Place
4. Flush Sediments/Dewater/On-Site Disposal
5. Flush Sediments/Dewater/Off-Site Disposal
6. Flush Sediments/Treat/Cap in Railroad Right-of-Way

Alternative #1 No-action would be taken.

Alternative #2 A storm water permit would be obtained and regular monitoring would be required.

Alternative #3 The sewer lines in the Main Plant Area would be filled with an inert material.

Alternative #4 The sewer sediments would be flushed and sediments would be dewatered for on-site disposal.

Alternative #5 As in Alternative #4 above, except that dewatered sediments would be deposited in an off-site landfill.

Alternative #6 In this case, the Columbia Mills' line would be flushed and cleaned and the sediments would be recovered, treated and deposited in the Drum Disposal Area for final capping.

2.5.4.6 Sewer System 5 Sediments

This former septic system, which consists of two small tanks, is located in the UST 1 Area and is not vital to any continued operations at the facility. The alternatives for this system are listed in Table 2-19 and defined below.

TABLE 2-19

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF MAIN PLANT AREA SEWER SYSTEM 5 SEDIMENTS
SEMIVOLATILE ORGANICS, PCBs AND METALS

1. No-action
2. Institutional - Monitoring
3. Flush System/Treat Water/Cap Sludge in Drum Disposal Area
4. Flush System/Treat Water/Cap Sludge in Drum Disposal Area, Fill System With Concrete
5. Fill System With Concrete Without Prior Cleaning
6. Excavate Tanks & Sediment/Cap in Railroad Right-of-Way

Alternative #1 No-action would be taken.

Alternative #2 Under this alternative, regular monitoring would be required.

Alternative #3 Flushing of the system with batch treatment of the water and disposal of the sludge in the Drum Disposal Area. The system would be left intact.

Alternative #4 Same as Alternative #2, but the system would be filled with concrete or sand and abandoned in-place.

Alternative #5 The system would be filled with concrete without prior cleaning and would be abandoned in-place.

Alternative #6 This alternative would involve excavating the tanks which comprise Sewer System 5 along with the sediment present in them and capping them in the Drum Disposal Area.

2.5.5 Definition of Alternatives for Buildings and Debris Piles

As reported in the RI report, one building which is still largely intact has considerable asbestos remaining in place that could be removed in a segregated fashion utilizing OSHA procedures. The remaining buildings, the Main Plant Area tunnels, and large portions of the plant yard contain piles of debris consisting largely of wood, bricks and metal ductwork. Low levels of asbestos have been found in these debris piles as well. Table 2-20 lists the alternatives for remediation of the two areas.

TABLE 2-20

LISTING OF REMEDIAL ALTERNATIVES
REMEDIATION OF MAIN PLANT AREA BUILDINGS AND DEBRIS PILES (ASBESTOS)

BUILDING 11

1. No-action
2. Limit Access
3. Seal Building
4. Remove Asbestos by OSHA Methods/Dispose in On-Site Landfill
5. Remove Asbestos by OSHA Methods/Dispose at Off-Site Landfill

DEBRIS PILES (In building interiors and outside buildings)

1. No-action
2. Limit Access
3. Consolidate Material/Cover in Place
4. Excavate/Dispose of in On-Site Landfill
5. Excavate/Dispose of in an Off-Site Landfill

2.5.5.1 Building 11

The following alternatives deal with the remediation of the asbestos remaining in the building.

Alternative #1 No-action would be taken.

Alternative #2 A secure fence would surround the area and doors and windows would be boarded up to prevent trespassers from entering.

Alternative #3 The building would be completely sealed by placing air tight covers over all windows and doorways, thus preventing migration of asbestos to the surrounding environment.

Alternative #4 The building would be remediated by putting the entire building under a slightly negative pressure and hanging curtains over all openings. The asbestos would then be removed from the floors, trenches, piping and ductwork by workers with required OSHA training and equipment. Bagged asbestos would be trucked to disposal in an on-site RCRA landfill to be constructed on Columbia Mills property.

Alternative #5 This alternative is the same as Alternative #4 except that bagged asbestos would be trucked to disposal at an off-site landfill.

2.5.5.2 Debris Piles

The alternatives for remediation of the debris piles found in most areas of the Main Plant are defined in the following paragraphs.

Alternative #1 No-action would be taken.

Alternative #2 A secure fence would surround the area to prevent trespassers from coming in contact with debris piles.

Alternative #3 The debris would be consolidated and covered with soil to prevent the asbestos from being blown around. The soil cover would be seeded to prevent its erosion.

Alternative #4 The debris would be excavated and disposed of at the on-site landfill.

Alternative #5 This alternative is the same as Alternative #4 except that the debris would be shipped for disposal to an off-site landfill.

An essential part of each of the alternatives involving excavation is the necessity of completely wetting the debris prior to excavation and loading to insure that asbestos particles are not released into the air.

As stated earlier, the Columbia Mills, Incorporated assumes no liability for asbestos at the facility and has included this evaluation of remedial alternatives solely for consideration by others.

3.0 PRELIMINARY SCREENING OF REMEDIAL ALTERNATIVES

3.1 SCREENING METHODOLOGY

In this section, alternatives developed for each medium in each area of the site are screened on the basis of effectiveness and implementability to determine which alternatives should be analyzed in detail. Alternatives surviving the screening are identified and are evaluated in greater detail in Section 4. The rating sheets contained in the NYSDEC Technical and Administrative Guidance Memorandum (TAGM) "Selection of Remedial Actions At Inactive Hazardous Waste Sites", dated May 15, 1990, are used for the preliminary screening.

It should be noted that, in some areas, a large number of alternatives appeared to rate nearly equal and thus survived the preliminary screening. However, with respect to the soils and sediments in the various areas, their ultimate disposal depends heavily on what is recommended for the disposal of the largest volume of material in the Drum Disposal Area. For instance, if an on-site landfill is constructed, soil from other areas could be placed in the same landfill at a small incremental cost. Likewise, if material in the Drum Disposal Area is shipped off-site for disposal, it would influence the choice of alternatives for disposal of smaller volumes of soil in other areas.

Thus, the screening and the following detailed evaluation of alternatives will start with the soils and sediment in the Drum Disposal Area and proceed from that point.

For each area, a table is used to present the screening results and the differences in effectiveness and implementability between the alternatives are discussed.

Appendix B contains more detailed tables showing the full comparison of all rating factors. Appendix C contains the NYSDEC rating forms for each alternative.

In all areas, the no-action alternative is carried over for detailed evaluation, even though it may not have ranked as high as other action alternatives. This is necessary to meet the requirements of the National Contingency Plan (NCP).

3.2 CONTAMINATED SOILS

This section screens the alternatives for remediation of soils both in the Drum Disposal Area and in the Main Plant Area.

3.2.1 Drum Disposal Area

Table 3-1 below summarizes the results of the screening of alternatives for soils/fill in the Drum Disposal Area.

TABLE 3-1

SCREENING OF ALTERNATIVES - SOIL/FILL IN DRUM DISPOSAL AREA

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	11	13	24*+
2. Institutional - Access Restrictions	13	13	26
3. Drain Ponds & Reroute Creek/Cap in Place	16	12	28*
4. Drain Ponds & Reroute Creek/Lime Stabilization/ Cap in Place	20	11	31*
5. Drain Ponds & Reroute Creek/Excavate/Cap in Railroad Right-of-Way	15	11	26
6. Drain Ponds & Reroute Creek/Excavate/Stabilize/ Cap in Railroad Right-of-Way	19	9	28*
7. Drain Ponds & Reroute Creek/ Excavate/Dispose in On-site Landfill	14	11	25
8. Drain Ponds & Reroute Creek/ Excavate/Dispose in Off-site Landfill	18	10	28*

* Indicates remedial alternative carried through to detailed evaluation.

\+ Indicates no-action alternative carried through to detailed evaluation to meet requirements of NCP.

1) Effectiveness Comparison

The "no-action" alternative is the least effective for meeting remedial objectives, with access restrictions ranking only slightly higher due to the increase in protection of the community and decrease in environmental impacts during remediation.

The three mid-range alternatives (# 3 Cap in Place; # 5 Excavate, Cap in railroad right-of-way; # 7 Excavate, dispose in on-site landfill) offer solutions with long lifetime but fall short due to the amount of untreated waste left on site.

The most effective alternatives were those that provided a permanent or long-lived solution and/or removal of waste from the site, such as alternatives # 4 (Lime stabilization and cap in place), # 6 (Excavate, stabilize and cap in railroad right-of-way) and # 8 (Excavate and dispose of in an off-site landfill). The most effective alternative (# 4 Lime stabilization and cap in place) also provides more protection to the community during remediation since excavation is not required.

2) Implementability Comparison

The most difficult alternative to implement is # 6 (Excavate, stabilize, cap in railroad right-of way) due mainly to difficulties in technical feasibility and in part to administrative feasibility. Alternative # 8 (Excavate, dispose in off-site landfill) was only slightly more implementable. However, in contrast, technical feasibility was high for this alternative but administrative feasibility and availability of service and materials was lower.

Alternatives # 3 (Cap in place), # 4 (Lime stabilization, cap in place), # 5 (Excavate, cap in railroad right-of-way), and # 7 (Excavate, dispose in on-site landfill) are somewhat more implementable than disposing of the soil in an off-site landfill. These four all rank similarly for technical and administrative feasibility and availability of service and materials. However, construction of a landfill on the Columbia Mills property would be administratively very difficult due to limitations posed by the geological characteristics of the site and wetlands issues.

The most implementable of the alternatives are # 1 (No-action) and # 2 (Access restrictions). It stands to reason that both are technically and administratively very feasible and that service and materials are readily available.

3) Overall Screening Results

Based on the preliminary screening, alternatives #3, #4, #6 and #8 will be carried through to detailed evaluation. Alternative #1 (No-action) will also be carried through to meet the NCP requirements.

Alternative # 4 (Lime stabilization, cap in place) results in the highest overall score. This alternative offers a permanent remedy by immobilizing inorganic wastes, provides protection to the community and minimizes environmental impacts during remediation because the contaminated fill will not be excavated and minimal untreated waste will be left on site. This alternative is also moderately implementable for technical and administrative feasibility. Services and materials for this alternative are also readily available.

Alternative # 3 (Cap in place), # 6 (Excavate, stabilize, and cap in place), and # 8 (Excavate, dispose in off-site land fill) all provide long-term or permanent remedies. The difference is that the alternative proposing excavation and disposal off-site provides the least protection of the community during remediation and is the least feasible administratively but is more technically feasible and provides for a higher degree of reliability and adequacy of environmental controls.

3.2.2 Main Plant Area

This section describes the summary of alternatives for soils in the Main Plant Area.

A. UST Area 1 Soils

Table 3-2 below summarizes the preliminary screening results for alternatives for remediation of soils in UST Area 1 containing VOC contamination.

TABLE 3-2
SCREENING OF ALTERNATIVES - UST AREA 1 SOILS

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26*
2. Limit Access	8	13	21
3. Slurry Wall/Capping	12	9	21
4. Excavation/On-site Disposal	15	9	24*
5. Excavation/Off-site Disposal	18	10	28*
6. Soil Washing (In-Situ)	22	10	32*
7. Vapor Extraction	22	13	35*

* Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

Alternative # 2 (Limit access) is the least effective because it does not provide a long-term solution and environmental control is not adequate or reliable. Alternative # 3 (Slurry wall/capping) is slightly more effective because it provides a long-term remedy. Since environmental controls and monitoring are not required for Alternative # 1 (No action), it ranks slightly higher than # 2 even though it is not a long-term remedy.

Alternative # 4 (Excavation, on-site disposal) and # 5 (Excavation, off-site disposal) are fairly close for overall effectiveness. However, off-site disposal is slightly more effective because it leaves minimal untreated waste on site and is more reliable, even though on-site disposal offers a little more protection to the community and environment during remediation.

The most effective alternatives (# 6-Soil washing and # 7-Vapor extraction) scored equally for overall effectiveness. Soil washing provides slightly more protection to the community while vapor extraction impacts the environment slightly less.

2) Implementability Comparison

The least implementable alternatives (#3 Slurry wall, capping and # 4 Excavation, on-site disposal) rank lowest because they are technically and administratively less feasible. Off-site disposal and soil washing are only slightly more implementable.

Alternatives # 1 (No-action), # 2 (Limit access), and # 3 (Vapor extraction) are the most implementable because they are technically and administratively more feasible.

3) Overall Screening Results

As a result of the preliminary screening process, the No-action, On-site and Off-site disposal, Soil washing, and Vapor extraction alternatives will be carried through to detailed analysis.

Alternative # 7 (Vapor extraction) ranks highest overall followed closely by alternative # 6 (Soil washing). Both alternatives offer permanent remedies, adequate protection of the community and environment during remediation, and leave minimal, untreated waste on site. Vapor extraction is somewhat more technically feasible.

Of the remaining screened alternatives, no-action remains due to implementability and lack of need for monitoring and environmental controls. No-action does not provide a long-term remedy and does not minimize the amount of untreated waste left on site. On-site and off-site disposal are both long-term remedies and provide protection to the environment during remediation. The overall score for off-site disposal is slightly higher than on-site disposal because it is more technically feasible and it minimizes the amount of untreated waste left on-site.

B. Test Pit 3 Area Soils

Table 3-3 below summarizes the results of the screening of alternatives for remediating the VOCs in soil in the Test Pit 3 Area.

TABLE 3-3
SCREENING OF ALTERNATIVES - TEST PIT 3 AREA VOLATILES

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	4	13	17*+
2. Vertical Barrier/Slurry Wall	12	9	21
3. Excavation/On-site Disposal	13	8	21
4. Excavation/Off-site Disposal	17	9	26
5. Vapor Extraction/Ground Water Extraction	22	12	34*
6. Bioremediation (In-Situ)	19	10	29*
7. Soil Washing (In-Situ)	18	10	28*
8. Excavation/Spread out (Aerate)	16	9	25
9. Excavate/Low Temperature Incineration	15	10	25

* Indicates remedial alternative carried through to detailed evaluation.
\+ Indicates no-action alternative carried through to detailed evaluation to meet requirements of NCP.

1) Effectiveness Comparison

The effectiveness of each alternative was evaluated for its potential to eliminate significant threats to public health and the environmental through reductions in the VOC volume, toxicity and mobility. Vapor extraction, in conjunction with ground water depression, was determined to be the most effective alternative, while the no-action alternative was determined to be the least effective. Vapor extraction would remove the VOC soils contamination in place without disturbing or altering the surface and subsurface soils. For the in-situ alternatives of bioremediation and soil washing to be effective, the concrete pad covering the majority of the area would have to be removed. Vapor extraction would allow for the treatment of contaminated vadose zone soils which would not be effectively treated by injecting the aqueous solutions through wells into the ground water and saturated soils.

Concrete pad removal would also allow VOCs currently trapped in the soils beneath the pad to volatilize, which could cause potential health risks. Excavation of these soils would further increase volatilization and greatly increase the potential for air-related problems. In general, alternatives requiring excavation were rated lower than the in-situ alternatives in terms of effectiveness. The in-situ alternatives requiring pad removal rated lower than vapor extraction, which would not greatly disturb the pad's integrity.

All alternatives would require less than two years to implement, except for excavation and soil aeration. Experience gained during the aeration of VOC-contaminated soils from UST areas under the IRM program, demonstrated that a time frame of two to four years would be required for the aeration of all Test Pit 3 Area contaminated soil. Although modeling, conducted as a part of the September 1990 vapor extraction pilot scale study, indicated that it would require approximately four years to remediate the VOC-contaminated soils, this is a worst-case estimate. The actual clean up time frame is expected to be less. The Vapex Environmental Technologies, Inc. report entitled "Preliminary Design Evaluation and Full Scale Conceptual Design of a Soil Vapor Extraction System for the Test Pit 3 Area at the Columbia Mills Site, Minetto, New York", dated December 1990, includes the pilot scale and modeling results.

Most treatment alternatives were determined to be permanent, removing the majority of soils contamination and requiring few controls and little long-term operation and maintenance. The alternatives of no-action, slurry wall construction and excavation/on-site disposal would leave the contamination at the site and require more extensive controls and operation and maintenance. Though off-site disposal was not considered a permanent remedy, it would remove the majority of contaminated soils from the site.

2) Implementability Comparison

The implementability of each alternative was evaluated by examining the technical and administrative feasibility plus the availability of services and materials needed to conduct the remedial action. The no-action alternative, obviously, was determined to be the most implementable while excavation/on-site disposal was determined to be hardest to implement.

Vapor extraction/ground water extraction was determined to have a high implementability rating since the ability to construct the system was rated high. No future remedial actions may be anticipated and services and materials needed for the construction and operation are available. The other in-situ processes were rated lower because of the degree of uncertainty and difficulty in construction associated with them. In general, the alternatives involving excavation were rated lower than the in-situ methods because of the difficulty involved in removing the concrete pad and excavating the VOC contaminated soils while controlling VOC emissions.

3) **Overall Screening Results**

As a result of the screening process, three remedial alternatives were selected to be evaluated in more detail: vapor extraction/ground water extraction, in-situ bioremediation and in-situ soil washing. These alternatives were ranked the highest with total "scores" of 34, 29 and 28, respectively. The no-action alternative will also be carried through to meet the NCP requirements. The alternatives involving soil excavation were eliminated due to the risk posed by resulting uncontrolled VOC emissions to both workers on-site and those in close proximity off-site.

The construction of slurry walls was eliminated due to the inability to key them into a competent confining layer. There is no continuous low permeability geologic unit in the unconsolidated zone across the site, which indicates the unconsolidated material and the bedrock are in direct hydraulic communication. The slurry walls would have to be keyed into the bedrock, which is typically highly fractured near its contact with the overlying unconsolidated material. The bedrock fractures would act as pathways for contaminant migration. Thus containment would not be a feasible alternative.

A detailed evaluation of alternatives has been submitted in a separate report, "Interim Remedial Measure Report - Evaluation of Alternatives For Treatment of VOC Contaminated Subsurface Soils in Test Pit 3 Area", February 1991, revised April 1991. Vapor Extraction has been accepted by NYSDEC as the preferred alternative. The results are also contained in Section 4 of this report.

C. **Excavated Soil Piles**

Table 3-4 below summarizes the results of the screening of the alternatives for remediating the metals and semivolatile organics contaminated soil piles. The soil in these piles was previously excavated from UST Areas 1 and 2 and aerated to remove VOC contamination.

TABLE 3-4 SCREENING ALTERNATIVES-SOIL PILES EXCAVATED FROM UST AREAS			
Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-Action	16	13	29* +
2. Institutional-Access Restrictions	13	13	26
3. Dispose in On-Site Landfill	18	11	29
4. Dispose in Off-Site Landfill	19	11	30*
5. Cap in Railroad Right-of-Way	19	11	30*
6. Stabilization/Cap in Railroad Right-of-Way	20	11	31*

* Indicates remedial alternative carried through to detailed evaluation.
\+ Indicates no-action alternative carried through to detailed evaluation to meet requirements of NCP.

1) Effectiveness Comparison

The least effective alternative is to restrict access because it does not provide for protection against environmental impacts during remediation and requires some monitoring. No-action is somewhat more effective because no monitoring or controls are required.

The remaining four alternatives rank very closely for effectiveness. All are long-term or permanent remedies. Disposal in an on-site landfill is very effective except that it requires an elevated degree of monitoring and environmental controls. Disposal in an off-site landfill does not provide as much protection of the community during remediation, but is adequate and reliable in terms of environmental controls. Capping the soil in the railroad right-of-way provides the same level of protection to the community and the environment during remediation as does on-site disposal, but does not require the same level of monitoring. The most effective alternative requires stabilization of the soil prior to capping it in the railroad right-of-way which produces a permanent remedy.

2) **Implementability Comparison**

The easiest alternatives to implement are no-action and access restrictions because they are both technically and administratively feasible. The four remaining alternatives rank the same for implementability. On-site disposal, capping in the railroad right-of-way with and without stabilization are slightly less technically and administratively feasible. Off-site disposal is slightly more technically feasible but is the most difficult in terms of administrative feasibility.

3) **Overall Screening Results**

Based on the results of the preliminary screening, off-site disposal, capping in the railroad right-of-way, and stabilization prior to capping in the railroad right-of-way will be retained for detailed analysis, as will the no-action alternative.

Both off-site disposal and capping in the railroad right-of-way are reasonably implementable and effective; both provide long-term remedies and would sufficiently reduce the risk of dermal exposure. Overall, stabilization prior to capping is the best alternative because it provides a permanent remedy.

3.3 CONTAMINATED SEDIMENTS

3.3.1 Drum Disposal Area Sediments

Table 3-5 below summarizes the results of the screening of alternatives for remediating the metals and semivolatiles contaminated pond and creek sediments in the Drum Disposal Area.

TABLE 3-5 SCREENING OF ALTERNATIVES - DRUM DISPOSAL AREA POND AND CREEK SEDIMENTS			
Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26* +
2. Limit Access	9	13	22
3. Excavation/On-Site Disposal	16	11	27*
4. Excavation/Off-Site Disposal	18	12	30*
5. Excavation/Treatment/On-Site Disposal	20	9	29*
6. Excavation/Treatment/Off-Site Disposal	19	9	28*
7. Excavation/Lime Stabilization/Cap in Railroad Right-of-Way	20	11	31*

* Indicates remedial alternative carried through to detailed evaluation.

\+ Indicates no-action alternative carried through to detailed evaluation to meet requirements of NCP.

1) Effectiveness Comparison

Alternative # 2 (Limit access) was ranked as the least effective alternative. No-action scored somewhat higher because no monitoring or other environmental controls are required.

On-site and off-site disposal without treatment rank next, with off-site disposal slightly more effective than on-site disposal because less monitoring is required and it minimizes the quantity of waste left on site. Off-site disposal, however, provides less protection to the community during remediation.

The three most effective alternatives, on-site and off-site disposal with treatment, and cap in railroad right-of-way with lime stabilization, all offer permanent remedies due to the reduction of contaminant mobility. Again, off-site disposal requires less environmental controls but also provides less protection for the community during remediation.

2) Implementability Comparison

On-site and off-site disposal with treatment would be the most difficult to implement because of their low technical and administrative feasibilities.

On-site and off-site disposal without treatment and capping in place with stabilization rank next for implementability because they are slightly more technically feasible with off-site disposal (alternative # 4) ranking the highest.

The least difficult alternatives to implement would be the no-action and access limitation alternatives. Both are technically and administratively most feasible.

3) Overall Screening Results

Based on the results of the preliminary screening, alternatives # 3 (on-site disposal), #4 (off-site disposal), # 5 (treatment, on-site disposal), # 6 (treatment, off-site disposal), and #7 (lime stabilization, cap in railroad right-of-way) will be carried through to detailed analysis. All five alternatives offer either permanent or long-term remedies. Alternative # 7 (lime stabilization, cap in railroad right-of-way) ranks the highest both for effectiveness and overall. Off-site disposal ranks next overall as it is the most technically feasible of the remaining alternatives. On-site and off-site disposal with treatment rank closely behind. Both alternatives rank low in implementability but score very high for effectiveness because they are considered permanent remedies and both minimize the amount of untreated waste left on the site. On-site disposal scored the lowest overall of the alternatives to be carried through to detailed evaluation. Since the waste would not be treated prior to being placed in an on-site landfill, the amount of untreated waste left on site is higher than for any other alternative retained by the screening process.

Alternative #1 (No-action) will also be carried through to detailed evaluation to meet the requirements of the NCP.

3.3.2 Main Plant Area

A. UST Area 1 Creek Sediments

Table 3-6 below contains the results of the screening of alternatives for remediating the metal and semivolatile organic contamination in the creek sediments in the vicinity of UST Area 1.

TABLE 3-6 SCREENING OF ALTERNATIVES - CREEK SEDIMENTS UST AREA 1			
Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26* +
2. Limit Access	9	13	22
3. Excavation/On-Site Landfill	15	11	26
4. Excavation/Off-Site Landfill	18	12	30*
5. Excavation/Treatment/On-Site Disposal	18	10	28*
6. Excavation/Treatment/Off-Site Disposal	19	10	29*
7. Excavation/Lime Stabilization/Cap in Railroad Right-of-Way	19	11	30*

* Indicates remedial alternative carried through to detailed evaluation.
\+ Indicates no-action alternative carried through to detailed evaluation to meet requirements of NCP.

1) Effectiveness Comparison

The no-action and limit access alternatives are the least effective alternatives with no-action scoring higher because no monitoring or other environmental controls are required. On-site disposal ranks slightly higher because it provides a long-term remedy.

The four most effective alternatives, off-site disposal, on-site and off-site disposal with treatment, and cap in railroad right-of-way with lime stabilization, rank very closely in effectiveness. On-site and off-site disposal with treatment, and cap in railroad right-of-way with lime stabilization provide permanent remedies. The four most effective alternatives would minimize the amount of untreated waste left on site. The off-site options provide higher control adequacy and reliability but less protection for the community during remediation.

2) Implementability Comparison

The most difficult alternatives to implement are on-site and off-site disposal with treatment because they are the least technically and administratively feasible. On-site disposal and capping the sediment in the railroad right-of-way following lime stabilization were slightly more feasible and therefore slightly more implementable.

Off-site disposal ranked as highly technically feasible and is one of the most implementable alternatives. The easiest alternatives to implement, no-action and limit access, are both very technically and administratively feasible.

3) **Overall Screening Results**

Based on the results of the preliminary screening, off-site disposal, on-site and off-site disposal with treatment, and capping the material in the railroad right-of-way following stabilization will be carried through to detailed analysis. The no-action alternative will also be carried through to meet the requirements of the NCP.

All four action alternatives are closely ranked for overall scores. Off-site disposal, one of the two highest ranking alternatives, is the most implementable of the four and provides a long-term remedy rather than permanent. The remaining action alternatives are permanent. On-site and off-site disposal with treatment follow closely behind off-site disposal without treatment and stabilizing/capping the material in the railroad right-of-way in overall score with variations in protection of the community, control adequacy and reliability, and technical and administrative feasibility.

3.4 CONTAMINATED GROUND WATER

This section presents the results of the screening of alternatives developed for remediation of ground water contamination in the Drum Disposal Area and in the Main Plant Area.

3.4.1 Drum Disposal Area Shallow Ground Water

Table 3-7 below summarizes the screening of the alternatives for remediating the metals-contaminated shallow ground water between Ponds 1 and 3 in the Drum Disposal Area.

TABLE 3-7
SCREENING OF ALTERNATIVES - DRUM DISPOSAL AREA SHALLOW GROUND WATER

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26*
2. Containment	14	10	24*
3. Extraction/Discharge to Sanitary Sewer	12	9	21
4. Extraction/Pretreatment/Discharge to Sanitary Sewer	12	8	20
5. Extraction/Treatment/Discharge to Surface Water	12	10	22*
6. Divert Pond Water/Lower GW Table/ Discharge to Surface Water	21	12	33*

* Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

The three extraction alternatives scored as the least effective of all the alternatives because they are not long-term remedies and they do not provide adequate or reliable environmental controls. The no-action alternative ranked slightly higher because no monitoring or other environmental controls are required. The containment alternative was somewhat more effective because it provides a longer lifetime for the remedial action.

The most effective alternative, diversion of pond water and lowering the ground water table, provides a long-term remedy, minimizes the amount of untreated waste ground water left on site, by preventing contact between the ground water and the source of contamination (the fill between Ponds 1 and 3) and provides adequate and reliable environmental controls.

2) Implementability Comparison

The most difficult alternative to implement would be extraction with pretreatment prior to discharge to the sanitary sewer, followed closely by extraction and direct discharge to the sanitary sewer. Both alternatives are the least technically and administratively feasible. The containment alternative and the alternative of extraction with treatment prior to discharge to surface water are slightly more technically feasible and therefore slightly easier to implement.

The diversion of pond water is one of the most implementable alternatives because it is technically very feasible. The no-action alternative is the easiest to implement because it is the most technically and administratively feasible.

3) Overall Screening Results

The no-action, containment, extraction with treatment prior to discharge to surface water, and diversion of pond water alternatives will be retained for detailed analysis based on the results of preliminary screening.

Alternative # 5 (Extraction, treatment, discharge to surface water) ranked the lowest of all the alternatives carried through to detailed analysis primarily because it does not provide a long-term remedy and it lacks adequate and reliable environmental controls. Containment ranks only slightly higher as it allows for a remedy of limited duration.

The no-action alternative ranks higher mainly because it is easily implemented. Overall, the alternative to divert pond water ranks highest because it is a long-term remedy, minimizes ground water waste left on site, and is very implementable.

3.4.2 Main Plant Shallow Ground Water

A. Shallow Ground Water - Test Pit 3 Area

Table 3-8 below summarizes the results of the preliminary screening of alternatives for remediating VOC-contaminated shallow ground water in the Test Pit 3 Area of the Main Plant.

TABLE 3-8 SCREENING OF ALTERNATIVES - SHALLOW GROUND WATER TEST PIT 3 AREA			
Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26*
2. Containment	12	10	22
3. Extraction/Discharge to Sanitary Sewer	16	12	28*
4. Extraction/Pretreatment/Discharge to Sanitary Sewer	14	12	26*
5. Extraction/Treatment/Discharge to Surface Water	14	13	27*
6. In-Situ Treatment (Bioremediation)	8	9	17

* Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

Effectiveness evaluations of the six alternatives listed above determined that ground water extraction and discharge to the sanitary sewer would be the most effective option. The second most effective alternatives involve ground water extraction/treatment and discharge to either the sanitary sewer or surface water. The containment, in-situ bioremediation and no-action alternatives, while viable, do not appear to be as effective as the above mentioned alternatives.

The containment and in-situ bioremediation alternatives do not appear to be as effective as Alternatives #3, #4 and #5 either because they allow contaminants to remain on-site (containment) or require more complex technology (bioremediation).

2) Implementability Comparison

Implementability evaluations determined that the no-action and the ground water extraction/treatment/discharge to surface water alternatives would be the least difficult to implement. The containment and in-situ bioremediation alternatives scored the lowest in terms of implementability.

3) Overall Screening Results

Preliminary screening of the six above alternatives has indicated that the containment and in-situ bioremediation alternatives would not be as effective or implementable as the four other alternatives.

Alternatives #3, #4 and #5 will be carried through a detailed analyses which will include ground water contaminant levels and local surface water/sanitary sewer hydraulic assessments. If contaminant levels are continually low, treatment may not be required. If the hydraulic capacity is unacceptable at the local sanitary plant, the surface water body may be used. The no-action alternative will also be carried into the detailed analysis for comparison.

B. Shallow Ground Water - UST Area 1

Table 3-9 below contains the results of the preliminary screening of alternatives for remediation of VOC-contaminated shallow ground water in the area of UST Area 1.

TABLE 3-9
SCREENING OF ALTERNATIVES - SHALLOW GROUND WATER UST AREA 1

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26*
2. Containment	12	10	22
3. Extraction/Discharge to Sanitary Sewer	16	12	28*
4. Extraction/Pretreatment/Discharge to Sanitary Sewer	15	11	26*
5. Extraction/Treatment/Discharge to Surface Water	14	10	24*
6. In-Situ Treatment (Bioremediation)	13	10	23

* Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

Effectiveness evaluations of the six above alternatives determined that ground water extraction and discharge to the sanitary sewer would be the most effective option. The second most effective group of alternatives involve ground water extraction/treatment/discharge to the sanitary sewer or to a nearby surface water body. The no-action, containment and in-situ bioremediation alternatives, while potentially viable, do not appear to be as effective as the above mentioned alternatives.

The no-action and containment alternatives would allow the VOC contamination to remain in place without treatment. The no-action alternative may result in contaminant migration.

The in-situ bioremediation alternative is not as effective as Alternatives #3, #4 and #5 because of the more complex technology involved.

2) Implementability Comparison

Implementability evaluations determined that the no-action alternative would be the easiest to implement. The next most implementable alternative involves ground water extraction and discharge to the sanitary sewer.

Implementability evaluations of the remaining alternatives shows no discernable differences in terms of ease of installation, operation and maintenance.

3) Overall Screening Results

In view of the overall ratings obtained for these six alternatives, a detailed analysis for Alternatives #3, # 4 and #5 is warranted. The no-action alternative will also be evaluated in more detail.

The VOCs may be easily stripped from the ground water stream before the effluent is discharged to the sanitary sewer or surface water.

Alternatives #3, # 4 and #5 will be carried through a detailed analysis which will include an assessment of ground water contaminant levels and sanitary sewer hydraulics. If contaminant levels are continually low, treatment may not be required.

3.4.3 Main Plant Area Deep Ground Water

A. Deep Ground Water - Test Pit 3 Area

Table 3-10 below summarizes the results of the screening of alternatives for remediating the VOC-contaminated deep ground water in the Main Plant Area in the vicinity of Test Pit 3.

TABLE 3-10
SCREENING OF ALTERNATIVES - DEEP GROUND WATER
MAIN PLANT TEST PIT 3

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26*
2. Extraction/Discharge to Sanitary Sewer	16	12	28*
3. Extraction/Pretreatment/Discharge to Sanitary Sewer	13	8	21*
4. Extraction/Treatment/Discharge to Surface Water	13	8	21*
5. In-Situ Treatment (Bioremediation)	10	8	18

* Indicates remedial alternative carried through to detailed evaluation

1) **Effectiveness Comparison**

Effectiveness evaluations of the five alternatives listed above indicated that ground water extraction and discharge to the sanitary sewer would be the most effective technique for VOC remediation. This was followed by ground water extraction, treatment and discharge to either the sanitary sewer or nearby surface water body and the no-action alternative. The in-situ bioremediation alternative was evaluated as being the least effective.

2) **Implementability Comparison**

The no-action alternative would be the easiest to implement. It would require no controls, operation and maintenance.

The next most implementable alternative was evaluated to be the extraction and discharge to sanitary sewer. The reason for this alternative being easier to implement than the remaining alternatives is quite evident. Once again, extracted ground water contaminant levels plus local sanitary plant hydraulics will determine this alternative's viability.

3) **Overall Screening Results**

In view of the above, Alternative #5 will be eliminated from future detailed analysis. Alternatives #1, #2, #3, and # 4 will be analyzed in detail with the preliminary preference to extract the ground water and discharge it to the sanitary sewer.

B. Deep Ground Water - Well B-19D AREA

Table 3-11 below summarizes the results of the screening of alternatives for remediating the VOC-contaminated deep ground water near UST Area 1/monitoring well B-19D in the Main Plant Area.

TABLE 3-11
SCREENING OF ALTERNATIVES - DEEP GROUND WATER
MAIN PLANT (WELL B-19D)

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	13	13	26*
2. Extraction/Discharge to Sanitary Sewer	16	12	28*
3. Extraction/Pretreatment/Discharge to Sanitary Sewer	13	8	21*
4. Extraction/Treatment/Discharge to Surface Water	14	8	22*
5. In-Situ Treatment (Bioremediation)	10	8	18

* Indicates remedial alternative carried through to detailed evaluation.

1) **Effectiveness Comparison**

Effectiveness evaluations of the five above alternatives indicated that ground water extraction and discharge to the local sanitary sewer provided the best alternative for VOC remediation. The alternatives of no-action and ground water extraction, treatment and discharge to sanitary sewer or nearby surface water are included in the next group of alternatives. The least effective of the five alternatives screened was bioremediation.

2) **Implementability Comparison**

The no-action alternative was evaluated to be the least difficult to implement. As with the Test Pit 3 Area contaminated deep ground water, the next most implementable alternative would be to extract the ground water and discharge it to the Minetto WWTP. The remainder of the alternatives (#3, #4 and #5) demonstrated no difference in implementability efforts.

3) **Overall Screening Results**

Screening process results indicate that Alternatives #1 and #2 are the most feasible. These alternatives will be carried through to detailed analysis. Alternatives #3 and #4 provided the next best options and will also be retained for detailed evaluations. Alternative #5 was the least desirable.

3.5 CONTAMINATED SEWER SEDIMENT

In this section, sewer sediment remedial alternatives developed in Phase I are screened on the basis of effectiveness and implementability. The feasibility of the alternatives are then compared.

3.5.1 Sewer System 1 Sediment

Sewer System 1 is comprised of a roof drain running from Building 69 to Benson Creek. This sewer system contains volatile and semivolatile organic, pesticide, and metal contaminated sediments. The results of the preliminary screening of the remedial alternatives for the system and sediments are contained in Table 3-12 below.

TABLE 3-12 SCREENING OF ALTERNATIVES - SEDIMENTS SEWER SYSTEM 1			
Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	20	13	33*
2. Institutional-Monitoring, Access Restrictions	17	13	30*
3. Excavation/Off-Site Disposal	19	12	31*
4. Excavation/On-Site Disposal	16	12	28
5. Excavation/Stabilize and Cap in Railroad Right-of-way	17	10	27
6. Flush Sediments/Treat/Cap in Railroad Right-of-way/Cap & Close Line	19	9	28
7. Flush Sediments/Treat/Cap in Railroad Right-of-way/Return Line to Service	19	10	29
8. Close Sewer Line in Place	22	12	34*

* Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

Closing Sewer System 1 in-place was determined to be the most effective alternative. The risk posed to the community, as well as to on-site workers, would be greatly reduced when compared to alternatives involving excavation. Excavation could cause contaminated particulates to become air-borne and increase the risk of contaminant exposure. This could be easily controlled, though, by wetting down the work area. The no-action alternative appears to be nearly as effective as closing the line in place for the same reason, as well as for the lack of monitoring requirements.

The two alternatives requiring the sediments to be flushed from the sewer line, treated and capped in the railroad right-of-way were rated the same as excavation and off-site disposal. The two alternatives in which the entire sewer line would be excavated and disposed of on-site rated the lowest of the action alternatives along with access restrictions due mainly to the amount of long-term monitoring required.

2) **Implementability Comparison**

The no-action and access restriction alternatives would be the easiest to implement. The next easiest alternatives to implement were determined to be excavation with on-site and off-site disposal and closing the sewer line in place. The alternative determined to be most difficult to implement involved flushing the line, treating and disposing of the sediment in the railroad right-of-way and permanently closing the sewer line.

3) **Overall Screening Results**

Overall, closing the sewer line in place was determined to be the most feasible alternative with the no-action alternative being the next most feasible. These two alternatives along with removal of the sediments for off-site disposal and access restrictions will be carried through to detailed analysis.

3.5.2 Sewer System 2A Sediments

Sewer System 2A contains VOC, semivolatile, metal and pesticide-contaminated sediments. The results of the preliminary screening of the remedial alternatives for the sediments are contained in Table 3-13 below.

TABLE 3-13
SCREENING OF ALTERNATIVES - SEDIMENTS SEWER SYSTEM 2A

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	17	13	30*
2. Institutional-Monitoring,Permitting	14	13	27
3. Close Line in place	19	12	31*
4. Flush Sediments/On-Site Disposal	15	11	26
5. Flush Sediments/Off-Site Disposal	18	12	30*
6. Flush Sediments/Treat/Cap in Railroad Right-of-way	18	10	28

* Indicates remedial alternative carried through to detailed evaluation.

1) **Effectiveness Comparison**

The least effective alternative was determined to be monitoring because it does not provide a long-term remedy and requires long term operation and monitoring. On-site disposal of flushed sediments is only slightly more effective mainly because it does provide a long-term remedy. The no-action alternative appears to be somewhat more effective due to lack of monitoring requirements.

Disposal off-site would pose short term risks to the nearby community (traffic, air-borne particulates), but would require little to no operation and maintenance and long term monitoring at the site. Treating the sediments and capping them in the railroad right-of-way would not pose as great a risk to nearby residents as off-site disposal, but maintenance of the cap would be required and a slightly more extensive monitoring program would need to be implemented. Closing the system in place was determined to be the most effective alternative because it provides protection to the community and environment during remediation and is a long-term remedy.

2) **Implementability Comparison**

The no-action and monitoring alternatives would be the least difficult to implement. Closing the system in place and off-site sediment disposal were determined to be the most implementable, followed by on-site disposal. Treatment and capping in the railroad right-of-way was ranked as the hardest to implement. Off-site disposal and closing the system in place would be very reliable in meeting performance goals. On-site disposal would be more difficult to implement than off-site disposal because of the required landfill construction. Also, monitoring and some future remedial actions would be necessary, including landfill cap maintenance. Cap maintenance would also be required if the sediments were treated and capped in the railroad right-of-way.

3) **Overall Screening Results**

The preliminary screening of the alternatives has indicated that no-action, off-site disposal of sediments, and closure of the system in place are the most feasible alternatives to be carried through detailed analysis.

Overall, closure of the system by filling with an inert material rates the highest because it provides protection to the community and environment, it is a long-term remedy and it is very technically feasible.

3.5.3 Sewer System 2B Sediments

Sewer System 2B, the main storm sewer running through the Columbia Mills facility, contains semivolatile, PCB and metal-contaminated sediments. The results of the preliminary screening of the remedial alternatives for the sediments are contained in Table 3-14 below.

TABLE 3-14
SCREENING OF ALTERNATIVES - SEDIMENTS SEWER SYSTEM 2B

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	20	13	33*
2. Monitoring/Permitting	17	13	30
3. Flush Sediments/On-Site Disposal	18	10	28
4. Flush Sediments/Off-Site Disposal	19	12	31*
5. Flush Sediments/Treat/Cap in Railroad Right-of-way	20	10	30
6. Close Main Plant Section of Line in Place/Divert Upstream Flow into Benson Creek	20	12	32*

* Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

Monitoring and permitting was determined to be the least effective alternative because it does not provide a long-term remedy and lacks adequate and reliable environmental controls. On-site disposal of flushed sediments is slightly more effective because it is a long-term remedy. Off-site disposal was ranked higher for effectiveness because monitoring and environmental controls on-site are not required after the sediments have been removed.

The most effective alternatives are no-action, treat and cap sediments in the railroad right-of-way, and closure of the Main Plant section and diversion of the upper portion into Benson Creek. No-action appears to be as effective as the other two alternatives because no monitoring or other environmental controls are required.

2) **Implementability Comparison**

The most implementable alternatives are no-action and monitoring. Off-site disposal and partial closure and diversion of the system would be slightly more difficult to implement. Off-site disposal is technically very feasible but difficult to administrate. Diversion of the upstream section and closure of the Main Plant section is easier to administrate but technically more difficult to carry out.

On-site disposal and treatment and capping of sediments in the railroad right-of-way are the most difficult alternatives to implement. Treatment and capping is not as technically feasible as on-site disposal but is more administratively feasible.

3) **Overall Screening Results**

Based on the results of preliminary screening, no-action, off-site disposal, and closure and diversion of portions of system 2B will be carried through to detailed analysis.

3.5.4 Sewer System 3 Sediments

The sediment in Sewer System 3, a narrow concrete trench in the main plant tunnel, was found to contain some metals. The results of the preliminary screening of the alternatives for remediating these sediments are contained in Table 3-15 below.

TABLE 3-15
SCREENING OF ALTERNATIVES - SEDIMENTS SEWER SYSTEM 3

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	20	13	33*
2. Institutional-Monitoring,Permitting	17	13	30
3. Close Line in Place	22	12	34*
4. Flush Sediments/Off-Site Disposal/Fill Trenches	19	12	31*
5. Flush Sediments/On-Site Disposal/Fill Trenches	18	11	29
6. Flush Sediments/Treat/Cap in Railroad Right-of-way/Fill Trenches	20	10	30*

*Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

Closing the line in place was determined to be the most effective alternative. Since the sediments will not be removed and all inlets and outlets will be filled with inert material, exposure is minimized and therefore provides a long-term solution that is protective of the community and the environment during remediation. Treating and capping the sediments and no-action ranked as the next most effective alternatives. No-action appears to be effective because environmental controls are not required and there is no exposure since the sediments are not removed. Treatment of the sediments prior to capping in the railroad right-of-way is considered a permanent remedy, although some monitoring would be required.

Off-site and on-site disposal ranked one and two points less, respectively. On site disposal would pose less risks to the community during remediation than off-site disposal because the sediments would not be transported off-site. Off-site disposal ranks higher because the extensive monitoring, operation and maintenance is not required. Monitoring and permitting is the least effective alternative since extensive controls are required.

2) Implementation Comparison

The no-action and monitoring alternatives were determined to be the most implementable alternatives since no construction is required. Closing the line in place and off-site disposal ranked next for implementability. Off-site disposal would be very reliable in meeting performance goals but would be difficult to administrate. Closing the line in place is slightly less technically feasible but easier to administrate.

On-site disposal and treat and cap ranked one and two points lower for implementability. On-site disposal would be more difficult to administrate but would be more technically feasible than flushing, treating, and capping the sediments in the railroad right-of-way.

3) Overall Screening Results

Overall, closing the sewer line in place was determined to be the most feasible alternative, with no-action being the next most feasible. These two alternatives along with off-site disposal will be carried through to detailed analysis.

3.5.5 Sewer System 4 Sediments

The sediment in Sewer System 4, which serves to collect surface water runoff along Route 48 and drains a portion of Building 8 on the Columbia Mills site, contains semivolatile and volatile organics, pesticides and metal contaminants. The results of the preliminary screening of the alternatives for remediating the sediment are contained in Table 3-16, below.

TABLE 3-16 SCREENING OF ALTERNATIVES - SEDIMENTS SEWER SYSTEM 4			
Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	20	13	33*
2. Institutional-Monitoring/Permitting	17	13	30*
3. Close Plant Sewer in Place	22	12	34*
4. Flush Sediments/Dewater/On-site Disposal	18	11	29
5. Flush Sediments/Dewater/Off-site Disposal	19	12	31*
6. Flush Sediments/Treat/Cap in Railroad Right-of-way	19	10	29

* Indicates remedial alternative carried through to detailed evaluation.

1) Effectiveness Comparison

Closing the plant sewer in place and no-action were determined to be the most effective alternatives. Closing the line in the plant area would leave the sediments in place and therefore not cause any exposures. It also would provide a long-term remedy. No-action appears nearly as effective because no monitoring is required.

The next two highest ranked alternatives were those involving off-site disposal of the sediments and treatment and capping of the sediments in the railroad right-of-way. Off-site disposal would pose a greater risk to the community than the on-site alternative, since contaminated sediments would be transported off-site increasing the amount of traffic and air-borne particulates. By disposing of the sediments off-site, the degree of operation, maintenance and long-term monitoring at the site would be less than that required if the sediments were disposed of in the railroad right-of-way.

The alternative of flushing the sediments from the sewer system and disposing of them on-site was ranked only one point lower than the two latter alternatives mentioned above. Even though 100 percent of the contaminated sediments would remain at the site, they are most likely not hazardous. Extensive monitoring would be required as part of the landfill operation. Monitoring was ranked as the least effective because of the extensive monitoring that would be required.

2) Implementability Comparison

The no-action and monitoring alternatives were rated the least difficult to implement, and off-site disposal of the sediments and closing the plant sewer in place were rated the least difficult action alternatives to implement. These were followed by on-site disposal and then the alternative involving sediment capping in the railroad right-of-way. While less project delays would be expected with the on-site disposal alternative, future site remedial actions (i.e., cap maintenance) would be necessary. Also, disposal in a landfill (on or off-site) would require more extensive coordination than disposal of the sediments in the railroad right-of-way.

3) Overall Screening Results

Based on the results of the preliminary screening, no-action, monitoring, close the plant sewer in place, and off-site disposal of flushed sediments will be carried through to detailed analysis. Closing the plant sewer in place would be very implementable and appears to be the most effective alternative. No-action appears to be nearly as effective and would be least difficult to implement, as would monitoring.

3.5.6 Sewer System 5 Sediments

The sediments in Sewer System 5, the septic system consisting of two small tanks near UST Area 1, are contaminated with semivolatile organics, PCBs and metals. The results of the preliminary screening of the alternatives for remediation of the sediments are contained in Table 3-17, below.

TABLE 3-17
SCREENING OF ALTERNATIVES - SEDIMENTS SEWER SYSTEM 5

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	20	13	33*
2. Institutional-Monitoring	17	13	30
3. Flush System/Treat Water/Cap Sludge in Railroad Right-of-way/Leave System in Place	20	10	30
4. Flush System/Treat Water/Cap Sludge in Railroad Right-of-way/Close System in Place	20	10	30
5. Close System in Place (Fill With Concrete)	22	12	34*
6. Excavate Tanks & Sediment/Cap in Railroad Right-of-way	20	11	31*

* Indicates remedial alternative carried through to detailed evaluation.

1) **Effectiveness Comparison**

Closing the system in place was determined to be the most effective alternative for the remediation of Sewer System 5. The two alternatives, which involve flushing the sediments from the system and capping them in the railroad right-of-way, excavation of the tanks and sediments, and the no-action alternative all ranked only two points lower. The monitoring alternative was ranked the lowest in terms of effectiveness.

The alternatives that do not require removal of the sediments, closing the system in place, no-action and monitoring, would pose much smaller short-term risks to the community and environment than flushing the sediments or excavating the tanks and sediments and moving them to the Drum Disposal Area railroad right-of-way.

2) **Implementability Comparison**

The no-action and monitoring alternatives would be the least difficult to implement, while closing the system in place was ranked as the least difficult action alternative to implement. Excavation was determined to be slightly less implementable. The two alternatives of flushing the system and capping the sediments were ranked as the most difficult to implement.

Closing the system in place would be technically easier to implement than the remaining action alternatives. Also, less delays would be expected. In each case, some future remedial actions would probably be necessary, including cap maintenance for the capping alternatives.

3) **Overall Screening Results**

The preliminary screening of the remedial alternatives for Sewer System 5 Sediments has resulted in retaining the no-action, close system in place, and excavate tanks alternatives for detailed analysis.

3.6 ASBESTOS CONTAMINATED BUILDINGS AND DEBRIS

In this section, alternatives developed in Phase I for the remediation of the asbestos-contaminated buildings and debris piles are screened on the basis of effectiveness and implementability to determine which alternatives should be analyzed in more detail. Although Columbia Mills accepts no responsibility for asbestos contamination at the site, Malcolm Pirnie, Inc. has screened the alternatives as agreed upon with the State.

3.6.1 Buildings - Main Plant Area

Table 3-18 summarizes the results of the screening of remedial alternatives for the asbestos in the remaining buildings in the Main Plant Area, primarily Building 11.

TABLE 3-18
SCREENING OF ALTERNATIVES - ASBESTOS BUILDING 11

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	11	13	24* +
2. Limit Access	5	13	18
3. Seal Building	15	13	28*
4. Remove Asbestos by OSHA Methods/ Dispose in Off-site Landfill	23	12	35*
5. Remove Asbestos by OSHA Methods/ Dispose at On-site Landfill	17	10	27*

* Indicates remedial alternative carried through to detailed evaluation.
\+ Indicates no-action alternative carried through to detailed evaluation to meet requirements of NCP.

1) Effectiveness Comparison

Each of the above alternatives were evaluated for their potential to eliminate significant threats to public health and the environment through reductions in the asbestos volume, toxicity and mobility.

Asbestos removal via OSHA methods with disposal at an off-site landfill appears to be the most effective and permanent disposal method. Disposal of the asbestos in an on-site landfill is also a permanent remedy but ranked substantially lower than off-site disposal because of the waste left on site and extensive monitoring that would be required. Sealing the buildings is even less effective because it does not provide a long-term remedy.

No-action and access limitations were determined to be the least effective. No-action appears to be more effective than limiting access because no monitoring is required.

2) Implementability Comparison

The easiest alternatives to implement were determined to be no-action, limit access, and seal buildings. Removal of asbestos and disposal in an off-site landfill was found to be slightly less implementable. On-site disposal of the asbestos would be the most difficult to implement because of landfill construction and administrative difficulties.

3) **Overall Screening Results**

Preliminary screening results from consideration of the five alternatives listed above have indicated that the access limitation alternative should be eliminated. The other three action alternatives will be further evaluated in Section 4 along with the no-action alternative.

3.6.2 Debris Piles Main Plant

Table 3-19 below summarizes the screening of alternatives for the asbestos-laden debris piles on the Main Plant Area grounds and in the more dilapidated buildings.

TABLE 3-19
SCREENING OF ALTERNATIVES - ASBESTOS - DEBRIS PILES MAIN PLANT

Remedial Alternative	Effectiveness (Maximum = 25)	Implementability (Maximum = 15)	Total (Maximum = 40)
1. No-action	11	13	24* +
2. Limit Access	5	13	18
3. Consolidate Material/Cover in Place	16	11	27*
4. Excavate/Dispose in On-site Landfill	17	10	27*
5. Excavate/Dispose at Off-site Landfill	22	12	34*

* Indicates remedial alternative carried through to detailed evaluation.
\+ Indicates no-action alternative carried through to detailed evaluation to meet requirements of NCP.

1) **Effectiveness Comparison**

Effectiveness evaluations of the five alternatives listed above demonstrated results similar to those concerned with asbestos contamination of the site buildings. The obvious nature of the asbestos contamination hinders the effectiveness of the access limitation and the no-action alternatives. As above, the most effective and permanent solution would be Alternative #5, off-site disposal. Alternatives #3 and #4 scored similarly in effectiveness ratings. Utilizing these two alternatives still presents potential future liabilities and long-term monitoring requirements.

2) **Implementability Comparison**

The no-action and access limitation alternatives were determined to be the most implementable of the five alternatives. The remaining action alternatives in order of implementability are off-site disposal, consolidate and cover in place, and on-site disposal. On-site disposal is the least implementable due to difficulties in landfill construction and lack of administrative feasibility due to wetlands issues.

3) **Overall Screening Results**

Preliminary screening results from consideration of the above five alternatives have again indicated that the access limitation alternative should be eliminated. The remaining alternatives will be evaluated in detail in Section 4. Off-site disposal of the debris piles appears to be the most feasible alternative overall.

4.0 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

4.1 INTRODUCTION

In this section, the alternatives retained by the screening process are analyzed with respect to the criteria in the NYSDEC TAGM on the selection of remedial actions at inactive hazardous waste sites. Each alternative is analyzed with respect to its compliance with the applicable or relevant and appropriate NYSDEC SCGs, protection of human health and the environment, short-term effectiveness, long-term effectiveness, reduction of toxicity, mobility and volume, implementability and cost. The tables in the TAGM are utilized in the detailed analysis. These rating tables are contained in Appendix D. For each remedial unit, a summary table is used to present the detailed analysis results.

Following the individual analysis of alternatives for each remedial unit, the alternatives are compared and contrasted and a preferred alternative is recommended. Present worth cost analyses for the alternative are contained in Appendix E.

4.2 CONTAMINATED SOILS

This section analyzes remedial alternatives retained by preliminary screening for the soils in both the Drum Disposal Area and the Main Plant Area.

4.2.1 Drum Disposal Area

4.2.1.1 Drum Disposal Area Soil/Fill Material

The contaminants of concern in the Drum Disposal Area soil/fill material are metals and semivolatile organics. Five alternatives survived the preliminary screening process. The results of the detailed analysis of these alternatives are summarized in Table 4-1.

TABLE 4-1
DETAILED ANALYSIS RESULTS
REMEDIATION OF DRUM DISPOSAL AREA FILL MATERIAL
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	2	4	6	0	13	15	46
Drain Ponds & Reroute Creek/ Cap in Place	10	20	9	6	2	12	15	74
Drain Ponds & Reroute Creek/Lime Stabilization/Cap in Place	10	20	9	11	8	11	14	83
Drain Ponds & Reroute Creek/Excavate/Lime Stabilization/Cap in Railroad Right-of-Way	10	20	8	11	8	9	13	79
Drain Ponds & Reroute Creek/Excavate/ Dispose in Off-Site Landfill	10	20	6	11	2	10	1	60

A. Individual Analysis of Alternatives

Alternative #1 - No Action

If no action is taken to remediate the Drum Disposal Area fill material, the shallow ground water in this area will continue to be contaminated by the fill and the SCGs for ground water will be contravened. Since the soil poses a risk to the environment and to human health for all pathways, this alternative ranks very low for the protection of human health and the environment. It also ranks low in terms of short-term and long-term effectiveness because of the risks posed to the community and the environment and the lack of permanence or duration of mitigation since none will take place.

This alternative will not reduce the toxicity, mobility or volume of waste in the Drum Disposal Area and scored zero for these considerations. Since there is nothing to construct or coordinate, the no action alternative is the very implementable.

Alternative #2 - Drain Ponds And Reroute Creek/Cap In-Place

Under this alternative, the influent water would be permanently diverted away from the ponds which would result in their drainage and the subsequent depression of the ground water table in the fill between the ponds. Leachate collection and treatment would also be required at least in the initial stages of construction. The wastes present in this area would be capped-in-place, with or without other wastes being placed in the areas, by the construction of a single membrane barrier cap. Although there are no applicable SCGs for soils, some metals have been present in the Drum Disposal Area shallow ground water at levels exceeding applicable GA standards. Rerouting the creeks and ponds in the area would aid in preventing the surface water from flowing through the fill between Ponds 1 and 3. Also, capping the fill material would prevent surface water from infiltrating into the fill material. By preventing ground water and surface water infiltration no contaminants would leach into the ground water. Thus, contaminants from the fill material would not cause contravention of the applicable SCGs.

This alternative would provide for the protection of human health and the environment. The fill material would be capped and contact would be prevented. Contamination of the ground water would also be prevented.

This alternative would be effective in the short term since there would be no significant risks posed to the community. Short-term environmental impacts would include the temporary loss of some habitats due to the rerouting of the creek and ponds. Capping the Drum Disposal Area fill material in place would not constitute a permanent remedial action. Operation and maintenance would be required for a period greater than 5 years and environmental controls would be required as a part of the remedy.

Of the four action alternatives that were analyzed in detail, this alternative would be the least difficult to implement. Since the fill material would be capped, some future remedial actions may be necessary, such as cap maintenance and repair.

<u>Alternative #3</u> - Drain Ponds And Reroute Creek/Lime Stabilization/Cap In-Place

This alternative is similar to the previous one, but stabilization of the material would be done by applying lime to the soils before the single membrane barrier cap is constructed. As with the previous alternative, applicable and appropriate SCGs should be met. Diverting the pond and creek water around the Drum Disposal Area will prevent surface water from flowing through the fill material. In this way, contaminants from the fill material will not leach into the ground water and cause exceedances of the GA standards.

The utilization of this alternative would protect human health and the environment. Exposure to contaminants would be limited due to installation of a cap over the fill area. Also, stabilizing the soil with lime would adjust the pH of the fill to deter the leaching of contaminants into the ground water. No significant short-term risks to the community would be posed by this alternative. Again, short-term risks to the environment may exist due to the temporary loss of habitat. This would only be short term since a replacement pond would be constructed in another location. Stabilizing the fill material with lime and capping in place would be considered a permanent alternative. Since the fill would be treated with the lime there would be residual left at the site. This residual would not be expected to be toxic or mobile. Operation and maintenance would be required for a period greater than 5 years, and environmental controls would part of the remedy. Controls would include monitoring wells to monitor ground water quality in the Drum Disposal Area.

The construction of this alternative would be somewhat more difficult than the previous alternative of capping the material in place, since an additional step, lime stabilization, would be involved. Some future remedial actions may be necessary such as cap maintenance and repair. It is expected that only normal coordination with the state agencies would be necessary.

<u>Alternative #4</u> - Drain Ponds And Reroute Creek/Excavate/Lime Stabilization/Cap In Railroad Right-Of-Way

This alternative would involve transporting the contaminated soil and drums located in the area east of Pond 1 a short distance to be deposited on top of other drums and ash in the railroad right-of-way between Ponds 1 and 3. Lime would be applied to the material, and a single membrane barrier cap would be constructed over the area. The creek would be permanently rerouted prior to excavating. All SCGs would be expected to be met with this alternative. Preventing the flow of surface water and ground water through the fill material would hinder the leaching of metals into the ground water. Although unrestricted use of the land following remediation would not be possible, this alternative would protect human health and the environment. Contact with the fill material would be prevented by the cap.

Conducting this alternative would pose a short-term risk to the community since excavation of the contaminated fill could produce blowing dust. This problem could be easily controlled though, by wetting down the work area with water and monitoring wind conditions. These mitigative efforts would not impact the community life style. Short term risks to the environment would include the possible spreading of contamination through airborne dust. Again, mitigative measures are available to minimize the potential impacts, such as wetting down work areas. The remedy would be classified as permanent and there should be less than 25 percent of the untreated waste remaining at the site. Operation and maintenance would involve monitoring ground water quality and cap maintenance and repair. The relative degree of long term monitoring required would be considered to be moderate.

This alternative would be very difficult to construct since it would involve excavating and stabilizing the fill material. As with the previous alternatives, some future remedial actions may be necessary and required coordination with the state agencies would be normal.

Alternative #5 - Drain Ponds And Reroute Creek/Excavate/Dispose In Off-Site Landfill

Under this alternative, the influent water to the ponds would be temporarily diverted and the ponds drained. The contaminated fill material in the Drum Disposal Area would then be excavated and transported to an off-site landfill for disposal. SCGs should be met with this alternative. Since the contaminated fill material would be removed from the site it would no longer cause contravention of ground water standards. Also, unrestricted use of the land would be possible since the contamination would be removed.

Short term risks would be posed to the community during the implementation of this alternative. There would be an increase in traffic, noise and dust in the residential area from the trucks transporting the material off-site. Although this remedy would not be classified as a permanent solution less than 25 percent of untreated hazardous waste would be left at the site. Operation and maintenance would be required for a period of less than 5 years, and environmental controls would be required as part of the remedy to determine the success of the alternative. Thus, the degree of long term monitoring required would be minimum.

Disposing of the material in an off-site landfill would be somewhat difficult to implement. Securing landfill space for this material could cause delays in the disposal and would require extensive coordination. Since the waste would be off-site, no future remedial actions would be anticipated at the Columbia Mills site.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the Drum Disposal Area metals and semivolatile organic contaminated fill are compared to each other on a criterion by criterion basis to identify the relative advantages and disadvantages of each.

All of the action alternatives would be expected to comply with applicable SCGs. They would all be equally protective of human health and the environment, although off-site disposal of the waste would allow for unrestricted use of the land in that area. The no action alternative would not comply with chemical-specific SCGs and would not be protective of human health and the environment. No action is the least effective in the short-term. The first two action alternatives, drain ponds and reroute creek/cap in place and drain ponds and reroute creek/lime stabilization/cap in place, would be the most effective in the short term. There would be no excavating of the fill material, thus disturbance of the contaminated fill would be kept to a minimum. With the other two alternatives, the possibility of spreading contamination through blowing dust would be greater. The two alternatives involving lime stabilization and the alternative of off-site disposal rank equally in long-term effectiveness. These were all more effective than just capping the material in place or no action since either an additional step would be taken to prevent the leaching of metals or the material would be disposed of off-site. The two alternatives involving lime stabilization ranked more favorably than the other alternatives for contaminant mobility reduction. This was due to the fact that mobility would be reduced by a treatment technology instead of by containment alone. No action ranked zero for reduction of toxicity, mobility or volume. The least difficult action alternative to implement would be drain ponds and reroute creek/cap in place, since this alternative would not involve any additional treatment or excavation. The most difficult to implement would be the fourth alternative which involved excavation, lime stabilization and capping in the railroad right-of way. No action would be the easiest to implement since no construction or coordination is required.

Other than no action, which has no cost associated with it, the most cost effective alternative was determined to be the one which involves capping the material in place. Taking into account order of magnitude costs, it was determined that disposing of the Drum Disposal Area fill material off-site would be more than ten times more expensive than capping the material in place. The additional step of lime stabilization would add only a small incremental cost to capping the material in place. Excavating the material, as in Alternative #4, would add an additional incremental cost. The no action alternative and the alternative of capping the material in place received a 15 out of 15 for cost since either would be the most cost effective. The least cost effective alternative, off-site disposal, received a 1 out of 15 since it was estimated that this alternative would cost ten times as much. Alternatives #3 and #4 were rated 14 and 13, respectively.

Overall, Alternative #3, Drain ponds and reroute creek/lime stabilization/cap in place, rated the highest with 83 out of 100 points. The lowest ranking action alternative was off-site disposal at 60 points, while the no action alternative ranked the lowest overall.

C. **Selection of Recommended Alternative**

MPI recommends that the alternative of draining the ponds and rerouting the creek, adding lime to the soils to adjust the pH to discourage metals leaching and capping the soils in place be implemented to remediate the contaminated fill material in the Drum Disposal Area. The conceptual design for this remedial action is provided in Section 5.0.

4.2.2 Main Plant Area

This section summarizes the results of the detailed analysis of alternatives for the remediation of soils in the Main Plant Area.

4.2.2.1 UST Area 1 Soils

Although the VOC contaminated soils in the immediate vicinity of UST Area 1 were removed during 1988, treatment of the soils southeast of the tank area is expected to occur in conjunction with the ground water remediation in that area. VOC contamination is present in both shallow and deep ground water in the area southeast of UST Area 1. Remediation of the ground water is expected to involve pumping and discharging the water. When this is done residual contamination is left in the soils and requires a great length of time to be flushed into the depressed ground water table for removal. Thus, the soils in this area southeast of UST Area 1 will be treated for VOC contamination and comprise the remedial unit UST Area 1 VOC-contaminated soils.

Five remedial alternatives survived the initial screening. In this section, the five alternatives are analyzed in detail. Table 4-2 summarizes the results of the analysis.

A. **Individual Analysis of Alternatives**

Alternative #1 - No Action

This alternative was eliminated from further consideration following analysis of its compliance with applicable SCGs. Since the soils may be serving as the source of contamination for ground water in the area, causing exceedances in GA standards, the no action alternative does not meet applicable SCGs.

TABLE 4-2
DETAILED ANALYSIS RESULTS
REMEDIATION OF UST AREA 1 SOILS
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	0	Alternative should not be further considered since it does not meet SCGs						0
Excavation/On-Site Disposal	10	20	8	6	2	9	4	59
Excavation/Off-Site Disposal	10	20	5	11	2	10	2	60
Soil Washing (In-Situ)	10	20	9	14	14	10	6	83
Vapor Extraction	10	20	9	14	15	13	15	96

<u>Alternative #2</u> - Excavation/On-Site Disposal

On-site disposal of the UST Area 1 soils would be expected to meet all SCGs and would be protective of human health and the environment. Exposure to contaminants would be acceptable since the material would be capped in a lined landfill.

It is expected that short term risks would be posed to the community during excavation of the UST Area 1 soils through contaminant volatilization. It is not expected that a significant short term risk would be posed to the environment. This alternative would not be classified as permanent, and none of the waste would be removed from site or destroyed. It would be moved from one location to another. Extensive long term monitoring would be required for the on-site landfill, and operation and maintenance would be required for a period greater than 5 years. Disposing of the material in an on-site landfill reduces contaminant mobility by containment.

Delays due to technical problems would be somewhat likely during implementation this alternative. Some future remedial actions may be necessary, such as repairing the impermeable cap. It is expected that extensive coordination would be required with state agencies in constructing the landfill.

<u>Alternative #3</u> - Excavation/Off-Site Disposal

This alternative would be expected to comply with all applicable SCGs and would be protective of human health and the environment. Since the material would be removed from site, unrestricted use of the land would be possible.

Significant short term risks to the community would have to be addressed during implementation of this remedial alternative. Increased traffic, noise and blowing dust would be created as a result of implementing this alternative. The implementation time for off-site disposal would be less than two years. The remedy would not be classified as permanent, but the contaminated soil would be removed from the site and there would be no treated residual left in UST Area 1. Only short term operation and maintenance would be required to confirm that all contaminated soil was removed from the tank area. Reduction in mobility of contamination would be provided by containment.

Off-site disposal would be somewhat difficult to implement, and delays due to technical problems would be somewhat likely. Since the material would be removed from the site, no future remedial actions would be anticipated. Extensive coordination with state agencies would be required to implement this alternative.

<u>Alternative #4</u> - Soil Washing (In Situ)

The process of soil washing is applied to unexcavated soils using a ground water extraction/reinjection system. An aqueous solution of surfactant is injected into the soils. A water recirculating system is then utilized to capture the contaminated ground water and solution down gradient from the contaminated area, treat it and deliver it back to the soil and ground water. Action specific SCGs should be met with this alternative. Any recirculated water pumped back into the ground water would have to meet NYSDEC standards for discharge to GA waters.

Since the contamination would be removed from the soils, this alternative would be protective of human health and the environment. Unrestricted use of the land would be possible. No significant short term risks to the community would be expected during implementation of soil washing. This alternative will be classified as a permanent action. A minimal amount of long term monitoring and operation and maintenance would be required since the contamination at the site would be removed.

This alternative would be difficult to implement since the washing solution must contact all contaminated soil. Also, a bench scale or pilot scale study would have to be conducted in order to verify that soil washing would be an effective remedial action in this area of the site. No future remedial action would be anticipated, again, since the contamination would be removed from the soil.

Alternative #5 - Vapor Extraction

Vapor extraction operates by inducing air flow through contaminated soil. As the air passes through the soil, it entrains and removes contaminants that exist in the vapor phase. The VOC-laden gas is collected and discharged to the air. The gas would most likely be treated prior to discharge, depending on regulatory requirements. This alternative would meet the action-specific SCGs determined to be applicable for air discharge. Action limits, as defined in the NYSDEC Air Cleanup Criteria document (January 8, 1990) are examples of air related SCGs.

Since the contamination would be removed from the site this alternative would protect human health and the environment. Short term risks to the community could be posed by the VOC contaminated air stream, but the risk would be easily controlled through a treatment system, such as granular activated carbon. No significant short term risks would be expected to be posed to the environment. Because the contamination would be removed from the site, a minimal amount of long term monitoring and operation and maintenance would be required. This alternative would be somewhat difficult to construct, but would be very reliable in meeting the specified performance goals. No future remedial actions would be anticipated again, since the contamination would be removed from the soils. A pilot scale study would have to be conducted in order to verify that vapor extraction would be an effective remedial action in this area of the site. Based on the results of a 1990 pilot test conducted in the Test Pit 3 Area, this technology appears to be an effective method of soil remediation for the soils at the Columbia Mills site.

B. Comparative Analysis of Alternatives

In this section remedial alternatives for the UST Area 1 VOC contaminated soil are compared to each other on criterion by criterion basis to identify the relative advantages and disadvantages of each.

Except for the first alternative, no action, all alternatives would be expected to comply with applicable SCGs. Since the UST Area 1 soils appear to be contributing to the contravention of some GA standards, the no action alternative was eliminated. Of the four action alternatives, all would protect human health and the environment. The off-site disposal alternative and treatment alternatives of soil washing and vapor extraction would remove the contamination from the site, allowing for unrestricted use of the land. Although on-site disposal would not remove the contaminated soils from the site, soils would be capped and immobilized. This would prevent contact with them.

The two in-situ alternatives of soil washing and vapor extraction would be more effective in the short term mainly because they do not involve excavation. Excavating the soils would enhance dust generation and cause VOCs to become airborne.

Also, the two in-situ treatment alternatives would be more effective in the long term. The contamination would be destroyed rather than being moved from one location to another. This is reflected in their scores for reduction of toxicity, mobility or volume. The excavation alternatives would not provide for a reduction in toxicity and volume, whereas the two treatment alternatives would.

Vapor extraction would be the least difficult alternative to implement, while excavation and on-site disposal would be the most difficult to implement. This is because construction of an on-site landfill would be necessary. The other two alternatives, excavation/off-site disposal and soil washing, would be somewhat less difficult to implement than the on-site disposal alternative.

Looking at relative present worth, vapor extraction appears to be the most cost effective of the five alternatives, other than no action, which has no cost associated with it. Soil washing was determined to be roughly two and one-half times as expensive overall than vapor extraction. The costs of on-site and off-site disposal would be four and eight times more expensive than vapor extraction.

C. Selection of Remedial Alternative

MPI recommends that the alternative of vapor extraction be implemented to remediate the VOC-contaminated soils in UST Area 1. This alternative is effective both in the short term and long term and would be least difficult to implement. It would also be most cost effective. The conceptual design of this remedial action is provided in Section 5.0.

4.2.2.2 Test Pit 3 Area Soils (VOCs)

In this section, the four remedial alternatives for the VOC contaminated soils in the Test Pit 3 Area retained by the preliminary screening process are analyzed in detail. Table 4-3 summarizes the results.

TABLE 4-3
DETAILED ANALYSIS RESULTS
REMEDIATION OF TEST PIT 3 AREA SOILS
VOLATILE ORGANICS

Alternative	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Mobility, Toxicity and Volume (15)	Implementability (15)	Compliance With ARARs (10)	Protection of Human Health and Environment (20)	Cost (15)	Total (100)
No Action	2	6	0	13	6	8	15	50
Vapor Extraction/ Ground Water Extraction	9	13	15	12	10	20	15	94
Bioremediation (In-Situ)	6	13	15	10	10	20	8	82
Soil Washing (In-Situ)	6	13	15	10	10	20	8	82

A. Individual Analysis of Alternatives

Alternative #1 - No Action

Since the soil in the Test Pit 3 Area is the source of contamination in the ground water in this area, the SCGs for ground water would continue to be contravened if the no action alternative is chosen. This alternative would not be very protective of human health and the environment and would not be effective in the short-term or long-term.

The no action alternative would not reduce the toxicity, mobility or volume of the waste. However, this alternative would be very implementable since there would be nothing to construct or coordinate.

Alternative #2 - Vapor Extraction/Ground Water Depression

Vapor extraction is classified as a permanent remedial alternative. In conjunction with ground water extraction, it would effectively alleviate VOC contamination in the Test Pit 3 Area soils while posing little to no short term risks to the community and environment. Treatment of the extracted soil gas would be conducted prior to its discharge to the atmosphere. Although this could concentrate the VOCs in the treatment medium (i.e. carbon) disposal of the medium would most likely consist of off-site destruction or treatment.

This alternative would meet the action-specific SCGs determined to be applicable for air and water discharge. Action limits, as defined in the NYSDEC's Air Cleanup Criteria document (January 8, 1990) are examples of air related SCGs. The extracted ground water would more than likely be discharged to the sanitary sewer or surface water (Oswego River) in accordance with conditions set forth by the NYSDEC.

Because the contamination would be removed from the site, a minimal amount of long term monitoring and operation and maintenance would be required.

The pilot scale study conducted by Vapex indicated that vapor extraction would be an effective alternative for the treatment of Test Pit Area VOC soils. This technology has initially been proven effective. Thus, the components of the alternative are well demonstrated and all materials would be readily available.

Alternative #3 - In-Situ Bioremediation

Bioremediation is classified as a permanent remedial alternative. Although it appears that the application of this alternative to the VOC contaminated soils would be effective, short term risks could be posed to the nearby community. In order to treat the vadose zone soils, the concrete pad currently covering the majority of the area would require removal. Removal of the pad could cause uncontrolled VOC emissions which would pose a threat to neighboring residents. Removal of the pad would have to be done in a manner in which VOC emissions could be controlled and minimized.

This alternative would, more than likely, meet the SCGs applicable to the technology. A water recirculating system would be utilized to capture the contaminated ground water and injected aqueous solution downgradient from the contaminated area, treat it and deliver it back to the soil and ground water. Contaminant levels in the treated water being pumped back into the ground water would have to be brought down to the applicable NYSDEC effluent limitations for discharge to Class GA waters.

A minimal amount of long term monitoring and operation and maintenance would be required since the contamination at the site would be destroyed.

This alternative would be difficult to implement since the concrete pad foundation would have to be removed, and it is uncertain whether or not bioremediation would actually be applicable to the Test Pit 3 area soils. Several factors have negative impacts on the success of bioremediation, including the presence of elevated levels of metals. Although metal levels in the Test Pit 3 area soils appear to be "normal", bench scale and pilot testing would have to be conducted in order to ensure the applicability of the technology.

Removal, transportation and disposal of the concrete pad covering, the area would be necessary for the implementation of this alternative. In the VOC contaminated soil area, the pad covers approximately 15,000 ft^2. Since the concrete is 0.5 feet thick, approximately 280 yd^3 of concrete would have to be removed and disposed of.

Alternative #4 - In-Situ Soil Washing

As with vapor extraction and bioremediation, soil washing is classified as a permanent remedial alternative. The process is similar to bioremediation in that it is applied to unexcavated soils using a ground water extraction/reinjection system. The difference, of course, is that an aqueous solution of surfactant is injected into the soils instead of nutrients for microorganisms. As with bioremediation, the concrete pad covering the majority of the Test Pit 3 Area must be removed in order to effectively treat the contaminated vadose zone soils. This could pose a threat to those living in close proximity to the site.

Action-specific SCGs should be met with this alternative. As with bioremediation, any recirculated water pumped back into the ground water would have to meet NYSDEC standards for discharge to GA waters.

A minimal amount of long term monitoring and operation and maintenance would be required since the contamination at the site would be removed.

This alternative would be difficult to implement since the concrete pad would have to be removed and VOC emissions would have to be controlled. Also, a bench scale or pilot scale study would have to be conducted in order to verify that soil washing would be an effective remedial action in this area of the site.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the Test Pit 3 Area VOC contaminated soils are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

Of the three treatment alternatives, vapor extraction/ground water extraction would present the fewest short term adverse effects, as the pad covering the area would not be removed. The other two treatment alternatives would present equivalent short term adverse effects. These include possible VOC emission problems and generation of blowing dust. The no action alternative is almost completely ineffective in the short term.

All three treatment alternatives would be equally effective in the long term. These three remedies are classified as permanent, and a minimal amount of operation and maintenance and long term monitoring would be required for each. All of the action alternatives provide for equal reduction in the volume and toxicity of the VOC contamination in the soils; the no action alternative provides none and is very ineffective as a long-term remedy.

A difference exists between vapor extraction/ground water extraction and the other two action alternatives with respect to implementability. Vapor extraction/ground water extraction is the most easily implemented action alternative, involving little to no surface and subsurface alteration. Also, the vapor extraction process has been shown to be effective on the Test Pit 3 Area soils. Employing in-situ bioremediation or soil washing would require a pilot study prior to full scale design. No action is the most implementable since there is no construction or coordination required.

All of the action alternatives provide adequate protection of human health and the environment. No chemical-specific SCGs exist for the VOC soils in the Test Pit 3 Area remedial unit. The three treatment alternatives are expected to readily meet all action-specific SCGs, which include NYSDEC air action limits and effluent limits for discharges to Class GA ground waters.

Other than no action, vapor extraction/ground water extraction is the most cost effective of the three action alternatives. The other two treatment alternatives were estimated to cost over twice as much.

C. Selection of Recommended Alternative

MPI recommends that the vapor extraction/ground water extraction alternative be implemented to remediate the VOC contaminated soils in the Test Pit 3 Area remedial unit. This alternative should meet the remedial action objective of reducing total target VOC soil concentrations to approximately 1 ppm. This alternative is more effective in the short term and easier to implement. It is also more cost effective.

4.2.2.3 UST Excavated Soil Piles

In this section the four alternatives retained by preliminary screening are analyzed in detail. Table 4-4 summarizes results of the detailed analysis of the remedial alternatives for the UST excavated soil piles. The contaminants of concern are metals and semivolatile organics.

A. Individual Analysis of Alternatives

<u>Alternative #1</u> - No Action

The no action alternative ranks high for compliance with SCGs since none are contravened by taking no action in the remediation of the excavated soil piles. This alternative offers only moderate protection to human health and the environment since dermal contact with the soil may pose a risk to humans.

The no action alternative is not very effective in the short-term or long-term since no remediation would occur. No reduction of toxicity, mobility or volume would take place with this alternative. The no action alternative is, however, very implementable since no construction or coordination is required.

<u>Alternative #2</u> - Disposal In Off-Site Landfill

This alternative would involve transporting the UST excavated soil piles to an off-site landfill and would be expected to comply with all explicable SCGs. Since the contaminated soils would be removed from the site, human health and the environment would be protected.

As with this alternative for other remedial units, off-site disposal of the contaminated soil would pose short term risks to the community, such as increased traffic, noise and blowing dust. These risks could be controlled. Again, this alternative would not be classified as permanent, although, the expected lifetime of the effectiveness would be 25-30 years. Because the contamination would be removed from the site, a minimal amount of long term monitoring and operation and maintenance would be required. This alternative would provide for a reduction in contaminant mobility by containment but would not provide for a reduction in toxicity or volume.

Disposing of the contaminated soil off-site would not be difficult to implement since it involves only transporting the material from one location to another. Because the material is off-site no future remedial actions would be anticipated. Extensive coordination would be required to obtain the necessary landfill space for this material.

TABLE 4-4
DETAILED ANALYSIS RESULTS
REMEDIATION OF UST EXCAVATED SOIL PILES
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	9	6	6	0	13	15	59
Dispose In Off-Site Landfill	10	20	6	12	2	11	10	71
Cap in Railroad Right of Way	10	20	8	10	2	11	15	76
Lime Stabilazation/Cap in Railroad Right-of-Way	10	20	8	13	8	11	15	85

Alternative #3 - **Cap In Railroad Right-Of-Way**

This alternative would involve transporting the UST excavated soil piles to the back area of the site where they would be capped in the railroad right-of-way along with the existing drum disposal area fill. All applicable SCGs would be expected to be met and this alternative would provide for the protection of human health and the environment since contact would be prevented.

Short term risks could be posed to the community, such as dust generation, which in turn could promote contaminant migration. This risk could be easily controlled though by wetting down the work area with water. Long term monitoring and operation and maintenance would be required to ensure the effectiveness of the cap. As with off-site landfilling, capping the soil in the railroad right-of-way would provide for only a reduction in mobility and not a reduction in toxicity or volume of the waste.

This alternative would be somewhat more difficult to construct and implement than off-site disposal. Since the material would be capped on-site, some future remedial actions may be necessary.

Alternative #4 - **Lime Stabilization/Cap In Railroad Right-Of-Way**

This alternative would involve transporting the contaminated soil piles to the drum disposal area, applying lime to reduce the likelihood of metals leaching from the soil and capping the material with the rest of the drum disposal area fill. Applicable SCGs would be expected to be met, and this alternative would provide for protection of human health and the environment. Although unrestricted use of the land following remediation would not be possible, exposure to contaminants would be acceptable. The soil would have an impermeable cap on it to prevent human contact with the soil. Also, the ground water in the area would be depressed and would not come into contact with the capped fill material, preventing the leaching of metals into the ground water.

A significant short term risk to the community that would need to be addressed would be the generation of airborne dust. This could be easily controlled though, again, by wetting down work areas and exposed soil surfaces. This alternative would be classified as permanent since the addition of lime would inhibit the leaching of metals. As with the previous alternative, long term operation and maintenance would be required to ensure the effectiveness of the alternative. The cap will have to maintained and ground water quality monitored. Lime stabilization and capping in railroad right-of-way will provide for a reduction in mobility by an alternative treatment technology.

This alternative would be more difficult to construct since an additional step, lime stabilization, is involved, but should be very reliable in meeting specified performance goals. Some future remedial actions may be necessary, such as cap repair.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the metals and semivolatile organic contaminated soil piles are compared to each other on a criterion by criterion basis to identify the relative advantages and disadvantage of each.

Each of the three action alternatives would comply with applicable SCGs and provide for the protection of human health and the environment. The no action alternative would comply with SCGs, but would not be very protective of human health and the environment since PAH's were found at levels that would cause a significant risk. Disposing of the soil in an off-site landfill would remove the contamination from the site and provide for unlimited use of the area. Although the other two action alternatives involve capping the material on-site, protection of human health and the environment is still attained since contact with the soils would be prevented.

No action and off-site disposal of the soils would be less effective in the short term than the other two alternatives. Increased traffic off-site during remediation would pose short term risks and would also enhance the possibility of contaminant migration off-site during off-site disposal. In the long term, lime stabilization and capping the soil in the railroad right-of-way would be more effective since it is a more permanent solution. Off-site disposal would require less long term monitoring than the other two on-site alternatives. No action would be the least effective in the long-term since no remediation would occur and all of the waste would be left on site. The alternative of lime stabilization/cap in railroad right-of-way would provide for a more effective reduction in mobility of the contaminants. No action would provide for no reduction in contaminant mobility, volume or toxicity.

Overall, all three action alternatives appear to be equally implementable. There are, however, differences in the technical feasibility of each alternative. For instance, off-site disposal would be easier to implement than capping the material in the railroad right-of-way. In turn, this alternative would be easier to implement than adding lime to the soil and capping it in the railroad right-of-way. The third action alternative would, however, be more reliable in meeting the specified performance goals than the first two. Also, even though no future remedial actions would be anticipated with off-site disposal, extensive coordination would be required to implement the alternative. With the other two on-site alternatives, some future remedial actions may be necessary but only normal coordination would be required. The no action alternative would be the easiest to implement because it requires no construction or coordination.

Other than no action, which has no cost associated with it, the two alternatives that cap the waste in the railroad right-of-way are the most cost effective. Capping the waste without lime stabilization is only very slightly more cost effective than capping the waste with lime stabilization. Off-site disposal would be the least cost effective because of transportation and disposal fees.

C. Selection of Recommended Alternatives

MPI recommends that the alternative of lime stabilization/cap in railroad right-of-way be implemented to remediate the metals and semivolatile organic contaminated soil piles remedial unit. This alternative appears to be more effective in the long term and in its reduction of contaminant mobility. The conceptual design of this remedial action is provided in Section 5.0.

4.3 CONTAMINATED SEDIMENTS

This section analyzes alternatives retained by preliminary screening for the remediation of sediments in both the Drum Disposal Area and Main Plant Area.

4.3.1 Drum Disposal Area

4.3.1.1 Drum Disposal Area Pond and Creek Sediments

Pond and creek sediments in the Drum Disposal Area are contaminated with metals and semivolatile organics. Six remedial alternatives survived the initial screening process and have been analyzed in detail in this section. Table 4-5 summarizes the results of the detailed analysis.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

The no action alternative does not allow for compliance with chemical-specific SCGs for sediment. This alternative also would not be very protective of human health and the environment because dermal contact with the sediment poses carcinogenic and non-carcinogenic risks.

TABLE 4-5
DETAILED ANALYSIS RESULTS
REMEDIATION OF DRUM DISPOSAL AREA POND AND CREEK SEDIMENTS
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	5	6	6	0	13	15	51
Excavation/On-Site Disposal	10	20	9	6	2	11	13	71
Excavation/Off-Site Disposal	10	20	6	11	2	12	8	69
Excavation/Treatment/On-Site Disposal	10	20	9	11	8	9	7	74
Excavation/Treatment/Off-Site Disposal	10	20	6	14	8	9	6	73
Excavation/Lime Stabilization/Cap in Railroad Right-of-Way	10	20	9	11	8	11	15	84

The no action alternative is not very effective in the short-term and even less effective in the long-term. No reduction of toxicity, mobility or volume of waste would occur with this alternative. However, the no action alternative would be very implementable since no construction or coordination would be required.

<u>Alternative #2</u> - Excavation/On-Site Disposal

This alternative involves excavating the contaminated sediments and disposing of them in an on-site landfill. Removal of sediments containing levels of contaminants at concentrations much greater than the sediment criteria, as defined in the NYSDEC Sediment Criteria Guidance Document, would be done under this alternative. Thus, compliance with the applicable SCGs would be expected. This alternative would be protective of human health and the environment since the sediments would be capped in the landfill to prevent contact and contaminant leaching.

No significant short term risks would be expected to be posed to the community. Possible short term risks to the environment could be posed during the removal of the sediments from the creek when contaminants could become suspended in the surface water. This could be minimized, though, by conducting the work during the summer months when very little water is present. Also, mitigative measures, such as collecting the surface water and treating it, would have to be implemented. The alternative would not be classified as permanent, and 100 percent of the waste would be left at the site. Long term monitoring and operation and maintenance would be required since the contamination would be left at the site. This alternative would provide for a reduction in contaminant mobility by containment.

On-site disposal would be somewhat difficult to implement but would be very reliable in meeting the specified performance goals. Again, some future remedial actions may be necessary. These would include cap repair.

<u>Alternative #3</u> - Excavation/Off-Site Disposal

As with the previous alternative, applicable SCGs would be met. Sediments containing contaminants at levels greatly exceeding the appropriate criteria would be removed from the stream and ponds and disposed of in an off-site landfill. This alternative would protect human health and the environment and provide for unrestricted use of the land since the contamination would be removed from the site.

Short term risks would be posed to the community due to the transportation of contaminated sediments off-site. Possible short term risks to the environment could be posed by dredging the sediments from the creek and stirring up contamination. Mitigative measures such as collecting the surface water and treating it would have to be implemented to minimize potential impacts. This alternative is effective in the long term since the contamination would be removed from the site, and a minimal amount of long term monitoring and operation and maintenance would be required. As with the previous alternative, disposal of the sediments off-site would reduce the mobility of contaminants by containment.

This alternative would not be difficult to implement and would be reliable in meeting the specified performance goals. No future remedial actions may be anticipated, but extensive coordination would be required to gain landfill access for disposal.

<u>Alternative #4</u> - Excavation/Treatment/On-Site Disposal

This alternative would involve treating the sediments to stabilize the metals and then disposing of the sediments in an on-site landfill. Applicable SCGs would be met, and this alternative would provide for the protection of human health and the environment.

The short term risks posed by this alternative would be similar to those posed by excavation and on-site disposal. However, this alternative would be more effective in the long term since it is classified as permanent and the metals would be less likely to leach out of the sediments. Operation and maintenance would be required for the on-site landfill.

This alternative would be very difficult to implement since in addition to having to construct the on-site landfill the material must also be treated. Since disposal would be in the on-site landfill, some future remedial actions may also be necessary.

<u>Alternative #5</u> - Excavation/Treatment/Off-Site Disposal

This alternative would involve treating the sediments and disposing of them in an off-site landfill. As with the previous alternatives, applicable SCGs would be met. Treating the sediments and disposing of them off-site would protect human health and the environment.

Short term risks to the community and environment would be similar to those posed by off-site disposal without treatment. By treating the sediments, though, this alternative would be more effective in the long term. It would be classified as permanent and no long term operation and maintenance would be required since sediments would be removed from the site. This alternative would provide for the reduction in contaminant mobility by treatment as well as containment.

This alternative would be more difficult to implement than off-site disposal alone due to the additional step of treatment. Since the material would be removed from the site, no future remedial actions would be anticipated. Also, extensive coordination would be required.

<u>Alternative #6</u> - Excavation/Lime Stabilization/Cap in Railroad Right-Of-Way

This alternative would involve excavating the sediment from the creeks and ponds, adding lime to aid in the prevention of metals leaching from the sediment and capping it in the railroad right-of-way on top of the Drum Disposal Area fill material. All applicable SCGs would be expected to be met and this alternative would provide for the protection of human health and the environment.

Short term risks posed to the environment would be similar to those posed by on-site disposal. No short term risks to the community would be expected. The treated residual may be toxic but would not be mobile. Since the contamination would be present at the site, long term monitoring and operation and maintenance would be required. Environmental controls required as part of this alternative would include ground water monitoring wells to ensure the effectiveness of the alternative.

This alternative would be somewhat difficult to construct and some future remedial actions may be necessary. Services and materials would be readily available.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the drum disposal area pond and creek sediments are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

All of the action alternatives would comply with applicable SCGs; and all would be equally protective of human health and the environment, although the off-site disposal alternatives would remove the contamination from the site altogether. The no action alternative would not comply with chemical-specific SCGs and would provide very little protection to human health and the environment. Elevated level of arsenic, nickel and zinc in the sediment have been determined to be major contributors to risks to human health.

The alternatives which involve the disposal of the sediments in an on-site landfill or in the railroad right-of-way are more effective in the short term. This is due in part to the possibility of contamination being transported off-site when the sediments are removed for disposal in an off-site landfill. In the long term, the alternative of excavation/treatment/off-site disposal appears to be the most effective. This is because it is a permanent treatment alternative and the sediments would be removed from the site. A minimal amount of long term monitoring and operation and maintenance would be required. The no action alternative and excavation/on-site disposal would be the least effective in the long term. With the latter alternative, contaminant mobility would be reduced only by containment, and long term monitoring and maintenance would be required. The other three action alternatives ranked equally in terms of long term effectiveness. The treatment alternatives would be more effective in reducing the mobility of contaminants in the sediment. No action would not reduce toxicity, mobility or volume of the contaminants.

Off-site disposal of the sediment appears to be the most implementable action alternative followed by on-site disposal and lime stabilization/capping in the railroad right-of-way. The two alternatives of treatment and on-site and off-site landfill disposal would be the least implementable. No action is the easiest alternative to implement because no construction or coordination is required.

Other than no action, which has no cost associated with it, excavation/lime stabilization/cap in railroad right-of-way would be the most cost effective alternative. On-site disposal would be the next most cost effective, while the least cost effective alternative would be excavation, treatment and off-site disposal.

C. Selection of Recommended Alternatives

MPI recommends that the alternative of excavating the ponds and creek sediment, adding lime and capping it in the railroad right-of-way be implemented to remediate the metals and semivolatile organic contaminated sediment in the Drum Disposal Area. Overall, this alternative "scored" a total of 84 out of 100 points, the highest of all alternatives. The conceptual design for this remedial action is provided in Section 5.0.

4.3.2 Main Plant Area

4.3.2.1 UST Area 1 - Creek Sediments

Some metals and semivolatile organics are present in the UST Area 1 creek sediments at levels greatly exceeding the sediment criteria. Five of the original remedial alternatives were retained by the preliminary screening process and are analyzed in detail in this section. Table 4-6 summarizes the results of the detailed analysis.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

If the no action alternative were implemented, compliance with chemical-specific SCGs for sediments would not be achieved. This alternative would be somewhat protective of human health and the environment.

The no action alternative would not be very effective in the short-term and even less effective in the long-term since the remedial measure is not permanent or enduring. No reduction of toxicity, mobility or volume of the contaminated sediments would occur with this alternative. However, the no action alternative would be very implementable since it would require no construction or coordination.

TABLE 4-6
DETAILED ANALYSIS RESULTS
REMEDIATION OF UST AREA 1 CREEK SEDIMENTS
METALS AND SEMIVOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	12	6	6	0	13	15	58
Excavation/Off-Site Disposal	10	20	6	11	2	12	10	71
Excavation/Treatment/On-Site Disposal	10	20	8	11	8	9	2	68
Excavation/Treatment/Off-Site Disposal	10	20	6	14	8	10	7	75
Excavation/Lime Stabilization/Cap in Railroad Right-of-Way	10	20	8	11	8	11	15	83

Alternative #2 - **Excavation/Off-Site Disposal**

This alternative would involve dredging the sediments in the area of Benson Creek near UST Area 1 and disposing of them in an off-site landfill. This alternative would comply with applicable SCGs, since sediments containing contaminants at levels greatly exceeding their respective criteria would be removed. Contaminant levels remaining in the sediment following remediation would be present at near criteria concentrations. This alternative would protect human health and the environment by removing the contaminated sediments from the site.

As brought up in the detailed analysis of previous alternatives involving off-site disposal, short term risks would be posed to the community during implementation of remedial activities. This remedy would not be classified as permanent, but less than 25 percent of the waste would be left at the site following remediation and no treated residual would remain. A minimal amount of long term operation and maintenance would be required since the contaminated sediments would be removed form the site.

This alternative would not be difficult to implement and would be reliable in meeting the specified performance goals. Delays would be somewhat likely since disposal at an off-site landfill would have to secured. Extensive coordination would required. Again, since no contamination would be left at the site, no future remedial actions would be anticipated.

Alternative #3 - **Excavation/Treatment/On-Site Disposal**

This alternative would involve dredging the sediments from Benson Creek, treating them to stabilize metals and disposing of them on-site in a landfill. The sediment in the creek would be cleaned up to near criteria levels to protect human health and the environment.

Any short term risks posed to the community and the environment during implementation would be easily controlled. This alternative would be classified as permanent, but there would be treated residual left at the site. This residual could be toxic but would not be mobile. Long term operation and maintenance would be required to maintain the landfill. Environmental controls, including ground water monitoring wells, would be required as part of the remedy.

This alternative would be very difficult to implement since it involves both treatment and construction of an on-site landfill. Delays would be somewhat likely in coordinating this effort, while some future remedial actions would be necessary, such as cap repair.

Alternative #4 - **Excavation/Treatment/Off-Site Disposal**

This alternative would involve excavating the sediments, treating them to stabilize the metals and removing them from the site to an off-site landfill. As with the other alternatives, contaminant levels in the sediments would be brought down to near criteria levels to ensure the protection of human health and the environment.

The short term risks posed by the implementation of this alternative are similar those posed by the implementation of Alternative 2, Excavation/off-site disposal. The time required to implement this remedy would be less than two years and it would be classified as permanent since stabilization of the metals would be done. There would be no treated residual left at the site since the material would be brought off-site for disposal at a landfill. Again, a minimum amount of long term operation and maintenance would be required since the material would be brought off-site. This alternative would be more effective than disposing of the sediment off-site without treatment since the mobility of the contamination would be reduced by a treatment technology in addition to containment.

Treatment and off-site disposal of the sediments would be difficult to implement, but would be reliable in meeting the performance goals, bringing contaminant levels down to near criteria concentrations. While extensive coordination would be required, no future remedial actions would be anticipated at the site.

Alternative #5 - Excavation/Lime Stabilization/Cap In Railroad Right-Of-Way

As part of this alternative, lime would be added to the excavated sediments to hinder the leaching of metals. This material would then be capped in the railroad right-of-way along with the Drum Disposal Area fill material. Applicable SCGs would be met and human and environmental exposure to the sediments would be prevented.

The short term risks posed by this alternative would be similar to those posed by treating the sediments and disposing of them in an on-site landfill (Alternative #3). Long term monitoring and operation and maintenance would be required to ensure the effectiveness of this alternative. Environmental controls, such as ground water monitoring wells, would be required as part of this remedy to detect potential problems. Using lime to deter leaching of metals from the sediments reduces mobility by a treatment technology instead of by containment alone.

This alternative would be somewhat difficult to implement, but delays due to technical problems would be unlikely. Since the treated material would be capped on-site, some future remedial actions may be necessary.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the UST Area 1 creek sediments are compared to each other to identify the relative advantages and disadvantages of each.

The no action alternative would not comply with chemical-specific SCGs and would only be somewhat protective of human health and the environment. Untreated sediments would remain on site so that exposure to the contaminated sediments would still be possible. The four action alternatives analyzed in detail would comply with applicable SCGs and provide equally for the protection of human health and the environment. Implementation of the on-site disposal alternatives would pose fewer short term risks than the off-site disposal alternatives. For all alternatives, any risk posed to the community or environment should be easily controlled.

Excavation/treatment/off-site disposal would be most effective in the long term. Under this alternative, the sediments would be treated and removed from the site. Thus, a minimal amount of monitoring would be required. The overall long term effectiveness of the other three action alternatives rank equally. The no action alternative would be the least effective in the long-term since the waste would remain on-site as it currently exists. The three treatment alternatives rank higher in reduction of contaminant mobility than excavation/off-site disposal. For excavation/off-site disposal, contaminant mobility would be reduced by containment, where as under the three treatment alternatives mobility would be reduced through treatment and containment. The no action alternative would not lead to the reduction of the toxicity, mobility or volume of the contaminated sediment.

Off-site disposal would be the least difficult action alternative to implement since it involves only excavating the sediment and transporting it off-site. The least implementable action alternative was determined to be the one involving treatment and disposal in an on-site landfill. This would be more difficult to implement due to the additional steps of treatment and construction of the on-site landfill. Of the two remaining action alternatives, the one involving lime stabilization and capping in the railroad right-of-way was determined to be more implementable. The no action alternative would be the easiest to implement since no construction or coordination is required.

Except for no action, which has no cost associated with it, excavation/lime stabilization/cap in railroad right-of-way was determined to be the most cost effective. The relative cost of the alternative involving off-site disposal was estimated to be roughly one and one-half times that of excavation/lime stabilization/cap in railroad right-of-way. Treatment and on-site disposal was determined to be the least cost effective alternative.

C. Selection of Recommended Alternatives

MPI recommends that the alternative of excavation/lime stabilization/cap in railroad right-of-way be implemented to remediate the contaminated sediments in UST Area 1. This alternative ranked the highest with a total of 83 out of 100 points. The conceptual design of this remedial action is provided in Section 5.0.

4.4 CONTAMINATED GROUND WATER

In this section, the alternatives retained by the preliminary screening process for the remediation of ground water in the Drum Disposal Area and Main Plant Area are analyzed in detail.

4.4.1 Drum Disposal Area - Shallow Ground Water

4.4.1.1 Drum Disposal Area - Shallow Ground Water Between Ponds 1 & 3

Levels of some metals have been detected at concentrations exceeding their respective GA standards/guidance values in the shallow ground water between Ponds 1 and 3 in the Drum Disposal Area. In this section, the four alternatives which survived preliminary screening are analyzed in more detail. The results of the detailed analysis of alternatives are summarized in Table 4-7.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

If no action is taken to remediate the shallow ground water in the Drum Disposal Area, contravention of the GA values for some metals will continue. Thus, this alternative would not meet chemical specific SCGs, such as ground water standards. This alternative would not be protective of human health and the environment since exposure to contaminants via the ground water would not be acceptable.

No significant short term risks are currently posed to the community, however, there are short term risks to the environment that must be addressed. Since no actions can be undertaken as part of the alternative, though, there are no available mitigative measures to minimize the potential risks posed to the environment. This alternative would not be effective in the long term. The reason the no action alternative "scored" under this criterion was that no operation and maintenance or environmental controls would be required. These would actually be required, but cannot be implemented under this alternative since no action can be taken. This alternative provides for no reduction of contaminant toxicity, mobility or volume.

This alternative would be the least difficult to implement. Delays would be unlikely, but some future remedial actions may be necessary. Minimal coordination would be required.

TABLE 4-7
DETAILED ANALYSIS RESULTS
REMEDIATION OF SHALLOW GROUND WATER
IN DRUM DISPOSAL AREA (Between Ponds 1 & 3)
METALS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Containment	10	17	9	4	2	10	2	54
Extraction/Treatment/ Discharge to Surface Water	10	17	9	6	6	10	12	70
Divert Pond Water/Lower GW Table/ Discharge to Surface Water	10	17	8	10	2	11	15	73

Alternative #2 - Containment

Containment consists of constructing subsurface barriers to restrict ground water movement through contaminated soil or other unconsolidated material. A typical technology includes the construction of vertical barriers, such as slurry walls. Construction of the walls creates a ground water flow barrier and restricts the transportation of contaminants. Under this alternative, slurry walls would be constructed to minimize ground water infiltration into the metal-contaminated fill material in the Drum Disposal Area. This would reduce the chance of contaminant migration. Since ground water would no longer contact the contaminated fill material, applicable SCGs, ground water standards, would be met. This alternative would protect both human health and the environment.

No significant short term risks would be posed to the community through the implementation of this alternative. Any short term risks posed to the environment could be minimized. This alternative would not be classified as permanent and would have an expected lifetime of 15-20 years. Long term operation and maintenance would be required to ensure the integrity of the slurry wall. Environmental controls, such as ground water monitoring wells, would be used to detect any potential problems.

Implementing this alternative would be very difficult since the slurry wall would have to be keyed into an unfractured level of the underlying bedrock. Since the bedrock is typically fractured, some future remedial actions would be necessary with this alternative.

Alternative #3 - Extraction/Treatment/Discharge to Surface Water

Under this alternative, ground water recovery wells would be installed in the Drum Disposal Area to allow withdrawal of the contaminated ground water. This ground water would then be treated and discharged to the surface water. This alternative would comply with applicable SCGs, including discharge limits set by the State. Implementing this alternative would provide for the protection of human health and the environment.

No significant short term risks to the community would be expected, and any short term risks posed to the environment would be easily minimized. The remedy would not be classified as permanent and long term operation and maintenance would be required. Environmental controls (ground water monitoring wells) would also be required to ensure that ground water contamination is being alleviated. The relative degree of long term monitoring required would be extensive when compared to other remedial alternatives. This alternative would serve to reduce the volume of contamination in the ground water.

Extracting and treating the ground water would be somewhat difficult to implement. Also, some future remedial actions may be necessary.

Alternative #4 - Divert Pond Water/Lower Ground Water Table/Discharge to Surface Water

Under this alternative, trenches would be excavated through the existing ponds and creek to divert surface water and ground water around the Drum Disposal Area fill. In this way, water will not flow through the fill and become contaminated. Compliance with applicable SCGs would be expected.

Short term risk would be posed to both the environment and community during the implementation phase of this alternative. Since the generation of leachate is possible, construction of a pond at the end of each trench immediately downgradient from the Drum Disposal Area will be necessary. This will enable any suspended contaminants to settle out and will allow the water to be collected and treated if necessary. This alternative would not be classified as a permanent remedy and long term operation and maintenance would be required. Environmental controls, such as ground water monitoring wells and piezometers, would be required to ensure that water does not flow through the contaminated fill material.

The implementation of this alternative would be somewhat difficult, but this technology would be very reliable in meeting the specified performance goals. Some future remedial action may be necessary, such as trench maintenance and repair.

B. Comparative Analysis of Alternatives

In this section, the remedial alternatives for the shallow ground water in the Drum Disposal Area are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

With the exception of the no-action alternative, all alternatives will comply with applicable SCGs, including GA standards/guidance values and surface water discharge limits. The three action alternatives would be equally protective of human health and the environment, while the no-action alternative would provide for less protection.

Overall, the alternatives of containment and extraction/treatment would be equally effective in the short term. Diverting the pond water to lower the ground water table would be somewhat less effective in the short term due to possible risks posed to the community and environment, as explained above. The no-action alternative would be the least effective in the short term. In the long term, Alternative #4, Divert pond water, would be the most effective. This alternative has the longest expected lifetime and a minimal amount of long term monitoring would be required. The least effective alternative in the long term would be containment.

The alternative involving extraction and treatment of the ground water was determined to be most effective in the reduction of contaminant toxicity, mobility and volume. Containment and diverting the pond water to lower the ground water table each scored the same under this criterion. The no-action alternative "scored" 0 out of 15 points due to the fact that no reduction of toxicity, mobility or volume would result.

The no-action alternative was determined to be the most implementable since it is not difficult to construct and minimal coordination would be required. Diverting the pond water and discharging to surface water was determined to be the second most implementable, while the remaining two alternatives, containment and extraction and treatment, we determined to be the least.

In terms of total present worth, no action would obviously be the most cost effective. The most cost effective action alternative was determined to be diverting the pond water and discharging to surface water. The relative cost of containment was estimated to be the highest of the four alternatives analyzed in detail. This is reflected in its "score" of 2 out of 15 points. It was estimated that this alternative would cost roughly eight times as much as diverting the pond and creek flows to lower the ground water table.

C. Selection of Recommended Alternatives

MPI recommends that the alternative of diverting the pond and creek water to lower the ground water table and discharging to the surface water be implemented to remediate the shallow ground water in the Drum Disposal Area. This alternative is also part of the alternative determined to be the most feasible for the remediation of the Drum Disposal Area fill material in Section 4.2.1.1. By diverting the flow of the creek and ponds, water will not flow through the fill material and act as a transport medium for contamination. The conceptual design for this remedial action is provided in Section 5.0.

4.4.2 Main Plant Area - Shallow Ground Water

4.4.2.1 Shallow Ground Water - Test Pit 3 Area

VOCs have been detected in the shallow ground water in the Test Pit 3 Area and some have been present at concentrations exceeding MCL/GA standards. Four remedial alternatives were retained by the screening process and are analyzed in detail in this section. The results of the detailed analysis are summarized in Table 4-8.

TABLE 4-8
DETAILED ANALYSIS RESULTS
REMEDIATION OF SHALLOW GROUND WATER
IN MAIN PLANT AREA (Test Pit 3 Area)
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Extraction/Discharge to Sanitary Sewer	3	11	7	6	0	12	15	54
Extraction/Pretreatment/Discharge to Sanitary Sewer	10	17	9	7	6	12	8	69
Extraction/Treatment/Discharge to Surface Water	10	20	9	7	6	13	8	73

A. Individual Analysis Of Alternatives

Alternative #1 - No Action

This alternative would involve taking no action to remediate the ground water in the Test Pit 3 Area. This would not comply with applicable SCGs since standards have been exceeded in the past. Due to the presence of contamination in the ground water, this alternative would not provide for the protection of human health and the environment.

Under this alternative, no significant short term risks would be posed to the community. Risks, however, would be posed to the environment since the ground water is contaminated. No available mitigative measures would minimize the potential impacts to the environment since no action can be taken under this alternative. This alternative would not be effective in the long term. No operation and maintenance would be required under this alternative, however, this is misleading since operation and maintenance should be required but can not be implemented. No reduction of contaminant toxicity, mobility or volume would be accomplished.

Since no action would be taken under this alternative, it would not be difficult to implement and delays would be unlikely. However, some future remedial actions would probably be necessary. Minimal coordination would be required.

Alternative #2 - Extraction/Discharge To Sanitary Sewer

This alternative would involve installing ground water recovery wells and withdrawing the ground water and discharging it to the Minetto WWTP. Without pretreatment, this alternative may not meet action-specific SCGs, such as discharge limits imposed by the NYSDEC and the Town of Minetto WWTP. Also, the BOD levels may be too low for the WWTP to effectively treat the water.

Any short term risks expected to be posed to the community and the environment would be easily mitigated. This alternative would not be classified as permanent, but it would remove most of the contamination from the ground water in the area. Operation and maintenance would be required for a period greater than 5 years to ensure proper operation of the system. Long term monitoring would also be required to ensure the effectiveness of the alternative.

Withdrawing and discharging the contaminated ground water would not be difficult to construct and delays would be unlikely. Some future remedial actions may be necessary.

Alternative #3 - Extraction/Pretreatment/Discharge To Sanitary Sewer

This alternative is similar to alternative #2, but the withdrawn ground water would be pretreated prior to its discharge to the WWTP. Since the water would be treated, it is expected that applicable SCGs would be met. Action-specific SCGs include discharge limits imposed by the State or WWTP. As with the previous alternative, BOD levels may be too low for the WWTP to effectively treat the water. The water may actually be too clean and reduce the effectiveness of the WWTP. Since SCGs would be met with this alternative it would provide for the protection of human health and the environment.

Any risks posed to the community during the implementation of this alternative should be easily controlled and no short term risks to the environment would be expected. This alternative would involve on-site treatment but would not be classified as a permanent remedy. Operation and maintenance would be required for a period greater than five years since the system is expected to operate for a greater length of time. Long term monitoring would be required to ensure the effectiveness of this alternative.

It is not anticipated that this alternative would be difficult to construct and it should be very reliable in meeting the specified performance goals. Treatment technologies are commercially available for this type of application.

Alternative #4 - Extraction/Treatment/Discharge To Surface Water

This alternative would involve withdrawing ground water from the area through the use of recovery wells. The withdrawn ground water would be treated for VOC contamination and discharged to nearby surface water, such as Benson Creek or the Oswego River. Compliance with applicable SCGs would be anticipated since treatment of contamination to discharge levels set by the State would be required. Some metals, including iron, may also have to be reduced via treatment to meet the surface water discharge limits.

Short term risks could be posed to the community during the construction phase of this alternative, such as, during the off-site excavation of a trench for the ground water discharge line. However, any risks would be easily controlled. Although this on-site treatment alternative would not be classified as permanent, the majority of contamination would be removed from the site. As with the other alternatives, operation and maintenance would be required for a period greater than 5 years and monitoring would be required to ensure the effectiveness of this alternative.

The technical feasibility of this alternative rated relatively high since it would not be difficult to construct and would be reliable in meeting the specified performance goals. Normal coordination with the state agencies would be required and technologies are commercially available for this application.

B. Comparative Analysis Of Alternatives

In this section, remedial alternatives for the shallow ground water in the Test Pit 3 Area are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

The treatment alternatives, Alternatives # 3 and #4, would comply with applicable SCGs since the contaminated ground water would be treated at the site. With the no action alternative, exceedances of some MCL/GA standards and guidance values would continue. The alternative involving ground water withdrawal, treatment and discharge to surface water would provide for greatest protection of human health and the environment, while the no action alternative would provide for the least.

The two treatment alternatives would be equally effective in the short term, while the no action alternative would be the least. Under the no action alternative, short term risks would continue to be posed to the environment due to the contamination present in the ground water. The three action alternatives would require long term operation and maintenance as well as monitoring. Long term monitoring should also be required under the no action alternative but can not be implemented since no action at all can be taken. The two alternatives involving treatment at the site were determined to be slightly more effective in the long term than the alternative of extraction/discharge to sanitary sewer due to the fact that on-site treatment would be done. Again, Alternatives #3 and #4 would provide for a greater reduction in the volume of contamination at the site.

Overall, the alternative of extracting the ground water, treating it then discharging it to surface water was slightly more implementable than the other two action alternatives. The no action alternative, obviously, would be the easiest to implement since it would not be difficult to construct and minimal coordination would be required.

The most cost effective action alternative was determined to be Alternative #2, Extraction/discharge to sanitary sewer. The order of magnitude costs for the other two action alternatives were estimated to be twice as much as the cost of Alternative #2.

C. Selection Of Recommended Alternative

MPI recommends that the alternative of extraction/treatment/discharge to surface water be implemented to remediate the VOC-contaminated shallow ground water in the Test Pit 3 Area. This alternative would provide for the greatest protection of human health and the environment and would comply with applicable SCGs. It would also be effective in both the short term and long term. The conceptual design for this remedial action is provided in Section 5.0.

4.4.2.2 Shallow Ground Water - UST Area 1

VOCs have been detected at levels exceeding ground water SCGs in the shallow ground water in the periphery of UST Area 1. Four alternatives remained through preliminary screening and have been analyzed in detail. Table 4-9 summarizes the results of the detailed evaluation.

A. Individual Analysis of Alternatives

<u>Alternative #1</u> - No Action

This alternative would not meet the chemical- specific goals of the class GA ground water standards. Action-specific and location-specifics SCGs would not apply to this alternative. It would appear to be somewhat protective of human health and the environment due to the lack of exposure routes.

Similarly, this alternative would appear adequate for short-term effectiveness. There would be no significant short-term risks due to the lack of exposure routes. However, this alternative would not provide a long-term or permanent remedy. There would be no reduction in toxicity, mobility, or volume of the contaminants of concern and the alternative would allow for the possibility of future exposures.

Because this alternative requires no action, it is relatively easy to implement. However, it may require future remedial actions.

<u>Alternative #2</u> - Extraction/Discharge to Sanitary Sewer

The chemical-specific and action-specific SCGs would not be met by this alternative since no treatment takes place prior to discharge to the sanitary sewer. After remediation, there would be less risk to human health but some environmental risks may remain.

During remediation, negligible short-term risks to human health and the environment would be possible due to the increased probability of exposure to the extracted ground water. This alternative did not rank high for long-term effectiveness. It would be neither a permanent nor long-term remedy and extensive monitoring and maintenance would be required.

This alternative would be easily implemented because it would be technically very feasible and only normal coordination with other agencies would be required.

<u>Alternative #3</u> - Extraction/Pretreatment/Discharge to Sanitary Sewer

All SCGs would be expected to be met by this alternative. There would be greater overall protection of human health and the environment because the ground water would be treated before being discharged to the sanitary sewer.

This alternative would be very effective in the short-term because of the removal of VOCs that would occur during treatment of the ground water. Removal of the VOCs from the ground water would help to reduce the volume of contamination in the UST Area 1. However, this alternative would not be effective as a long-term remedy if it were

TABLE 4-9
DETAILED ANALYSIS RESULTS
REMEDIATION OF SHALLOW GROUND WATER
IN MAIN PLANT AREA (UST 1 Area)
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Extraction/Discharge to Sanitary Sewer	3	11	9	6	0	12	13	54
Extraction/Pretreatment/Discharge to Sanitary Sewer	10	17	9	8	6	9	10	69
Extraction/Treatment/Discharge to Surface Water	10	17	9	7	6	11	15	75

implemented without subsequent treatment of the contaminated soil. Since there would be some residual contamination, some long-term monitoring would be required.

Because of the need to discharge to the sanitary sewer, extensive administrative coordination would be required in order to implement this alternative.

Alternative #4 - **Extraction/Treatment/Discharge to Surface Water**

This alternative is identical to Alternative #2 except that the extracted water would be discharged to Benson Creek. Therefore, many of the components of the individual detailed evaluation are similar.

This alternative would be expected to meet all applicable SCGs. Overall, human health and the environment would be protected because the ground water would be treated before being discharged to the surface water.

This alternative would be very effective in the short-term because of the removal of VOCs that would occur during treatment of the ground water. Removal of the VOCs from the ground water would help to reduce the volume of contamination in UST Area 1. However, this alternative would not be effective as a long-term remedy if it were implemented without subsequent treatment of the contaminated soil. Monitoring would be required since the water would be discharged to surface water.

Because this alternative would be technically feasible and only moderate coordination would be required, it would be relatively easy to implement.

B. Comparative Analysis of Alternatives

This section compares the alternatives for remediating the shallow ground water in UST Area 1 based on the criteria used for the detailed analysis of each alternative.

The alternatives that would treat the extracted ground water prior to discharge would be expected to comply with all applicable SCGs. No action would appear to comply with all but the chemical-specific SCGs because there are none that apply to the location or the action. For Alternative #2, the SCGs for discharging water to the sanitary sewer would, most likely, not be met since no treatment would be employed prior to discharge. The chemical-specific SCGs also would not be met.

The two treatment alternatives would be the most protective to human health and the environment since the risk of exposures would be reduced by the removal of VOCs. During remediation, these two alternatives would also be the most effective due to the treatment of the contaminants in the water prior to discharge. The alternative of extracting and discharging the water to the sanitary sewer without treatment would be less protective since there would be a greater chance for exposure. Since the no action alternative would leave all of the contaminants in place, this would be the least protective of all the alternatives. Similarly, the short-term effectiveness of the no action alternative would be the least of all alternatives.

When evaluated for long-term effectiveness, the treatment alternative involving ground water discharge to the sanitary sewer would be slightly more effective than the treatment alternative that would discharge to surface water because of the monitoring requirements. The alternative that would discharge the extracted ground water directly to the sanitary sewer without first treating the water is one of the least effective alternatives for meeting long-term remediation goals due to the lack of treatment and extensive monitoring requirements. Since the remedial units and the applicable remedial alternatives were evaluated separately, treatment of the source of contamination was not considered. Therefore, none of the alternatives for remediating the ground water were considered to be permanent or long-term remedies.

The two alternatives that would treat the water prior to discharge would reduce the volume of hazardous wastes. The no action alternative and the alternative that would discharge the water into the sanitary sewer would not reduce volume, toxicity or mobility.

The easiest of the four alternatives to implement would be no action. Of the three extraction alternatives, the one that would not require treatment would be the most implementable due to relative ease of construction. The alternative that would discharge to surface water following treatment would be less difficult to implement than the alternative of discharging to the sanitary sewer, due mainly to less coordination with other agencies.

The most cost-effective alternative would be no action because no costs would be incurred. Of the three extraction alternatives, the alternative that would treat the ground water and discharge it to the surface water would be the most cost effective. The alternative that would treat the water prior to discharge to the sanitary sewer would be the least cost-effective.

Overall, the alternative that would treat the water prior to discharge to surface water would be the most feasible, ranking 75 out of 100 points. The alternative that requires pretreatment and discharges to the sanitary sewer ranked only slightly lower. The least feasible alternatives to achieve the remedial objectives would be the no action alternative and the alternative of discharging to the sanitary sewer without pretreatment.

C. Selection of Recommended Alternative

MPI recommends that the alternative of treating the extracted ground water prior to discharge to surface water be implemented to remediate the VOC contaminated ground water in the periphery of UST Area 1. It may be necessary to remediate the contaminated soil in the same area in conjunction with this alternative in order to remove the source of ground water contamination and to provide a remedial measure that will fulfill the remedial goals for UST Area 1. Based on the results of the detailed analysis of alternatives for remediating this soil (Section 4.2.2.1), vapor extraction appears to be the most feasible. The conceptual design for the ground water remedial measure is provided in Section 5.0.

4.4.3 Main Plant Area - Deep Ground Water

4.4.3.1 Deep Ground Water - Test Pit 3 Area

VOCs have been detected at levels exceeding ground water SCGs in the deep aquifer in the Test Pit 3 Area. Four alternatives remained through preliminary screening and have been analyzed in detail. Table 4-10 summarizes the results of the detailed evaluation.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

This alternative would not meet the chemical- specific goals of the class GA ground water standards. Action-specific and location-specifics SCGs would not apply to this alternative. It would appear to be somewhat protective of human health and the environment due to the lack of exposure routes.

Similarly, this alternative would appear adequate for short-term effectiveness because there would be no significant short-term risks due to the lack of exposure routes. However, this alternative would not provide a long-term or permanent remedy, there would be no reduction in toxicity, mobility, or volume of the contaminants of concern, and it would allow for the possibility of future exposures.

Because this alternative requires no action, it is relatively easy to implement but may require future remedial actions.

Alternative #2 - Extraction/Discharge to Sanitary Sewer

The chemical-specific and action-specific SCGs would not be met by this alternative since no treatment takes place prior to discharge to the sanitary sewer. After remediation, there would be less risk to human health but some environmental risks may remain.

TABLE 4-10
DETAILED ANALYSIS RESULTS
REMEDIATION OF DEEP GROUND WATER
IN MAIN PLANT AREA (Test Pit 3 Area)
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Extraction/Discharge to Sanitary Sewer	3	11	9	6	0	12	15	56
Extraction/Pretreatment/Discharge to Sanitary Sewer	10	17	9	7	6	8	8	65
Extraction/Treatment/Discharge to Surface Water	10	20	9	7	6	8	8	68

During remediation, negligible short-term risks to human health and the environment would be possible due to the increased probability of exposure to the extracted ground water. This alternative did not rank high for long-term effectiveness. It would be neither a permanent nor a long-term remedy and extensive monitoring and maintenance would be required.

This alternative would be easily implemented because it would be technically very feasible and only normal coordination with other agencies would be required.

Alternative #3 - Extraction/Pretreatment/Discharge to Sanitary Sewer

All SCGs would be expected to be met by this alternative. There would be greater overall protection of human health and the environment because the ground water would be treated before being discharged to the sanitary sewer.

This alternative would be very effective in the short-term because of the removal of VOCs that would occur during treatment of the ground water. Removal of the VOCs from the ground water would help to reduce the volume of contamination in the Test Pit 3 Area. Some long-term monitoring would be required for this alternative.

This alternative would be somewhat difficult to implement because of the depth of the ground water. Because of the need to discharge to the sanitary sewer, extensive administrative coordination would be required in order to implement this alternative.

Alternative #4 - Extraction/Treatment/Discharge to Surface Water

This alternative is identical to Alternative #2, except that the extracted water would be discharged to the Oswego River via a storm sewer. Therefore, many of the components of the individual detailed evaluation are similar.

This alternative would be expected to meet all applicable SCGs. Overall, human health and the environment would be protected because the ground water would be treated before being discharged to the surface water.

This alternative would be very effective in the short-term because of the removal of VOCs that would occur during treatment of the ground water. Removal of the VOCs from the ground water would help to reduce the volume of contamination in the Test Pit 3 Area. Monitoring would be required since the water would be discharged to surface water.

This alternative would be somewhat difficult to implement because of the depth of the ground water.

B. Comparative Analysis of Alternatives

This section compares the alternatives for remediating the deep ground water in the Test Pit 3 Area based on the criteria used for the detailed analysis of each alternative.

The alternatives that would treat the extracted ground water prior to discharge would be expected to comply with all applicable SCGs. No action would appear to comply with all but the chemical-specific SCGs because there are none that apply to the location or the action. For Alternative #2, the SCGs for discharging water to the sanitary sewer would, most likely, not be met since no treatment would be employed prior to discharge. The chemical-specific SCGs also would not be met.

The treatment alternative that would discharge the extracted ground water to surface water would be the most protective of human health and the environment since the risk of exposures would be reduced by the removal of VOCs. This alternative includes the effects of remediation of the soil in Test Pit 3 Area by vapor extraction under a current IRM. Therefore, the source of contamination would also be removed. The next most protective alternative would discharge the water to the sanitary sewer following treatment. During remediation, the above two alternatives would be the most effective due to the treatment of the contaminants in the water prior to discharge. The alternative to extract and discharge the water to the sanitary sewer without treatment would be less protective since there would be a greater chance for exposure. Since the no action alternative would leave all of the contaminants in place, this would be the least protective of all of the alternatives. Similarly, the short-term effectiveness of the no action alternative would be the least of all alternatives.

When evaluated for long-term effectiveness, the two treatment alternatives would be slightly more effective than the alternative that would discharge the extracted ground water without treatment and the no action alternative. The treatment rendered to the ground water would help meet long-term remediation goals. Since the remedial units and the applicable remedial alternatives were evaluated separately, treatment of the source of contamination was not considered in this section.

The two alternatives that would treat the water prior to discharge would reduce the volume of hazardous wastes. The no action alternative and the alternative that would discharge the water into the sanitary sewer would not reduce volume, toxicity or mobility.

The easiest of the four alternatives to implement would be no action. Of the three extraction alternatives, the one that would not require treatment would be the most implementable. The two treatment alternatives would be least implementable due to coordination with other agencies and difficulties in construction.

The most cost-effective alternative would be no action because no costs would be incurred. Of the three alternatives that would extract the ground water, the alternative that would not require treatment would be the most cost effective. The alternatives that would treat the water prior to discharge would be the least cost-effective.

Overall, the alternative that would treat the water prior to discharge to surface water would be the most feasible, ranking 68 out of 100 points. The alternative that requires pretreatment and discharge to the sanitary sewer ranked only slightly lower. The least feasible alternative to achieve the remedial objectives would be the no action alternative.

C. Selection of Recommended Alternative

MPI recommends that the alternative of treating the extracted ground water and discharging it to surface water be implemented to remediate the VOC-contaminated ground water in the Test Pit 3 Area. It will be necessary to remediate the contaminated soil in the same area in conjunction with this alternative in order to remove the source of ground water contamination and to provide a remedial measure that will fulfill the remedial goals for the Test Pit 3 Area. The conceptual design for this remedial measure is provided in Section 5.0

4.4.3.2 Deep Ground Water - Well B-19D Area/UST Area 1

VOCs have been detected at levels exceeding ground water SCGs in the deep aquifer in the Well B19-D Area, southeast of UST Area 1. Four alternatives remained through preliminary screening and have been analyzed in detail. Table 4-11 summarizes the results of the detailed evaluation.

A. Individual Analysis

<u>Alternative #1</u> - No Action

This alternative would not meet the chemical- specific goals of the class GA ground water standards. Action-specific and location-specific SCGs would not apply to this alternative. It would appear to be somewhat protective of human health and the environment due to the lack of exposure routes.

Similarly, this alternative would appear adequate for short-term effectiveness because there would be no significant short-term risks due to the lack of exposure routes. However, this alternative would not provide a long-term or permanent remedy, there would be no reduction in toxicity, mobility, or volume of the contaminants of concern, and it would allow for the possibility of future exposures.

Because this alternative requires no action, it is relatively easy to implement but may require future remedial actions.

TABLE 4-11
DETAILED ANALYSIS RESULTS
REMEDIATION OF DEEP GROUND WATER
IN MAIN PLANT AREA (Well B-19D Area)
VOLATILE ORGANICS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	8	6	6	0	13	15	54
Extraction/Discharge to Sanitary Sewer	3	11	9	6	0	12	13	54
Extraction/Pretreatment/Discharge to Sanitary Sewer	10	17	9	7	6	8	10	67
Extraction/Treatment/Discharge to Surface Water	10	17	9	7	6	9	15	73

Alternative #2 - **Extraction/Discharge to Sanitary Sewer**

The chemical-specific and action-specific SCGs would not be met by this alternative since no treatment takes place prior to discharge to the sanitary sewer. After remediation, there would be less risk to human health but some environmental risks may remain.

During remediation, negligible short-term risks to human health and the environment would be possible due to the increased probability of exposure to the extracted ground water. This alternative did not rank high for long-term effectiveness. It would be neither a permanent nor long-term remedy and extensive monitoring and maintenance would be required.

This alternative would be easily implemented because it would be technically very feasible and only normal coordination with other agencies would be required.

Alternative #3 - **Extraction/Pretreatment/Discharge to Sanitary Sewer**

All SCGs would be expected to be met by this alternative. There would be greater overall protection of human health and the environment because the ground water would be treated before being discharged to the sanitary sewer.

This alternative would be very effective in the short-term because of the removal of VOCs that would occur during treatment of the ground water. Removal of the VOCs from the ground water would help to reduce the volume of contamination in the Well B19-D Area/UST Area 1. However, this alternative would not be effective as a long-term remedy if it were implemented without subsequent treatment of the contaminated soil. Since there would be some residual contamination, some long-term monitoring would be required.

Because of the need to discharge to the sanitary sewer, extensive administrative coordination would be required in order to implement this alternative.

Alternative #4 - **Extraction/Treatment/Discharge to Surface Water**

This alternative is identical to Alternative #3 except that the extracted water would be discharged to Benson Creek or the Oswego River. Therefore, many of the components of the individual detailed evaluation are similar.

This alternative would be expected to meet all applicable SCGs. Overall, human health and the environment would be protected because the ground water would be treated before being discharged to the surface water.

This alternative would be very effective in the short-term because of the removal of VOCs that would occur during treatment of the ground water. Removal of the VOCs from the ground water would help to reduce the volume of contamination in UST Area 1. However, this alternative would not be effective as a long-term remedy if it were implemented without subsequent treatment of the contaminated soil. Monitoring would be required since the water would be discharged to surface water.

Because this alternative would be technically feasible and only moderate coordination would be required, it would be somewhat easy to implement.

B. Comparative Analysis of Alternatives

This section compares the alternatives for remediating the deep ground water in Well B19-D Area/UST Area 1 based on the criteria used for the detailed analysis of each alternative.

The alternatives that would treat the extracted ground water prior to discharge would be expected to comply with all applicable SCGs. No action would appear to comply with all but the chemical-specific SCGs because there are none that apply to the location or the action. For Alternative #2, the SCGs for discharging water to the sanitary sewer would, most likely, not be met since no treatment would be employed prior to discharge. The chemical-specific SCGs also would not be met.

The two treatment alternatives would be the most protective to human health and the environment since the risk of exposures would be reduced by the removal of VOCs. During remediation, these two alternatives would also be the most effective due to the treatment of the contaminants in the water prior to discharge. The alternative to extract and discharge the water to the sanitary sewer without treatment would be less protective since there would be a greater chance for exposure. Since the no action alternative would leave all the contaminants in place, this would be the least protective of all of the alternatives. Similarly, the short-term effectiveness of the no action alternative would be the least of all alternatives.

When evaluated for long-term effectiveness, the two treatment alternatives would be slightly more effective than the alternative that would discharge the extracted ground water without treatment and the no action alternative because the treatment rendered to the ground water would help meet long-term remediation goals. Since the remedial units and the applicable remedial alternatives were evaluated separately, treatment of the source of contamination was not considered in this section.

The two alternatives that would treat the water prior to discharge would reduce the volume of hazardous wastes. The no action alternative and the alternative that would discharge the water into the sanitary sewer would not reduce volume, toxicity or mobility.

The easiest of the four alternatives to implement would be no action. Of the three alternatives that would extract the ground water, the alternative that would not require treatment would be the most implementable due to the relative ease of construction. The alternative that would discharge to surface water following treatment would be slightly less difficult to implement than the alternative to discharge to the sanitary sewer due to less required coordination with other agencies.

The most cost-effective alternative would be no action because no costs would be incurred. Of the three extraction alternatives, the one that would require treatment before discharging to surface water would be the most cost effective. The alternative that would discharge to the sanitary sewer with pretreatment would be the least cost-effective.

Overall, the alternative of treating the water and discharging it to surface water would be the most feasible, ranking 73 out of 100 points. The alternative that requires pretreatment and discharge to the sanitary sewer ranked only slightly lower. The least feasible alternatives to achieve the remedial objectives would be the no action alternative and the alternative that discharges untreated water to the sanitary sewer.

C. Selection of Recommended Alternative

MPI recommends that the alternative of treating the extracted ground water and discharging it to surface water be implemented to remediate the VOC contaminated ground water in the Well B19-D Area. It may be necessary to remediate the contaminated soil in the same area in conjunction with this alternative in order to remove the source of ground water contamination and to provide a remedial measure that will fulfill the remedial goals for the Well B19-D Area. The conceptual design for this remedial measure is provided in Section 5.0.

4.5 CONTAMINATED SEWER SEDIMENT

In this section, the alternatives for the remediation of the contaminated sewer sediments retained by the preliminary screening process are analyzed in detail.

4.5.1 Sewer System 1 Sediment

VOCs, semivolatiles, pesticides and metals have been detected in the soils/debris present in Sewer System 1, which served to control roof run-off from Building 69. No water has been observed to be flowing in this system. Four of the original alternatives for the remediation of the contaminated debris in this sewer line were brought through preliminary screening for detailed analysis. In this section, those four alternatives are analyzed in detail. Table 4-12 summarizes the results.

TABLE 4-12
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 1

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	17	10	9	0	13	15	74
Institutional - Monitoring, Access Restrictions	10	20	10	7	0	13	15	75
Excavation/Off-Site Disposal	10	20	6	12	2	10	10	70
Close Sewer Line in Place	10	20	10	11	5	11	8	75

A. Individual Analysis of Alternatives

Alternative #1 - No Action

There are no SCGs directly applicable to the soil/debris present in Sewer System 1. Since no water has been observed to be flowing in the system the material present would not contribute to the contamination of surface water. Thus, compliance with applicable SCGs was assumed in evaluating this criterion. This alternative would not provide for full protection of human health and the environment since contaminated soil/sediment would still be present in the line. Human contact with the contaminated soil, though, would be highly unlikely since the line is buried and contact would be limited to through the manholes, which are currently covered.

Under this alternative significant short term risks would not be posed to the community nor the environment. As previously stated, access to the contamination is extremely limited and contaminant transport is unlikely. This alternative would not be effective in the long term since no action would be taken to remediate the soil/sediment. Operation and maintenance, as well as environmental controls, would not be required. The no action alternative would provide for no reduction in toxicity, mobility or volume of the contamination.

The no action alternative, obviously, would not be difficult to implement and no delays due to technical problems would be likely. Some future remedial actions may be necessary though. The administrative feasibility ranked high due to the requirement of only a minimal amount of coordination.

Alternative #2 - Institutional-Monitoring, Access Restrictions

This alternative would involve expanding the existing site fence to include the sewer system. Monitoring of the system would also be required to ensure that no contamination is being discharged from the line. As with the previous alternative, applicable SCGs would be expected to be met. Although unrestricted use of the land would not be possible, exposure to contaminants in the line would be prevented. Monitoring would be done in order to protect both the environment and community.

No short term risks would be posed to the community or environment during implementation of this alternative. Institutional actions would not be permanent, and long term operation and maintenance would be required. As with the no action alternative, no reduction in toxicity, mobility or volume would be provided for.

This alternative would not be difficult to construct since it would involve only monitoring of the system. Minimal coordination would be required and any delays due to technical problems would be unlikely. Some future remedial actions may, however, be necessary.

Alternative #3 - Excavation/Off-Site Disposal

This alternative would involve excavating the entire sewer system and disposing of it in an off-site landfill. Although no chemical specific SCGs apply to the soil/sediment in the sewer line, action specific SCGs would have to be met during remediation. The action limit for airborne particulates during remediation, as defined in the NYSDEC Air Clean Up Criteria Document (January 8, 1990), is an example of an air related SCG which would need to be met during remedial activities. This alternative would provide for the protection of human health and the environment at the site since the contaminated soil in the sewer system would be removed from the site.

Short term risks would be posed to the community during the implementation of this alternative. Increased traffic, noise and blowing dust could result from implementing this alternative, but these risks could be easily controlled. Although short term risks to the environment would exist, such as the possible transport of contaminants through blowing dust, mitigative measures are available to minimize the potential impacts. This alternative would not be classified as a permanent remedy, but it would be effective in the long term since the contamination would be removed from the site and a minimal amount of operation and maintenance would be required. Disposing of the soil/sediment off-site would reduce contaminant mobility by containment.

This alternative would be very difficult to implement but would be reliable in meeting the specified performance goals. No future remedial actions would be anticipated since all material would be removed from the site. Extensive coordination would be required with other agencies for off-site disposal.

Alternative #4 - Close Sewer Line In Place

This alternative would involve injecting grout or some other inert material into the sewer line to seal it, there by immobilizing the debris present in the line and preventing access to it. Applicable SCGs would be met with this technology. Although the debris would remain in the sewer line, contact with it would be prevented. Thus, this alternative would provide for the protection of human health and the environment.

No short term risks to the community or environment would be posed by the implementation of this alternative. Although closing the sewer line in place would not be classified as a permanent remedy, it would be effective in the long term. Only a minimum amount of long term monitoring would be required. This alternative would provide for the reduction in mobility of the contaminants in the line by containment and would be irreversible for most of the constituents.

This alternative would be somewhat difficult to construct and delays due to technical problems would be unlikely. Some future remedial actions may be necessary, such as grout replacement/repair.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the Sewer System 1 soils/sediments are compared to each other to identify the relative advantages and disadvantages of each.

All alternatives would comply with any applicable SCGs. For instance, during the excavation of the sewer system under Alternative #3, the action limit for airborne particulates would have to be complied with. The no action alternative would be somewhat less protective of human health and the environment than the other alternatives since the material would be left in the system. The three action alternatives would provide equally for the protection of human health and the environment, although off-site disposal would allow for unrestricted use of the land in that area.

Alternative #3, Excavation/off-site disposal, would be the least effective in the short term. This is due mainly to fact that generation of blowing dust could pose a risk to the community and the environment during implementation. Mitigative measures are available, though, to control this risk. The other three alternatives were determined to be equally effective in the short term since no risk would be posed to the community or environment. The alternative involving excavation and off-site disposal was determined to be the most effective in the long term since the contaminated medium would be removed from the site and little to no long term maintenance and operation would be required. Closing the sewer line in place ranked the second most effective in the long term. Only a minimum amount of monitoring would be required. The alternative determined to be the least effective in the long term was the one involving institutional actions. Although the no action alternative ranked higher in terms of long term effectiveness than the institutional action alternative, it would not be more effective. This "score" reflects the fact that no action at all, including long term monitoring, could be undertaken as part of the no action alternative.

Closing the sewer line in place would provide for the greatest reduction in mobility of the contaminants since the soil/sediment would be sealed in the line. Excavation/off-site disposal would provide for the second greatest reduction in mobility. The other two alternatives, no action and institutional action, would provide for no reduction in contaminant mobility or volume. The most implementable alternatives would be Alternatives #1 and #2. Excavation and off-site disposal would be the least implementable, while closing the sewer line in place would be less difficult to construct, since it would involve only injecting grout or cement into the sewer lines.

The no action alternative would be the most cost effective. The most cost effective action alternative would be monitoring and access restrictions. The alternative involving closing the sewer line in place would involve the greatest costs to implement. Off-site land disposal was estimated to cost roughly one and one-half times as much as the alternative of monitoring and access restrictions.

C. Selection of Recommended Alternative

The monitoring and access restriction alternative and the alternative to close the sewer line in place rank the same for overall feasibility, each scoring 75 out of 100 total points. However, MPI recommends that the alternative of closing the sewer line in place be implemented to remediate the contaminated soils/sediment present in Sewer System 1. This alternative would be more effective in the long term than the alternative of monitoring and access restrictions and would provide for the reduction in contaminant mobility. The conceptual design for this remedial action is provided in Section 5.0.

4.5.2 Sewer System 2A Sediment

Sediment in Sewer System 2A, which is located in the Test Pit 3/Building 69 Area, contains VOCs, semivolatiles, pesticides and metals. Three of the original remedial alternatives for this system survived the preliminary screening process and are analyzed in detail in this section. Table 4-13 summarizes the results of the detailed analysis.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

There are no SCGs directly applicable to the sediments in Sewer System 2A. The sediment criteria, as defined in the NYSDEC Sediment Criteria Guidance Document, would not apply since those criteria are applicable to pond and creek sediments. Exposure to the contaminated sediment, although unlikely, would not be acceptable since no remedial action would be taken. Thus, this alternative would not provide for the full protection of human health and the environment.

No short term risks would be posed to the community or the environment through implementation of this alternative. Contact with the sediments would be highly unlikely since the line is buried. The long term effectiveness of this alternative would be minimal, and no reduction in contaminant toxicity, mobility or volume would be accomplished.

The no action alternative would not be difficult to implement and delays due to technical problems would be unlikely. Some future remedial actions may be necessary since none would be taken at this time. Again, minimal coordination would be required.

TABLE 4-13
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 2A

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	17	10	6	0	13	15	71
Close Line in Place	10	20	10	8	5	12	15	80
Flush Sediments/Off-Site Disposal	10	20	6	11	2	10	2	61

Alternative #2 - **Close Line In Place**

This alternative would involve injecting grout or some other type of inert material into Sewer System 2A to contain the contaminated sediments and prevent contaminant migration. As noted in the analysis of the previous alternative, there are no applicable SCGs for the sewer sediment. Thus, compliance with SCGs was assumed in evaluating this criterion. Closing the line in place would provide for the protection of human health and the environment since contact with the contaminants would be prevented, as would migration.

No short term risks would be anticipated during the implementation of this alternative. Implementation time would be expected to be less than two years. Closing the line in place would be somewhat effective in the long term. Although the remedy would not be classified as permanent, there would be no treated residual left at the site and only a minimum amount of long term monitoring would be required. A reduction in the mobility of the contaminants would be provided for by containment under this alternative.

Closing System 2A in place would be somewhat difficult to implement but would be reliable in meeting the specified performance goals. Delays due to technical problems would be unlikely. Some future remedial actions may be necessary, such as grout repair/replacement. Normal coordination with other agencies would be required under this alternative, and technologies are available for this application.

Alternative #3 - **Flush Sediments/Off-Site Disposal**

This alternative would involve flushing the sediments from the line, collecting the water and sediments at the line's intersection with Sewer System 2B, treating the water and disposing of the sediment off-site. Applicable SCGs would be met with this alternative. For example, action specific SCGs which would have to be met would be discharge limits set for the treated water collected during the implementation of this alternative. Protection of human health and the environment would be provided for by this alternative since the sediment would be removed from the site.

Short term risks would be posed to the community and environment during the implementation phase of this alternative. Some risks would be posed by the off-site transportation of the sediment and during the flushing of the sediment from the line. This alternative would be effective in the long term since the contamination would be removed from the site and a minimal degree of long term monitoring would be required. However, flushing the sediments and disposing them off-site would not be classified as a permanent remedy. This provides only for immobilization of contaminants through containment.

This alternative would be very difficult to implement but would be reliable in meeting the specified performance goals. Since the contaminated sediments would be removed from the site, no future remedial actions would be anticipated. Extensive coordination would be required for off-site disposal and delays would be somewhat likely.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the Sewer System 2A sediments are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

Although no SCGs are directly applicable to the sewer sediments, any action specific SCGs would be met with the alternatives. The no action alternative would provide the least protection of human health and the environment since the sediments would remain in place. The other two action alternatives would provide better protection since the sediments would either be sealed in the line or removed from the site.

The no action alternative and closing the line in place would equally be effective in the short term since no risks would be posed to the community or the environment. With Alternative #3, Flush sediments/off-site disposal, some short term risks would be posed, but would be easily controlled. Flushing the sediments and disposing of them off-site would be most effective in the long term since contamination would be removed from the site and only a minimum amount of long term monitoring would be required. The no action alternative would be the least effective in the long term. The greatest reduction in contaminant mobility would be provided by the alternative of closing the line in place since the sediments would be sealed in an inert mass. Off-site disposal would be the second most effective in mobility reduction while the no action alternative would provide for no reduction. Obviously, the no action alternative would be the easiest to implement. Closing the line in place, which would involve injecting grout material into the line, would be the most implementable action alternative, where as off-site disposal would be the least.

In terms of relative cost, the most cost effective alternative would be no action. The most cost effective of the remaining two alternatives would be closing the line in place since relatively few costs would be involved. It was estimated that flushing the sediments from the line and disposing of them off-site would be at least eight times more expensive than closing the line in place.

C. Selection of Recommended Alternative

MPI recommends that the alternative of closing Sewer System 2A in place be implemented to remediate the sediments present in that line. This alternative would be effective in the short term and would provide for the greatest reduction in contaminant mobility. The conceptual design for this remedial action is provided in Section 5.0.

4.5.3 Sewer System 2B Sediment

Semivolatiles, PCBs and metals have been detected in the sediment present in the Main Plant Area section of Sewer System 2B. Three of the original alternatives for the remediation of the sediments survived the preliminary screening and are analyzed in detail in this section. The detailed analysis results are summarized in Table 4-14.

A. Individual Analysis of Alternatives

Alternative # 1 - No Action

Under this alternative no action would be taken to remediate the contaminated sediment present in Sewer System 2B. No SCGs are directly applicable to the in-situ sediment in the line. Based on analytical results of sampling, contaminant levels in the water flowing through Sewer System 2B are below applicable surface water criteria. Thus, it appears that the sediment present in the line is not contributing contamination to the water. This alternative would not provide for full protection of human health and environment since contaminated sediment would remain on-site, although access would be limited.

Since contaminant migration does not appear to be occurring through the line and contact with the sediment is severely limited, no short term risks to the community or environment would be posed. Since no action would be taken, the required time to implement this remedy would be less than two years. This alternative would not be effective in the long term since no steps would be taken to remediate the contaminated sediment. Thus, no reduction in toxicity, mobility or volume would occur.

Since no action would be taken under this alternative, it would not be difficult to implement and minimal coordination would be required. However, some future remedial actions may be necessary.

TABLE 4-14
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 2B

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	17	10	9	0	13	15	74
Flush Sediments/Off Site Disposal	10	20	6	12	2	11	15	76
Close Main Plant Section of Line in Place/ Divert Upstream Flow into Benson Creek	10	20	8	11	5	12	15	81

__Alternative # 2__ - **Flush Sediments/Off-Site Disposal**

Although no chemical-specific SCGs exist for the sewer sediment, action-specific SCGs which would have to be complied with would include any discharge limits for the treated water produced during implementation of this alternative. The water used to flush the sediments would have to be collected along with the sediments, treated and discharged to surface water, most likely the Oswego River. Since the sediments would be disposed of off-site, this alternative would provide for the protection of human health and the environment.

Risks associated with off-site disposal would again be posed to the community and the environment under this alternative. The required time to implement this remedy would be expected to be less than two years. Off-site disposal would be an effective long term solution even though it is not classified as permanent. All of the sediment would be removed from the site and only a minimum amount of long term monitoring would be required at the site. Contaminant mobility would be reduced by containment in the landfill.

This alternative would be somewhat difficult to construct since provisions would have to be made to collect both the water and sediment flushed from the line as well as treat the water. Once the alternative is carried out, no future remedial actions would be anticipated at the site. Extensive coordination would be required.

__Alternative #3__ - **Close Main Plant Section Of Line In Place/Divert Upstream Flow Into Benson Creek**

This alternative would involve installing a new section of line to connect the upstream flow of Sewer System 2B into Benson Creek. The Main Plant section of the line would then be sealed in place by injecting grout or similar inert material into the line. Since no chemical-specific SCGs are applicable to the sediments in the sewer line, compliance with SCGs was assumed in evaluating this criterion. Since the contaminated sediments would be sealed in the buried line, human contact and contaminant migration would be prevented, thus protecting human health and the environment.

Even though this alternative could pose short term risks to the community and the environment, these risks would be easily controlled. Sealing the sediments in place would not be a permanent remedy but would be effective in the long term. Only a minimum amount of long term monitoring would be required.

This alternative would be somewhat difficult to implement since it involves the construction of a sewer line. Once in place, however, this should be very reliable in meeting the specified performance goals. Some future remedial actions may be necessary and would include grout repair and maintenance.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the Sewer System 2B sediments are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

Although no SCGs are directly applicable to the sediments in the sewer system, any action - specific SCGs should be met by the action alternatives. The two action alternatives would provide better protection of human health and the environment since contact with the sediments and contaminant migration would be prevented.

The no action alternative would pose the least short term risks and would be most effective during the implementation phase. The other two alternatives would pose more risks to both the community and the environment. Off-site disposal would provide for the greatest long term effectiveness since the contamination would be removed from the site and minimum long term monitoring and maintenance would be required. Again, no action would be the least effective in the long term. Alternative #3, which involves sealing the main plant section of the line, would be the most effective in reducing the mobility of contaminants. The no action alternative would not provide for any reduction in the toxicity, mobility or volume of the contamination.

The no action alternative, obviously, would be the most implementable alternative since it would not be difficult to construct and minimal coordination would be required. Overall, diverting the upstream flow into Benson Creek and closing the main plant section of Sewer System 2B would be slightly more implementable than flushing the sediments from the line and disposing of them off-site. With Alternative #2, although no future remedial actions would be anticipated, delays in implementation would be somewhat likely and extensive coordination would be required. Closing the main plant section of Sewer System 2B in place may require some future remedial actions, but delays would be unlikely and extensive coordination would not be required.

Again, the most cost effective alternative would be no action. The cost involved in implementing the two action alternatives would be similar.

C. Selection of Recommended Alternative

Based on the detailed analysis, MPI recommends that the alternative of closing the main plant section of Sewer System 2B in place and diverting the upstream flow into Benson Creek be implemented to remediate the contaminated sediment in the main plant section of the line. MPI also recommends that the section of the line in the Main Plant Area be sealed at the conclusion of vapor extraction/ground water withdrawal operations in the Test

Pit 3 Area. It is currently believed that System 2B aids in draining ground water from the Test Pit 3 Area via French drains installed along the foundation of Building 7. If the sewer were plugged, ground water could back up in the Test Pit 3 Area, preventing effective operation of the withdrawal system. Diversion of the upstream section of the line and plugging the line near Benson Creek could be completed prior to grouting the entire Main Plant Area section. The conceptual design for this remedial action is provided in Section 5.0.

4.5.4 Sewer System 3 Sediment

Sewer System 3 is comprised of the concrete lined trench located in the tunnel running beneath the Main Plant Area and all piping which connects into it. Results of past sampling have indicated the presence of slightly elevated levels of some metals in the sediment in this system. Three of the original alternatives for the remediation of the sediment in Sewer System 3 survived the preliminary screening process and are analyzed in detail in this section. Table 4-15 summarizes the results of the detailed analyses.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

Since there are no applicable SCGs for the sewer sediment, it was assumed that this alternative would comply with SCGs in evaluating compliance under this criterion. Because of the location of Sewer System 3, contact with the sediments would be limited, and transport of the sediments does not seem feasible due to the amount of debris in the trench. Thus, this alternative would appear to provide for the protection of human health and the environment.

Under the no action alternative, no short term risks would be posed to the community or environment. This remedy would not be classified as permanent since no action would be taken. The expected lifetime of this alternative would be less than 15 years, and long term operation and maintenance would not be required. No reduction in the toxicity, mobility or volume of the contamination would be accomplished through the no action alternative.

This remedial action would not be difficult to implement and delays due to technical problems would be unlikely since no action would be taken. Minimal coordination would be required. Some future remedial actions would probably be necessary, though.

TABLE 4-15
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 3

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	10	20	10	9	0	13	15	77
Close Line in Place	10	20	10	11	5	10	15	81
Flush Sediments/Off-Site Disposal/ Fill Trenches	10	20	6	12	2	11	8	69

Alternative #2 - Close Line In Place

As mentioned in the analysis of the previous alternative, there are no applicable SCGs for the sewer sediments. Thus, compliance under this criterion was assumed. Although exposure to contaminants in Sewer System 3 and transport of sediments downstream are unlikely, this alternative would insure against exposure and contaminant migration since the sediments would be sealed in grout or concrete.

No significant short term risks would be posed to the community or environment during the implementation of this alternative. It is expected that less than two years would be required to seal the line place. Although this alternative would not be classified as permanent, the expected lifetime of the remedy would be twenty five to thirty years. Long term operation and maintenance would be required, but only at a minimum. Closing the line in place would reduce the mobility of contamination by containment.

This alternative would be very difficult to construct due to the amount of asbestos and debris in the tunnel. Also, it would take much effort to ensure that all pipes connecting into the trench are sealed. Delays due to technical problems during implementation of this alternative would be unlikely. Some future remedial actions may be necessary, such as grout repair/replacement. It would be expected that normal coordination with other agencies would be required.

Alternative #3 - Flush Sediments/Off-Site Disposal/Fill Trenches

Under this alternative, any sediments in Sewer System 3 would be flushed downstream to a collection point where all water and sediment would be collected. The water would be treated and discharged to a surface water body, such as the Oswego River. The sediments would be disposed of at an off-site landfill and the trench would be filled in with grout or some other type of inert material. Compliance with applicable SCGs was assumed to be the case, as it was under the previous alternatives. Off-site disposal would provide for the protection of human health and the environment since the sediment would be flushed from the system and removed from the site.

Some short term risks would be posed to the community since the material would be taken off-site for disposal, but these risks could be easily controlled. Short term risks would also be posed to the environment during the implementation of this alternative. For example, if all water used in flushing the sediments is not captured and treated, possible contaminant migration into the Oswego River could occur. The time required to implement this remedy would be expected to be less than two years. This alternative would not be classified as permanent, but long term operation and maintenance would not be required since the material would be removed from the site. As with other alternatives involving landfill disposal, this alternative provides for immobilization of contaminants through containment.

This alternative would be somewhat difficult to implement since all water used to clean the system would have to be captured and treated prior to discharge. Since the sediment material would be removed from the site, no future remedial actions would be anticipated. Extensive coordination would be required for this alternative.

B. Comparative Analysis of Alternatives

In this section, the remedial alternatives analyzed in detail for the Sewer System 3 sediments are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

In rating the three alternatives' compliance with applicable SCGs, it was assumed that any SCGs would be met. Overall, all three alternatives would provide for the protection of human health and the environment. The two action alternatives would ensure better protection since the sediment would be sealed in the line or flushed and removed from the site. But, due to the inaccessibility of the system, the no action alternative would also be effective.

The no action alternative and closing the line in place would be equally effective in the short term. No risks would be posed to the community or the environment. As explained above, some short term risks would be posed during the implementation of the alternative involving flushing the sediments and disposing of them off-site.

In terms of long term effectiveness, Alternative # 3, Flush sediments/off-site disposal/fill trenches, was rated the highest. This rating reflects the fact that the material would be removed from the site and only minor operation and maintenance would be required. Closing the line in place would be nearly as effective in the long term as Alternative #3, while no action would be the least. Sealing the line with grout would provide for the greatest reduction in contaminant mobility. Thus, closing the line in place was rated the highest for this criterion. Off-site disposal of the sediment would reduce contaminant mobility by containment but would be less effective. Obviously, the no action alternative would provide for no reduction.

The no action alternative would be the most implementable of the three remedies. Closing the line in place would be the least implementable due to the amount of debris and asbestos in the tunnel area. Also, it would be difficult to seal all piping entering the tunnel area and trench due to the poor condition of most of the piping. Flushing the sediments and disposing of them off-site would be slightly less difficult than closing the line in place, but a water treatment system would have to be installed.

The no action alternative would be the most cost effective since no action would be taken to remediate the sewer system sediments. Of the two action alternatives, closing the line in place was determined to be the most cost effective. The relative cost of flushing the sediments from the line and disposing of them off-site was estimated to be nearly twice as costly as closing the line in place.

C. Selection of Recommended Alternative

MPI recommends that the alternative of closing the line in place be implemented to remediate Sewer System 3. Although this alternative would be somewhat more difficult overall to implement, it would provide for the greatest reduction in contaminant mobility and would be effective in the short and long terms. The conceptual design for this remedial action is provided in Section 5.0.

4.5.5 Sewer System 4 Sediment

VOCs, semivolatiles, pesticides and elevated levels of some metals have been detected in the sediment in Sewer System 4. System 4 is comprised of the Minetto storm sewer and a Columbia Mills stub originating in Building 8. Four alternatives for the remediation of the sediment in the Columbia Mills stub were retained by the screening process and are analyzed in detail in this section. The results of the detailed analysis of these alternatives are summarized in Table 4-16.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

Under this alternative no action would be taken to remediate the sediment present in Sewer System 4. Although no SCGs are directly applicable to sewer sediment, it appears that sediment in this sewer system may be contributing some contamination to the water flowing through the line and into the Oswego River. Thus, in rating this alternative's compliance with applicable SCGs, it was determined that full compliance would not be achieved. The no action alternative would not provide for full protection of human health and the environment since exposure to contaminants in the sediments would not be acceptable.

TABLE 4-16
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 4

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	17	10	9	0	13	15	70
Monitoring/Permitting	6	17	10	7	0	13	9	62
Close Line in Place	10	20	10	11	5	12	15	83
Flush Sediments/Dewater/ Off-Site Disposal	10	20	6	12	2	11	6	67

No short term risks would be posed to the community or the environment under this alternative. Although some contaminants were detected at elevated concentrations in the sewer water in the system, those concentrations would be greatly reduced when the water is discharged to the Oswego River. This alternative would not be permanent and would not provide for any reduction in the toxicity, mobility or volume of contamination present in the sediment.

Since no action would be taken under this alternative, it would not be difficult to implement. Minimal coordination would be required and delays due to technical problems would be unlikely. However, some future remedial actions would probably be necessary.

<u>Alternative #2</u> - Monitoring/Permitting

This alternative would involve obtaining a permit for the discharge from Sewer System 4. Monitoring would be required to ensure compliance with discharge limits set by the regulatory agencies. Although some contaminants appear to be present at elevated concentrations in the water in Sewer System 4 (when compared to surface water SCGs) compliance with the regulatory discharge limits would be expected since they would incorporate a dilution factor.

As with the previous alternative, no short term risks would be posed. The time required to implement this alternative would be less than two years. Permitting Sewer System 4 would not be a permanent remedial measure and a moderate degree of long term monitoring would be required. This alternative would not provide for any reduction in contaminant toxicity, mobility or volume.

Since no action would be taken under this alternative, it would not be difficult to implement. However, some future remedial actions may be necessary.

<u>Alternative #3</u> - Close Line In Place

Under this alternative, the Columbia Mills stub of Sewer System 4 would be sealed in place by injecting grout or other inert material into the line. Since no SCGs apply to the sewer sediment and water would be prevented from flowing through the Columbia Mills line, compliance with applicable SCGs was assumed in rating this criterion. Protection of human health and the environment would be provided for since any contamination present in the sewer would be sealed in it, preventing exposure and contaminant transport.

This alternative would pose no short term risks to the environment or the community during its implementation. It would be effective in the long term since the sediment would be immobilized and only a minimum amount of long term monitoring would be required. Operation and maintenance would be required, such as grout repair. This alternative provides for immobilization by containment.

Closing the line in place would be somewhat difficult to implement since access to the line is somewhat restricted. It would be very reliable in meeting the specified performance goals but some future remedial actions may be necessary. Only normal coordination with other agencies would be expected.

<u>Alternative #4</u> - Flush Sediments/ Dewater/Off-Site Disposal

This alternative would involve flushing the sediments from the Columbia Mills section of the sewer, collecting both water and sediment, treating and discharging the water and disposing of the sediment in an off-site landfill. In rating the alternative's compliance with applicable SCGs, it was assumed SCGs would be met. Since the sediments would be removed from the site, this alternative would provide for full protection of human health and the environment.

The implementation of this alternative could pose some short term risks to both the community and environment due to the increased off-site traffic and possible contaminant migration. Less than two years would be required to implement this alternative. Flushing the sediments from the line and disposing of them off-site would not be classified as a permanent remedy, however, long term monitoring and operation and maintenance would not be required at the site since the contaminated medium would be removed. Reduction in contaminant mobility would be provided for by containment.

This alternative would be somewhat difficult to implement since a water collection and treatment system would have to be installed. Since the sediments would be removed from the site, no future remedial actions at the site would be necessary. Extensive coordination would be required for this alternative.

B. Comparative Analysis of Alternatives

In this section, remedial alternatives for the Sewer System 4 sediments are compared to each other to identify the relative advantages and disadvantages of each.

Although there are no SCGs directly applicable to sewer sediment, the sediment in the sewer may be contributing to the somewhat elevated levels of some contaminants in the sewer water. Because of this, the alternatives involving no action and monitoring/permitting "scored" less under the SCG criterion than the other two alternatives of closing the line in place and flushing the sediments and disposing of them off-site. Also, the latter two alternatives would provide better protection of human health and the environment since any contamination would be immobilized.

Alternatives #1-#3 would be more effective in the short term than Alternative #4, which involves flushing the sediments and disposing of them off-site. This is due to the possible risks posed during the implementation of Alternative #4. Off-site disposal, however, would be more effective in the long term since the contamination would be removed from the site and no long term monitoring would be required. Closing the line in place was determined to be slightly less effective in the long term than off-site disposal since long term operation and maintenance would be required. The alternative of monitoring and permitting would be least effective in the long term because of the amount of long term monitoring required as well as operation and maintenance.

Closing the line in place would provide for the greatest reduction in contaminant mobility since the sediments would be sealed in the line. Flushing the sediments and disposing of them in an off-site landfill would provide for less reduction since it would be reversible for most constituents. The other two alternatives would provide for no reduction in contaminant toxicity, mobility or volume since no action would be taken to promote this.

No action would obviously be the most implementable alternative. The action alternative which rated the highest in terms of implementability was Alternative #2, Monitoring/permitting. This alternative would not be difficult to implement since it would only involve obtaining a permit and sampling the sewer discharge on a routine basis. Closing the line in place would be slightly less implementable, while flushing the sediment from the line and disposing of it off-site would be the most difficult alternative to implement. In comparing the alternative of off-site disposal to closing the line in place, no future remedial actions may be anticipated with off-site disposal, but delays would be somewhat likely and extensive coordination would be required.

The no action alternative would be the most cost effective remedial action. Of the action alternatives, closing the line in place was determined to be the least expensive. In terms of relative cost, flushing the sediments from the line and disposing of them off-site was determined to be the least cost effective at nearly two and one-half times the cost of closing the line in place.

C. Selection of Recommended Alternative

MPI recommends that the alternative of closing the Columbia Mills' portion of Sewer System 4 in place by injecting grout or some other type of inert material be implemented to remediate sediments contained in the line. Overall, this alternative was determined to be the most feasible and would provide for the greatest reduction in contaminant mobility. It was also the most cost effective action alternative. The conceptual design for this remedial action is provided in Section 5.0.

4.5.6 Sewer System 5 Sediment

The sediments in Sewer System 5, a former septic system located near UST Area 1, contain semivolatile, PCB and metal contamination. Three alternatives for the remediation of the sediments in Sewer System 5 were retained by the preliminary screening process and are analyzed in detail in this section. Results of the detailed analysis are summarized in Table 4-17.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

Under this alternative no action would be taken to remediate the sediment present in the septic tanks which comprise Sewer System 5. Although there are no SCGs applicable to the sediment present in Sewer System 5, the water present in Tank 2 contains some contaminants at levels exceeding Class D surface water standards. A discharge pipe apparently ran from Tank 2 part way down the bank of Benson Creek, which is a Class D stream. Precipitation and surface water run-off appear to be the only sources of water in Tank 2. If this tank were to overflow, the water could run into Benson Creek. Since some contaminants are present at elevated concentrations in the tank water, the no action alternative was determined not to be in full compliance with applicable SCGs. Although this contamination is present, the alternative would provide for the protection of human health and the environment since exposure to the contaminants was determined to be acceptable.

No short term risks would be posed to the community or environment during the implementation phase of this alternative. Since no action would be taken, the time required to implement this remedy would be less than two years. This alternative would not be effective in the long term since it is not permanent and the expected lifetime of the effectiveness is less than 15 years. No long term monitoring or operation and maintenance would be required, but this is due to the fact that no action can be taken under this alternative.

This remedial action would not be difficult to implement, but some future remedial actions may be necessary.

Alternative #2 - Close System In Place (Fill With Concrete)

This alternative would involve removing any water present in the tanks and then filling in both tanks with concrete. There are no SCGs directly applicable to the sediments present in the system. Since no water could contact the sediments following remediation, contravention of any water standards would not be expected. Thus, closing Sewer System 5 in place was assumed to meet applicable SCGs. This remedial action would protect human health and the environment since the sediments would be sealed in the tanks.

TABLE 4-17
DETAILED ANALYSIS RESULTS
REMEDIATION OF SEWER SYSTEM SEDIMENTS
SEWER SYSTEM 5

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	20	10	9	0	13	15	73
Close System in Place (Fill with Concrete)	10	20	10	11	5	12	15	83
Excavate Tanks & Sediment/Cap in Railroad Right-of-Way	10	20	9	10	2	11	5	67

No short term risks would be posed during the implementation of this alternative. This alternative would not be classified as permanent but would have an expected lifetime of effectiveness of up to 30 years. Only a minimum amount of long term monitoring would be required. Closing the system in place would provide for reduced contaminant mobility by containment and would be irreversible for most of the constituents.

This alternative would be somewhat difficult to construct when compared to the no action alternative. It should be reliable in meeting the specified goals and delays due to technical problems would be unlikely. Some future remedial actions may be necessary, such as repairing any cracks in the concrete.

Alternative #3 - Excavate Tanks And Sediment/Cap In Railroad Right-Of-Way

This alternative would involve excavating the tanks which comprise Sewer System 5 along with the sediment present in them and capping them in the Drum Disposal Area. As with the previous alternative, compliance with applicable SCGs was assumed under the SCG rating criterion. Protection of human health and the environment would be provided for since the material would be capped and exposure would be prevented.

No short term risks to the community would be posed during the implementation. Short term risks could be posed to the environment, but there are mitigative measures available to minimize the potential impacts. This remedy would not be classified as permanent, but would have an expected lifetime of approximately 30 years. Long term operation and maintenance and monitoring would be required to ensure the effectiveness of this alternative. For example, ground water monitoring wells would be used to ensure that the capped material is not contributing to ground water contamination. Capping the tanks and sediments in the Drum Disposal Area would provide for immobilization of contaminants through containment.

This remedial action would be somewhat difficult to construct since it would involve tank excavation and transportation to the Drum Disposal Area. As with other on-site disposal alternatives, some future remedial actions may be necessary. It is expected that normal coordination with other agencies would be required for this alternative.

B. Comparative Analysis of Alternatives

In this section, the remedial alternatives for the Sewer System 5 sediments are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

Although no SCGs are applicable to the sediments in Sewer System 5, the sediments in Tank 2 may be contributing to the slight contamination of water present in that tank. This water may be conveyed to Benson Creek. For this reason, the no action alternative was rated lower in its compliance with SCGs than the other two action alternatives. Closing the system in place or capping it in the Drum Disposal Area would prevent the sediments from contributing to the exceedance of SCGs in the water. All alternatives would provide for the protection of human health and the environment.

The alternatives of no action and closing the system in-place would pose no short term risks while excavating the tanks and sediment and capping them in the railroad right-of-way would be slightly less effective in the short term. This is due to the possible risks posed to the environment. The no action alternative would be the least effective in the long term. Even though no operation and maintenance would be required, the expected lifetime of effectiveness would be less than fifteen years. Closing the system in-place would be the most effective alternative in the long term. This would be slightly more effective than excavating the tanks and sediment and disposing of them in the railroad right-of-way because the relative degree of long term monitoring required would be less.

The no action alternative would provide no reduction in contaminant toxicity, mobility or volume since no action would be taken. Closing the system in place would provide for the greatest reduction in contaminant mobility, while excavating the tanks and sediment and disposing of them in the Drum Disposal Area would provide slightly less. Obviously, the most implementable alternative would be no action since it would not be difficult to construct and no delays would be anticipated. Minimum coordination would be required. The least implementable of the three alternatives analyzed in detail was determined to be Alternative #3, Excavate tanks and sediment/cap in railroad right-of-way. This alternative would be somewhat difficult to construct and some future remedial actions may be necessary.

In terms of cost effectiveness, the no action alternative was rated the highest. The most cost effective action alternative was determined to be closing the system in place. Excavating and capping the material in railroad right-of-way would cost approximately three times the cost of closing the system in place.

C. Selection of Recommended Alternative

Results of the detailed analysis of alternatives for the remediation of Sewer System 5 sediments indicate that the most feasible remedial action would be to close the system in place by filling it with concrete. This alternative would be effective in both the short and long terms and would provide for the greatest reduction in contaminant mobility. However, MPI recommends that the second most effective action alternative of excavating the tanks and sediments and capping them in the railroad right-of-way be implemented as part of larger scale remedial action.

Based on the analytical results of sediment sampling conducted in Benson Cre elevated levels of metals are present in the creek sediments near Sewer System 5. C possible scenario was that System 5 was contributing to the contamination of the cr sediments. Sampling of System 5, though, indicated that levels of most contamin (especially metals) appear to be higher in Benson Creek near System 5 than in the two tanks themselves. This indicates that the source of the contamination present in the creek sediments is most likely not Sewer System 5, but some other source nearby. One possible source could be the fill material which comprises the creek bank between Benson Creek and the System 5 tanks. This material consists of slag and ash.

Since the alternative of excavating the tanks and sediment and capping them in the Drum Disposal Area was also determined to be feasible for remediating System 5, MPI recommends that this alternative be implemented to include the slag and ash fill adjacent to System 5. Removal of this material could be done at the same time the sediments in this area (UST Area 1 creek sediments remedial unit) are excavated and capped in the railroad right-of-way. In this way, no great increase in remedial efforts would be expended.

4.6 ASBESTOS CONTAMINATED BUILDINGS AND DEBRIS

In this section, the alternatives for the remediation of the asbestos contaminated buildings and debris at the site retained by the preliminary screening process are analyzed in detail and a preferred remedial action is recommended for each remedial unit. Although Columbia Mills accepts no responsibility for asbestos contamination at the site, MPI has analyzed alternatives to clean up the asbestos as agreed upon with the State.

4.6.1 Building - Main Plant Area

Asbestos contamination is widespread throughout the buildings at the Columbia Mills site. During an inspection conducted by C & S Environmental Laboratory, Inc. in August 1987, asbestos was found to be present in pipe insulation, wire insulation, transite board, boiler insulation and floor sweepings. All buildings inspected were found to contain some amount of asbestos, including Buildings 8, 10A, 11, 12, 30, 31 and 32. Building 11 is

TABLE 4-18
DETAILED ANALYSIS RESULTS
REMEDIATION OF MAIN PLANT AREA
BUILDING 11 ASBESTOS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	17	4	6	0	13	15	61
Seal Buildings	10	20	9	4	2	13	15	73
Remove Asbestos by OSHA Methods/ Dispose in Off-Site Landfill	10	20	6	12	5	11	12	76
Remove Asbestos by OSHA Methods/ Dispose in On-Site Landfill	10	20	8	7	5	9	10	69

one of the only buildings still largely intact which contains asbestos that could be removed in a segregated fashion. Remediation of this building is addressed in this section. Remediation of the more dilapidated buildings is addressed in Section 4.6.2.

Four of the original remedial alternatives for the asbestos contaminated building were retained by the preliminary screening process and are analyzed in detail in this section. The results of the detailed analyses are summarized in Table 4-18.

A. Individual Analysis of Alternatives

<u>Alternative #1</u> - No Action

The no action alternative does not allow for compliance with chemical-specific SCGs for asbestos. This alternative would be somewhat protective of human health and the environment because the magnitude of risk to the environment is very small and only the air route of exposure is unacceptable.

The no action alternative would be very ineffective in both the short-term and long-term since the remedial measure would not be permanent or long-lived. No reduction of toxicity, mobility or volume of the asbestos waste would occur with this alternative. However, the no action alternative would be very implementable since no construction or coordination would be required.

<u>Alternative #2</u> - Seal Building 11

This alternative would involve sealing the building closed with bricks/concrete blocks to prevent the asbestos from becoming airborne and being blown off-site. Since the asbestos would be prevented from becoming airborne, this alternative should comply with any applicable SCGs and would provide for the protection of human health and the environment. The building could not be used, though, because of the presence of asbestos.

This alternative would pose some risks to the community during implementation because of the possibility of some asbestos becoming airborne. These risks could be easily controlled, though, by temporarily sealing the building with plastic sheeting. No risks to the environment would be posed in the short term. Sealing the building would not be a permanent remedy and it would have an expected effective lifetime of less than 15 yrs. Long term monitoring, operation and maintenance would be required to insure the effectiveness of this alternative. This alternative would provide for the immobilization of the asbestos through containment.

The construction of the building seals would not be difficult when compared to the other alternatives. Delays due to technical problems would be unlikely during implementation and normal coordination with other agencies would be required. Some future remedial actions may be necessary, such as seal repair.

<u>Alternative #3</u> - Remove Asbestos By OSHA Methods/Dispose In Off-Site Landfill

Under this alternative, the asbestos in Building 11 would be removed by OSHA methods and disposed of in an off-site landfill. Applicable SCGs would be complied with since work would be done in such a manner as to prevent the spreading of asbestos contamination during implementation. Removing the asbestos from the site altogether would provide for the protection of both human health and the environment.

Possible short term risks to the community and the environment may exist during the implementation of this alternative. Risks of exposure could exist during the on-site work of asbestos consolidation and during the transportation of asbestos off-site. These risks would be easily controlled, though, by enclosing the work area with plastic sheeting and through the bagging of the asbestos material for disposal. This containment alternative was classified as permanent since it would significantly and, in the case of asbestos, permanently reduce the mobility and availability of the asbestos to environmental transport and uptake. Since the asbestos material would be removed from the site, no long term monitoring, operation and maintenance would be required.

Implementing this alternative would be somewhat more difficult than implementing the previous alternative since the asbestos would have to be segregated from the other debris and bagged. Thus, direct asbestos handling would be involved where as it would not if the buildings were sealed. Disposing of the material off-site would be reliable in meeting the clean-up goals, and no future remedial actions at the site would be necessary. Extensive coordination with other agencies would be required to insure all asbestos handling is done in accordance with OSHA and New York State Department of Labor regulations.

<u>Alternative #4</u> - Remove Asbestos By OSHA Methods/Dispose In On-Site Landfill

This alternative would involve removing the asbestos from the building and disposing of it in an on-site landfill. Applicable SCGs would be complied with since work would be done in such a manner as to prevent the spreading of asbestos contamination during implementation. By capping the material in a landfill on-site, unrestricted use of the land and water would not be possible. However, this alternative would provide for the protection of human health and environment since exposure would be prevented.

Short term risks could be posed to both the community and environment during the implementation phase of this alternative due to the asbestos handling. These risks could be easily controlled, though, by following the proper procedures for asbestos work and complying with the appropriate regulations. As with the previous alternative, which also involved land disposal, disposal in an on-site landfill would be permanent for asbestos. Long term monitoring, operation and maintenance would be required, though, since the material would remain on site and the condition of the landfill would have to be maintained.

This alternative would be difficult to construct since it would involve asbestos handling as well as the construction of a landfill. Disposing of the material in a landfill would be reliable in meeting the clean up goals. Some future remedial actions may be necessary, such as cap repair. Again, extensive coordination would be required to implement this alternative.

B. Comparative Analysis of Alternatives

In this section, the remedial alternatives analyzed in detail for the asbestos contaminated Building 11 are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

All three action alternatives would comply with applicable SCGs and provide equally for the protection of human health and the environment. Removing the asbestos from the site and disposing of it in an off-site landfill would, in theory, provide for unrestricted use of the building as well as the land (since an on-site landfill would not be constructed). The no action alternative would not comply with chemical-specific SCGs, and a potential risk of exposure to asbestos via the air route would exist.

The alternative to seal the building would be the most effective in the short term since it would not involve a great amount of asbestos handling, if any. Handling the material may cause some asbestos to become airborne, thus increasing the risk of exposure as well as environmental transport. Off-site disposal would be the least effective action alternative in the short term since the asbestos would be handled and transported off-site. The no action alternative would be the least effective in the short term since the asbestos would be left on-site in its current condition.

In the long term, removing the asbestos from the building and disposing of it off-site was determined to be the most effective alternative. It would be a permanent remedy, the material would be removed from the site and no long term monitoring, operation and maintenance would be required at the site. Disposing of the material on-site would be less effective in the long term since the material would be left on-site and long term monitoring and maintenance would be required. Sealing the building was determined to be the least effective action alternative in the long term. It would not be permanent, the waste would be left at the site and long term monitoring/maintenance would be required. Also, the building could not be used or demolished and replaced without having all of the asbestos contained in it removed first. The no action alternative appears to be more effective in the long term because no monitoring, controls or maintenance would be required.

Disposing of the asbestos material in a landfill, either on-site or off-site, would provide for a greater reduction in contaminant mobility than sealing the building. All action alternatives would immobilize the asbestos by containment. But, landfill disposal was determined to be irreversible since disturbance of the material would be much less likely in the landfill than in the building. No action would not reduce the toxicity, mobility or volume of the waste.

The most implementable action alternative for the remediation of the asbestos contaminated Building 11 would be to seal it up to prevent asbestos from being blown around. Removing the asbestos by OSHA methods and disposing of it in an off-site landfill was determined to be slightly less implementable. This is because it would be more difficult to construct, delays during implementation would be somewhat likely and extensive coordination would be required with other agencies. On-site disposal of the asbestos would be the least implementable of the action alternatives since it would be the most difficult to construct and some future remedial actions, such as cap repair, may be required. No action would be the easiest to implement since there is no construction or coordination involved.

In terms of total relative costs for the three action alternatives, sealing the building was determined to be the most cost effective. The least cost effective alternative would be disposing of the asbestos on-site. It was estimated that on-site disposal would incur costs one and one half times greater than those incurred by sealing the building.

C. Selection of Recommended Alternative

MPI recommends that the alternative of off-site disposal be implemented to remediate the asbestos contamination present in Building 11. This alternative would provide for the protection of human health and the environment and would be the most effective alternative in the long term. The conceptual design for this alternative is provided in Section 5.0.

4.6.2 Debris Piles in Building Interiors and Exteriors - Main Plant Area

Asbestos has been detected in the debris piles located on the grounds of the Columbia Mills site. Asbestos has also been found in all buildings (besides Building 11) inspected. The asbestos remediation in Building 11 was discussed in the preceding section.

TABLE 4-19
DETAILED ANALYSIS RESULTS
REMEDIATION OF MAIN PLANT AREA
DEBRIS PILE ASBESTOS

Alternative	Compliance with SCGs (10)	Protection of Human Health and Environment (20)	Short Term Effectiveness (10)	Long Term Effectiveness (15)	Reduction of Toxicity, Mobility or Volume (15)	Implementability (15)	Cost (15)	Total (100)
No Action	6	17	4	6	0	13	15	61
Consolidate Material/Cover in Place	10	20	8	7	2	11	15	73
Excavate/Dispose of in On-Site Landfill	10	20	8	7	5	9	8	67
Excavate/Dispose of in Off-Site Landfill	10	20	6	11	5	11	8	71

Four alternatives for the remediation of the asbestos contaminated debris piles were retained by the preliminary screening process and are analyzed in detail in this section. The results of the detailed analyses are summarized in Table 4-19.

A. Individual Analysis of Alternatives

Alternative #1 - No Action

The no action alternative does not allow for compliance with chemical-specific SCGs for asbestos. This alternative would be somewhat protective of human health and the environment because the magnitude of risk to the environment is very small and only the air route of exposure is unacceptable.

The no action alternative would be very ineffective in both the short-term and long-term since the remedial measure is not permanent or long-lived. No reduction of toxicity, mobility or volume of the asbestos waste would occur with this alternative. However, the no action alternative would be very implementable since no construction or coordination would be required.

Alternative #2 - Consolidate Material/Cover In Place

Under this alternative, all asbestos contaminated debris would be consolidated and moved to a central location at the site. The material would then be capped with soil. Since the asbestos would be prevented from becoming airborne, this alternative should comply with any applicable SCGs, and it would provide for the protection of human health and the environment. Unrestricted use of the land would not be possible, though, since the covered material could not be disturbed.

This alternative would be relatively effective in the short term. During implementation, risks of exposure and contaminant transport would be increased due to the handling of asbestos in the open. Compliance with applicable regulations would control these risks, though. Capping the consolidated material would not be a permanent remedy, but it would have a long effective lifetime. The material would be immobilized at the site by containment, and long term monitoring and operation and maintenance would be required to insure the effectiveness of the alternative.

This alternative would not be difficult to construct when compared with the other action alternatives. Some future remedial actions may be necessary, such as cap repair. Extensive coordination would be required with other agencies to insure all applicable regulations are complied with for asbestos work.

Alternative #3 - Excavate/Dispose Of In On-Site Landfill

This alternative would involve excavating the asbestos laden debris and disposing of it in an on-site landfill. Applicable SCGs would be complied with since work would be done in such a manner as to prevent the spreading of asbestos contamination during implementation. By capping the debris in a landfill on-site, unrestricted use of the land and water would not be possible. However, this alternative would provide for the protection of human health and the environment since exposure would be prevented.

Short term risks could be posed to both the community and environment during the implementation phase of this alternative due to the asbestos handling. These risks could be easily controlled, though, by following the proper procedures for asbestos work and complying with the appropriate regulations. Disposal in an on-site landfill would be permanent for asbestos since it would permanently reduce the mobility and availability of the asbestos to environmental transport and intake. Long term monitoring, operation and maintenance would be required, though, since the material would remain on site and the condition of the landfill would have to be maintained.

This alternative would be difficult to construct since it would involve asbestos handling as well as the construction of a landfill. Disposing of the material in a landfill would be reliable in meeting the clean up goals. Some future remedial actions may be necessary, such as cap repair. Again, extensive coordination would be required to implement this alternative.

Alternative #4 - Excavate/Dispose Of In Off-Site Landfill

Under this alternative, the debris piles would be disposed of in an off-site landfill. Applicable SCGs would be complied with since work would be done in such a manner as to prevent the spreading of asbestos contamination during implementation. Removing the debris from the site altogether would provide for the protection of both human health and the environment.

Possible short term risks to the community and environment may exist during the implementation of this alternative. Risks of exposure could exist during the on-site work of asbestos consolidation and during the transportation of debris off-site. These risks could be easily controlled, though, by wetting down the work area and bagging identified asbestos material for disposal. This containment alternative was classified as permanent since it would significantly and, in the case for asbestos, permanently reduce the mobility and availability of the asbestos to environmental transport and uptake. Since the debris would be removed from the site, no long term monitoring, operation and maintenance would be required.

Implementing this alternative would be somewhat less difficult than implementing the previous alternative since a landfill would not have to be constructed on-site. Disposing of the material off-site would be reliable in meeting the clean up goals, and no future remedial actions at the site would be necessary. Extensive coordination with other agencies would be required to insure all asbestos handling is done in accordance with OSHA and New York State Department of Labor regulations.

B. Comparative Analysis of Alternatives

In this section the remedial alternatives analyzed in detail for the asbestos contaminated debris piles are compared to each other on a criterion-by-criterion basis to identify the relative advantages and disadvantages of each.

All three action alternatives would comply with applicable SCGs and provide equally for the protection of human health and the environment. Removing the debris from the site and disposing of it in an off-site landfill would, in theory, provide for unrestricted use of the land (since asbestos contamination would not remain at the site). No action would not comply with chemical-specific SCGs, and a potential risk of exposure to asbestos via the air route would exist.

Disposing of the debris at the site, either by consolidating it and capping it or in an on-site landfill, would pose less risks during implementation than off-site disposal. All action alternatives would involve the handling of asbestos which may cause some asbestos to become airborne. This would increase the risk of exposure as well as environmental transport. Off-site disposal would be the least effective action alternative in the short term since the asbestos would be handled and transported off-site. No action would be the least effective in the short term overall.

In the long term, disposing of the asbestos laden debris off-site was determined to be the most effective alternative. It would be a permanent remedy, the material would be removed from the site and no long term monitoring or operation and maintenance would be required at the site. Disposing of the material on-site would be less effective in the long term since the material would be left on-site and long term monitoring and maintenance would be required. No action would be the least effective since the untreated waste would be left on-site and it is not a permanent remedy.

Disposing of the asbestos laden debris in a landfill, either on-site or off-site, would provide for a greater reduction in contaminant mobility than consolidating the material and capping it in the Main Plant Area. All action alternatives would immobilize the asbestos by containment. But, landfill disposal was determined to be irreversible since disturbance of the material would be much less likely in the landfill than in the capped area at the site. No action would not reduce the toxicity, mobility or volume of the asbestos.

The no action alternative would be the easiest to implement because no construction or coordination is required. The most implementable action alternatives were determined to be consolidating and covering the debris in place and disposing of it at an off-site landfill. These alternatives ranked equally in terms of implementability, but there were differences in the technical feasibility of each. Consolidating and covering the debris would be less difficult to construct than off-site disposal and less delays would be expected, but it would be less reliable in meeting the specified clean up goals and some future remedial actions may be necessary. Overall, on-site disposal ranked as the least implementable alternative due mainly to the fact that an on-site landfill would have to be constructed and maintained.

Except for the no action alternative, which has no cost associated with it, it was determined that overall costs involved with covering the debris material in place would be more cost effective than on-site and off-site landfill disposal. It was estimated that the relative order of magnitude costs of the latter two alternatives would be twice that of consolidation/capping.

C. Selection of Recommended Alternative

MPI recommends that the alternative of consolidating the debris material and covering it in place be implemented to remediate the asbestos contaminated debris piles. This action would provide for the protection of human health and environment and was determined to be one of the most implementable alternatives. The conceptual design of this remedial action is provided in Section 5.0.

5.0 CONCEPTUAL DESIGN OF THE RECOMMENDED ALTERNATIVES

5.1 INTRODUCTION

This section of the FS Report provides a conceptual design of the recommended alternatives and describes the integration and implementation of the remedial measures. The recommended remedial alternatives for each remedial unit were selected based on the results of the detailed analysis in accordance with the guidelines established by the NYSDEC TAGM "Selection of Remedial Actions at Inactive Hazardous Waste Sites". The alternatives for each remedial unit that remained from the preliminary screening process in Section 3 were analyzed and evaluated in detail in Section 4. The detailed screening was based on the compliance of each alternative with applicable New York State SCGs, overall protection of human health and the environment, short-term impacts and effectiveness, long-term effectiveness and permanence, reduction of toxicity, mobility or volume of hazardous wastes, implementability and relative costs.

Based on the results of the detailed evaluation of the screened alternatives in Section 4, a remedial alternative was recommended for each remedial unit. The remedial measure recommended for each unit is outlined in Table 5-1. A summary of estimated costs for each measure appears in Section 5.4.

5.2 INTEGRATION OF REMEDIAL ALTERNATIVES

Although the remedial alternatives were developed and analyzed separately for each remedial unit, some of the remedial measures that have been recommended address more than one remedial unit due to the impact of a source area on more than one medium. Therefore, the conceptual design of a remedial measure may encompass more than one remedial unit. Table 5-2 summarizes the integration of the remedial measures.

TABLE 5 - 1
COLUMBIA MILLS
RECOMMENDED ALTERNATIVES

REMEDIAL UNIT	REMEDIAL MEASURE
SOIL	
Drum Disposal Area Fill Material	Drain Ponds, Reroute Creek, Lime Stabilization, Cap in Place
UST Area 1 Soil	Vapor Extraction
Test Pit 3 Area Soil	Vapor Extraction, Ground Water Extraction
UST Excavated Soil Piles	Lime Stabilization, Cap in Railroad Right-of-Way
SEDIMENT	
Drum Disposal Area Pond & Creek Sediment	Excavation, Lime Stabilization, Cap in Railroad Right-of-Way
UST Area 1 Creek Sediment	Excavation, Lime Stabilization, Cap in Railroad Right-of-Way
GROUND WATER	
Drum Disposal Area Shallow Ground Water	Divert Pond Water, Lower GW Table, Discharge to Surface Water
Test Pit 3 Area Shallow Ground Water	Extraction, Treatment, Discharge to Surface Water
UST Area 1 Shallow Ground Water	Extraction, Treatment, Discharge to Surface Water
Test Pit 3 Area Deep Ground Water	Extraction, Treatment, Discharge to Surface Water
Well B-19D Area Deep Ground Water	Extraction, Treatment, Discharge to Surface Water
SEWERS	
Sewer System 1	Excavate Lines, Dispose in Capped Area
Sewer System 2A	Remove Sediments, Dispose in Capped Area
Sewer System 2B	Divert Upstream Portion to Benson Creek, Remove Sediments, Dispose in Capped Area
Sewer System 3	Remove Sediments, Dispose in Capped Area, Fill Trenches
Sewer System 4	Remove Sediments, Dispose in Capped Area
Sewer System 5	Excavate Tanks, Cap in Railroad Right-of-Way
ASBESTOS	
Building Asbestos	Remove Asbestos by OSHA Methods, Dispose in Off-Site Landfill
Debris Pile Asbestos	Consolidate Material, Cover in Place

TABLE 5 - 2
COLUMBIA MILLS
INTEGRATION OF REMEDIAL MEASURES

	REMEDIAL MEASURE	REMEDIAL UNIT ADDRESSED
A.	Lime Stabilize, Cap Wastes in the Railroad Right-of-Way	Drum Disposal Area Fill Material
		UST Excavated Soil Piles
		Drum Disposal Area Pond & Creek Sediment
		UST Area 1 Creek Sediment
		Drum Disposal Area Shallow Ground Water
		Tanks 1 and 2, Sewer System 5
		Sediments and Excavated Materials from Sewers
B.	Vapor Extraction of Soils, Extraction and Treatment of Ground Water	Test Pit 3 Area Soil
		Test Pit 3 Area Shallow Ground Water
		Test Pit 3 Area Deep Ground Water
		UST Area 1 Soil
		UST Area 1 Shallow Ground Water
		Well B-19D Area Deep Ground Water
C.	Remove Sediments and Seal or Excavate Main Plant Area Sewers	Sewer System 1
		Sewer System 2A
		Sewer System 2B, Main Plant Area Portion
		Sewer System 3
		Sewer System 4, Main Plant Area Portion
D.	Asbestos Abatement:	
	Remove Building Asbestos by OSHA Methods, Dispose in Off-Site Landfill	Building Asbestos
	Consolidate Debris Piles and Cover in Place	Debris Pile Asbestos

5.2.1 Combined Remedial Measures

A. Lime Stabilize, Cap Wastes in the Railroad Right-of-Way

The selected remedial measure for the soil and fill in the Drum Disposal Area will also incorporate: the sediments which are to be dredged from the Drum Disposal Area ponds and a portion of the intermittent creek, the sediments dredged from Benson Creek adjacent to UST Area 1, the sediments and excavated materials from the sewers in the Main Plant Area, the stockpiled soils from the former UST areas and the excavated tanks and surrounding fill from Sewer System 5. The wastes will be stabilized by the application of lime, covered with a single membrane barrier cap and surrounded by a leachate collection trench.

Also included within the same remedial measure is the drainage of the Drum Disposal Area ponds and diversion of the creek that drains Pond 1 in the Drum Disposal Area. The drainage of the ponds and creek serves to lower the ground water table and to divert the surface water away from the contaminated fill, facilitating the remediation of the shallow ground water between Ponds 1 and 3. The upstream portion of Sewer System 2B will be diverted to Benson Creek and will provide the drainage for Ponds 2 and 3. The system will serve as a permanent conveyance for the diverted water away from the fill, as is called for in the remediation of the shallow ground water in the Drum Disposal Area.

B. Vapor Extraction of Soils, Extraction and Treatment of Ground Water

The remedial measure of utilizing vapor extraction to treat the VOC-contaminated Test Pit 3 Area soil is being implemented as an IRM and includes the pumping and treating of ground water to depress the ground water table in the vapor extraction treatment area. Similarly, if vapor extraction of the soil in the periphery of UST Area 1 is deemed necessary, the vapor extraction treatment will be done in conjunction with the pumping and treating of the shallow and deep ground water in that area.

C. Removal of Sediments from Main Plant Area Sewers

The remedial measure recommended by MPI was to seal and plug the Main Plant Area sewers. However, based on further consideration of future use of the site and public concern, the NYSDEC has determined that the sewer sediments must be removed from the Main Plant Area. Therefore, Sewer Systems 1, 2A, 3, and the Main Plant Area portions of 2B and 4, will be remediated as recommended by the NYSDEC. The inlets and outlets of nearly all sewer systems will be sealed and all accessible conveyances of the systems will be cleaned of sediments. In the case of sewer system 1, excavation of the line is a more efficient and cost-effective sediment removal measure.

The sediments removed by flushing or excavation will undergo TCLP analyses to determine proper disposal of the sediments. If the sediments do not exceed the regulatory TCLP levels, they will be disposed of in the capped area. However, if any of the TCLP levels are exceeded, other appropriate disposal methods will be used.

Some coordination of the remediation of sewers will be necessary. For example, the remediation of Sewer Systems 2A and 2B should not be implemented until after the Test Pit 3 Area IRM is completed. Sealing of these sewer lines might back up ground water in the Test Pit 3 Area and negatively affect the vapor extraction IRM.

D. Asbestos Abatement

Although The Columbia Mills, Inc. accepts no responsibility for asbestos contamination at the site, MPI recommends that the asbestos-contaminated buildings be remediated using a different technology than that used for the asbestos-contaminated debris piles. The building asbestos should be removed by OSHA-approved methods and transported to a permitted landfill for disposal. The debris piles containing asbestos should be consolidated, covered by clean fill and capped.

5.3 CONCEPTUAL DESIGN OF REMEDIAL MEASURES

The following are conceptual designs for the remedial measures to be employed at the Columbia Mills site. Provisions will be made to provide for safe working conditions during the construction period. A site safety plan will be developed and appropriate actions will be taken to insure the health and safety of people on the site.

5.3.1 Lime Stabilize, Cap Waste In Railroad Right-of-Way

The remedial measure which will involve lime stabilizing and capping various site wastes in the railroad right-of-way is the largest and most complex of the remedial measures to be conducted at the Columbia Mills site. This remedial measure will consolidate and confine a large portion of the contaminated wastes at the Columbia Mills site to prevent the risk of contact with the contaminated media. The remedial measure consists of the following tasks to be carried out in the approximate order listed below:

A. Sampling and analysis to determine extent of soil to be excavated outside the limits of capped area.

B. Diversion of upstream portion of Sewer System 2B.

C. Creation of access (roadways and clearings) to capped area. Installation of electric service.

D. Creation of catch basins and temporary trenches. Installation of treatment systems. Treatment of water from catch basins will be ongoing during construction of capped area. Sediments will be removed from catch basins on a regular basis and placed in the right-of-way.

E. Application of lime to contaminated fill left in place in the railroad right-of-way. Includes survey and stakes to define boundaries.

F. Construction of intercepting trench at west end of capped area to divert ground water away from fill. Placement of recovery wells and pumps to further lower the ground water table, if necessary.

G. Excavation of contaminated fill materials in the Drum Disposal Area outside the limits of the capped area. Excavated fill will be placed within the boundaries of the capped area. Application of lime to the excavated fill materials. Backfill excavation with clean soil.

H. Construction of inner leachate collection trench, collection pit, and treatment system.

I. Dredging of contaminated sediments from the intermittent creek and Ponds 1, 2, and 3, as well as removal of sediment and fill from the Sewer System 5 area and sediments from the creek adjacent to UST Area 1. Sediments will be placed within the boundaries of the capped area. Application of lime to the sediments.

J. Placement of sewer sediments or excavated sewers from the Main Plant Area (remedial measure for Sewer Sediments) within the limits of the capped area. Application of lime to the sediments.

K. Diversion of the water in Ponds 1, 2, and 3 by construction of permanent trenches through the bottom of the ponds. The water from Pond 1 will be diverted around the Drum Disposal Area to the intermittent stream beyond the clean up area. The water drained from Ponds 2 and 3 will be diverted to MH-1A on Sewer System 2B.

L. Removal of catch basins. Disposal of catch basin sediments in capped area.

M. Placement of UST Stockpiled Soils over fill and sediments in capped area to facilitate proper grading prior to construction of the cap. Placement of additional clean fill if necessary for grading.

N. Construction of single membrane barrier cap.

O. Replacement of amphibian breeding sites.

P. Placement of monitoring wells.

Q. Secure capped area with fence and locks.

The majority of construction, especially with respect to the dredging of sediments and drainage of ponds, will be executed during the summer and early fall months when the ground water table is the lowest. In this manner, the sediments removed from the creek and ponded areas in the Main Plant Area and the Drum Disposal Area will be relatively dry and should not require additional dewatering. Construction during the dry period will also facilitate construction of the drainage trenches in the Drum Disposal Area. An intercepting trench will be constructed at the west end of the capped area to control the flow of water into the ponds and the capped area. It may be necessary to add recovery wells in the vicinity of the ponds during the dredging of the ponds and construction of the drainage trenches to further lower the ground water table. The ground water extracted from these wells will be pumped to the catchment basins along with the water draining from the ponds and treated before being discharged into Sewer System 2B.

The total estimated project cost for this remedial measure (Tasks A through Q) is \$3,006,905 and the total present worth is \$3,228,400. A detailed breakdown of the estimated cost is presented in Section 5.4.

A. Sampling and Analysis of Soil in Drum Disposal Area

Additional sampling of the soil in the Drum Disposal Area will be conducted to determine the limits of remediation. Any soil found to contain concentrations of lead above the clean-up level will be excavated and/or treated with lime and capped.

B. Diversion of Sewer System 2B

As shown in Figure 5-1, a new connection will be made to Sewer System 2B at a point near the former apartment buildings. The new piping will convey water from this point to the ponded area of Benson Creek behind the Main Plant Area. This will serve as a permanent conveyance for water drained from the Drum Disposal Area, as well as for storm water from the catch basin on Benson Avenue. The existing pipe leading toward the Main Plant Area will be broken and plugged to prevent water from flowing into the Main Plant Area portion of the sewer.

The new section of sewer will have a slope of at least 0.004 so that water will flow from the new connection to the ponded area of Benson Creek. The piping will be 12 inches in diameter and approximately 1,000 feet in length. The outlet construction will consist of a concrete structure with its foundation in the bank of the pond, downstream from the discharge of Benson Creek.

C. Creation of Access and Installation of Electric Service

Once the limits of remediation have been determined, some initial clearing of brush and debris will be necessary to create access and roadways. A gravel access roadway will be constructed to facilitate movement of equipment during excavation and construction in the Drum Disposal Area and will serve as a roadway to monitor the site after the cap is completed.

Electric service will be brought into the Drum Disposal Area to power pumps, treatment systems, etc.

D. Catchment Areas

Two separate catchment areas will be constructed as shown in Figure 5-1. One will serve to collect water and sediments from Pond 1 and the intermittent creek for treatment, and the other will collect the same from Ponds 2 and 3. The treated water from each catchment area will be pumped to the intermittent stream downstream of the area or to MH2B-1A, depending on the catchment used. Construction of the catchment areas may begin prior to completion of the diversion of Sewer System 2B. However, the trench from Ponds 2 and 3 cannot be connected to the catchment area until the diversion of Sewer System 2B is complete. Discharge limits based on SCGs will be determined prior to the construction of the catchment areas and treatment systems.

The construction of the catchment area for Pond 1 and the intermittent creek will involve widening a portion of the intermittent creek downstream from the area where sediments are to be dredged to a width of 40 feet. The portion of the creek that will be serving as the catchment area will be deepened to about four feet to assist in capturing and settling out sediments and to allow for enough volume to completely drain Pond 1, if necessary. A temporary trench will be excavated to a depth of approximately three feet through Pond 1 and tied into the intermittent stream.

The catchment area for Ponds 2 and 3 will be constructed by damming a portion of the low area east of MH2B-1A. A trench will be dug between Ponds 2 and 3 to allow for drainage of water from Pond 2 to Pond 3. Another trench will be constructed to connect Pond 3 to the catchment area. The catchment basin will be approximately 20 feet wide by 12.5 feet long by 4 feet deep to allow for enough volume to completely drain Ponds 2 and 3, if necessary.

Once the catchment areas are completed, a separate treatment system will be installed and operated at each catchment basin. Monitoring and treatment of the water will be ongoing during the construction period to ensure the treated water meets appropriate water quality criteria. The type of treatment will be determined based upon the analysis of the first water collected and the historical ground water and surface water data. The treated water will be discharged to the intermittent stream and to Sewer System 2B.

Sediments that have accumulated in the catch basins will be removed on a regular basis during construction of the capped area. The sediments will be placed in the right-of-way.

Once construction of the capped area is complete, subsequent analysis of any water remaining in the catchment areas will determine the need for continued treatment. Once the water in the catchment basins meets the SCGs for surface water, treatment will cease, the catchment areas will be removed and the intermittent stream will be restored. Likewise, the trench from Pond 3 leading to the catchment area will be diverted to MH2B-1A for direct discharge into Sewer System 2B.

E. Lime Stabilization of Contaminated Fill in the Railroad Right-of-Way

The outer boundaries of the capped area will be finalized during more extensive field surveying based on soil analysis. Lime will be applied to this area at a rate to be determined by pilot testing. The anticipated limit of the capped area is shown on Figure 5-1. The application of lime to the contaminated fill is expected to raise the pH of any percolating waste sufficiently to prevent the leaching of metals from the fill material. The treatment will not involve mixing the lime into the material, which is proposed to be capped, but will involve the application of lime to the surface of the material. Precipitation as well as any water originating from excavated sediments, which will also be capped in this area, will aid in the lime's infiltration into the material. Each addition of wastes from other areas of the Columbia Mills site will be similarly stabilized by the application of lime.

F. Construction of Trench at West End of Capped Area

A wide trench will be constructed at the west end of the Drum Disposal Area as shown in Figure 5-1. The trench will divert ground water flow to Trenches A and B on either side of the area to be capped and away from the fill material, thus preventing contact with the contaminated fill. It will also act to limit access to the capped area. If necessary, recovery wells and pumps may also be installed to further lower the ground water table. The trench will be excavated to a depth of approximately two to three feet below the lower limit of the fill material (approximately 15 feet below the land surface) and will be an estimated 50 to 60 feet wide at land surface. The trench length will be approximately 500 feet.

G. Excavation of Contaminated Fill Outside of the Capped Area

Some of the contaminated fill is currently located outside of the boundaries of the area to be capped. For this reason, it will be necessary to excavate a small quantity of the fill and place it inside the limits of the area to be capped as shown on Figure 5-1. The extent of the fill to be excavated will be confirmed during additional sampling and analysis of the fill. Comparisons of detected levels will be made with predetermined clean-up levels. The excavated fill will then be stabilized by the application of lime as previously described. Areas that have concentrations exceeding the clean-up levels will be excavated and the fill replaced with clean fill before other construction such as the installation of leachate collection trenches, can proceed.

H. Construction of Leachate Collection Trench

A separate trench to collect leachate will be excavated around the boundaries of the capped area as shown in Figure 5-2. The leachate collection trench will completely surround the area to be capped. The cap will extend over the trench to prevent storm water run-off from infiltrating the contaminated fill.

The trench will be 3 feet wide and will extend just below the lower limits of the contaminated fill. Perforated pipe will be installed in the bottom and the trench will be filled with crushed gravel.

The leachate will be collected and monitored in a collection pit. Adjustments of the pH of the leachate will be made as necessary. Treatment alternatives are being evaluated and may involve on-site or off-site treatment. On-site treatment could consist of any of the following treatment methods, singly or in combination: oxidation, ion exchange, precipitation, sedimentation, or filtration.

I. Dredging of Sediments and Excavation of Sewer System 5 Tanks

The areas containing contaminated sediment, as shown on Figures 2-4 and 2-6, will be dredged and the sediment removed from these areas will be transported to the Drum Disposal Area. The sediments removed from the intermittent creek and Ponds 1, 2 and 3 will be placed directly onto the lime stabilized area of fill within the limits of the capped area as shown in Figure 5-1. Removal of sediments from the intermittent creek will include the excavation of the buried clay pipe located near the eastern end of the concrete "tunnel". The tanks from Sewer System 5 and the fill comprising the adjacent creek bank will be excavated during the dredging of the UST Area 1 sediments. Additional sampling will be necessary to confirm the remedial boundary in this area. The sediments removed from Benson Creek will be transported to the railroad right-of-way along with the tanks and fill excavated from Sewer System 5 and the adjacent bank, where they will be placed with the Drum Disposal Area sediments. Lime will be applied at a rate to be determined to prevent the leaching of metals from the sediments.

The sediments removed are expected to be relatively dry due to the seasonal low ground water and drainage of the water from the ponds in the Drum Disposal Area into catchment basins. As previously stated, it may be necessary to add recovery wells to pump down the ground water in the area of the ponds to facilitate removal of sediments. In order to prevent the water in Benson Creek from flowing into the area from which sediments are being removed, a small temporary dam or sheet piling will be installed and the creek will be temporarily diverted (possibly into the new branch of sewer system 2B). Once the contaminated sediments have been removed, the dam or sheet piling will be removed and the creek will be restored.

J. Disposal of Main Plant Area Sewer Sediments

The sediments and excavated sewers from the Main Plant Area will be placed in the capped area for disposal providing the TCLP analyses of the sediments indicate no exceedances of the regulatory levels. Lime will be applied to the sediments and excavated materials to prevent the leaching of metals.

K. Construction of Diversion Trenches

Trenches will be constructed through Ponds 1, 2 and 3 to permanently lower and divert the ground water and surface water. The trenches will be excavated to a depth greater than the lower extent of contaminated fill to sufficiently lower the ground water table in the capped area. The trench on the north side of the capped area (through Pond 1) will originate near the culvert which allows water to flow under the existing railroad tracks into Pond 1 and will continue, as shown in Figure 5-2, around the capped area to a point in the intermittent stream beyond the tunnel. The trench on the south side of the capped area (through Ponds 2 and 3) will originate near the culvert which allows water to flow under the existing railroad tracks into Pond 2 and continue through Pond 3 to MH-1A of Sewer System 2B.

The trenches will be six feet wide and lined with a geotextile filtering membrane which will allow water to flow into the trench and provide stabilization for the side walls. The trenches will be lined with crushed stone to allow for water to flow through the trenches and to prevent the trenches from becoming filled with debris. The existing contours of the ponds will remain except for where stabilization of slopes are necessary.

L. Removal of Catch Basins

Once the diversion trenches have been constructed and analyses of the water being captured in the catch basis show treatment of the water is no longer necessary, the catch basis will be removed. Any sediments in the catch basins will be removed, placed in the capped area and treated with lime. The intermittent stream will be restored and the diversion trench through Ponds 2 and 3 will be completed to allow direct discharge into MH-1A on Sewer System 2B.

M. Regrading of Capped Area with Stockpiled Soils

The soils which were previously excavated from the former UST areas and stockpiled in the Main Plant Area will be used to approximate the contours of the final capped area. The soil will be loaded onto trucks and transported to the Drum Disposal Area where it will be systematically placed and compacted to form a base for the final cover. Clean fill will be brought in, if necessary, to complete the final grading as shown in Figure 5-2.

N. Construction of Single Membrane Barrier Cap

When the final grading of the fill materials and stockpiled soils is complete, the construction of the single membrane barrier cap will begin. First, a 12-inch layer of uniformly-graded sand will be placed over the area to be capped followed by a synthetic membrane layer to prevent infiltration. Another 12-inch layer of sand will be placed over the membrane to promote drainage of water off the cap and into the trench drains. A final 12-inch layer of topsoil which will sustain the growth of vegetation will be required to prevent the erosion of the cover materials as shown in the cross-section in Figure 5-3. The erosion layer will be seeded with a mixture of grass and other vegetation as yet to be determined.

O. Replacement of Amphibian Breeding Sites

The three ponds in the Drum Disposal Area will be drained permanently upon completion of the remediation. Two of the ponds, Pond 1 and Pond 2, dry up during the summer months. Pond 3 retains about one foot of water during the driest part of the season. Since the ponds may function as amphibian breeding sites, they will be replaced by one pond on an acre per acre basis. The location of the replacement pond has not yet been determined. However, one possibility is to widen the intermittent stream near the proposed catchment area.

P. Placement of Monitoring Wells

Upon completion of the capped area, monitoring wells will be installed at locations to be determined. The number of monitoring wells to be installed will be determined during the final stages of design but is anticipated to be between three and five wells.

Q. Installation of Fence

A fence will be installed to surround and secure the entire capped area. The fence will be a six feet high, chain link fence with a double swing gate to allow for vehicle and equipment access for monitoring and maintenance purposes. The gate will be equipped with locks. Signs will also be posted to warn against trespassing.

5.3.2. Vapor Extraction Treatment of Soils, Extraction and Treatment of Ground Water

The extraction and treatment of ground water will be carried out in conjunction with the vapor extraction treatment of soils. This remedial measure will be implemented at two locations at the Columbia Mills site, the Test Pit 3 Area and in the vicinity of UST Area 1. Vapor extraction/ground water withdrawal in the Test Pit 3 Area is being conducted under the IRM program. Design plans and specifications were submitted to the NYSDEC in December 1991 for the full scale operation and were based on the results of the pilot test conducted by Vapex in 1990. Final design of the system will be completed once a determination has been made as to which treatment alternatives for the air and water streams are most feasible.

The design process for the vapor extraction/ground water withdrawal system to be located in the periphery of UST Area 1 is expected to be similar to that followed for the Test Pit 3 Area system. This will include the performance of a pilot scale study to determine the design specifications for the system. Thus, the remedial measure for UST Area 1 will consist of the following tasks:

A. Install ground water recovery wells in the area of ground water contamination and commence pumping operations to prevent the contaminant plume in this area from migrating. Pipe the withdrawn ground water to the ground water treatment system which will be in operation in the Test Pit 3 Area unless hydraulics or contaminant loadings prohibit such a set up. Should this be the case, a separate treatment system or modifications to the Test Pit 3 system would be necessary.

B. During recovery well installation, sample soil from borings and submit for analysis to determine if any areas containing high levels of volatile organic compound (VOC) contamination exist in the unsaturated zone.

C. Depending on the analytical results of the soil sampling, the following actions will be taken:

1. Very low VOC concentrations or no VOCs detected in soil sample.

   Remediation of the soil would not be necessary if no VOCs were detected or if VOC concentrations were near the established clean-up level of 1 ppm.

2. Intermediate VOC concentrations detected in soil sample.

   A soil gas survey would be conducted to better determine the extent of VOC contamination in the subsurface soils. Vapor extraction would be delayed until the remediation of the Test Pit 3 Area was complete and the treatment system which will be in operation in that area was available. Vapor extraction would be implemented on the UST soils to aid in reducing the length of time required for ground water treatment.

3. High VOC concentrations detected in soil sample.

   A soil gas survey would be conducted to pinpoint the problem areas. Remediation of the soil in these areas utilizing a separate vapor extraction system would commence as soon as possible. The determination of what constitutes intermediate or high VOC levels will be made by MPI in conjunction with the NYSDEC and will be based on detected levels relative to the existing data base.

Again, a pilot test will be conducted in UST Area 1 to verify design specifications and system layout details. It is anticipated that four ground water recovery wells would be necessary to dewater the area of concern and capture the contaminated ground water. Nine piezometers would be necessary to monitor the depth of the ground water during dewatering operations.This layout is shown in Figure 5-4.

The total estimated project cost for Option 3 above, where a separate vapor extraction system would be required, is $313,657. The total present worth is $630,700. Both costs assume that the entire UST Area 1 soil would require remediation. This would include the installation of 16 vacuum wells and 12 vacuum piezometers, based on an expected 30 feet radius of influence as determined by pilot tests from Test Pit 3 Area. A detailed breakdown of the estimated cost is presented in Section 5.4.

5.3.3 Remove Sediments from Main Plant Area Sewers

The sediments in the Main Plant Area sewers will be removed by flushing the individual lines or excavating the system/along with the sediments. All accessible inlets and outlets of the flushed sewer lines will be plugged.

The water used to flush each line will be contained on-site to allow the sediments to settle out. The water will be treated and the sediments will undergo TCLP analysis to determine proper disposal. Likewise, the excavated sediments will be analyzed for TCLP. If the sediments do not exceed regulatory levels, they will be disposed of in the capped area and stabilized with lime. However, if any of the TCLP levels are exceeded, other appropriate disposal methods will be determined.

The remediation of each sewer system will be addressed individually. Sewer system 1 will be excavated. Sewer systems 2A, 2B, 3 and 4 will be flushed and accessible inlets and outlets will be plugged. In addition, the trenches in sewer system 3 will be filled. System 5 has been addressed in the Drum Disposal Area remedial measure. The tanks in system 5, and the surrounding fill, will be removed along with the sediments in Benson Creek, which are located adjacent to System 5 (Figure 5-5).

The outlets of systems 2A and 2B will not be plugged until the vacuum extraction IRM for Test Pit 3 Area is complete. Plugging the outlets of systems 2A and 2B may cause the ground water to back up and may negatively affect the vacuum extraction IRM. Similarly, the upstream portion of system 2B must be diverted before the Main Plant Area portion can be flushed.

The total estimated project cost for the remedial measure for Sewer Systems 1, 2A, 2B, 3 and 4 is $190,959 and the total present worth is $196,900. The detailed breakdown of the estimated cost is presented in Section 5.4.

5.3.4 Asbestos Abatement

The remediation of asbestos-contaminated structures and debris has been included in the conceptual design of remedial measures as per an agreement with the NYSDEC. The Columbia Mills, Inc. claims no responsibility for the remediation of any asbestos-contaminated material on the Columbia Mills site.

The remediation of the asbestos-contaminated buildings, particularly Building No. 11, will be facilitated through the removal of all asbestos by OSHA-approved methods. The asbestos material will be disposed of at an off-site landfill. It is estimated that approximately 6,000 cubic yards of asbestos wastes remain in the buildings in the form of pipe and wire insulation, transite board and floor sweepings. The building being remediated will be placed under a slightly negative pressure and all building openings will be covered to prevent the migration of asbestos to the surrounding environment during remediation. The bagged asbestos will be trucked to the Oswego County landfill for disposal.

The asbestos-laden debris on the grounds of the Columbia Mills site will be consolidated into one large pile on top of the concrete pads in the northern section of the Main Plant Area. The integrity of the concrete pads will be inspected and any cracks, holes or floor drains will be filled or repaired. The asbestos-contaminated debris piles will be wetted to prevent asbestos fibers from becoming airborne. The debris will then be moved onto the prepared concrete pad as shown in Figure 5-6. Approximately 34,000 cubic yards of asbestos contaminated debris will be consolidated and covered in an area of approximately 300 feet by 250 feet and will be approximately 20 feet high with a 3:1 side slope.

The cover for the consolidated debris pile will consist of 18 inches of topsoil which will support vegetation to prevent erosion of the cover. The cross section of the consolidated debris piles is also shown in Figure 5-6.

The total estimated project cost for this remedial measure is $5,685,766. A detailed breakdown of the estimated cost is presented in Section 5.4.

5.4 SUMMARY OF ESTIMATED COSTS

This section presents a breakdown of costs for the remedial measures described in Section 5.3. Table 5-3 details the costs for the remedial measure to lime stabilize and cap the waste in the railroad right-of-way, Table 5-4 details the costs for the vapor extraction of soils and extraction and treatment of ground water, Table 5-5 presents detailed costs to remove sediments from the Main Plant Area sewers, and Table 5-6 details the costs for asbestos abatement.

The estimated total present worth for the remediation of the Columbia Mills Site, excluding the asbestos abatement, is $4,056,000. The estimated total present worth of the asbestos abatement is $5,695,200.

Respectfully submitted,

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Vice-President

Prepared by,

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TABLE 5-3

LIME STABILIZE, CAP WASTES IN RAILROAD RIGHT-OF-WAY

COST ESTIMATE

A. Diversion of Sewer System 2B			
1.	Manholes	3 X $2,000 ea. =	$6,000
2.	Trenching	1,000LF X $60/LF =	$6,000
3.	Pipe Installation	1,000LF X $40/LF =	$4,000
4.	Backfill	1,000LF X $20/LF =	$2,000
5.	Outlet Structure		$3,000
6.	Miscellaneous Connections		$2,000
7.	Install Plug		$1,000
		TOTAL	$24,000
B. Catchment Areas			
1.	Excavation	200cy X $10/cy =	$2,000
2.	Bottom Stabilization	10,000SF X $1.00/SF =	$10,000
3.	Treatment of Contaminated Water	200,000 gal X $0.20/gal =	$40,000
		TOTAL	$52,000
C. Initial Lime Application			
1.	Site Preparation		$10,000
2.	Lime Application	4.6 acres X $10,000/acre =	$46,000
		TOTAL	$56,000
D. Construction of Cut-off Trench			
1.	Excavation	1,000cy X $10/cy =	$10,000
2.	Stabilize Trench	500LF X $200/LF =	$100,000
		TOTAL	$110,000

TABLE 5-3

LIME STABILIZE, CAP WASTES IN RAILROAD RIGHT-OF-WAY

COST ESTIMATE

E. Dredging of Sediments and Excavation of Sewer System 5 Tanks			
1.	Dredging of Sediments	4,000cy X $20 =	$80,000
2.	Excavate System 5 Area	200cy X $10/cy =	$2,000
3.	Transport Excavated Material	200cy x 4,000LF @ $5/cy/1,000LF =	$4,000
4.	Lime Application	4.6 acres X $10,000/acre =	$46,000
		TOTAL	$132,000
F. Excavation of Contaminated Fill Outside of the Capped Area			
1.	Excavation	10,000cy X $10/cy =	$100,000
2.	Transport Excavated Material	10,000cy X 400LF @ $5/cy/1,000LF	$20,000
3.	Backfill with Clean Material	10,000cy X $20/cy =	$200,000
		TOTAL	$320,000
G. Construction of Leachate Collection Trench, Collection Pit and Treatment System			
1.	Trenching	1,500LF X $60/LF =	$90,000
2.	Trench Stabilization	1,500LF X $20/LF =	$30,000
3.	Install Perforated Pipe	1,500LF X $40/LF =	$60,000
4.	Crushed Stone	5,000 Tons X $20/Ton =	$100,000
5.	Treatment System		$35,000
		TOTAL	$315,000
H Regrading of the Capped Area with Stockpiled Soils			
1.	Transportation of Stockpiled Soil	1,000cy X 3,000LF @ $5/cy/1,000LF =	$15,000
2.	Grading	4.6 acres X $5,000/acre =	$23,000
		TOTAL	$38,000

TABLE 5-3

LIME STABILIZE, CAP WASTES IN RAILROAD RIGHT-OF-WAY

COST ESTIMATE

I. Construction of Diversion Trenches

1.	Trenching	1,500LF X $60/LF =	$90,000
2.	Trench Stabilization	1,500LF X $20/LF =	$30,000
3.	Install Perforated Pipe	1,500LF X $40/LF =	$60,000
4.	Crushed Stone	5,000 Tons X $20/Ton =	$100,000
		TOTAL	$280,000

J. Construction of Single Membrane Barrier Cap

1.	Site Preparation		$50,000
2.	Sand Underlayment Layer (Uniformly graded)	15,000cy X $30/cy =	$450,000
3.	Liner	200,000SF X $1.00/SF =	$200,000
4.	Sand (graded in place)	15,000cy X $20/cy =	$300,000
5.	Topsoil (graded in place)	15,000cy X $30/cy =	$45,000
6.	Seeding	5.0 acres X $1,000/acre =	$5,000
		TOTAL	$1,050,000

CONSTRUCTION COST	$2,377,000
CONTINGENCY (15%)*	$356,550
TOTAL CONSTRUCTION COST	**$2,733,550**
ENGINEERING (10%)	$237,355
TOTAL PROJECT COST	**$3,006,905**
ANNUAL O&M COST	$23,500
PRESENT WORTH - O&M (30 YRS)	$221,535
TOTAL PRESENT WORTH	**$3,228,400**

* Includes sampling and analysis, fencing, electricity, removal of catch basins, monitoring well installations and pond replacement.

TABLE 5-4

VAPOR EXTRACTION OF SOILS,

EXTRACTION AND TREATMENT OF GROUND WATER (UST AREA 1)

COST ESTIMATE

A. Mobilization/Demobilization			$500
B. Ground Water Extraction Wells (4-inch)		(4)	
1.	(4) 30 foot boreholes		
	▪ 20 feet in Auger	4 X 20LF x $25 LF =	$2000
	▪ 10 feet in Rollerbit	4 X 10LF x $40 LF =	$1600
2.	Split spoons and Analysis		$5,000
3.	Well Installation (including stick-up)		
	▪ 4-inch PVC Screen (0.01")	25 ft/well X 4 wells X $35/ft	
	▪ 4-inch PVC Riser	7 ft/well X 4 wells X $35/ft =	$4480
4.	Decontamination	4 hrs X $135/hour =	$540
5.	Guard Pipes	4 X $200 each =	$800
		TOTAL	$14,420
C. Piezometers (Vacuum & GW) → 1 inch I.D.			
1.	(21) 20' boreholes (Auger)	21 X 20LF X $15/LF =	$6300
2.	Split spoon	105	(included above)
3.	Well installation (including Stick-up)		
	▪ 1. 1 inch PVC Screen	10 ft/borehole X 21	
	▪ 1 inch PVC Riser	12 ft/borehole X 21 X $18/LF =	$8316
4.	Decontamination	4 hours X $135/hour =	$540
		TOTAL	15,156

TABLE 5-4

VAPOR EXTRACTION OF SOILS,

EXTRACTION AND TREATMENT OF GROUND WATER (UST AREA 1)

COST ESTIMATE

D. Vacuum Extraction Wells (2 inch)

1. (16) 20' boreholes (Auger)	16 X 20LF = 320 LF X $15/LF =	$4800
2. 80 Split spoons	80	(included above)
3. Well Installation (including Stick-up)		
▪ 2 inch PVC Screen	15 ft/borehole X 16	
▪ 2 inch PVC Riser	7 ft/borehole X 16 X $18/LF =	$6336
4. Decontamination	6 hrs X $135/hour =	$810
5. Guard Pipes	16 X $175 each =	$2800
	TOTAL	$14,746

E. Pumps/Piping

1. Well Pumps	4 X $1160 =	$4640
2. Recovery Well Piping & Insulation		$6090
3. Recovery Well Valves & Tap		$730
4. Vapor Extraction Well Piping		$13,870
5. Winterization, Electricity, Gas		$45,670
	TOTAL	$71,000

F. Ground Water Treatment System $42,000
Includes Piping, Valves, Fittings, Tanks and Treatment System

---

G. Vapor Treatment System $120,000
Includes Piping, Valves, Fittings, Tanks and Catalytic Reactor

TABLE 5-4

VAPOR EXTRACTION OF SOILS,

EXTRACTION AND TREATMENT OF GROUND WATER (UST AREA 1)

COST ESTIMATE

CONSTRUCTION COST	$247,950
CONTINGENCY (15%)	$37,193
TOTAL CONSTRUCTION COST	**$285,143**
ENGINEERING (10%)	$28,514
TOTAL PROJECT COST	$313,657
ANNUAL O+M COST	$100,000
PRESENT WORTH - O+M (4 YRS)	$317,000
TOTAL PRESENT WORTH	**$630,700**

NOTE: Estimate for treatment systems based on cost estimate for Test Pit 3.

TABLE 5-5

REMOVE SEDIMENTS FROM OR EXCAVATE PLANT SEWER LINES,

DISPOSAL OF SEDIMENTS IN CAPPED AREA

COST ESTIMATE

A. Sewer System 1 - Excavate, Lime Stabilize, Cap in RR Right-of-Way

1.	Line Excavation/Backfill		$8,415
2.	Transportation to Capped Area	\$5/cy-1000ft. x 13 cy x 2000 ft.	$130
3.	Lime Application	\$0.25/ft^2 x 350ft^2 [13cy, 1ft. lift]	$90
4.	Soil Cover	\$20/cy x 350ft^2 x 0.25ft. x cy/27ft^3	$65
		TOTAL	$8,700
		ANNUAL O&M COST	$25

B. Sewer Systems 2A, 2B and 4 - Flush Sediments, Lime Stabilize, Cap in RR Right-of-Way

1.	Mobilization/Demobilization	\$2000/sewer system x 3	$6,000
2.	Water/Sediment Collection Systems	\$3900 + \$4900 + \$3900	$12,700
3.	Flush Sewer Lines	\$10/ft. x 1160 ft.	$11,600
4.	Water Treatment/Discharge	\$17100 + \$14500 + \$14500	$46,100
5.	Install Plugs	4 ea. x \$1000	$4000
6.	Transportation to Capped Area	\$5/cy - 1000ft. x 43 cy x 3000ft.	$645
7.	Lime Application	\$0.25/ft^2 x 1160ft^2 [43cy, 1ft. lift]	$290
8.	Soil Cover	\$20/cy x 1160ft^2 x 0.25ft. x cy/27ft^3	$220
		TOTAL	$81,555
		ANNUAL O&M COST	$65

TABLE 5-5

REMOVE SEDIMENTS FROM OR EXCAVATE PLANT SEWER LINES

COST ESTIMATE

C. Sewer System 3 - Flush Sediments, Lime Stabilize, Cap in RR Right-of-Way, Fill Trenches

1.	Mobilization/Demobilization		$2,000
2.	Water/Sediment Collection System		$4,900
3.	Flush Sewer Line		$6,500
4.	Water Treatment/Discharge		$14,500
5.	Seal Lines		$20,000
6.	Grout System 3		$12,000
7.	Transportation to Capped Area	\$5/cy - 1000ft. x 30 cy x 3000ft.	$450
8.	Lime Application	\$0.25/ft^2 x 810ft^2 [30cy, 1ft. lift]	$200
9.	Soil Cover	\$20/cy x 810ft^2 x 0.25ft. x cy/27ft^3	$150
		TOTAL	$60,700
		ANNUAL O&M COST	$545

SUBTOTAL CONSTRUCTION COST	$150,955
CONTINGENCY (15%)	$22,643
TOTAL CONSTRUCTION COST	**$173,598**
ENGINEERING (10%)	$17,360
TOTAL PROJECT COST	**$190,958**
ANNUAL O&M COST	$635
PRESENT WORTH - O&M (30 YRS.)	$5,986
TOTAL PRESENT WORTH	**$196,900***

* The total present worth cost of the sewer remedial measure listed in the Columbia Mills Site Record of Decision (March 1992) was $227,400. This higher cost included the cost of diverting the upstream section of Sewer System 2B. This activity, however, is considered to be part of the alternative of lime stabilizing wastes and capping them in the railroad right-of-way. Since this cost is included under that measure, it has been removed from the estimate for the remediation of Systems 1,2A, 2B, 3 and 4. The revised present worth more accurately reflects anticipated project costs.

TABLE 5-6

ASBESTOS ABATEMENT

COST ESTIMATE

A. Buildings

Includes: Sealing Building and Roof Under Negative Pressure, HEPA Vacuum Clean Walls, Floors, Ceilings, Removal of Roofing, Encapsulation, Air Monitoring

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B. Debris Piles

Includes: Preparation of Concrete Slab, Wetting of Materials, Transportation to Slab, Collection and Filtration of Water, Cover and Grade, Seed Cover, Air Monitoring

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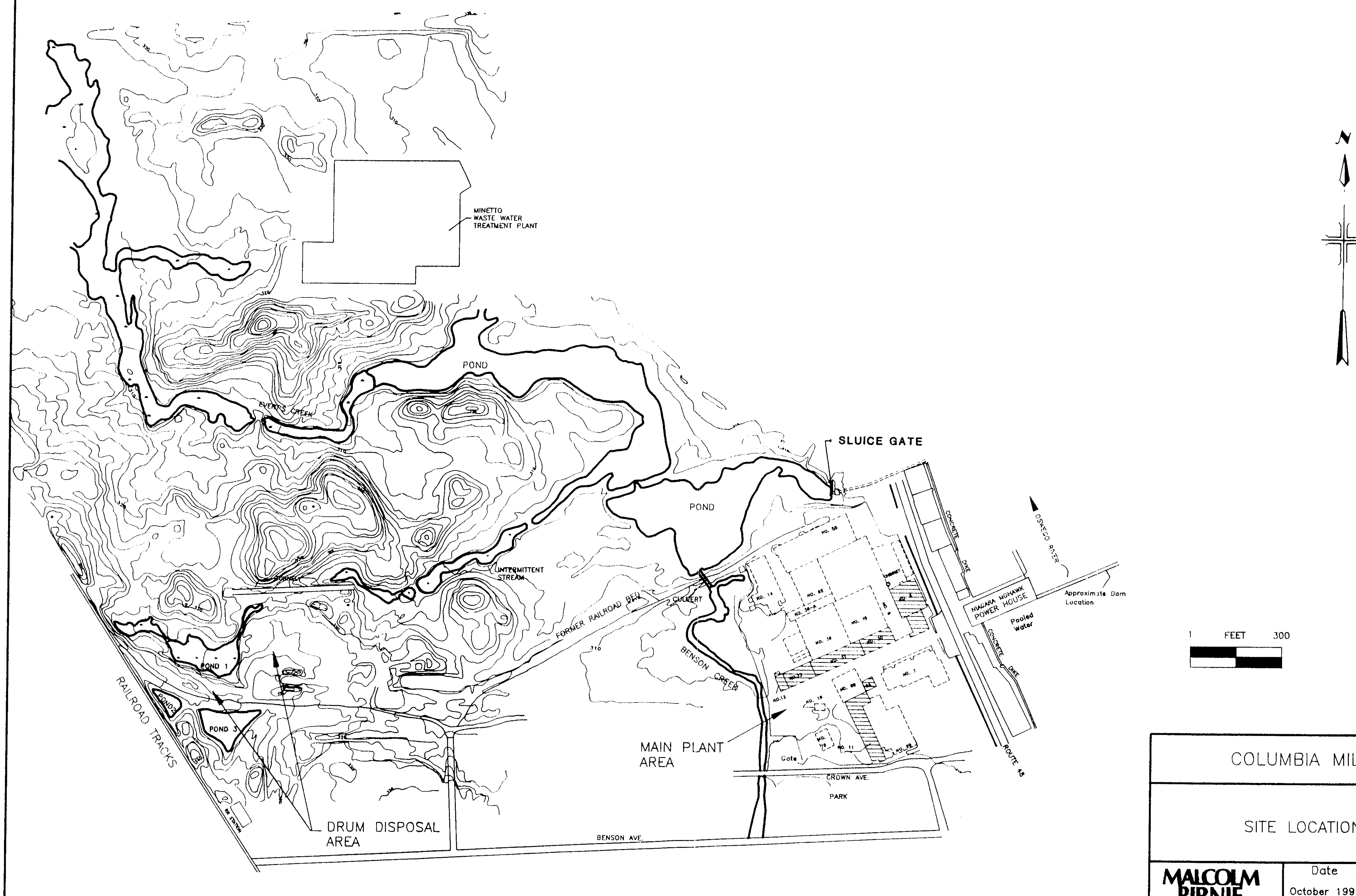
SUBTOTAL CONSTRUCTION COST*	$5,148,497
CONTINGENCY (5%)	$257,425
TOTAL CONSTRUCTION COST	**$5,405,922**
ENGINEERING (5%)	$279,844
TOTAL PROJECT COST	**$5,685,766**
ANNUAL O&M COST	$1000
PRESENT WORTH - O&M (30 YRS)	$9,427
TOTAL PRESENT WORTH	**$5,695,200**

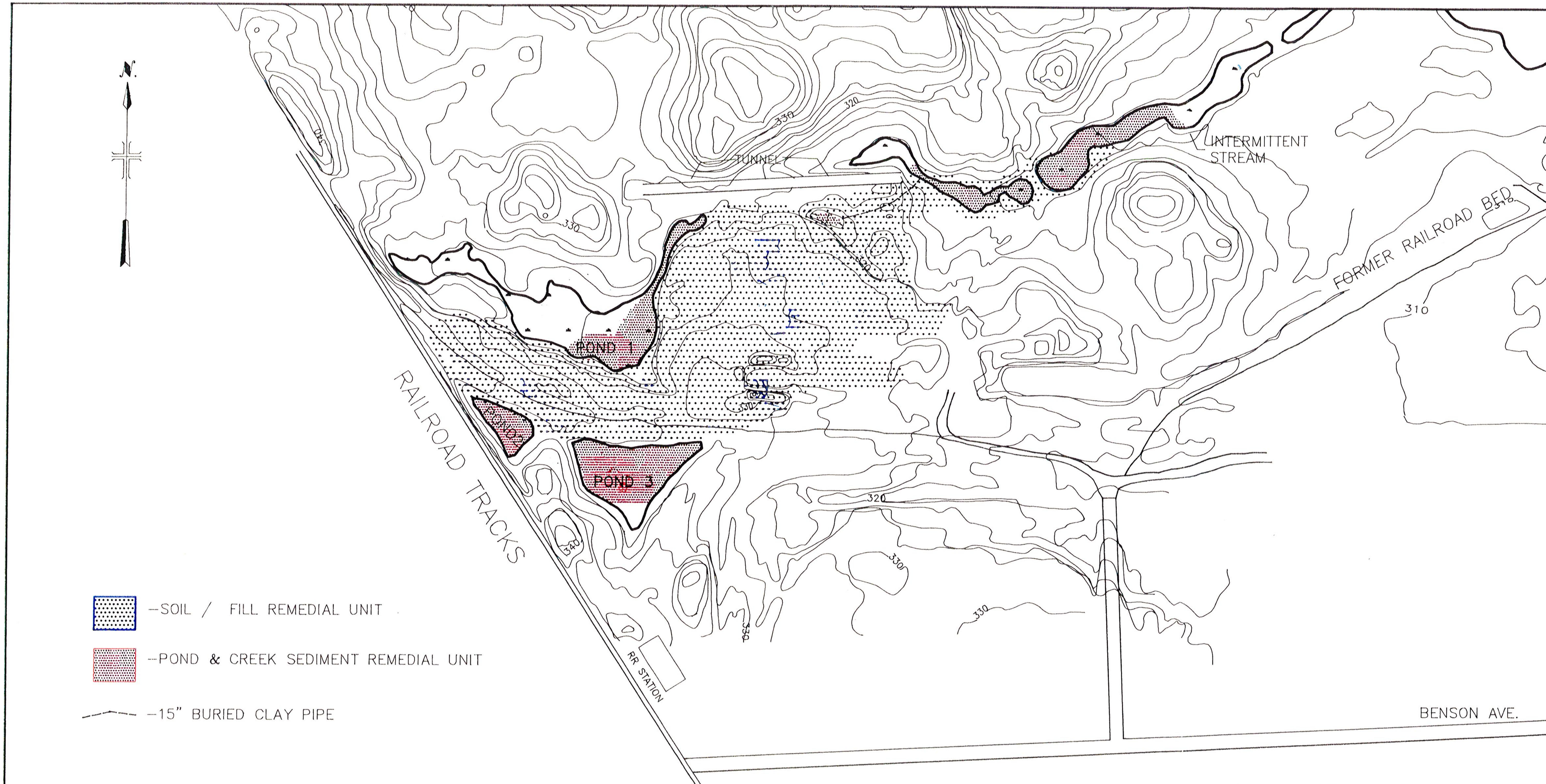
NOTE: * - Based on a detailed estimate from Environmental Protection Services, Inc, Liverpool, New York , November 1988. The cost has been adjusted to reflect 1992 dollars.



COLUMBIA MILLS

SITE LOCATION MAP

MALCOLM PIRNIE	Date	Figure No.
	October 1991	2–1



COLUMBIA MILLS		
DRUM DISPOSAL AREA SOIL / FILL & SEDIMENT REMEDIAL UNIT LOCATIONS		
MALCOLM PIRNIE	Date APRIL 1992	Figure No. 2-4

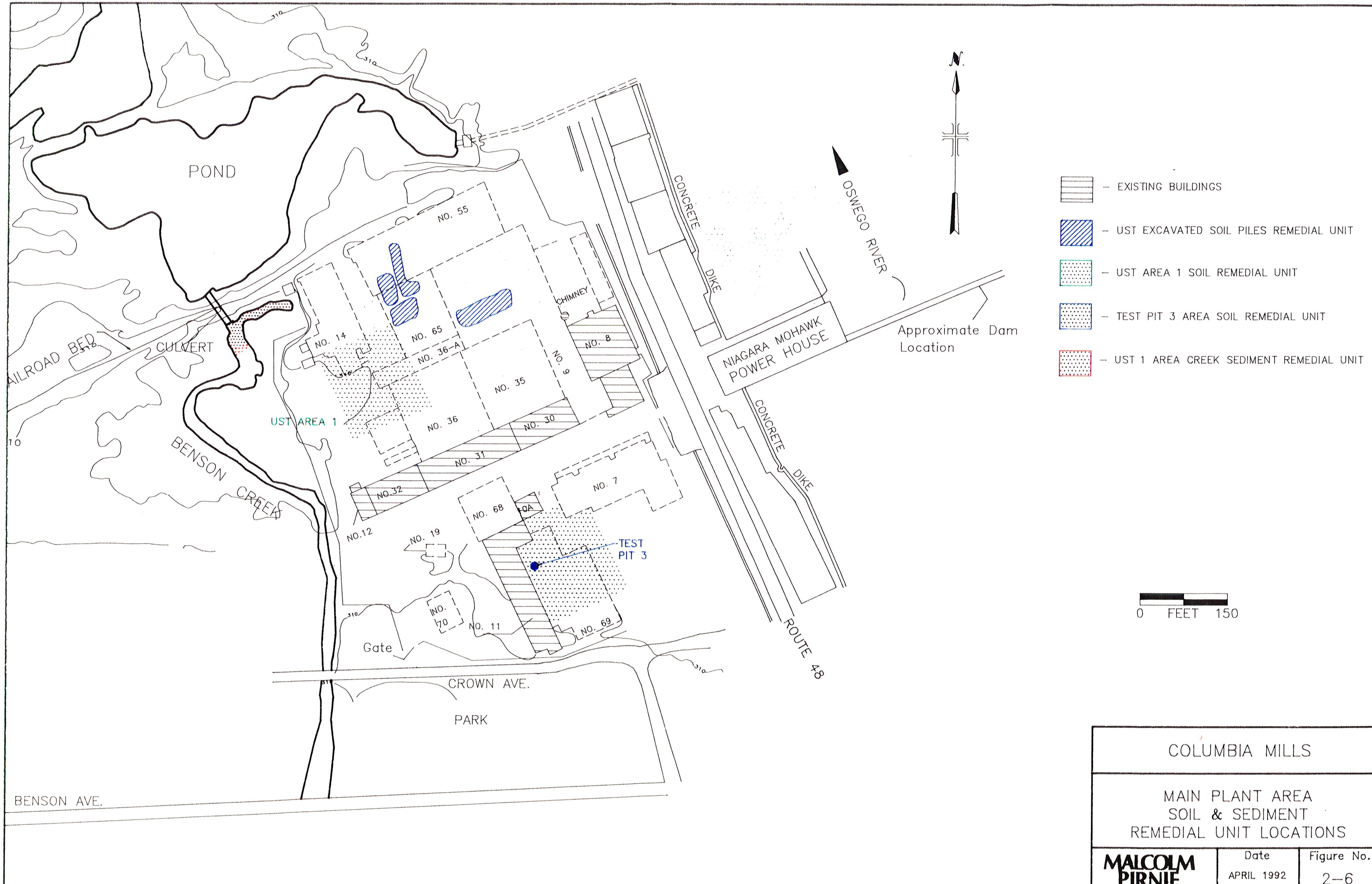
B-11D O – MONITORING WELL LOCATION

– DRUM DISPOSAL AREA SHALLOW GOUND WATER REMEDIAL UNIT

– UST AREA 1 SHALLOW / DEEP GROUND WATER REMEDIAL UNITS

– TEST PIT 3 AREA SHALLOW / DEEP GROUND WATER REMEDIAL UNITS

COLUMBIA MILLS		
GROUND WATER REMEDIAL UNIT LOCATIONS		
MALCOLM PIRNIE	Date October 1991	Figure No. 2-5

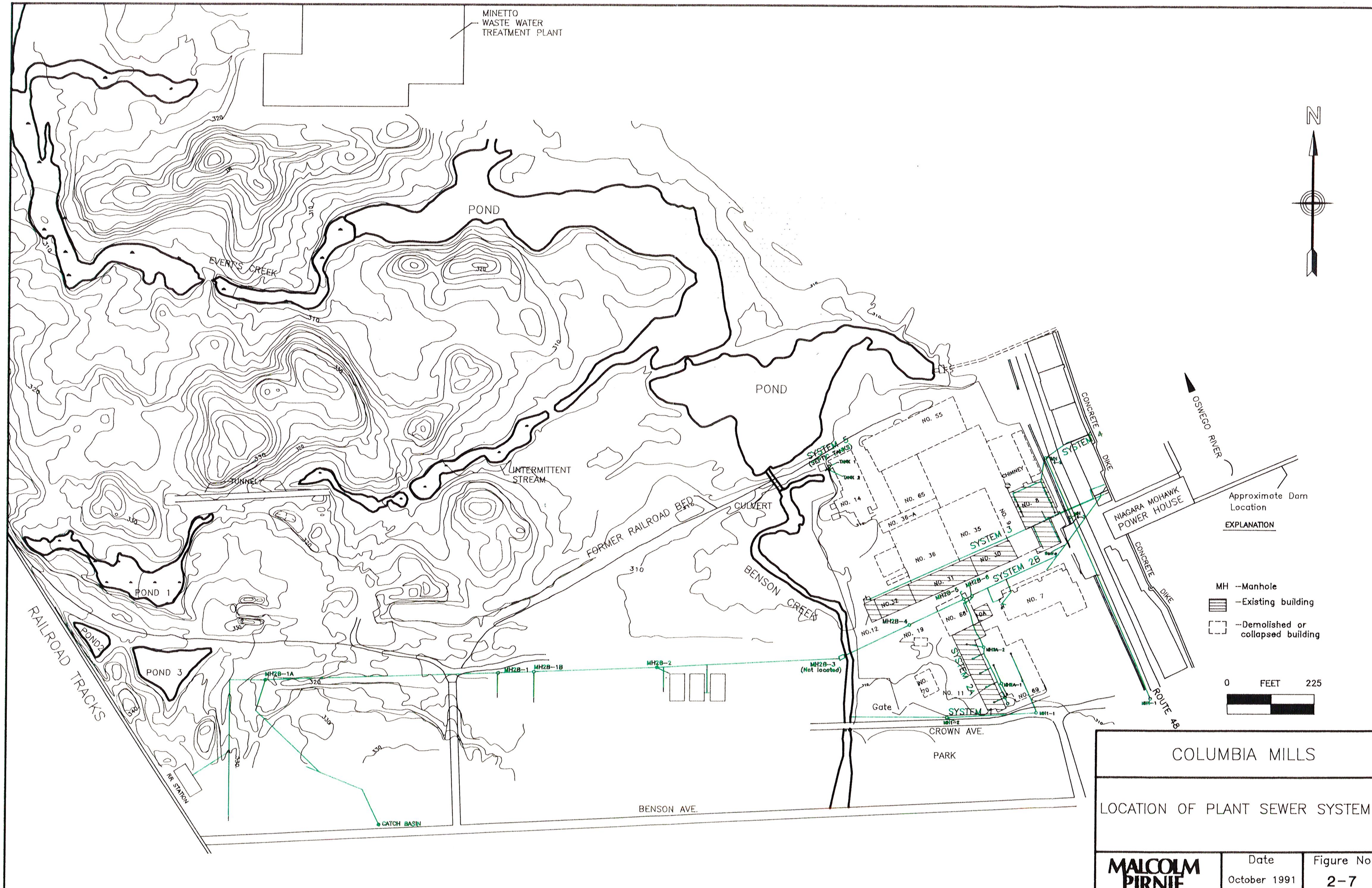


COLUMBIA MILLS

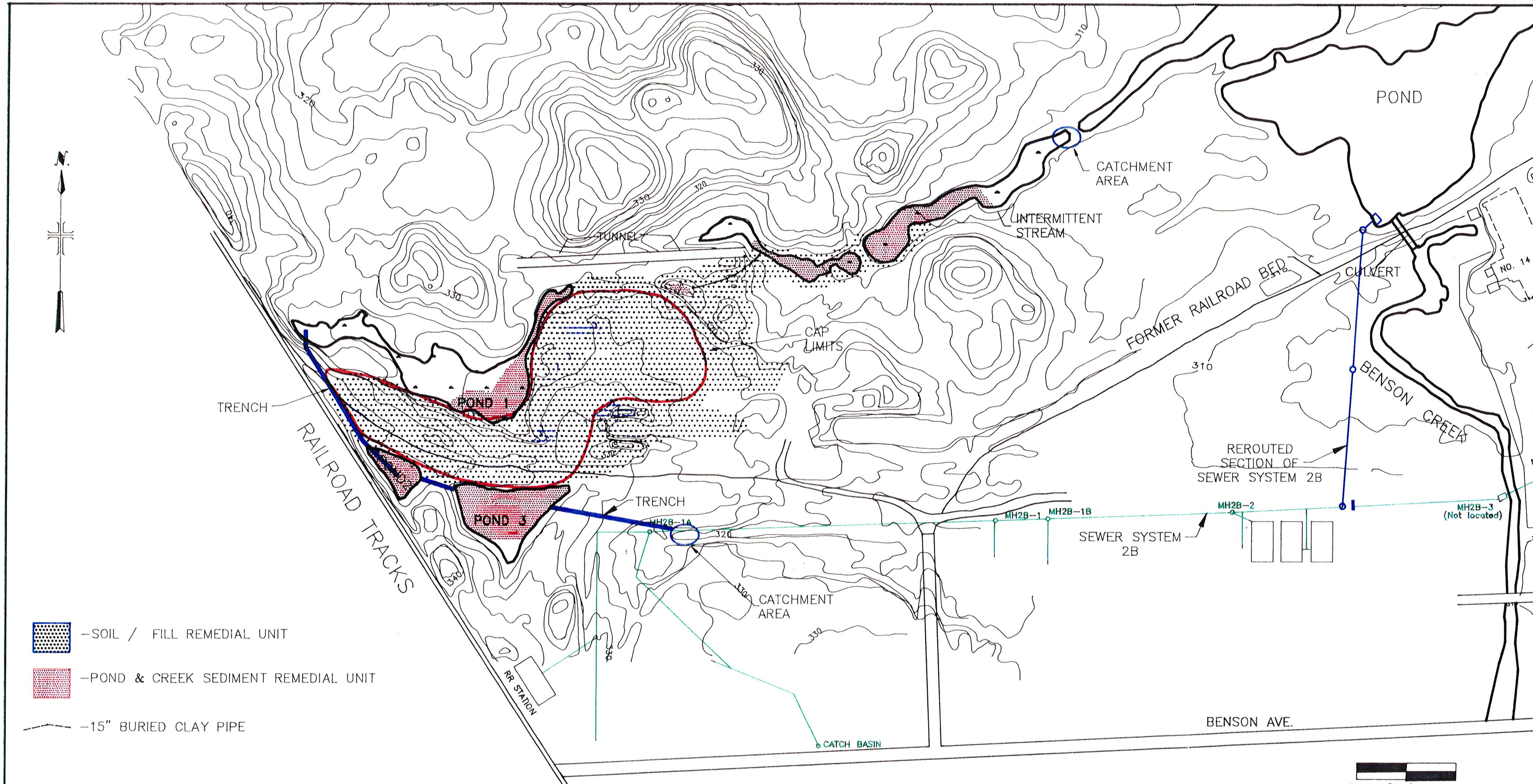
MAIN PLANT AREA
SOIL & SEDIMENT
REMEDIAL UNIT LOCATIONS

MALCOLM PIRNIE

Date	Figure No.
APRIL 1992	2–6



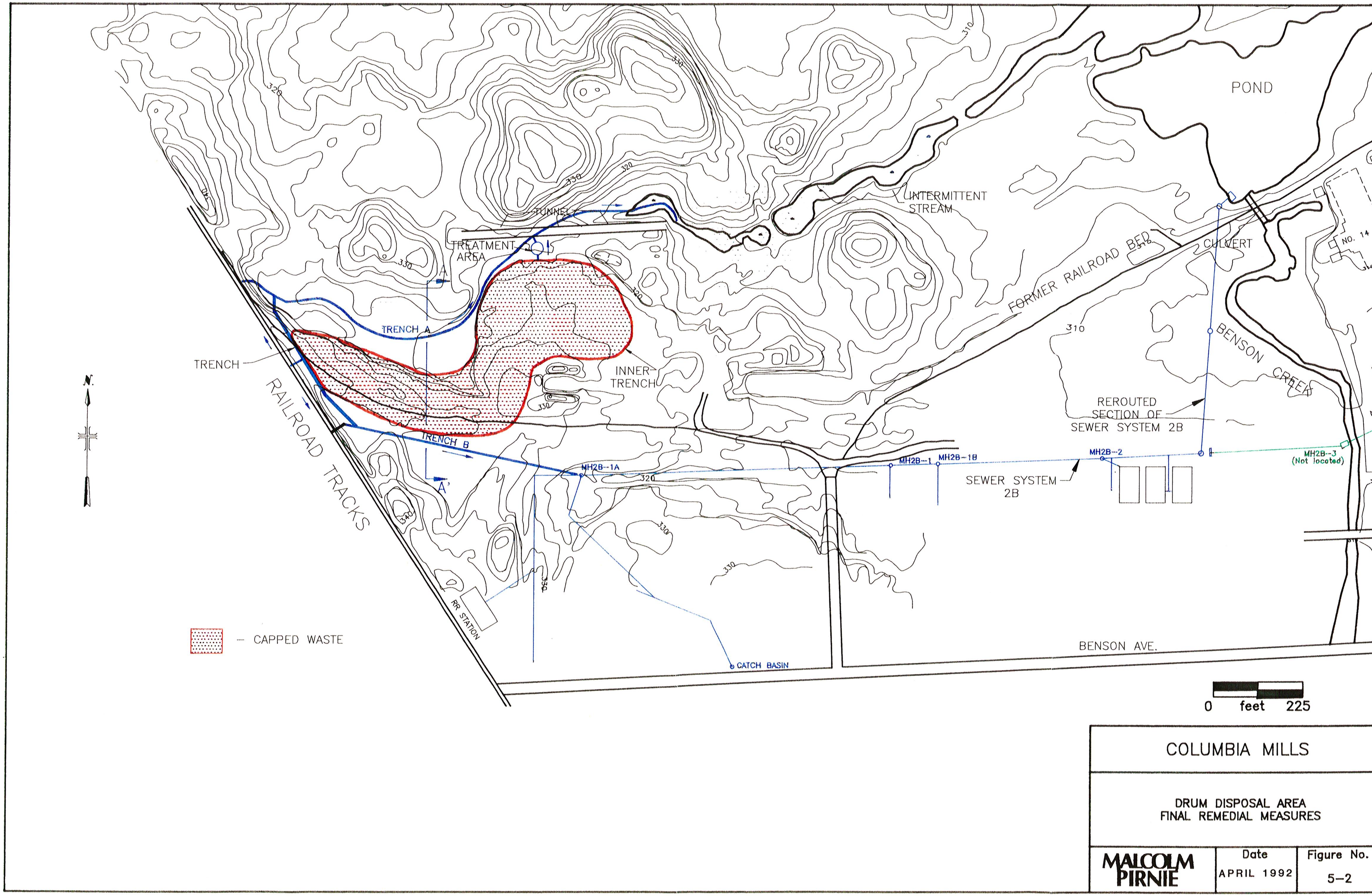
COLUMBIA MILLS		
LOCATION OF PLANT SEWER SYSTEM		
MALCOLM PIRNIE	Date October 1991	Figure No. 2-7

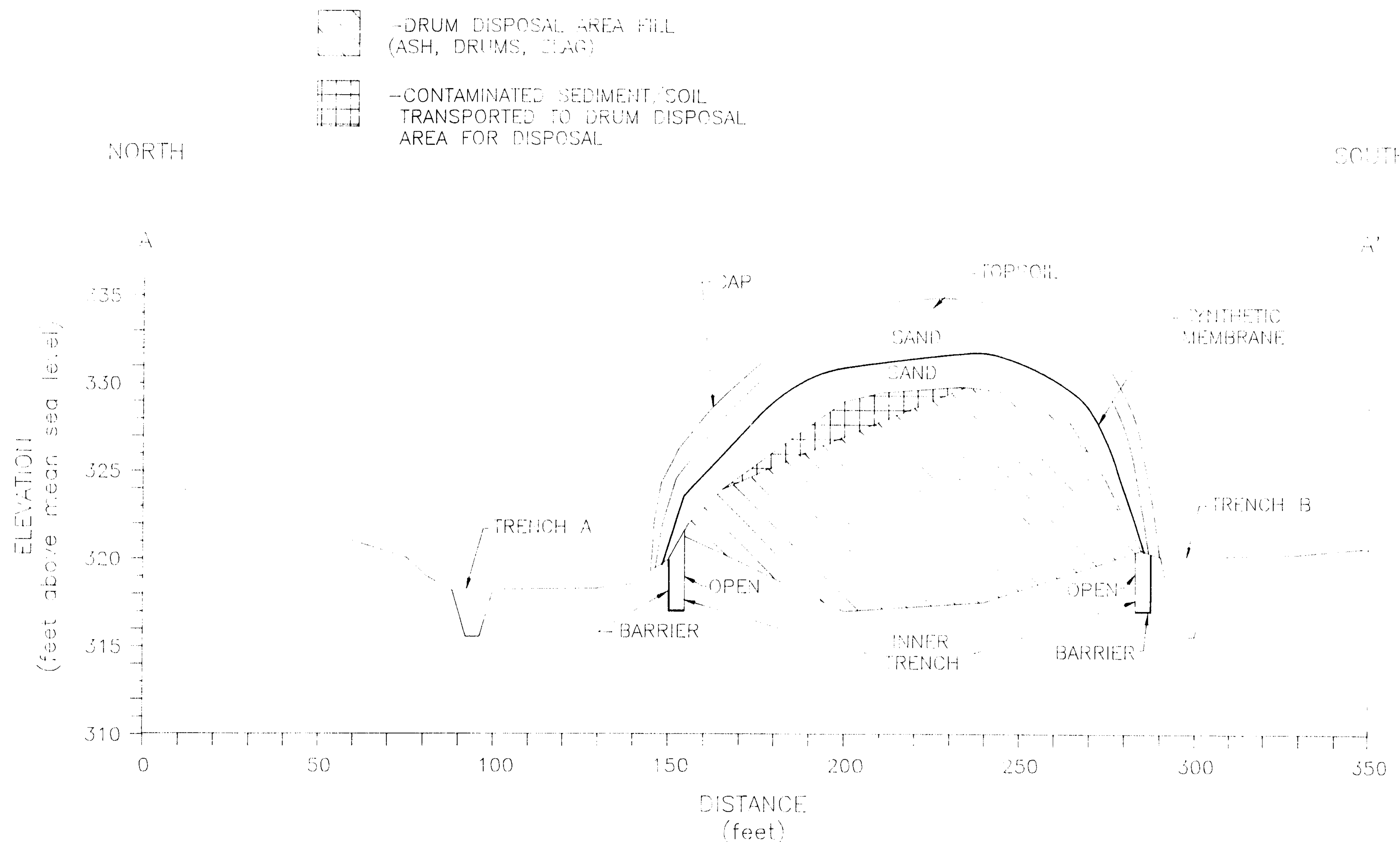


COLUMBIA MILLS

DRUM DISPOSAL AREA DURING CONSTRUCTION OF REMEDIAL MEASURES

MALCOLM PIRNIE	Date	Figure No.
	APRIL 1992	5-1


POND
INTERMITTENT STREAM
TUNNEL
TREATMENT AREA
CULVERT
FORMER RAILROAD BED
NO. 14
TRENCH A
TRENCH
INNER TRENCH
RAILROAD TRACKS
TRENCH B
A'
MH2B-1A
MH2B-1
MH2B-1B
MH2B-2
MH2B-3 (Not located)
SEWER SYSTEM 2B
REROUTED SECTION OF SEWER SYSTEM 2B
BENSON CREEK
BENSON AVE.
CATCH BASIN
RR STATION
N
- CAPPED WASTE
0 feet 225
COLUMBIA MILLS
DRUM DISPOSAL AREA
FINAL REMEDIAL MEASURES
MALCOLM PIRNIE
Date
APRIL 1992
Figure No.
5-2

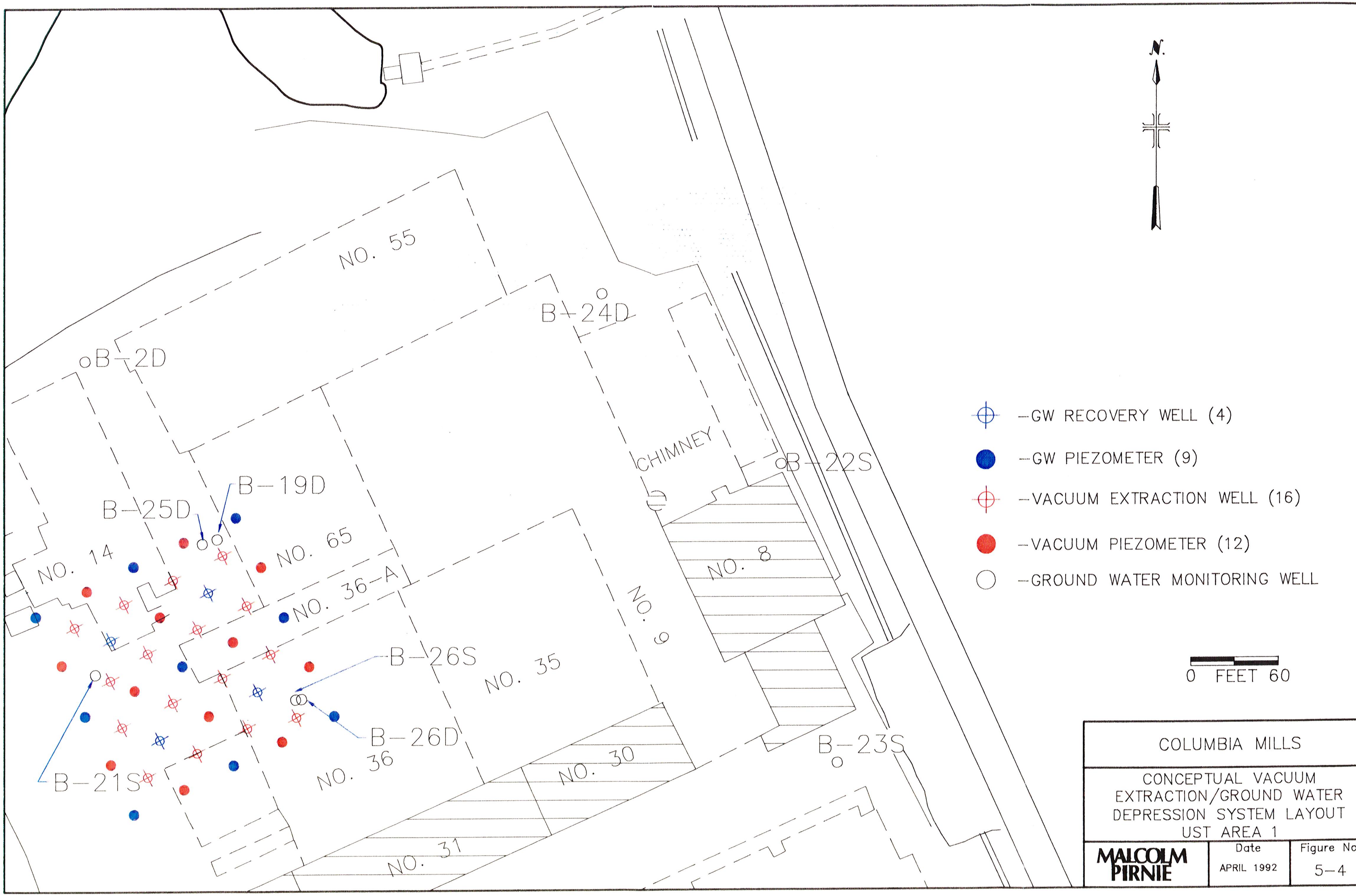


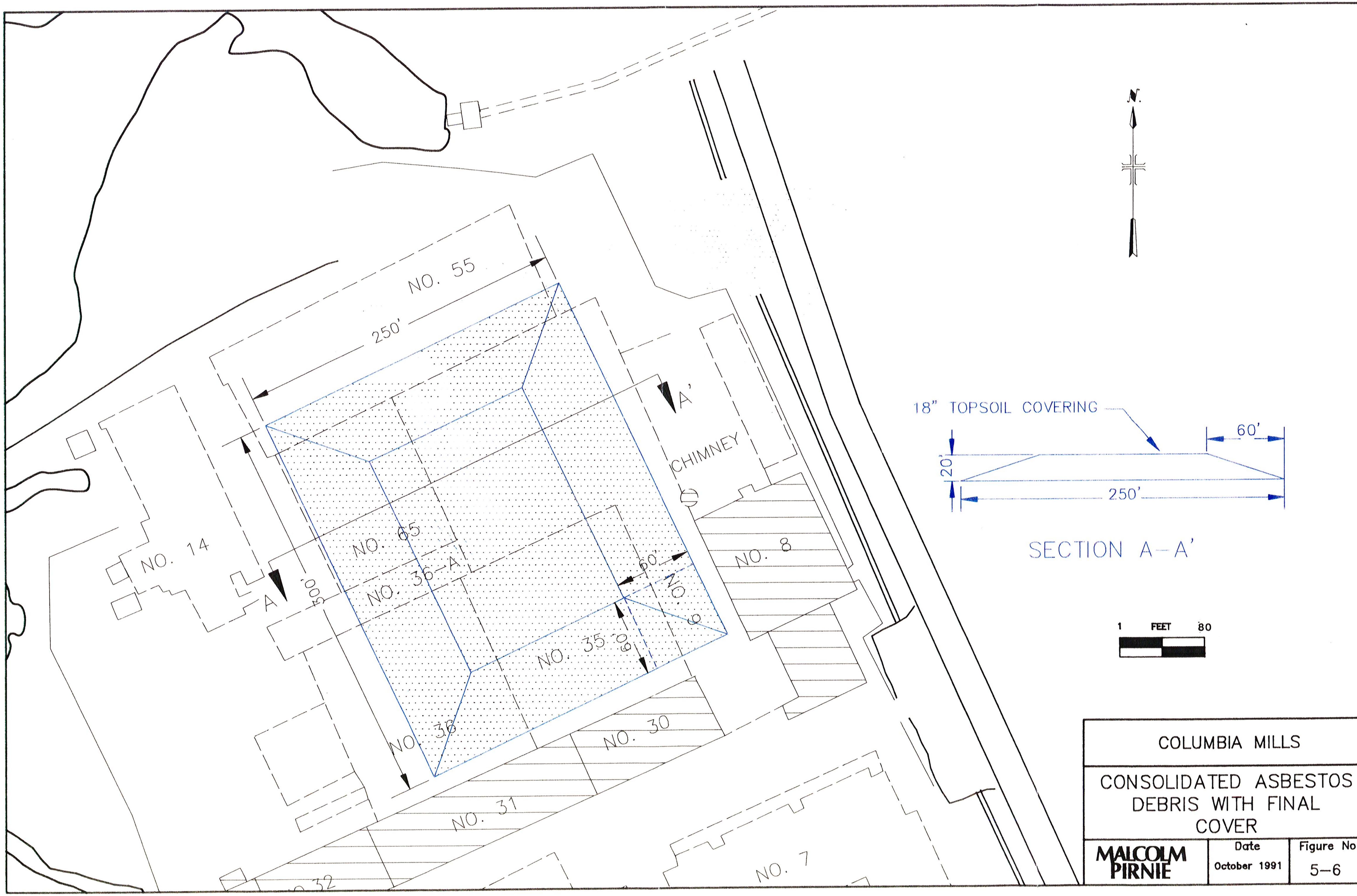
MALCOLM PIRNIE

CROSS SECTION A–A' – SINGLE MEMBRANE BARRIER CAP & AREA DETAILS

MALCOLM PIRNIE, INC.

FIGURE 5–3


N.
NO. 55
B-24D
B-2D
CHIMNEY
B-22S
B-19D
B-25D
NO. 65
NO. 14
NO. 36-A
NO. 8
NO. 9
B-26S
NO. 35
B-26D
B-23S
B-21S
NO. 36
NO. 30
NO. 31
-GW RECOVERY WELL (4)
-GW PIEZOMETER (9)
-VACUUM EXTRACTION WELL (16)
-VACUUM PIEZOMETER (12)
-GROUND WATER MONITORING WELL
0 FEET 60
COLUMBIA MILLS
CONCEPTUAL VACUUM EXTRACTION/GROUND WATER DEPRESSION SYSTEM LAYOUT UST AREA 1
MALCOLM PIRNIE
Date
APRIL 1992
Figure No.
5-4



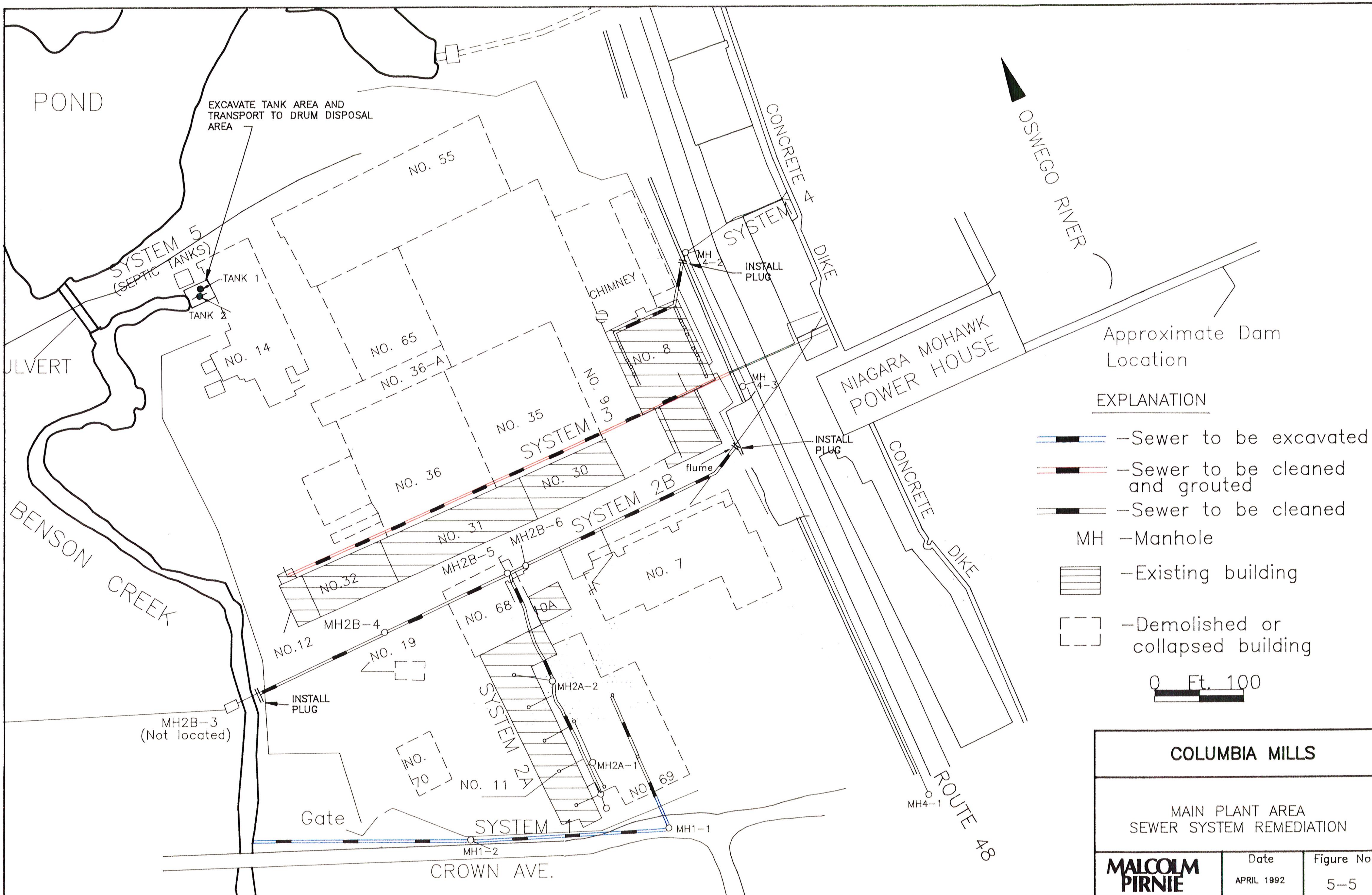
COLUMBIA MILLS

CONSOLIDATED ASBESTOS DEBRIS WITH FINAL COVER

MALCOLM PIRNIE

Date: October 1991

Figure No. 5-6


POND
EXCAVATE TANK AREA AND TRANSPORT TO DRUM DISPOSAL AREA
SYSTEM 5 (SEPTIC TANKS)
TANK 1
TANK 2
ULVERT
NO. 55
NO. 14
NO. 65
NO. 36-A
NO. 35
NO. 36
NO. 9
CHIMNEY
NO. 8
MH 4-2
INSTALL PLUG
SYSTEM 4
CONCRETE
DIKE
OSWEGO RIVER
Approximate Dam Location
NIAGARA MOHAWK POWER HOUSE
MH 4-3
SYSTEM 3
NO. 30
NO. 31
NO. 32
SYSTEM 2B
flume
MH2B-6
MH2B-5
MH2B-4
NO. 7
NO. 68
10A
NO. 12
NO. 19
BENSON CREEK
INSTALL PLUG
MH2B-3 (Not located)
MH2A-2
SYSTEM 2A
MH2A-1
NO. 70
NO. 11
NO. 69
MH4-1
ROUTE 48
Gate
SYSTEM 1
MH1-1
MH1-2
CROWN AVE.
EXPLANATION
-Sewer to be excavated
-Sewer to be cleaned and grouted
-Sewer to be cleaned
MH -Manhole
-Existing building
-Demolished or collapsed building
0 Ft. 100
COLUMBIA MILLS
MAIN PLANT AREA SEWER SYSTEM REMEDIATION
MALCOLM PIRNIE
Date APRIL 1992
Figure No. 5-5