DAMES & MOORE
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CORRECTIVE MEASURE STUDY FINAL REPORT

Prepared for:

GE APPARATUS SERVICE SHOP
TONAWANDA, NEW YORK

April 24, 2000

Prepared by:

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April 24, 2000

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Re: Corrective Measure Study Final Report
GE Apparatus Service Center
Tonawanda, New York

Dear Mr. Shattuck:

On behalf of the General Electric Company (GE), Dames & Moore has prepared the attached *Corrective Measure Study Final Report* (*CMS Final Report*) for the GE Apparatus Service Center in Tonawanda, New York. This *CMS Final Report* has been prepared in accordance with the terms of GE's May 1996 *Part 373 Hazardous Waste Management Permit* (*373 Permit*).

This *CMS Final Report* evaluates the potential corrective measure alternatives for GE's Tonawanda service shop that were described in the *CMS Task I Report,* which GE submitted to NYSDEC on December 3, 1999. The NYSDEC approved the *CMS Task I Report* on January 19, 2000. In the *CMS Final Report,* we have updated the corrective measure alternatives to incorporate the results presented in the *Supplemental Sewer Investigation Report*, which GE submitted to NYSDEC on April 17, 2000. We have also presented and evaluated two modified versions of Alternative 3 (Asphalt Caps).

We look forward to your comments on this report and on the recommended corrective measures for GE's Tonawanda Apparatus Service Center. Please contact us if you have any questions or comments regarding this material.

Very truly yours,
DAMES & MOORE

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CORRECTIVE MEASURE STUDY
FINAL REPORT
GE APPARATUS SERVICE SHOP
TONAWANDA, NEW YORK

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1.0 INTRODUCTION

On behalf of the General Electric Company (GE), Dames & Moore has prepared this *Corrective Measure Study (CMS) Final Report* for GE's Apparatus Service Center at 175 Milens Road, Tonawanda, New York. This *CMS Final Report* has been prepared in response to the January 19, 1999 letter from the New York State Department of Environmental Conservation (NYSDEC), in partial fulfillment of the terms of GE's May 1996 *6 NYCRR Part 373 Hazardous Waste Management Permit* under the Resource Conservation and Recovery Act (RCRA).

This report is organized in seven sections. Section 2.0 presents background information for the site, including a summary of the history of GE's Tonawanda Service Shop. Section 3.0 summarizes the results of previous investigations conducted at the site. Section 4.0 describes the objectives of the CMS. Section 5.0 summarizes the corrective measure technologies that were examined in the December 3, 1999 *CMS Task I Report.* Section 6.0 describes the criteria used to evaluate potential corrective measure alternatives for the site. The five corrective measure alternatives that were proposed in the December 3, 1999 *CMS Task I Report* are described and evaluated in Section 7.0, along with a sixth alternative that combines elements of two other alternatives. Section 8.0 contains a recommendation for a corrective measure for GE's Tonawanda facility, and Section 9.0 presents the schedule for the implementation of the proposed corrective measure.

2.0 BACKGROUND

This section provides a brief description of the site and its history.

2.1 SITE DESCRIPTION

The GE Apparatus Service Center is located in Tonawanda, New York, approximately fifteen miles north of downtown Buffalo and approximately two miles east of the Niagara River. Figure 1 shows the site location. The site is in an urban area that includes some commercial business and other industries. GE's 5.3-acre property includes a 69,000-square-foot one-story building. GE built the slab-on-grade building in 1968 and expanded the building in 1978.

GE uses the facility, which is also known as the Buffalo Service Shop, to repair industrial equipment, such as electric motors, transformers, turbines, pumps, and compressors. During these operations, GE generates hazardous wastes. GE also receives liquids, solids, and other articles containing polychlorinated biphenyls (PCBs) from customers and other GE repair facilities for repair or storage prior to shipment for off-site disposal or treatment at facilities with appropriate permits.

In May 1996, NYSDEC issued a *6 NYCRR Part 373 Hazardous Waste Management Permit* (*373 Permit*) to GE for the Buffalo Service Shop. This permit allows GE to store hazardous wastes that contain volatile organic compounds (VOCs), metals, and PCBs. GE does not treat or dispose hazardous or solid wastes at the site.

Module III of the *373 Permit* lists eight Solid Waste Management Units (SWMUs) and Areas of Concern (AOCs) at the facility. These eight SWMUs, which are shown in Figure 2, are:

- RCRA Container Storage Area
- PCB Container Storage Area
- PCB Work Area
- Former Rinse Water Underground Storage Tank
- Old Oil/Water Separator
- New Oil/Water Separator

- Floor Drains and Sewers
- Rail Spur

These eight SWMUs are described below.

RCRA Container Storage Area

The RCRA Container Storage Area (CSA) is an outdoor area adjacent to the east side of the building. GE has used the RCRA CSA since 1980 to store 55-gallon steel drums of materials that contain metals and VOCs. The maximum capacity of the storage area is approximately 36 drums. This unit consists of a six-inch thick concrete pad with a concrete curb that provides secondary containment. The floor and curbs of the storage area are sealed with epoxy. A galvanized metal roof and three fiberglass walls were installed in 1986 to protect the storage area from rain. Security is provided by a locking fence surrounding three sides of the area. The building wall forms the fourth side of the RCRA CSA.

PCB Container Storage Area

GE used the PCB CSA from 1978 to 1994 to store 55-gallon steel drums that contained PCB materials. The maximum capacity for the PCB CSA was 75 drums. GE used this storage area to store PCB items before they were shipped to qualified disposal sites. As shown in Figure 2, the PCB CSA was in a room in the southeast corner of the building. The storage area consisted of a six-inch-thick concrete floor with secondary containment provided by a concrete curb. A sump approximately three feet wide is just outside and north of this unit.

PCB Work Area

GE has operated the PCB Work Area, which is inside the southeast portion of the building as shown in Figure 2, since 1978. GE stores PCB-containing wastes and other items in the PCB Work Area. The PCB Work Area is on a concrete slab with secondary containment currently provided by a concrete curb. Prior to 1983, a trench and a sink in this area drained into the former rinse water tank.

From 1978 to 1994, the PCB Work Area held three 275-gallon portable aboveground storage tanks that were used to temporarily store PCB waste oil during repairs. In 1994, GE removed these three tanks during the partial closure activities for this area. The tanks were properly disposed off-site as a PCB waste.

Former Rinse Water Underground Storage Tank

In June 1977, GE installed the rinse water underground storage tank (UST) east of the building to hold PCB-containing wash water from the trench drain and sink in the PCB Work Area. This 2,000-gallon carbon steel UST was four feet below grade. GE used the UST for approximately five and a half years. The average residence time of the liquid in the UST was one year. The UST was surrounded by pea gravel backfill and anchored to a concrete pad with tie-down straps. The UST had a cutoff valve, but it had no secondary containment. The UST vessel had a manhole for access.

In May 1983, GE removed and disposed the contents of the UST as PCB liquid. In December 1983, decontamination of the UST was completed when the interior of the vessel was rinsed with diesel fuel. The rinse oil was disposed off-site. On October 14, 1986, GE excavated and removed the UST and the ancillary pipes in accordance with a NYSDEC-approved Closure Plan.

Old (Active) Oil/Water Separator

According to GE, the old oil/water separator on the east side of the building is active. This unit has concrete covers. The old oil/water separator receives wastewater from floor drains and steam booths within the building. After the oil is separated, the water discharges to the Town of Tonawanda's wastewater treatment plant via the sanitary sewer. Periodically, GE checks the thickness of the oil layer in this oil/water separator with a dipstick. The oil is periodically removed from the separator by a scavenger.

New (Inactive) Oil/Water Separator

The new oil/water separator is just south of the building and has manhole covers. This unit is inactive. When it was active, the new oil/water separator received wastewater from floor drains and steam booths within the building. After the oil was separated, the water discharged to the Town of Tonawanda's wastewater treatment plant via the sanitary sewer. Periodically, GE would check the thickness of the oil layer in this oil/water separator with a dipstick. The oil was periodically removed from the separator by a scavenger.

Floor Drains and Sewers

Separate sanitary and storm sewers serve GE's Buffalo Service Shop. Figure 3 reflects Dames & Moore's current understanding of the sewer systems at the site. The sewer systems drain to the sanitary and storm sewer manholes near the southwest corner of the building. From there, both systems feed into the municipal sewer systems that flow beneath Milens Road. The municipal sanitary sewer discharges to Tonawanda's wastewater treatment plant, and the municipal storm sewer discharges to the Niagara River.

The depth of the sanitary sewers that serve GE's Tonawanda service shop, which are shown in green in Figure 3, varies from approximately three to nine feet below the ground surface. The sanitary sewer system at the site includes one manhole near the southwest corner of the building.

Five floor drains in the building discharged to the sanitary sewer through either the old (active) or the new (inactive) oil/water separator. Four of these five drains were inside the building, and one was along the south wall of the building, immediately west of the truck bay trench. Three of the five drains have been plugged. The two floor drains that have not been plugged are in the spray booth and steam cleaning booth in the center of the building. These two drains discharge to the old (active) oil/water separator. The old (active) oil/water separator discharges to the four-inch diameter sanitary sewer on the east side of the building. The new (inactive) oil/water separator in the south end of the building connects to the four-inch sewer pipe south of the building. The plumbing from the rest rooms and locker rooms on the west side of the building discharges to a six-inch tile sanitary sewer west of the building. Wastewater in this six-inch pipe also flows to the sanitary sewer manhole near the southwest corner of the building.

Sanitary wastewater flows away from the on-site manhole to the southwest, toward Milens Road, where the sanitary sewer connects to the municipal sanitary sewer system.

The storm sewers at GE's Tonawanda service center, which are shown in blue in Figure 3, are at approximately the same depth as the sanitary sewers. The storm sewer system at the site includes three manholes (STMH-1, STMH-2, and STMH-3) and three catch basins (CB-1, CB-2, and CB-3).

As shown in Figure 3, a floor drain in the north end of the building and a drainage trench in the rail bay are connected to a six-inch tile storm sewer on the east side of the building. According to GE's records, five other floor drains inside the building that connected to the storm sewer have been sealed.

Approximately 130 feet south of the rail spur, the diameter of the storm sewer increases to eight inches. The diameter of the pipe increases to ten inches where the sewer passes beneath the southwest corner of the building. Roof drains discharge to this storm sewer at three locations east of the building.

Near the southeast corner of the building, the ten-inch pipe turns west at storm sewer manhole STMH-3 and slopes to the west toward manhole STMH-2. The truck bay trench and another set of roof drains connect to the sewer between these two manholes. A twelve-inch lateral, which enters STMH-2 from the north, carries storm water from roof drains on the west side of the building. Flow leaves STMH-2 to the west through a fifteen-inch pipe that connects to manhole STMH-1 near the southwest corner of the building. A six-inch tile storm sewer line runs south from the west side of the building to STMH-1. A fifteen-inch pipe exits STMH-1 and slopes to the southwest, toward Milens Road, where it connects to the municipal storm sewer system.

All three catch basins drain to STMH-1. Dames & Moore has not determined the diameter of the pipe that connects catch basin CB-1, which is west of the building, to STMH-1. Catch basin CB-2, which is near the southwest corner of the building, discharges through a ten-inch pipe, and CB-3, which is south of the building, discharges through a six-inch pipe.

As shown in Figure 3, portions of the sanitary and storm sewers were abandoned in 1978 during the construction of the addition to the building. The records that Dames & Moore has reviewed do not indicate whether these pipes were removed or plugged and left in place.

Rail Spur

The rail spur area is a 140-foot by 60-foot area in the northeast portion of the site with two railroad tracks that are currently in use. Since 1969, GE has used the northeast corner of the building to store flatbed rail cars. Historically, GE has used the two railroad bays in the building to load and unload electrical equipment onto the flatbed rail cars. As shown in Figure 2, the railroad tracks extend east beyond the fence on the east side of the site. GE's property line also extends east of the fence at the rail spur. The areas between the tracks and the adjacent road to the north are paved with asphalt. Drums of nonhazardous abrasive sand blasting materials have also been stored in the rail spur area. A portion of the ground surface shows signs of past spills of those sand blasting materials.

2.2 HYDROGEOLOGY

The regional ground water flow pattern beneath the site is probably toward the west-northwest. Shallow groundwater probably discharges toward the nearest surface water body, Two Mile Creek, which is approximately 3,000 feet west of the site. However, a bedrock trough located beneath Two Mile Creek may influence the direction of groundwater flow in the bedrock. Published background information indicates the presence of these four hydrostratigraphic zones in the area around the site: the unsaturated zone, the tension-saturated zone, the saturated overburden, and the saturated bedrock.

Unsaturated Zone

The unsaturated zone is characterized by dry, moderate to very dense, compact glaciolacustrine sediments, which are predominantly clays and silts. This zone also includes the fill that is present near the building and in utility excavations. The unsaturated zone contains local zones of perched water associated predominantly with filled utility excavations. In native soils, the unsaturated zone extends to at least 15 feet below ground surface (bgs).

Tension-Saturated Zone

The tension-saturated zone, which is also called the capillary fringe, consists of damp to moist, loose to moderately dense glaciolacustrine sediments, which are predominantly clays and silts.

Slight changes in the degree of saturation could cause significant fluctuations in both the thickness of the capillary fringe and the water table elevation. The capillary fringe extends from approximately 15 to approximately 25 feet bgs. The relatively thick tension-saturated zone is caused by the fine-grained nature of the sediments.

Saturated Overburden

The saturated zone is composed of soft to moderately dense glaciolacustrine sediments, which are predominantly clays and silts. The water table in these native soils is at 22 to 25 feet bgs. Based on the regional hydrology and topography, the groundwater in this zone appears to flow toward the west-northwest.

Saturated Bedrock

Geotechnical borings advanced by the New York State Department of Transportation indicate that the top of bedrock lies approximately 60 to 70 feet bgs. The quality and flow direction of the groundwater in the bedrock are unknown.

2.3 REGULATORY FRAMEWORK

Module III of the *373 Permit* requires Corrective Actions for all releases of hazardous wastes or constituents from any SWMUs or AOCs. Corrective Actions are to be implemented wherever they are necessary, including areas beyond the facility boundaries. Corrective Actions include a RCRA Facility Assessment (RFA), a RCRA Facility Investigation (RFI) and, if needed, Corrective Measures. GE completed the RFA in 1988 and the RFI in 1998.

The *373 Permit* specifies that GE may be required to prepare a *Corrective Measure Study* (CMS) and Report after the RFI is completed if:

- The concentrations of hazardous constituents (if any) in the media at the site exceed their corresponding individual action levels, or

- The concentrations of hazardous constituents in the media at the site do not exceed their corresponding individual action levels, but additive exposure risk, due to the presence of multiple constituents, is not protective of human health, or

- The concentrations of hazardous constituents in the media at the site do not exceed their corresponding individual action levels, but still pose a threat to human health or the environment, given site-specific exposure conditions.

The results of the RFI indicate that the concentrations of selected constituents (primarily PCBs) at the Tonawanda facility exceed the recommended soil cleanup objectives (RSCOs) published by the NYSDEC in TAGM HWR-94-4046. On October 5, 1999, the NYSDEC required that GE conduct a focused CMS for the Tonawanda facility. On November 1, 1999, GE submitted a schedule for the focused CMS (*CMS Schedule*) to the NYSDEC, and on December 3, 1999, GE submitted the *CMS Plan*. The NYSDEC approved the *CMS Plan* on January 19, 2000, and requested that GE proceed with the CMS.

2.4 CORRECTIVE MEASURE STUDY PROCESS

The CMS evaluates corrective measure alternatives for the Tonawanda facility that are technologically feasible and reliable and that effectively mitigate and minimize damage to and provide adequate protection of human health and the environment. According to GE's *373 Permit*, the CMS will be developed using target cleanup levels that are considered to be protective of human health and the environment. Where available, the target cleanup levels may be promulgated standards. The cleanup objectives in Table 1 are New York State groundwater standards (6 NYCRR Part 700) and RSCOs from NYSDEC TAGM HWR-94-4046.

The CMS consists of four tasks:

Task I: Identification and Development of the Corrective Measure Alternative or Alternatives

Task I includes a description of the current situation at the site, the establishment of corrective action objectives, the screening of corrective measure technologies, and the identification of the corrective measure alternative or alternatives for the site. The identification and development of the corrective measure alternatives were summarized in the December 3, 1999 *CMS Task I Report*. On January 19, 2000, the NYSDEC approved the *CMS Task I Report* and requested that GE continue with Tasks II, III, and IV of the CMS.

Task II: Evaluation of the Corrective Measure Alternative or Alternatives

In Task II, the corrective measure alternative or alternatives are evaluated on the basis of technical, environmental, human health, and institutional concerns. A cost estimate is also developed for each alternative.

Task III: Justification and Recommendation of the Corrective Measure or Measures

In Task III, a corrective measure or measures are recommended for the concerns identified during the RFI and the supplemental sewer investigation, which was performed in accordance with the NYSDEC-approved November 17, 1999 *Supplemental Sewer Investigation Work Plan.* The measure or measures will be justified on the basis of technical, human health, and environmental considerations.

Task IV: Reports

This *CMS Final Report* includes the information gathered under the NYSDEC-approved *CMS Plan*, including the results of supplemental investigations and summaries of Tasks II and III.

After the CMS is completed and the corrective measures are selected, the NYSDEC will modify GE's permit to incorporate the selected corrective measures. At that point, GE will initiate the Corrective Measure Implementation (CMI). The CMI will include the final engineering design, construction, operation, maintenance, and monitoring of the selected corrective measures.

3.0 PREVIOUS INVESTIGATIONS

This section provides a brief summary of the results of the recent investigations that GE has conducted at the site in accordance with terms of the *373 Permit* and at NYSDEC's request. The work is described in these three reports:

- *RFI Report* (April 2, 1999)
- *CMS Task I Report* (December 3, 1999)
- *Supplemental Sewer Investigation Report* (April 17, 2000)

These reports are summarized in the remainder of this section.

3.1 RCRA FACILITY INVESTIGATION

GE submitted the *RFI Report* to the NYSDEC on April 2, 1999. The *RFI Report* summarized the results of previous investigations at the site and the RFI. The general objectives of the RFI were to:

- Further evaluate the nature and extent of the contaminants that had previously been found in the backfill, native soils, perched water and groundwater near the eight SWMUs and AOCs at the site;
- Further evaluate the direction and estimated rate of migration of contaminants in site media; and
- Generate sufficient data to evaluate corrective measure alternatives.

The analytical results for the soil and groundwater samples collected during the RFI from the locations shown in Figure 4 were compared to the criteria in Table 1 to evaluate whether the soil and groundwater near the SWMUs had been impacted. The criteria in Table 1 include the recommended soil cleanup objectives (RSCOs) from NYSDEC's TAGM HWR-94-4046 and New York State groundwater standards (6 NYCRR Part 700). The RFI results for each of the eight SWMUs or AOCs are summarized in the following sections.

3.1.1 RCRA Container Storage Area

The scope of work for the RFI included an investigation of the soil quality at the perimeter of the RCRA CSA, but not beneath the concrete pad. Based on the analytical results from the four soil borings installed near the RCRA CSA during the RFI, the soils surrounding the RCRA CSA do not appear to have been significantly impacted by either PCBs or VOCs. Therefore, neither additional investigative work nor corrective action were recommended.

Only traces of PCBs were detected in the subsurface soils from four soil borings located near the RCRA CSA. PCBs were detected in subsurface soils at concentrations less than the NYSDEC's RSCO of 10 milligrams per kilogram (mg/kg). The concentrations of PCBs in surface soil samples were also less than the RSCO for surface soil of 1 mg/kg.

During the RFI, only one VOC (1,1-dichloroethane [1,1-DCA]) was detected near the RCRA CSA at one location, in a duplicated soil sample collected from six to eight feet below the ground surface. The reported concentrations (0.0059 mg/kg in the original sample and 0.0083 mg/kg in the duplicate sample) of 1,1-DCA were less than the RSCO for 1,1-DCA (0.2 mg/kg). No other VOCs were found near the RCRA CSA.

3.1.2 PCB Container Storage Area

The scope of work for the RFI included an investigation of the soil quality adjacent to, but not beneath, the PCB CSA. The soils south and southeast of the PCB CSA do not appear to have been significantly impacted by PCBs. Therefore, neither additional investigative work nor corrective action was deemed necessary in this area.

Low concentrations of PCBs were found in the soil samples collected from a depth of two feet near the southeast corner of the building outside the PCB CSA. The PCB concentration in a surface soil sample collected near the southeast corner of the building was 0.32 mg/kg, which is less than the RSCO of 1.0 mg/kg. Only traces of PCBs, less than 0.2 mg/kg, were found in subsurface soils near the south side of the building.

The *RFI Report* noted that in 1987 Lawler, Matusky, & Skelly reported that a surface soil sample collected along the fence line east of the RCRA CSA contained a PCB concentration of 2 mg/kg, which exceeds the RSCO of 1 mg/kg.

3.1.3 PCB Work Area

The scope of work for the RFI included an investigation of the soil quality outside the PCB work area. Dames & Moore recommended that the area outside the PCB work area, east of the building near the old oil/water separator and the former rinse water tank, be included in the focused CMS. However, the issues that Dames & Moore found outside the PCB work area appear to be related to two other AOCs, the former rinse water UST excavation and the sewers, rather than to the PCB work area itself.

During the RFI, PCBs were detected at concentrations exceeding the RSCOs in soil samples from one location outside the PCB work area east of the building along the sewer lines. PCBs were also detected in a sample of the perched groundwater collected from monitoring well MW-3 near the PCB work area. During previous investigations near the PCB work area, PCBs were detected in surface soils east of the building, between the old oil/water separator and the former rinse water tank.

3.1.4 Former Rinse Water Tank Excavation

Based on the results of previous investigations and the RFI, Dames & Moore recommended that a focused CMS be performed at the former rinse water tank excavation. The fill within the former UST excavation and the perched groundwater within the fill showed evidence of impacts from PCBs and VOCs. The impacted materials appeared to be limited to the former UST excavation. Dames & Moore found that contaminant migration to the native soils around or beneath the former UST excavation is limited to the materials in the immediate proximity of the former excavation.

During the RFI, soil and groundwater samples were collected both within and outside of the former rinse water tank excavation, which was approximately 10 to 12 feet deep. The PCB concentration in a sample of the fill collected from four to six feet below grade in the former tank pit excavation was 66 mg/kg, which exceeds the RSCO of 10 mg/kg for subsurface soils. The chlorobenzene concentration in this soil sample was 34 mg/kg, which exceeds the RSCO of 1.7 mg/kg. However, the soil sample from 10 to 11 feet in the same location had a PCB concentration of 2.99 mg/kg and a chlorobenzene concentration of 0.03 mg/kg, which suggests that both PCB and chlorobenzene concentrations in the soil decrease with depth.

Both VOCs and PCBs were detected in the perched groundwater in the fill in the former rinse water tank excavation at concentrations that exceed the NYSDEC's groundwater standards. However, native low permeability clay separates this perched groundwater from the underlying groundwater, and PCBs and VOCs were not detected in the groundwater sample from a deep monitoring well located outside the former tank excavation.

The soil quality outside the former rinse water tank excavation was evaluated at six soil borings around the former tank excavation. PCBs were not detected in the soil samples collected from five of the six borings. The total concentration of PCBs detected in a soil sample from the sixth soil boring was 0.25 mg/kg, which is less than the RSCO.

The RFI Report noted that in 1987, LMS reported that a surface soil sample collected along the fence line east of the former UST excavation contained 4.5 mg/kg PCBs as well as 120 mg/kg petroleum hydrocarbons.

3.1.5 Old Oil/Water Separator

Based on the results of the RFI, Dames & Moore concluded that the old oil/water separator may have been a source of the PCBs found in soil and perched groundwater samples collected along the sewer line south of the old oil/water separator. Thus, Dames & Moore recommended that the old oil/water separator be included in a focused CMS.

Only traces of PCBs were present down to a depth of approximately four feet in soil boring B-23, which was located near the old oil/water separator. The maximum PCB concentration detected was 3.1 mg/kg, which is below the RSCO of 10 mg/kg for subsurface soils. PCBs were not detected in samples collected below four feet, and no VOCs were detected in the soil at this location. However, a soil sample collected from two to four feet below grade at the soil boring for MW-2, which is near the sewer lines approximately 50 feet south of the old oil/water separator, contained 33 mg/kg PCBs.

3.1.6 New Oil/Water Separator

Based on the RFI results, the new oil/water separator does not appear to have significantly impacted the surrounding soil and groundwater quality. Neither additional investigative work nor corrective action was recommended.

No VOCs were detected in the soil downgradient of the new oil/water separator. Traces of PCBs (2.5 mg/kg) were found at a depth of six to eight feet in a soil boring located west and downgradient of the new oil/water separator. The soil PCB concentrations at another soil boring located downgradient of the new oil/water separator were also less than the RSCOs.

No PCBs were detected in the perched groundwater downgradient of the new oil/water separator. The only VOCs detected in the groundwater downgradient of the new oil/water separator were chloroform and methylene chloride. The reported concentrations (1.9 μg/L chloroform and 0.56 μg/L methylene chloride) were below groundwater standards.

3.1.7 Drains and Sewers

Based on the results of the RFI, Dames & Moore concluded that portions of the sewers may have been affected by releases at the site. Dames & Moore recommended that two portions of the sewer system, the sewer lines east of the building near the former rinse water UST and the truck bay trench and sump, be included in a focused CMS. The NYSDEC also requested additional investigation of the storm sewer catch basins and manholes at the site. The results of the supplemental sewer investigation requested by the NYSDEC are summarized in Section 3.3. The remainder of this section summarizes the findings of the RFI regarding the drains and sewers at the site.

The *RFI Report* indicated that all of the floor drains in the building had been plugged with the exception of floor drains in the spray booth and the steam cleaning booth located in the northeast part of the building. The active floor drains inside the building lead to the active old oil/water separator, which discharges to the sanitary sewer.

The results of the RFI indicated that the exterior drains in the truck bay trench, the truck bay sump, and the sewers on the east side of the building appear to have been impacted by PCBs. PCB-containing sediments were found in the truck bay trench (240 mg/kg) and the sump in the truck bay area (24 mg/kg) on the south side of the building. The precipitation that accumulates in the trench discharges to the storm sewer, and the sump is periodically pumped out.

The soils that surround the sewer lines contain some PCBs at concentrations that exceed RSCOs, predominantly at a depth of two to six feet. The elevated levels of PCBs are concentrated on the east side of the building, near the former rinse water tank, where a maximum PCB concentration of 53.5 mg/kg was detected.

Although PCBs and VOCs were found in the fill and perched groundwater along the sewer lines, it does not appear that significant amounts of PCBs and VOCs migrate along the sewer line backfill. A groundwater sample from monitoring well MW-2, which is screened in the fill around the sewer lines between the old (active) oil/water separator and the former rinse water UST excavation contained concentrations of PCBs (142 μg/L) and VOCs (13 μg/L dichlorobenzenes, 5 μg/L ethylbenzene, and 30 μg/L xylenes) that exceed groundwater standards. However, only traces of two VOCs (1.9 μg/L chloroform and 0.56 μg/L methylene chloride) were detected in the July 1998 groundwater sampling event at a monitoring well that is screened in the fill near where the sewer lines exit the site. These concentrations did not exceed the groundwater standards. In December 1998, VOCs were not detected in groundwater from the same location. PCBs were not detected at this monitoring well during either of the 1998 sampling events.

3.1.8 Rail Spur Area

The surface soils near the rail spur in the northeast part of the site contain concentrations of PCBs (up to 142 mg/kg) that exceed the RSCO of 1.0 mg/kg. However, the concentrations of

PCBs in subsurface soils are less than the RSCO of 10 mg/kg. Dames & Moore recommended a focused CMS for the surface soils at the rail spur area.

The extent of PCB-impacted soils in the rail spur appears to be delineated. The region of PCB-impacted surface soil in the northeast part of the site encompasses the area of the railroad tracks within the fence and extends east of the fence. These PCB-containing soils encompass approximately 18,000 square feet. A two- to three-foot deep soil mound north of the railroad tracks also contains PCB concentrations above RSCOs.

3.1.9 Summary of RFI Results

The RFI concluded that PCB and VOC impacts at the Tonawanda site are limited in concentration and extent. Figure 5 shows the extent of the surface soil in the rail spur area northeast of the building that has been impacted by PCBs. Figure 6 shows the extent of the soil in the area near the sewer lines and the former UST excavation immediately east of the building that has been affected by PCBs and VOCs. The impacted subsurface soil is limited to the fill around the sewer lines and in the former rinse water UST excavation. Groundwater that is perched in this fill material has also been impacted by PCBs and VOCs, but this groundwater is separated from the underlying groundwater by the native low-permeability clay. Based on the findings of the RFI, Dames & Moore concluded that a focused CMS would be appropriate for these five areas at the site, which are shown in Figure 7:

- The former rinse water UST excavation;
- The sewer lines east of the building near the former rinse water tank;
- The truck bay trench and sump;
- The area around the old oil/water separator; and
- The surface soils near the rail spur.

Surface soils, subsurface soils, or sediments in all five areas contain concentrations of PCBs that exceed the NYSDEC's RSCOs. The fill beneath the surface in the former rinse water tank excavation also contains concentrations of chlorobenzene that exceed RSCOs. Samples of the perched groundwater from the fill in the former rinse water UST excavation and along the sewer lines near the former rinse water UST excavation exhibit concentrations of PCBs and VOCs that exceed groundwater standards. It does not appear that significant amounts of PCBs and VOCs migrate along the sewer line backfill.

3.2 CMS TASK I REPORT

On December 3, 1999, GE submitted the *CMS Task I Report* to the NYSDEC, who approved the *CMS Task I Report* on January 19, 2000. As described in Section 2.4, the *CMS Task I Report* described current conditions at the site, established remedial action objectives, screened corrective measure technologies, and identified the corrective measure alternatives that are evaluated in this *CMS Final Report*. The contents of the *CMS Task I Report* have been incorporated into this *CMS Final Report*.

3.3 SUPPLEMENTAL INVESTIGATION REPORT

On April 17, 2000, GE submitted the *Supplemental Sewer Investigation Report (SSI Report)* to NYSDEC. GE conducted a supplemental investigation at the site in response to a letter from the NYSDEC, which was dated October 5, 1999. The objectives of the supplemental investigation were to evaluate whether there have been historical releases of PCBs from the building to the soil adjacent to the building and to sample the sediments in the three on-site catch basins and in the three on-site storm sewer manholes. The results of the supplemental investigation suggest that PCB- and VOC-impacted sediments are present in the on-site storm sewers. Thus, the on-site storm sewers are included in the CMS. The locations of the catch basins and storm sewers are shown in Figure 3. The remainder of this section summarizes the results of the supplemental investigation.

Supplemental Review of Site Records

During the supplemental review of GE's site records, Dames & Moore reviewed several documents that had not been reviewed during the RFI. Most of these documents were historical drawings of the on-site storm and sanitary sewers. None of these documents had evidence of historical spills that may have impacted the sewers or sewer bedding material.

Two of the documents that Dames & Moore reviewed indicated two possible connections from floor drains in the building to the storm sewer. A 1974 drawing by George H. Drake Inc. Plumbing, entitled *General Electric Apparatus Service Shop, Town of Tonawanda, N.Y., Exhibit B*, shows a drainage trench in the rail bay that is connected to the storm sewer. A conversation between Dames & Moore and GE personnel in January 2000 indicated that the drainage trench in the rail bay currently appears to be active.

The 1974 drawing also shows a drinking fountain in the northern end of the building that is connected to the storm sewer. A 1997 report by GES, entitled *Industrial Shop Process and Sewer System Characterization,* stated that a dye tracer released into a floor drain in the north end of the building had been detected in manhole STMH-3, indicating that the floor drain discharged to the storm sewer. The floor drain mentioned in the GES report appears to be in the same place as the drinking fountain shown in the 1974 drawing. Figure 3 reflects Dames & Moore's current understanding of the connections from the building interior to the storm sewer east of the building.

Sampling of Catch Basins and Manholes

There are PCB- and VOC-impacted sediments in the on-site storm sewers. The impacts are greatest in the storm sewer manhole farthest upstream and decrease markedly in the downstream sewers.

Dames & Moore inspected manholes STMH-1, STMH-2, and STMH-3 and catch basin CB-1 on January 25, 2000. Dames & Moore returned to the site on February 29, 2000 to inspect catch basins CB-2 and CB-3, when access to the catch basins was not prevented by snow and ice. The locations of the manholes and catch basins are shown in Figure 3.

Storm sewer manhole STMH-1, which is located near the southwest corner of the building, did not contain sediments. This finding was consistent with the observations at this location during the RFI. However, Dames & Moore did observe sediments in the two remaining storm sewer manholes (STMH-2 and STMH-3) and three catch basins (CB-1 through CB-3). Dames & Moore collected sediment samples from these five locations.

The analytical results for the sediment samples collected from the storm sewer manholes and catch basins are summarized in Table 2. As shown in Table 2, VOCs were not detected in the sediment sample from CB-1. Traces of acetone, toluene, and xylenes were detected in the sediment samples from CB-2 and CB-3.

No sediment sample was collected from STMH-1, which contained no sediment. No VOCs were detected in the sediment sample from STMH-2. The concentration of total VOCs detected in the sediment sample from STMH-3, which is near the southeast corner of the building, was 1,966 mg/kg. Most of the VOCs detected in STMH-3 were chlorinated benzene compounds.

PCBs were detected in the sediment samples from all three catch basins. The concentrations of PCBs detected in the catch basins ranged from 0.1 mg/kg at CB-1 (west of the building) to 1.6 mg/kg at CB-3 (south of the building).

PCBs were also detected in the sediment samples collected from manholes STMH-2 and STMH-3. The concentration of PCBs detected in the sediment sample from manhole STMH-3, which is near the southeast corner of the building, was 41,300 mg/kg. Dames & Moore noted that the sediment sample from STMH-3 represented black, oily sediments that were present on the northwest side of STMH-3. As shown in Figure 3, the northwest side of STMH-3 is on the inside corner of a turn and is therefore less likely to be scoured by flows in the sewer. Thus, the black material is believed to represent sediments that have been deposited over a long period of time. The PCB concentration of 20.7 mg/kg detected in the sediment sample from manhole STMH-2, which is immediately downstream of STMH-3, is consistent with Dames & Moore's belief that the impacted sediments in STMH-3 are probably not being transported beyond STMH-3 by the flow in the storm sewer.

4.0 OBJECTIVES

Based on the results of the RFI, corrective actions at GE's Tonawanda facility should address these four potential exposure and contaminant migration pathways:

- Direct contact with sediments, surface soils, subsurface soils, and perched groundwater contaminated with PCBs and VOCs;
- Off-site transport of PCB-contaminated sediments and soils;
- Infiltration through contaminated soil; and
- Migration of contaminated perched groundwater.

Table 1 lists the New York State groundwater standards (6 NYCRR Part 700) and the RSCOs (NYSDEC TAGM HWR-94-4046) that will be used as cleanup criteria for the PCBs and VOCs detected in the soil, sediments, and perched groundwater at the Tonawanda facility. The corrective action objectives for the Tonawanda site, which were established in the *CMS Task I Report* and approved by the NYSDEC, are to:

- Remove or prevent contact with and off-site transport of sediments containing PCBs at concentrations greater than the RSCO of 1 mg/kg;

- Remove or prevent contact with, off-site transport of, and infiltration of precipitation through surface soils containing PCBs at concentrations greater than the RSCO of 1 mg/kg;

- Remove or prevent contact with and infiltration through subsurface soils containing PCBs or VOCs at concentrations greater than the RSCOs listed in Table 1; and

- Prevent or control the migration of perched groundwater containing PCBs or VOCs at concentrations exceeding New York State groundwater standards.

5.0 CORRECTIVE MEASURE TECHNOLOGIES

In the *CMS Task I Report*, Dames & Moore evaluated 15 corrective measure technologies that could potentially be applicable to GE's Tonawanda service shop, based on the RFI results and Dames & Moore's understanding of site conditions. These technologies were:

- No Action;
- Institutional Actions;
- Monitoring
- Surface Capping;
- Surface Controls;
- Dust Controls;
- Excavation and Removal;
- Lining Sewers;
- On-Site Disposal;
- Off-Site Disposal;
- Pretreatment (Dewatering and Solid Separation);
- Thermal Treatment;
- Chemical Treatment;
- Immobilization and Physical Treatment; and
- In-Situ Treatment.

These potentially applicable corrective measure technologies are briefly described in this section.

No Action

The no-action alternative involves allowing the site to remain in its current condition and taking no action to address the issues of PCB- and VOC-impacted soil, sediment, and groundwater contamination. The no action alternative is included for the purpose of comparison.

Institutional Actions

Institutional actions involve placing access restrictions on areas that contain contaminated media. Institutional actions may include imposing deed restrictions, posting signs, and installing fences. Institutional controls can limit human exposure to materials that remain on site.

Monitoring

Groundwater monitoring at wells within and at the perimeter of a site is used to track the movement or degradation of contaminants in the groundwater. Monitoring is useful in evaluating the effectiveness of other remedial technologies.

Surface Capping

Surface capping involves the placement of covers constructed of materials such as synthetic membranes, asphalt, concrete, clay, bentonite, and soil. Caps serve as barriers to prevent contact with contaminated soil. They may also be used to limit surface water infiltration, thereby lessening the impact of soil contamination on groundwater quality.

Surface Controls

Surface controls include slope grading and diversion and collection ditches to control the flow of surface water. Erosion controls limit the transport of contaminated surface soil. Surface controls are a method for containing contamination and are effective when used with treatment or removal technologies.

Dust Controls

Dust controls, including revegetation, capping, and watering, help to reduce contaminant transport through airborne particulate material. Dust controls are effective when used in conjunction with treatment or removal technologies.

Excavation and Removal

The excavation and removal of contaminated soil and sediments involves excavating, loading, and transporting the soil to an on-site or off-site facility for treatment or disposal. The excavated areas are usually backfilled with clean material. Excavation can also include the removal of sediments from structures such as catch basins, manholes, and sewers.

Lining Sewers

Lining sewer pipes after they have been cleaned will prevent infiltration into the pipes from contaminated subsurface soil or groundwater.

On-Site Disposal

On-site disposal of soil or sediment takes place at a new or existing on-site landfill. The landfill must be constructed in accordance with the Federal and State regulations governing the disposal of solid, hazardous, and toxic wastes. On-site disposal is an effective means of containment, although it does not permanently destroy or reduce the toxicity of the waste.

Off-Site Disposal

Off-site disposal takes placed at a properly licensed off-site facility to which the waste material must be transported. Off-site disposal is an effective means of containment, although it does not permanently destroy or reduce the toxicity of the waste.

Pretreatment

The treatment or disposal of contaminated soils and sediments may require pretreatment such as dewatering or solids separation. Methods of dewatering include centrifuging, gravity thickening, and filtration. Both the solids and the water must be treated or disposed appropriately.

Thermal Treatment

Thermal treatment is used to destroy or desorb organic contaminants from soil. Thermal soil aeration or desorption involves heating contaminated soil or sediment to a temperature at which volatile and semi-volatile organic compounds volatilize. Incineration involves heating the soil to the point of combustion in order to oxidize organic material, including contaminants. The off-gases from thermal treatment are treated to remove the organic compounds and particulate matter.

Chemical Treatment

Chemical treatment can be used to immobilize, extract, or detoxify contaminants. Chemical treatment technologies include soil washing, solvent extraction, and chemical detoxification.

Physical Treatment

Physical treatment methods include solidification and stabilization, encapsulation, and volatilization. Solidification and stabilization involves mixing waste with a solidifying agent, producing a solid matrix in which contaminants are mechanically fixed. Encapsulation methods seal contaminants within an organic binder or resin. Volatilization of contaminants can be accomplished through mechanical aeration or thermal treatment.

Immobilization

Immobilization methods, which include precipitation, chelation, and polymerization, bind contaminants, making them less mobile. Immobilization techniques tend to be applied to inorganic contaminants such as metals rather than organic compounds like PCBs and VOCs.

In-Situ Treatment

In-situ treatment can be used to immobilize, volatilize, detoxify, destroy, or remove contaminants. In-situ treatment technologies include bioremediation, heating, soil flushing, vitrification, and soil vapor extraction.

In the *CMS Task I Report*, Dames & Moore eliminated on-site disposal, immobilization and physical treatment, chemical treatment, and in-situ treatment from consideration based on site-specific constraints including the size of the site and the nature and limited extent of the contamination. The remaining technologies were combined into the five corrective measure alternatives that are evaluated in this *CMS Final Report.*

6.0 EVALUATION CRITERIA

In accordance with the *373 Permit*, the corrective measure alternatives developed in the *CMS Task I Report* have been evaluated on the basis of technical, environmental, human health, and institutional concerns, and a cost estimate has been developed for each alternative. This section describes the evaluation criteria that are used in the CMS.

6.1 TECHNICAL EVALUATION

The technical evaluation of each alternative includes evaluations of the expected performance, reliability, implementability, and safety of each corrective measure alternative.

Performance

The evaluation of the performance of each alternative focuses on its expected effectiveness and useful life. The effectiveness is evaluated in terms of the ability of the alternative to contain, remove, destroy, or treat sources of concern, including VOC- and PCB-impacted soil and water. The useful life of each alternative is defined as the length of time for which the effectiveness can be maintained. This is a function of the expected service lives of various components of the alternative and the availability of required resources.

Reliability

The reliability of the alternatives is a function of operation and maintenance requirements and the demonstrated reliability of the component technologies, both individually and in combination, under conditions similar to those anticipated at GE's Tonawanda facility.

Implementability

The evaluation of the alternatives' implementability addresses the ease of construction, the time required for construction, and the time required for beneficial results to be observed.

Safety

The evaluation of the safety of each alternative focuses on the safety of nearby communities and environments as well as workers during implementation.

6.2 ENVIRONMENTAL IMPACT

The environmental assessment for each alternative focuses on the facility conditions and contamination migration pathways addressed by each alternative. The assessment includes an evaluation of the short- and long-term beneficial and adverse effects of the alternative, an examination of the effects of the alternative on environmentally sensitive areas, and an analysis of the measures available to mitigate adverse effects.

6.3 HUMAN HEALTH EFFECTS

Each alternative has been evaluated in terms of the extent to which it mitigates short- and long-term potential exposure to residual contamination, and in terms of the ability of the alternative to protect human health both during and after implementation. This evaluation includes estimates of levels and types of contamination that will remain at GE's Tonawanda facility, potential exposure routes, and potentially affected populations. Each alternative has been evaluated to estimate the potential level of exposure to contaminants during and after its implementation. The anticipated residual contaminant levels have been compared with relevant standards, criteria, and guidelines for the protection of human health.

6.4 INSTITUTIONAL NEEDS

Each alternative has been evaluated to assess the impact of various institutional requirements on its design, operation, and timing. The alternatives are evaluated to assess whether they will comply with relevant federal, New York State, and local environmental and public health standards, regulations, criteria, and guidelines.

The Corrective Measure Study process for GE's Tonawanda site is regulated under RCRA. Portions of the federal Toxic Substances Control Act (TSCA) that pertain to low-occupancy areas will be considered as guidelines. TSCA [40 CFR 761.61 (a)(4)(i)] requires that bulk PCB remediation waste, such as soil, in low occupancy areas be cleaned up to contain PCB concentrations less than or equal to 25 mg/kg. Soil with PCB concentrations between 25 and 50 mg/kg may remain at the site if it is enclosed with fences posted with appropriate signs. Soil with PCB concentrations between 25 and 100 mg/kg may remain at the site if it is covered with an asphalt cap with a minimum thickness of six inches. The deed to the site must be amended to require the owner of the site to maintain the asphalt cap. The NYSDEC's groundwater standards and RSCOs for PCBs and VOCs are also applicable to GE's Tonawanda facility.

In addition to the consideration of the ability of the alternatives to comply with regulations and guidelines, the evaluations take into account the anticipated community reaction to the implementation of the alternatives.

6.5 COST ESTIMATE

The present worth of each corrective measure alternative has been estimated using a discount rate of five percent and a maximum project life of thirty years. The estimated present worth includes direct and indirect capital costs and annual operation and maintenance costs. The components that are considered for each of these costs are:

Direct Capital Costs

- Construction costs, including materials, labor, and construction equipment;
- Equipment costs, including treatment, containment, disposal, and service equipment; and
- Buildings and services costs, including process and nonprocess buildings, utility connections, purchased services, and disposal.

Indirect Capital Costs

- Engineering expenses, including administration, design, construction supervision, drafting, and testing of alternatives;
- Legal fees and license or permit costs;
- Startup and shakedown costs; and
- Contingency allowances for unforeseen circumstances.

Operation and Maintenance Costs

- Operating labor costs;
- Maintenance materials and labor costs;
- Auxiliary materials and energy, including electricity, chemicals, water and sewer service, and fuel;
- Purchased services, including sampling costs and laboratory fees;
- Disposal and treatment costs for waste materials generated during the operation of the alternative;
- Administrative costs;
- Insurance, taxes, and licensing costs; and
- Maintenance reserve and contingency funds.

The sources used to develop the cost estimates include vendor quotes and published reference materials, including R. S. Means' *Environmental Cost Data – Assemblies* (2000) and R. S. Means' *Heavy Construction Cost Data* (2000).

7.0 CORRECTIVE MEASURE ALTERNATIVES

The five corrective measure alternatives assembled in the *CMS Task I Report* are described and evaluated in this section. These five alternatives are:

- Alternative 1: No Action with Access Controls;
- Alternative 2: Surface Soil Excavation and Off-Site Disposal;
- Alternative 3: Asphalt Caps
- Alternative 4: Surface and Subsurface Soil Excavation and Off-Site Disposal; and
- Alternative 5: On-Site Thermal Desorption.

This section also includes a description and evaluation of a sixth alternative, which is referred to as Alternative 3A: Asphalt Cap over Subsurface Soil. This alternative represents a variation on Alternative 3, which was presented in the CMS Task I Report.

The five alternatives originally presented in the *CMS Task I Report* have been updated to incorporate the results of the *Supplemental Sewer Investigation.* Alternative 3 has also been modified to include a second asphalt cap in addition to the single cap proposed in the *CMS Task I Report.* Figures 8 through 13 show site plans that depict the major elements of each alternative. Table 3 presents a summary of the major elements of the six alternatives. The remainder of this section, which is Task II of the CMS, provides a detailed description and evaluation of each of the six corrective measure alternatives.

7.1 ALTERNATIVE 1: NO ACTION WITH ACCESS CONTROLS

The no-action alternative involves:

- Institutional actions
  - Fences and signs
  - Deed restrictions
- Groundwater monitoring

The no action alternative is presented for the purpose of comparison. As shown in Figure 8, the existing fence would be extended to enclose an additional 9,000-square-foot area around the rail spur where surface soil with PCB concentrations greater than 1 mg/kg has been found. Additional new fences east and north of the building would limit access to the area containing PCB- and VOC-impacted soil and perched groundwater. Signs would be posted along the fence line, at building exits leading to the fenced-off area, and near the truck bay trench and sump. The deed for the property would be amended to restrict future use of the land to reduce the risk of human contact with contaminants. Groundwater samples would be collected and analyzed annually to monitor the concentrations of PCBs and VOCs that remain in the groundwater at the site. The shallow, perched groundwater would be monitored at existing monitoring well MW-4. The deeper groundwater would be monitored at existing monitoring well MW-5, which is east of the building, and at two new monitoring wells which would be installed northwest and southwest of the building, as shown in Figure 8. The two new wells, which would be constructed of two-inch polyvinyl chloride (PVC) pipe, would be screened in a ten-foot interval approximately 60 to 70 feet below the ground surface. No remedial action would be taken.

Dames & Moore estimates that if Alternative 1 were selected and incorporated into a modified *373 Permit* for GE's Buffalo Service Shop, the final design could be completed within two weeks. We anticipate that construction of the corrective measure could be completed within two weeks of NYSDEC approval of the final corrective measure design. The groundwater quality at the site would be monitored annually for five years following the construction of the corrective measure.

Dames & Moore anticipates that if impacted perched groundwater were affecting the underlying groundwater, it would become apparent during the five-year monitoring program in samples from monitoring wells screened in the deep groundwater. During the RFI, the depth to perched groundwater at monitoring well MW-3, which is screened in the fill, was approximately six feet below the ground surface. If the clay has an assumed hydraulic conductivity on the order of 10^{-6} cm/s and an estimated porosity of approximately 0.35, perched groundwater would infiltrate downward at a rate of approximately 3 feet per year. Thus, impacted perched groundwater would reach the screened interval of deep monitoring well MW-5, which is approximately 40 feet below the base of the former UST excavation, within approximately 15 years after it had begun to infiltrate. The perched groundwater in the fill in the former rinse water UST excavation has probably been impacted since before the former rinse water UST was removed in 1986. Dames & Moore anticipates that the 5-year monitoring program would be completed in 2006, by which time impacts to the underlying deep groundwater, if there were any, should have become apparent.

7.1.1 Technical Evaluation

The no-action alternative would not contain, remove, destroy, or treat the PCB- and VOC-impacted soil, sediment, and perched groundwater at the Tonawanda Apparatus Service Center. Alternative 1 would require little maintenance to remain operational, and could be implemented with little difficulty. Alternative 1 would pose little risk to worker or public safety during implementation, but site workers would still face a significant risk of exposure to PCB-impacted surface soil.

7.1.2 Environmental Impact

Alternative 1 does not address the facility conditions or the four contaminant migration and exposure pathways identified in the *CMS Task I Report*.

7.1.3 Human Health Effects

Alternative 1 would lessen the general public's risk of exposure by restricting access to impacted areas.

7.1.4 Institutional Needs

Alternative 1 would not comply with state and federal standards, criteria, and guidelines for the concentrations of PCBs and VOCs in soil, sediment, and water. PCBs would remain in the soil at concentrations greater than the NYSDEC's RSCO of less than 1 mg/kg at depths of ten inches or less and less than 10 mg/kg at depths greater than ten inches. VOC concentrations in the soil would also remain at concentrations greater than the NYSDEC's RSCOs.

Public reaction is anticipated to be generally negative if GE should choose to take no action at the Tonawanda site. The terms of the *373 Permit* require GE to make the public aware of the presence of impacted soils, sediments, and perched groundwater at the site.

7.1.5 Cost Estimate

Table 4 presents a preliminary cost estimate for Alternative 1. The estimated present worth of Alternative 1 is $80,000. This includes an estimated capital cost of approximately $40,000 and annual operation and maintenance costs of approximately $8,000 for five years.

7.2 ALTERNATIVE 2: SURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

The second proposed corrective measure alternative involves:

- Institutional actions
  - Deed restrictions
- Surface soil excavation and backfill
  - Rail spur
  - East of building
- Sediment removal
  - Truck bay trench and sump
  - Storm sewer, including manholes and catch basins
- Off-site disposal of soil and sediment
- Storm sewer cleaning
- Sealing of floor drain
- Sewer lining
- Groundwater monitoring

In this alternative, which is depicted in Figure 9, surface soil with PCB concentrations greater than the RSCO of 1 mg/kg would be excavated and properly disposed off-site. Confirmatory soil samples would be collected from the base of the excavation and analyzed for PCBs. An estimated 18,000 square-foot area around the rail spur and an area of approximately 3,500 square feet near the old oil/water separator and the former rinse water UST excavation on the east side of the building would be excavated to a depth of one foot. The surface soil excavation would yield approximately 800 cubic yards of soil. A roughly 100-cubic-yard soil pile near the rail spur would also be removed. The railroad spur itself would remain intact. The excavations would be backfilled with clean material imported from off-site, graded, and restored by seeding or paving. An estimated five cubic yards of sediments would be removed from the truck bay trench and sump and the storm sewer. The sediments would be dewatered and transported off-site for disposal at properly licensed facilities. Samples of the excavated materials would be analyzed for PCB and VOC content to properly characterize the materials for disposal. The estimated 825 cubic yards of soil and sediments with PCB concentrations less than 50 mg/kg could be disposed in a solid waste landfill. The remaining 80 cubic yards of material with PCB concentrations of 50 mg/kg or greater would be disposed in a TSCA landfill.

The deed to the property would be amended to restrict the future use of an area of approximately 2,300 square feet east of the building near the former rinse water tank excavation, where subsurface soil and perched groundwater that contain elevated concentrations of PCBs and VOCs would remain.

The on-site storm sewers, including the three on-site catch basins and the three on-site storm sewer manholes, would be cleaned to remove residual contamination. The water generated by the cleaning would be treated on-site and discharged to the sewer under the terms of an appropriate permit. The floor drain in the building that connects to the storm sewer would be sealed to avoid recontaminating the cleaned sewer. Approximately 100 feet of both the four-inch sanitary sewer and the eight-inch storm sewer near the old oil/water separator and the former rinse water tank excavation would be lined to prevent the infiltration of perched groundwater. The groundwater quality would be monitored for five years as described for Alternative 1.

Dames & Moore estimates that if Alternative 2 were selected and incorporated into a modified *373 Permit* for GE's Buffalo Service Shop, the final design could be completed within 90 days. We anticipate that construction of the corrective measure, including contractor selection, could be completed within five months of NYSDEC approval of the final corrective measure design.

The groundwater quality at the site would be monitored annually for five years following the construction of the corrective measure.

7.2.1 Technical Evaluation

Once the excavated areas were backfilled, Alternative 2 would minimize the risk of human contact with PCB-impacted surface soils. Cleaning the storm sewer and the truck bay trench and sump would prevent the PCB- and VOC-impacted sediments currently in the truck bay trench and sump and storm sewer manhole STMH-3 from migrating off-site. Sealing the interior floor drain that discharges to the storm sewer would reduce the risk of recontamination of the storm sewer. Alternative 2 would not address the PCB- and VOC-impacted subsurface soils and perched groundwater on the east side of the building. However, because the native low permeability clay separates the impacted subsurface soil and perched groundwater from the underlying groundwater, it is unlikely that the perched water would impact the underlying groundwater.

Excavation and disposal of contaminated materials at a properly permitted landfill is a reliable, proven technology for addressing PCB- and VOC-impacted soils and sediments. Sewer lining is a reliable way to improve the integrity of underground piping and reduce the potential for infiltration of perched groundwater into the sewer.

Alternative 2 could be implemented with little difficulty. Excavation and backfilling are common construction-related activities, and the contractor performing the work would be expected to comply with federal and state health and safety regulations. The risk to public safety should also be minimal as long as the activities occur in a fenced-off area and adequate dust control measures are used. The truck traffic from the transportation of the excavated materials to off-site facilities and the importation of clean backfill would slightly increase the risk of transportation-related accidents.

7.2.2 Environmental Impact

Alternative 2 would address the four potential contaminant migration and exposure pathways identified in the *CMS Task I Report*. The excavation and removal of surface soil would reduce the risk of direct contact with impacted materials as well as the potential for groundwater contamination by infiltration through impacted surface soil. Cleaning the storm sewer, catch basins, and manholes and sealing the interior floor drain that discharges to the storm sewer would address the primary potential route for the off-site transport of impacted materials. The potential for the migration of perched groundwater to the water table or into the sewers would be mitigated by the lining of the sewers near the former rinse water tank excavation and by the existing low permeability clay beneath the perched groundwater.

7.2.3 Human Health Effects

Alternative 2 would significantly reduce the risk of human exposure to PCBs in surface soils and PCBs and VOCs in sediments. The work would be performed under a contractor's health and safety plan, and the risk of exposure to PCBs during the excavation and filling would be minimal if adequate dust controls and personal protective equipment (PPE) were used. However, PCB- and VOC- impacted subsurface soil and perched groundwater would remain. The impacted water is perched in the fill near the surface, several feet above the water table and does not appear to pose a threat to any source of drinking water. The perched groundwater could eventually migrate downward to the water table or infiltrate the sewers and be transported off-site, increasing the risk of human exposure. However, groundwater samples from monitoring well MW-4, which is screened in the fill near the sewers in the southwest corner of the site, show no evidence of PCB or VOC impacts.

7.2.4 Institutional Needs

Alternative 2 would comply with the RSCO by excavating surface soils containing PCB concentrations greater than 1 mg/kg be and replacing them with clean fill. However, subsurface soil with PCB concentrations greater than 10 mg/kg would remain in a limited area. VOC concentrations in this limited area would also exceed the NYSDEC's RSCOs. Although PCB-and VOC- impacted groundwater would remain in the area near the former rinse water UST excavation, the results of the RFI indicate that this groundwater is perched in the fill well above the water table and is thus not a source of drinking water. The perched and deep groundwater would be monitored to evaluate whether the impacted perched water will affect the groundwater quality in the underlying groundwater.

The community reaction to Alternative 2 is expected to be more favorable than the reaction to Alternative 1. As shown in Table 3, Alternative 2 takes several steps to eliminate the risk of exposure to PCBs or VOCs through direct contact. However, it is anticipated that there still would be some apprehension about the possible risks involved in leaving the impacted subsurface soil in place in the former rinse water tank area without some form of containment.

7.2.5 Cost Estimate

Table 5 presents a preliminary cost estimate for Alternative 2. The estimated present worth of Alternative 2 is $260,000. This includes an estimated capital cost of approximately $223,000 and annual operation and maintenance costs of approximately $8,000 for five years.

7.3 ALTERNATIVE 3: ASPHALT CAPS

The third proposed corrective measure alternative, which is depicted in Figure 10, involves:

- Institutional actions
  - Fences and signs
  - Deed restrictions
- Surface soil excavation
  - Soil pile near rail spur
  - Small areas near fence east of building
- Sediment removal
  - Truck bay trench and sump
  - Storm sewer, including manholes and catch basins
- Off-site disposal of soil and sediment
- Storm sewer cleaning

- Sealing of floor drain
- Sewer lining
- Asphalt caps
  - Rail spur
  - Former rinse water UST area
- Groundwater monitoring

In Alternative 3, the soil mound near the rail spur would be excavated and disposed off-site at appropriately permitted facilities. The two small areas of impacted surface soil near the fence east of the building would be excavated to a depth of one foot, and confirmatory soil samples would be collected. Clean backfill imported from off-site would be placed in the excavations.

Asphalt caps would be constructed over a 22,000 square foot area near the rail spur and a 3,500 square foot area near the former rinse water UST excavation and the sewer lines east of the building. The soil excavated from the small areas near the fence would be placed beneath the caps. The caps would consist of a base course of three-quarter inch stone topped with a minimum of six inches of asphalt. The cap in the rail spur area would be constructed around the rails, which would remain intact. The caps would be sloped to prevent the accumulation of precipitation on the caps. The deed to the property would be amended to prohibit the disruption of the asphalt caps and to require the owner of the property to maintain the caps.

The sewers would be cleaned and lined and the floor drain in the building would be sealed as in Alternative 2. The groundwater would be monitored for five years as described in Alternatives 1 and 2. In addition, the asphalt caps would be inspected annually and repaired as needed to maintain their integrity.

Dames & Moore estimates that if Alternative 3 were selected and incorporated into a modified *373 Permit* for GE's Buffalo Service Shop, the final design could be completed within 90 days. We anticipate that construction of the corrective measure, including contractor selection, could be completed within five months of NYSDEC approval of the final corrective measure design.

The groundwater quality at the site would be monitored annually for five years following the construction of the corrective measure.

7.3.1 Technical Evaluation

Alternative 3 would remove or contain the PCB- and VOC-impacted materials at GE's Tonawanda service shop. As in Alternative 2, cleaning the storm sewer and the truck bay trench and sump would prevent the PCB- and VOC-impacted sediments currently in the truck bay trench and sump and in the storm sewers from migrating off-site. Sealing the interior floor drain would reduce the risk of recontamination of the storm sewer.

Well maintained asphalt caps would be a reliable containment method for the impacted soil and perched groundwater at GE's Tonawanda service shop, which is limited to surface soil, fill in the former rinse water UST excavation and along the sewer lines east of the building, and perched groundwater associated with the fill material. These impacted materials, which are within ten feet of the ground surface, are separated from the underlying groundwater by approximately 40 feet of native low-permeability clay. Previous investigations have indicated that the underlying groundwater has not been impacted by PCBs or VOCs.

Alternative 3 would not be difficult to implement, although construction of the cap around the rail spur would require caution to ensure that the rail spur would remain serviceable. The asphalt caps would require regular long-term maintenance. Because Alternative 3 would require little excavation, the risk of worker injury from excavation would be very small. The truck traffic from the importation of fill and material for the asphalt cap would slightly increase the risk of transportation-related accidents.

7.3.2 Environmental Impact

The placement of the half-acre asphalt cap around the rail spur would alter the drainage characteristics of the area that is currently unpaved. The cap would be sloped to direct the runoff away from the capped area as sheet flow.

Alternative 3 would address the four potential contaminant migration and exposure pathways identified in the *CMS Task I Report*. Cleaning the storm sewer, catch basins, and manholes and sealing the interior floor drain would address the primary potential route for off-site transport of impacted materials. The asphalt caps would reduce the risk of direct contact with impacted materials as well as the potential for groundwater contamination by infiltration through impacted soil. The perched groundwater could still potentially migrate to the water table or into the sewers, but this potential would be mitigated by the lining of the sewers near the former rinse water tank excavation and by the low permeability clay beneath the perched groundwater.

7.3.3 Human Health Effects

A properly maintained asphalt cap would greatly reduce the risk of human exposure to PCBs at the ground surface. The work would be performed under a contractor's health and safety plan, which would require the use of dust controls and PPE to mitigate the risk of worker exposure to impacted materials. Because impacted materials would remain at the site beneath the cap, the possibility remains that PCBs or VOCs could migrate to the water table or infiltrate the sewers and move off-site, leading to an increased risk of human exposure. However, the asphalt caps would prevent further infiltration of precipitation into the impacted surface soil and fill material, potentially eliminating the source of the perched groundwater.

7.3.4 Institutional Needs

Alternative 3 would comply with TSCA in its handling of surface soil and sediments. The sediments from the storm sewer catch basins and manholes and the soil from the mound near the rail spur would be removed from the site and disposed at properly permitted facilities. The asphalt caps would be constructed in accordance with TSCA requirements.

The community reaction to Alternative 3 is expected to be more favorable than the reaction to Alternative 2. Both alternatives take several steps to eliminate the risk of exposure to PCBs or VOCs through direct contact, but Alternative 3 also reduces the risk of infiltration through impacted materials. Public reaction may also be more positive because capping the impacted areas, rather than excavating and backfilling, would reduce the volume of truck traffic and the disruption of activity at and near the site.

7.3.5 Cost Estimate

Table 6 presents a preliminary cost estimate for Alternative 3. The estimated present worth of Alternative 3 is $280,000. This includes an estimated capital cost of approximately $152,000, annual groundwater monitoring costs of approximately $8,000 for five years, and annual cap maintenance costs of approximately $6,000 for 30 years.

7.4 ALTERNATIVE 3A: ASPHALT CAP OVER SUBSURFACE SOIL

Alternative 3A, which is depicted in Figure 11, involves:

- Institutional actions
  - Fences and signs
  - Deed restrictions
- Surface soil excavation
  - Soil pile near rail spur
  - Isolated areas near rail spur
- Sediment removal
  - Truck bay trench and sump
  - Storm sewer, including manholes and catch basins
- Off-site disposal of soil and sediment
- Storm sewer cleaning
- Sealing of floor drain
- Sewer lining
- Asphalt cap
  - Former rinse water UST area
- Groundwater monitoring

In Alternative 3A, approximately 100 cubic yards of soil in a mound near the rail spur would be excavated and disposed off-site at appropriately permitted facilities. Approximately 20 cubic yards of surface soil from two isolated areas near the rail spur with PCB concentrations greater than 25 mg/kg would be excavated and properly disposed off-site. Additional fences would be installed north of the building and south of the former UST excavation, and the fence at the rail spur would be extended to restrict access to the rail spur area. A 3,500 square foot asphalt cap would be constructed over the impacted soil near the former rinse water UST excavation and the sewer lines east of the building. The cap would consist of a base course of three-quarter inch stone topped with a minimum of six inches of asphalt. The cap would be sloped to prevent the accumulation of precipitation on the cap. The deed to the property would be amended to prohibit the disruption of the asphalt cap and to require the owner of the property to maintain the cap.

The sewers would be cleaned and lined and the floor drain in the building would be sealed as in Alternatives 2 and 3. The groundwater would be monitored for five years as described in Alternatives 1, 2, and 3. The asphalt cap would be inspected annually and repaired as needed to maintain its integrity.

Dames & Moore estimates that if Alternative 3A were selected and incorporated into a modified *373 Permit* for GE's Buffalo Service Shop, the final design could be completed within 90 days. We anticipate that construction of the corrective measure, including contractor selection, could be completed within five months of NYSDEC approval of the final corrective measure design. The groundwater quality at the site would be monitored annually for five years following the construction of the corrective measure.

7.4.1 Technical Evaluation

Alternative 3A would remove or contain the PCB- and VOC-impacted materials at GE's Tonawanda service shop. As in Alternatives 2 and 3, cleaning the storm sewer and the truck bay trench and sump would prevent the PCB- and VOC-impacted sediments currently in the truck bay trench and sump and in the storm sewers from migrating off-site. Sealing the interior floor drain would reduce the risk of recontamination of the storm sewer.

A well maintained asphalt cap would be a reliable containment method for the impacted soil and perched groundwater immediately east of the building at GE's Tonawanda service shop, which is limited to surface soil, fill in the former rinse water UST excavation and along the sewer lines east of the building, and perched groundwater associated with the fill material. These impacted materials, which are within ten feet of the ground surface, are separated from the underlying groundwater by approximately 40 feet of native low-permeability clay. Previous investigations have indicated that the underlying groundwater has not been impacted by PCBs or VOCs.

The rail spur area, in which impacted surface soil with PCB concentrations less than 25 mg/kg would remain, would be fenced off to limit access to the area. In accordance with TSCA requirements for low occupancy areas, signs would not be required on the fence because the remaining soil would have PCB concentrations less than 25 mg/kg. This alternative would not prevent infiltration through the impacted surface soils in the rail spur area. However, the slow rate of infiltration through the native low-permeability clay at the rail spur is expected to produce a negligible impact on the underlying groundwater quality.

Alternative 3A would not be difficult to implement. The asphalt cap would require regular long-term maintenance. Because Alternative 3A would require little excavation, the risk of worker injury from excavation would be very small.

7.4.2 Environmental Impact

Alternative 3A would address the four potential contaminant migration and exposure pathways identified in the *CMS Task I Report*. Cleaning the storm sewer, catch basins, and manholes and sealing the interior floor drain would address the primary potential route for off-site transport of impacted materials. The fences around the rail spur would reduce the risk of direct contact with impacted materials. The asphalt cap would reduce the risk of direct contact with impacted materials as well as the potential for groundwater contamination by infiltration through impacted soil. The perched groundwater could still potentially migrate to the water table or into the sewers, but this potential would be mitigated by the lining of the sewers near the former rinse water tank excavation and by the low permeability clay beneath the perched groundwater. Precipitation would infiltrate through the impacted surface soil at the rail spur, but the slow rate of infiltration through the native low-permeability clay at the rail spur would be expected to produce a negligible impact on the underlying groundwater quality.

7.4.3 Human Health Effects

The additional fences in Alternative 3A would reduce the potential for human contact with PCB-impacted surface soil near the rail spur, and a properly maintained asphalt cap would greatly reduce the risk of human exposure to PCBs and VOCs immediately east of the building. The work would be performed under a contractor's health and safety plan, which would require the use of dust controls and PPE to mitigate the risk of worker exposure to impacted materials. Because impacted materials would remain at the site, the possibility remains that PCBs or VOCs could migrate to the water table or infiltrate the sewers and move off-site, leading to an increased risk of human exposure. However, previous investigations have indicated that underlying groundwater has not been impacted by PCBs or VOCs. The asphalt cap would prevent further infiltration of precipitation into the impacted surface soil and fill material immediately east of the building, potentially eliminating the source of the perched groundwater.

7.4.4 Institutional Needs

Alternative 3A would comply with TSCA in its handling of surface soil and sediments. The sediments from the storm sewer catch basins and manholes and the soil from the mound and two isolated areas near the rail spur would be removed from the site and disposed at properly permitted facilities. The asphalt cap would be constructed in accordance with TSCA requirements.

The community reaction to Alternative 3A is expected to be similar to the reaction to Alternative 3. Both alternatives take several steps to eliminate the risk of exposure to PCBs or VOCs through direct contact and to reduce the risk of infiltration through impacted materials. Alternative 3A would leave surface soil near the rail spur with PCB concentrations less than 25 mg/kg, which would comply with the TSCA requirements for a low-occupancy area. The fences enclosing the impacted surface soil would minimize the risk of inadvertent direct contact with impacted materials.

7.4.5 Cost Estimate

Table 7 presents a preliminary cost estimate for Alternative 3A. The estimated present worth of Alternative 3A is $180,000. This includes an estimated capital cost of approximately $118,000, annual groundwater monitoring costs of approximately $8,000 for five years, and annual cap maintenance costs of approximately $2,000 for 30 years.

7.5 ALTERNATIVE 4: SURFACE AND SUBSURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

The fourth proposed corrective measure alternative includes:

- Surface soil excavation and backfill
  - Rail spur
  - East of building
- Subsurface soil excavation and backfill
  - Former rinse water tank excavation
- Sediment removal
  - Truck bay trench and sump
  - Storm sewer, including manholes and catch basins
- Storm sewer cleaning
- Sealing of floor drain
- Sewer replacement
- Off-site disposal of soil and sediment
- Groundwater monitoring

Alternative 4, which is depicted in Figure 12, is similar to Alternative 2, except that it also addresses subsurface contamination in the fill east of the building near the old oil/water separator and the former rinse water tank excavation. In Alternative 4, subsurface soil with PCB concentrations greater than the RSCO of 10 mg/kg would be excavated and properly disposed off-site. Approximately 450 cubic yards of impacted subsurface soil would be removed. Confirmatory samples would be collected following the excavation. The excavated areas would be backfilled with clean material imported from off-site and restored by seeding or paving.

The approximately 100 cubic yards of soil excavated from regions saturated with perched groundwater would be dewatered prior to disposal, and the water would be treated and discharged along with the water generated by the sewer cleaning. The estimated 400 cubic yards of soil with PCB concentrations less than 50 mg/kg would be disposed off-site as a non-hazardous solid waste. The remaining 50 cubic yards with PCB concentrations in excess of 50 mg/kg would be disposed at a TSCA-licensed facility.

Approximately 80 feet of the four-inch sanitary sewer and the eight-inch storm sewer that pass through the excavated area east of the building would be removed and replaced. It would not be necessary to line the sewers as in Alternatives 2 and 3 because the perched groundwater would no longer contain elevated PCB or VOC concentrations.

The removal of the impacted subsurface soil is expected to eliminate the source of the contamination in the perched groundwater near the east side of the building. The underlying groundwater would be monitored annually for five years at existing monitoring well MW-5 and at two new monitoring wells to confirm this. The new monitoring wells would be constructed as described in Alternative 1.

No permanent fences or deed restrictions would be required once the impacted materials had been removed from the focused CMS areas.

Dames & Moore estimates that if Alternative 4 were selected and incorporated into a modified *373 Permit* for GE's Buffalo Service Shop, the final design could be completed within 90 days. We anticipate that construction of the corrective measure, including contractor selection, could be completed within five months of NYSDEC approval of the final corrective measure design. The groundwater quality at the site would be monitored annually for five years following the construction of the corrective measure.

7.5.1 Technical Evaluation

Alternative 4 would remove all of the known impacted soil, sediment, and groundwater from the focused CMS areas, thus eliminating the risk of human contact. Cleaning the storm sewer and the truck bay trench and sump would prevent the PCB- and VOC-impacted sediments currently in the trench, sump, and storm sewer from migrating off-site. Sealing the interior floor drain that discharges to the storm sewer would remove a potential route for sewer recontamination.

Excavation and disposal at a properly permitted landfill is a reliable, proven technology for addressing PCB-impacted soils and sediments. Removing the impacted soils and perched groundwater from the site should minimize the potential for the cleaned sewer system to become contaminated through infiltration.

Alternative 4 could be implemented with little difficulty, although site operations would be interrupted during the replacement of the storm and sanitary sewers. Excavation and backfilling are common construction-related activities, and the contractor performing the work would be expected to comply with federal and state health and safety regulations. The risk to public safety should also be minimal as long as the activities occur in a fenced-off area and adequate dust control measures are used. The truck traffic from the transportation of the excavated materials to off-site facilities and the importation of clean backfill would slightly increase the risk of transportation-related accidents.

7.5.2 Environmental Impact

Alternative 4 would address the four contaminant migration and potential exposure pathways identified in the *CMS Task I Report*. The excavation and removal of surface soil would reduce the risk of direct contact with impacted materials. The excavation and removal of the impacted subsurface soil east of the building would further reduce the likelihood of groundwater contamination by infiltration through impacted soil. The removal of the impacted soil near the former UST excavation would also eliminate the potential for impacted perched groundwater to migrate to the water table or infiltrate into the sewers. Cleaning the storm sewer, catch basins, and manholes and sealing the interior floor drain would address the primary potential route for off-site transport of impacted materials.

7.5.3 Human Health Effects

Alternative 4 would significantly reduce the risk of human exposure to PCBs in surface soils and PCBs and VOCs in sediments and groundwater. The work would be performed under a contractor's health and safety plan, which would require the use of dust controls and PPE to mitigate the risk of worker exposure to impacted materials.

7.5.4 Institutional Needs

Alternative 4 would comply with TSCA in its handling of surface soil, subsurface soil, and sediments. Surface soil with PCB concentrations greater than 1 mg/kg and subsurface soil with PCB concentrations greater than 10 mg/kg would be excavated from the rail spur and former UST areas and replaced with clean fill. The excavated soil and the sediments removed from the storm sewer and the truck bay trench and sump would be disposed at properly permitted off-site facilities. The subsurface soil with VOC concentrations that exceed the NYSDEC's RSCOs would be removed and properly disposed off-site. Because all of the impacted materials in the focused CMS areas would be removed and properly disposed off-site, no deed restrictions would be required. Five years of groundwater monitoring is anticipated to be sufficient to establish that the groundwater beneath the site has not been impacted.

The community reaction to Alternative 4 is anticipated to be generally favorable. In addition to eliminating the risk of exposure to PCBs or VOCs through direct contact, Alternative 4 eliminates the possibility of contaminant migration off-site or to the water table by removing the remaining impacted materials from the site. Alternative 4 would cause more disruption to activities at and near the site than Alternatives 3 and 3A would, because of the significant volume of material that would be transported to and from the site.

7.5.5 Cost Estimate

Table 8 presents a preliminary cost estimate for Alternative 4. The estimated present worth of Alternative 4 is $300,000. This includes an estimated capital cost of approximately $278,000 and annual operation and maintenance costs of approximately $6,000 for five years.

7.6 ALTERNATIVE 5: ON-SITE THERMAL DESORPTION

The fifth proposed corrective measure alternative includes:

- Surface soil excavation and backfill
  - Rail spur
  - East of building
- Subsurface soil excavation and backfill
  - Former rinse water tank excavation
- Sediment removal
  - Truck bay trench and sump
  - Storm sewer, including manholes and catch basins
- Storm sewer cleaning
- Sealing of floor drain
- Sewer replacement
- On-site thermal desorption
- Groundwater monitoring

Alternative 5 would include all of the elements of Alternative 4 with the exception of off-site soil and sediment disposal. Instead, the excavated soil and sediment would be treated on-site using high-temperature thermal desorption (HTTD). Portable equipment would be mobilized to the site to treat the approximately 1,350 cubic yards of excavated soil and sediments to desorb and volatilize VOCs and PCBs. The portable system would be mounted on three trailers with a separate water treatment trailer. The total footprint of the system would be approximately 80 feet by 80 feet. Ideally, the HTTD system would be located near the excavation areas but far enough from the building to minimize the disruption of other site activities. Figure 13 shows one potential location for the HTTD system north of the rail spur. The off-gas and vapors from the HTTD system would be treated with granular activated carbon (GAC) to remove VOCs and PCBs and exhausted under the terms of an appropriate permit. The GAC would then be disposed at a properly licensed off-site facility.

Following thermal desorption, samples of the treated soil would be analyzed to confirm that the remaining concentrations of VOCs and PCBs meet the cleanup objectives. The clean soil would then be used to backfill the excavated areas. The groundwater beneath the site would be monitored annually for five years as described in Alternative 4 to confirm that it had not been impacted.

Dames & Moore estimates that if Alternative 5 were selected and incorporated into a modified *373 Permit* for GE's Buffalo Service Shop, the final design could be completed within 90 days. We anticipate that construction of the corrective measure, including contractor selection, could be completed within six months of NYSDEC approval of the final corrective measure design. The groundwater quality at the site would be monitored annually for five years following the construction of the corrective measure.

7.6.1 Technical Evaluation

Alternative 5 would remove the PCBs and VOCs from the impacted soil and sediment, yielding a significant reduction in the volume of impacted materials and allowing the excavations to be refilled with the excavated soil.

Alternative 5 would have more extensive short-term operation and maintenance requirements than the other alternatives. A bench-scale test would be required to evaluate the suitability of the impacted materials for treatment by HTTD. Once constructed, this alternative would cause significant disruptions of normal operations at the site. HTTD has been demonstrated to be effective in removing PCBs and VOCs such as those found at the Tonawanda facility, although it is usually used at larger sites where the quantity of impacted soil exceeds 5,000 cubic yards (GE's Tonawanda site has approximately 1,350 cubic yards of impacted materials). Portable HTTD systems should be available, but the mobilization, operation, and maintenance of the HTTD system would add to the time required for the remediation of the Tonawanda site. The risk of transportation-related injury with the implementation of Alternative 5 would not be significantly increased because the alternative would not require the off-site transportation of excavated material or the importation of fill.

7.6.2 Environmental Impact

Like Alternative 4, Alternative 5 would address the four potential contaminant migration and exposure pathways identified in the *CMS Task I Report*. Alternative 5 would have the added benefit of significantly reducing the toxicity of the impacted materials at the site. However, it would also increase the duration and complexity of the remediation process. In addition, although appropriate off-gas treatment would be used, the HTTD is likely to cause significant odor problems.

7.6.3 Human Health Effects

Alternative 5 would significantly reduce the risk of human exposure to PCBs in surface soils and PCBs and VOCs in sediments and groundwater. The work would be performed under a contractor's health and safety plan, which would require the use of dust controls and PPE to mitigate the risk of worker exposure to impacted materials.

7.6.4 Institutional Needs

Alternative 5 would comply with TSCA in its handling of surface soil, subsurface soil, and sediments. Surface soil with PCB concentrations greater than 1 mg/kg and subsurface soil with PCB concentrations greater than 10 mg/kg would be excavated from the rail spur and former UST areas. The excavated soil and the sediments removed from the storm sewer and the truck bay trench and sump would be treated on-site to reduce PCB concentrations to less than 1 mg/kg. The HTTD process would also reduce VOC concentrations to comply with the NYSDEC's RSCOs. Because the impacted soil in the focused CMS areas would be removed and treated before being used to backfill the excavations, no deed restrictions would be required. The groundwater beneath the site would be monitored for five years to confirm that it had not been impacted.

The initial community reaction to Alternative 5 is anticipated to be generally positive. Like Alternative 4, Alternative 5 eliminates both the risk of exposure to PCBs or VOCs through direct contact and the possibility of contaminant migration off-site or to the water table. The concept of treating, rather than disposing, the soil may appeal to the public. However, once the construction of the HTTD system begins, the treatment process is likely to significantly disrupt the service center's activity. HTTD is known to cause odor problems, although the off-gases from the process are treated to remove hazardous constituents. The odor problems could have a negative impact on the lifestyle of the nearby community.

7.6.5 Cost Estimate

Table 9 presents a preliminary cost estimate for Alternative 5. The estimated present worth of Alternative 5 is $1,300,000. This includes an estimated capital cost of approximately $1,272,000 and annual operation and maintenance costs of approximately $6,000 for five years.

7.7 COMPARISON OF ALTERNATIVES

This section presents a comparison of the six alternatives. Table 10 presents a summary of the estimated costs to implement the six corrective measure alternatives, and Table 11 presents a summary of the evaluations of the six alternatives.

The comparison of the corrective measure alternatives is based on their individual evaluations in Sections 7.1 through 7.6. The alternatives have been ranked qualitatively. In accordance with the terms of the *373 Permit*, preference has been given in the ranking process to the corrective measure alternatives that:

- Are most effective at performing the intended functions and maintaining performance for extended periods of time;
- Have proven effective under conditions similar to those anticipated at GE's Tonawanda facility;
- Do not require frequent or complex operation and maintenance activities;
- Can be constructed and operated to reduce levels of contamination to comply with applicable standards in the shortest period of time;
- Pose the least threat to the safety of nearby residents and environments as well as workers during implementation;
- Provide the minimum level of exposure to contaminants and the maximum reduction of exposure with time; and

- Pose the least adverse impact to the environment, or promise the greatest improvement, over the shortest period of time.

7.7.1 Technical Evaluation

Alternative 1, the no action alternative, will not remove or contain any contamination, nor would it address any of the potential contaminant migration pathways at the site. Alternative 1 can be removed from consideration because of its technical ineffectiveness.

All five of the remaining alternatives would minimize the risk of exposure from direct contact with surface soils, and all five have been used effectively at sites with conditions similar to those at GE's Tonawanda service shop. Alternatives 3, 3A, 4 and 5 have the added advantage of containing or removing PCBs and VOCs in subsurface soil and perched groundwater that could potentially migrate to the underlying groundwater or into the sewers and off-site. Alternative 3A would allow precipitation to infiltrate through the impacted surface soil near the rail spur. However, the slow rate of infiltration through the native low-permeability clay is expected to produce a negligible impact on the underlying groundwater quality. Alternative 5 involves the treatment of impacted soil and sediment, which is preferable to the containment offered by Alternatives 2, 3, 3A, and 4. However, Alternative 5 would be more difficult to implement than the other alternatives, and it would significantly increase the duration of the remediation process.

7.7.2 Environmental Impact

Alternatives 2, 3, 3A, 4, and 5 address the four exposure pathways discussed in Section 4.0. The risk of exposure by direct contact is limited by removing, capping, or restricting access to impacted soils. The excavation and capping reduce the risk of groundwater contamination due to infiltration through impacted surface soils. The sewer cleaning reduces the risk of off-site migration of impacted materials. Lining the sewers would reduce the risk of infiltration into the sewers. Alternatives 2, 3, and 3A would leave the impacted subsurface soil and associated perched groundwater in place in the former UST excavation area. However, the asphalt caps in Alternatives 3 and 3A would prevent the infiltration of precipitation through some or all of the impacted materials. Alternative 3A would allow precipitation to infiltrate through the impacted surface soil near the rail spur. However, the slow rate of infiltration through the native low-permeability clay is expected to produce a negligible impact on the underlying groundwater quality.

7.7.3 Human Health Effects

Alternatives 2 through 5 eliminate the risk of human exposure to PCBs by direct contact with surface soils. These five alternatives also involve cleaning the storm sewer to prevent impacted sediments from reaching public waterways. While Alternatives 2, 3, and 3A allow impacted subsurface soil and the associated perched groundwater to remain in place, the impacted materials are well above the water table. Because native low permeability clay lies beneath the fill, there is little danger that the impacted materials would impact any source of drinking water. Alternative 3A would also allow precipitation to infiltrate through the surface soil near the rail spur. However, the slow rate of infiltration through the native low-permeability clay is expected to produce a negligible impact on the underlying groundwater quality. Alternative 3A would prevent infiltration through the impacted subsurface soil and perched groundwater east of the building. Alternatives 3, 4, and 5 would remove or contain all of the impacted materials in the focused CMS areas, thus eliminating the risk that precipitation could infiltrate through these materials and migrate off-site or to the water table.

7.7.4 Institutional Needs

Alternatives 2 through 5 comply with TSCA guidelines or state RSCOs regarding the removal or containment of PCB-impacted surface soil and sediments. Alternatives 3, 4 and 5 also comply with TSCA and RSCOs for unrestricted access areas regarding the removal or containment of PCB-impacted subsurface soils. Alternative 3A meets the TSCA requirements for a low occupancy area by removing or capping soil with PCB concentrations greater than 25 mg/kg and by adding fences to limit access to the remaining impacted materials.

The public's reaction to Alternatives 2 through 5 is anticipated to be generally favorable. Some concerns might arise about the risks of leaving impacted materials in place in Alternative 2. The disruption in activity and the unpleasant odors that would occur during the implementation of Alternative 5 could lead to a negative reaction from the immediate community.

7.7.5 Cost Estimate

Table 10 presents a summary of the estimated costs for the five corrective measure alternatives. This table is presented for reference. In accordance with the terms of the *373 Permit*, cost has not been considered as a factor in determining the most appropriate corrective measure for GE's Tonawanda service shop.

Table 10 shows that Alternatives 3 and 4 are comparable in cost, and that Alternative 2 would cost only slightly less. Alternative 3A would cost less than Alternatives 2, 3, and 4. The capital cost to implement Alternative 5 (On-Site Thermal Desorption) is approximately four to six times the cost of the other alternatives. With current technology, the cost to rent and operate an HTTD system is such that HTTD becomes cost-effective for treating soil volumes in excess of 5,000 cubic yards. The volume of impacted soil and sediment at GE's Tonawanda facility is estimated to be only approximately 1,350 cubic yards.

8.0 RECOMMENDATION

Dames & Moore recommends that Alternative 3A, Asphalt Cap over Subsurface Soil, be implemented at GE's Tonawanda service shop. Dames & Moore bases this recommendation upon the comparison of the alternatives presented in Section 7.6.

Alternative 1 was not selected because it does not address the four exposure and migration pathways identified in the *CMS Task I Report*. Alternative 2 was discounted because, although it does address the four pathways, it would not prevent infiltration through the impacted fill material east of the building.

All four of the remaining alternatives involve the cleaning of the on-site storm sewer and the associated catch basins and manholes to prevent the off-site transport of impacted sediments. The four alternatives would also prevent contact with or off-site transport of impacted surface soils and sediments and limit the infiltration of precipitation through impacted subsurface materials. Alternatives 3 and 3A would meet these objectives by containing the impacted soils on-site, Alternative 4 would contain the soils off-site, and Alternative 5 would treat the soils on-site.

Alternative 5 has significantly greater operation and maintenance requirements than Alternatives 3, 3A, and 4. Mobilizing, operating, and demobilizing an HTTD system would extend the duration of the remedial process. The HTTD system would generate unpleasant odors and would significantly disrupt operations at the Tonawanda service shop. Dames & Moore believes that the extent of contamination at GE's Tonawanda facility is not sufficient to justify the complexity of operating an on-site HTTD system.

Of the remaining three alternatives, Alternative 3A was selected over Alternatives 3 and 4 as the corrective measure that would meet the objectives for GE's Tonawanda facility while minimizing disruption to site activities. The impacted soil and groundwater at the site consist of surface soil, fill material in utility excavations, and perched groundwater associated with the fill, all of which can safely be contained on-site behind fences or beneath an asphalt cap. The impacted fill and perched groundwater are within ten feet of the ground surface, separated from the underlying groundwater by approximately 40 feet of native low-permeability clay. The surface soil in the rail spur area would be surrounded by fences, minimizing the risk of direct contact with impacted materials. Although Alternative 3A would allow precipitation to infiltrate through the surface soil near the rail spur, the slow rate of infiltration through the native low-permeability clay is expected to produce a negligible impact on the underlying groundwater quality.

In summary, Alternative 3A will meet the objectives for GE's Tonawanda service shop as well as Alternatives 3 and 4, while causing less disruption to activities at and near the site.

9.0 SCHEDULE

The corrective measure schedule will be established after the NYSDEC approves this *CMS Final Report*. Dames & Moore expects that the implementation of the corrective measure will begin during the spring or summer following the NYSDEC's approval of this report.

Figure 14 shows the anticipated schedule for the Corrective Measure Implementation. This schedule is tentative and subject to change. The actual schedule for the Corrective Measure Implementation will depend on a number of factors, including the NYSDEC's responses. Dames & Moore anticipates that, following the NYSDEC's approval of this *CMS Final Report*, the NYSDEC will issue a modified *373 Permit* for GE's Buffalo Service Shop that incorporates the selected corrective measures. GE will make the RFI results and information about the planned corrective measures available to the community during the public notice period for the modifications to the *373 Permit*.

The final corrective measure design process would be completed within approximately two months of the NYSDEC's issuance of the modified *373 Permit*. Dames & Moore anticipates that the construction of the corrective measures, including the excavation and off-site disposal of impacted soil and sediments, the cleaning and partial replacement of the sewers, and the restoration of the site, could be completed in approximately three months following the selection of a contractor. The groundwater quality monitoring program would continue for five years after the construction of the corrective measures has been completed.

TABLE 1

CLEANUP OBJECTIVES FOR COMPOUNDS DETECTED IN SOIL, SEDIMENT AND GROUNDWATER
JULY 1998 THROUGH DECEMBER 1998

GE APPARATUS SERVICE CENTER
TONAWANDA, NEW YORK

Compound	Soil and Sediment					Groundwater				
	Number of Samples Analyzed[1]	Number of Detections	Maximum Concentration Detected (mg/kg)	Cleanup Objective[2] (mg/kg)	Number of Samples Above Cleanup Objective	Number of Samples Analyzed[1]	Number of Detections	Maximum Concentration Detected (µg/L)	Cleanup Objective[3] (µg/L)	Number of Samples Above Cleanup Objective
PCBs	**Surface Soil and Sediment/Subsurface Soil**									
Aroclor 1248	49/48	0/1	ND/0.21	1/10	0/0	7	2	21	0.09	2
Aroclor 1254	49/48	18/11	240/6.3	1/10	12/0	7	2	42	0.09	2
Aroclor 1260	49/48	45/21	160/110	1/10	26/3	7	4	100	0.09	4
Total PCBs (Lab)	49/48	45/23	240/116.3	1/10	30/3	7	4	142	0.1	4
VOCs	**Subsurface Soil**									
Benzene	19	0	ND	0.06	0	7	2	11	1	2
Chlorobenzene	19	2	34	1.7	1	7	2	540	5	2
Chloroform	19	0	ND	0.3	0	7	3	1.9	7	0
1,2-Dichlorobenzene	19	1	0.0027	7.9	0	7	1	3.5	3	1
1,3-Dichlorobenzene	19	3	6.7	1.6	1	7	4	50	3	4
1,4-Dichlorobenzene	19	4	1.1	8.5	0	7	4	48	3	4
1,1-Dichloroethane	19	1	0.0083	0.2	0	7	2	4.2	5	0
1,1-Dichloroethene	19	0	ND	0.4	0	7	2	6.4	5	1
cis-1,2-Dichloroethene[4]	19	0	ND	0.3	0	7	1	0.61	5	0
Ethylbenzene	19	0	ND	5.5	0	7	2	5.2	5	1
Methylene chloride	19	0	ND	0.1	0	7	1	0.56	5	0
Toluene	19	0	ND	1.5	0	7	1	1.2	5	0
1,1,1-Trichloroethane	19	0	ND	0.8	0	7	1	3.3	5	0
m-, p-Xylenes[5]	19	2	0.0012	1.2	0	7	2	25	5	2
o-Xylene[5]	19	0	ND	1.2	0	7	3	5	5	1
Total VOCs	19	6	34.78	10	1	7	5	626	NS	NS

Notes:
1. Laboratory analysis by EPA Methods 8082 (PCBs) and 8021 (VOCs)
2. Recommended Soil Cleanup Objectives (RSCOs) from NYSDEC TAGM HWR-94-4046
3. NYS Groundwater Standard (6 NYCRR Part 700), Division of Water TOGS, June 1998
4. Soil standards for trans-1,2-DCE
5. Standards for total xylenes
6. NA = Not Analyzed; ND = Not Detected; NS = No Standard

TABLE 2

SUMMARY OF DETECTED COMPOUNDS
SUPPLEMENTAL SEWER INVESTIGATION

GE APPARATUS SERVICE CENTER
TONAWANDA, NEW YORK

Analyte	CB-1 (West of Building)	CB-2 (Southwest of Building)	CB-3 (South of Building)	STMH-1 (Near Southwest Corner of Building)	STMH –2 (South of Building)	STMH-3 (Near Southeast Corner of Building)
VOCs (mg/kg)						
Acetone	ND	0.012 J	0.012 J	NS	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	NS	ND	14
1,3-Dichlorobenzene	ND	ND	ND	NS	ND	450 E
1,4-Dichlorobenzene	ND	ND	ND	NS	ND	190 E
Toluene	ND	0.0032 J	0.0057 J	NS	ND	ND
1,2,3-Trichlorobenzene	ND	ND	ND	NS	ND	10
1,2,4-Trichlorobenzene	ND	ND	ND	NS	ND	1,300 E
m-, p-Xylenes	ND	0.0015 J	0.0014 J	NS	ND	ND
o-Xylene	ND	ND	0.0027 J	NS	ND	2.2 J
Total VOCs	**ND**	**0.0167 J**	**0.0218 J**	**NS**	**ND**	**1966**
PCBs (mg/kg)						
PCB 1254	ND	ND	ND	NS	14	36,000
PCB 1260	0.1	1.3	1.6	NS	6.7	5,300
Total PCBs	**0.1**	**1.3**	**1.6**	**NS**	**20.7**	**41,300**

Explanations: A "J" flag indicates an estimated value that is less than the method detection limit.
An "E" flag indicates an estimated value that exceeds the calibration range of the analytical instrument.
ND = Not Detected
NS = Not Sampled

Note: No sample was collected from manhole STMH-1, which contained no sediment.

TABLE 3

SUMMARY OF PROPOSED CORRECTIVE MEASURE ALTERNATIVES

GE APPARATUS SERVICE CENTER
TONAWANDA, NEW YORK

Impacted Media	Focused CMS Areas	Exposure Pathways	Actions					
			Alternative 1	Alternative 2	Alternative 3	Alternative 3A	Alternative 4	Alternative 5
Surface Soil	• Former rinse water tank excavation • Old oil/water separator area • Rail spur	Direct exposure	Fences and signs Deed restrictions	Excavation and off-site disposal	Excavation, on- and off-site disposal, and asphalt caps	Excavation, off-site disposal, fences, and asphalt caps	Excavation and off-site disposal	Excavation and on-site HTTD
		Off-site transport	None					
		Infiltration through impacted soil	None					
Subsurface Soil	• Former rinse water tank excavation • Sewers east of building • Old oil/water separator area	Direct exposure	Fences and signs Deed restrictions	Deed restrictions	Asphalt caps	Asphalt caps	Excavation and off-site disposal	Excavation and on-site HTTD
		Infiltration through impacted soil	None	None	Asphalt caps	Asphalt caps		
Perched Groundwater	• Former rinse water tank excavation • Sewers east of building • Old oil/water separator area	Migration to water table or sewers	None	Sewer cleaning and partial lining	Sewer cleaning and partial lining	Sewer cleaning and partial lining	Removal and off-site disposal	Removal and off-site disposal
Sewers	• Sewers east of building	Off-site transport	None	Cleaning and partial lining	Cleaning and partial lining	Cleaning and partial lining	Cleaning and partial replacement	Cleaning and partial replacement
Sediments	• Storm sewer east of building • Truck bay trench and sump	Direct exposure	Fences and signs Deed restrictions	Removal and off-site disposal	Removal and off-site disposal	Removal and off-site disposal	Removal and off-site disposal	Removal and on-site HTTD
		Off-site transport	None					

TABLE 4

PRELIMINARY COST ESTIMATE
ALTERNATIVE 1
NO ACTION WITH ACCESS CONTROLS

Elements	Quantity	Unit	Unit Cost	Cost	Source
CAPITAL COSTS					
Institutional Actions					
Fences and signs					
6-foot galvanized chain-link fence	375	LF	$ 20.62	$ 7,732.50	ECHOS
6-foot swing gate, 20-foot double	2	EA	$ 1,425.00	$ 2,850.00	MEANS
Hazardous waste signing	20	EA	$ 49.83	$ 996.60	ECHOS
Land use restrictions					
Deed recording fees	1	LS	$ 100.00	$ 100.00	Estimate
Coordination	40	HR	$ 50.00	$ 2,000.00	Estimate
Attorney fees	40	HR	$ 200.00	$ 8,000.00	Estimate
			Subtotal	**$21,700**	
Install New Monitoring Wells					
Two wells to deep groundwater					
2-inch PVC casing	110	LF	$ 7.52	$ 827.20	ECHOS
2-inch PVC screen	20	LF	$ 10.73	$ 214.60	ECHOS
2-inch PVC plug	3	EA	$ 14.67	$ 44.01	ECHOS
Filter pack	20	LF	$ 8.15	$ 163.00	ECHOS
Grout	110	LF	$ 0.97	$ 106.70	ECHOS
Bentonite seal	3	EA	$ 29.75	$ 89.25	ECHOS
Drill 8" H.S.A.	130	LF	$ 17.86	$ 2,321.80	ECHOS
Cover	3	EA	$ 160.51	$ 481.53	ECHOS
			Subtotal	**$4,200**	
			Capital Cost Subtotal	**$25,900**	
Project Management and Engineering Design			15%	$3,900	
Construction Oversight			10%	$2,600	
Miscellaneous			10%	$2,600	
Contingency			20%	$5,200	
			Capital Cost Total	**$40,000**	

TABLE 4

PRELIMINARY COST ESTIMATE
ALTERNATIVE 1
NO ACTION WITH ACCESS CONTROLS

Elements	Quantity	Unit	Unit Cost	Cost	Source
ANNUAL OPERATION AND MAINTENANCE					
Groundwater Monitoring					
5 monitoring wells annually					
Sampling Labor	8	MH	$50.00	$400	Estimate
Analysis	5	Wells	$600.00	$3,000	Vendor
Reporting	1	Report	$2,000.00	$2,000	Estimate
			Subtotal	**$5,400**	
			Short Term O&M Subtotal	**$5,400**	
	Project Management	15%		$800	
	Miscellaneous	10%		$500	
	Contingency	20%		$1,100	
			Short Term O&M Total	**$8,000**	
			Present Worth Short Term O&M, 5 Years, 5% Interest	**$35,000**	
			TOTAL PRESENT WORTH OF ALTERNATIVE 1	**$80,000**	

Sources:
ECHOS - *Environmental Remediation Cost Data - Assemblies, 6th Annual Edition* , R.S. Means Company, Inc., 2000
Means - *Heavy Construction Cost Data, 14th Annual Edition* , R.S. Means Company, Inc., 2000
Vendor - Vendor quote
Estimate - Engineering judgement

TABLE 5

PRELIMINARY COST ESTIMATE
ALTERNATIVE 2
SURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

Elements	Quantity	Unit	Unit Cost	Cost	Source
CAPITAL COSTS					
Institutional Actions					
Land use restrictions					
Deed recording fees	1	LS	$ 100.00	$ 100.00	Estimate
Coordination	40	HR	$ 50.00	$ 2,000.00	Estimate
Attorney fees	40	HR	$ 200.00	$ 8,000.00	Estimate
			Subtotal	**$10,100**	
Install New Monitoring Wells					
Two wells to deep groundwater					
2-inch PVC casing	110	LF	$ 7.52	$ 827.20	ECHOS
2-inch PVC screen	20	LF	$ 10.73	$ 214.60	ECHOS
2-inch PVC plug	3	EA	$ 14.67	$ 44.01	ECHOS
Filter pack	20	LF	$ 8.15	$ 163.00	ECHOS
Grout	110	LF	$ 0.97	$ 106.70	ECHOS
Bentonite seal	3	EA	$ 29.75	$ 89.25	ECHOS
Drill 8" H.S.A.	130	LF	$ 17.86	$ 2,321.80	ECHOS
Cover	3	EA	$ 160.51	$ 481.53	ECHOS
			Subtotal	**$4,200**	
Sediment Removal					
Catchbasins, manholes, truck bay trench and sump					
Remove sediment	5	CY	$ 119.00	$ 595.00	Means
Dewater sediment	9	TON	$ 49.00	$ 428.75	ECHOS
			Subtotal	**$1,000**	
Surface Soil Removal					
Soil pile excavation					
Excavation	3	HR	$ 100.78	$ 298.61	ECHOS
Backhoe mob/demob	1	EA	$ 430.00	$ 430.00	Means
Surface excavation and backfill					
Pavement removal	350	SY	$ 4.15	$ 1,452.50	Means
Surface soil excavation	26	HR	$ 100.78	$ 2,656.36	ECHOS
Unclassified fill, delivered, off-site	791	CY	$ 4.77	$ 3,771.83	ECHOS
Spread/compact large areas, 6-inch lifts	791	CY	$ 0.98	$ 774.93	ECHOS
Confirmatory samples from base of excavation	25	EA	$ 90.00	$ 2,250.00	Vendor
			Subtotal	**$11,600**	
Sewers					
Cleaning					
Clean (jet rodder)	2	DAY	$ 3,700.00	$ 7,400.00	Vendor
Water treatment - mobilize/demobilize	1	EA	$ 4,500.00	$ 4,500.00	Vendor
Water treatment - operation	2	DAY	$ 1,000.00	$ 2,000.00	Vendor
Equipment decon	1	EA	$ 3,200.00	$ 3,200.00	Vendor
Video inspect after cleaning	1	EA	$ 1,300.00	$ 1,300.00	Vendor
Seal interior floor drain to storm sewer	1	EA	$ 160.00	$ 160.00	Means
Lining					
Line with flexible felt resin - 4 inch	110	LF	$ 30.00	$ 3,300.00	Means
Line with flexible felt resin - 8 inch	100	LF	$ 40.00	$ 4,000.00	Means
			Subtotal	**$25,900**	

TABLE 5

PRELIMINARY COST ESTIMATE
ALTERNATIVE 2
SURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

Elements	Quantity	Unit	Unit Cost		Cost		Source
Transportation and Disposal							
Asphalt							
Load	117	CY	$	2.98	$	347.67	ECHOS
Transport and dispose	204	TON	$	30.00	$	6,125.00	Vendor
Waste characterization sample	1	EA	$	600.00	$	600.00	Vendor
Soil and Sediment							
Roll-off spot fee plus 2 months rental	1	EA	$	1,200.00	$	1,200.00	Vendor
Load	885	CY	$	2.98	$	2,636.20	ECHOS
Transport and dispose < 50 mg/kg PCBs	1,413	TON	$	30.00	$	42,400.56	Vendor
Transport > 50 mg/kg PCBs	8	Load	$	510.00	$	4,080.00	Vendor
Dispose > 50 mg/kg PCBs	135	TON	$	105.00	$	14,148.75	Vendor
Waste characterization samples	2	EA	$	600.00	$	1,200.00	Vendor
Liquids							
Treat	0.50	DAY	$	1,000.00	$	500.00	Vendor
				Subtotal	**$**	**73,200**	
Site Restoration							
Topsoil, 4" deep, furnish & place	2,022	SY	$	3.03	$	6,127.33	Means
Seed, utility mix, 7 lb/msf, tractor	18	MSF	$	18.95	$	344.89	Means
Asphalt pavement	350	SY	$	33.50	$	11,725.00	Means
				Subtotal		**$18,200**	
				Capital Cost Subtotal		**$144,200**	
Project Management and Engineering Design			15%			$21,600	
Construction Oversight			10%			$14,400	
Miscellaneous			10%			$14,400	
Contingency			20%			$28,800	
				Capital Cost Total		**$223,000**	

TABLE 5

PRELIMINARY COST ESTIMATE
ALTERNATIVE 2
SURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

Elements	Quantity	Unit	Unit Cost	Cost	Source
ANNUAL OPERATION AND MAINTENANCE					
Groundwater Monitoring					
5 monitoring wells annually					
Sampling Labor	8	MH	$50.00	$400	Estimate
Analysis	5	Wells	$600.00	$3,000	Vendor
Reporting	1	Report	$2,000.00	$2,000	Estimate
			Subtotal	**$5,400**	
			Short Term O&M Subtotal	**$5,400**	
	Project Management		15%	$800	
	Miscellaneous		10%	$500	
	Contingency		20%	$1,100	
			Short Term O&M Total	**$8,000**	
			Present Worth Short Term O&M, 5 Years, 5% Interest	**$35,000**	
			TOTAL PRESENT WORTH OF ALTERNATIVE 2	**$260,000**	

Sources:

ECHOS - *Environmental Remediation Cost Data - Assemblies, 6th Annual Edition* , R.S. Means Company, Inc., 2000

Means - *Heavy Construction Cost Data, 14th Annual Edition* , R.S. Means Company, Inc., 2000

Vendor - Vendor quote

Estimate - Engineering judgement

TABLE 6

PRELIMINARY COST ESTIMATE
ALTERNATIVE 3
ASPHALT CAPS

Elements	Quantity	Unit	Unit Cost	Cost	Source
CAPITAL COSTS					
Institutional Actions					
Land use restrictions					
Deed recording fees	1	LS	$ 100.00	$ 100.00	Estimate
Coordination	40	HR	$ 50.00	$ 2,000.00	Estimate
Attorney fees	40	HR	$ 200.00	$ 8,000.00	Estimate
			Subtotal	**$10,100**	
Install New Monitoring Wells					
Two wells to deep groundwater					
2-inch PVC casing	110	LF	$ 7.52	$ 827.20	ECHOS
2-inch PVC screen	20	LF	$ 10.73	$ 214.60	ECHOS
2-inch PVC plug	3	EA	$ 14.67	$ 44.01	ECHOS
Filter pack	20	LF	$ 8.15	$ 163.00	ECHOS
Grout	110	LF	$ 0.97	$ 106.70	ECHOS
Bentonite seal	3	EA	$ 29.75	$ 89.25	ECHOS
Drill 8" H.S.A.	130	LF	$ 17.86	$ 2,321.80	ECHOS
Cover	3	EA	$ 160.51	$ 481.53	ECHOS
			Subtotal	**$4,200**	
Sediment Removal					
Catchbasins, manholes, truck bay trench and sump					
Remove sediment	5	CY	$ 119.00	$ 595.00	Means
Dewater sediment	9	TON	$ 49.00	$ 428.75	ECHOS
			Subtotal	**$1,000**	
Surface Soil Removal					
Soil pile excavation					
Excavation	3	HR	$ 100.78	$ 298.61	ECHOS
Backhoe mob/demob	1	EA	$ 430.00	$ 430.00	Means
Surface excavation and backfill					
Surface soil excavation	1	HR	$ 100.78	$ 100.78	ECHOS
Unclassified fill, delivered, off-site	7	CY	$ 4.77	$ 35.33	ECHOS
Spread/compact large areas, 6-inch lifts	7	CY	$ 0.98	$ 7.26	ECHOS
Confirmatory samples from base of excavation	2	EA	$ 90.00	$ 180.00	Vendor
			Subtotal	**$1,100**	
Sewers					
Cleaning					
Clean (jet rodder)	2	DAY	$ 3,700.00	$ 7,400.00	Vendor
Water treatment - mobilize/demobilize	1	EA	$ 4,500.00	$ 4,500.00	Vendor
Water treatment - operation	2	DAY	$ 1,000.00	$ 2,000.00	Vendor
Equipment decon	1	EA	$ 3,200.00	$ 3,200.00	Vendor
Video inspect after cleaning	1	EA	$ 1,300.00	$ 1,300.00	Vendor
Seal interior floor drain to storm sewer	1	EA	$ 160.00	$ 160.00	Means
Lining					
Line with flexible felt resin - 4 inch	110	LF	$ 30.00	$ 3,300.00	Means
Line with flexible felt resin - 8 inch	100	LF	$ 40.00	$ 4,000.00	Means
			Subtotal	**$25,900**	

TABLE 6

PRELIMINARY COST ESTIMATE
ALTERNATIVE 3
ASPHALT CAPS

Elements	Quantity	Unit	Unit Cost		Cost		Source
Transportation and Disposal							
Soil and Sediment							
Roll-off spot fee plus 1 month rental	1	EA	$	800.00	$	800.00	Vendor
Load	94	CY	$	2.98	$	279.79	ECHOS
Transport and dispose < 50 mg/kg PCBs	102	TON	$	30.00	$	3,045.00	Vendor
Transport > 50 mg/kg PCBs	4	Load	$	510.00	$	2,040.00	Vendor
Dispose > 50 mg/kg PCBs	63	TON	$	105.00	$	6,594.58	Vendor
Waste characterization samples	1	EA	$	600.00	$	600.00	Vendor
Liquids							
Treat	0.5	DAY	$	1,000.00	$	500.00	Vendor
				Subtotal	**$**	**13,900**	
Asphalt Cap							
Cap Construction							
Base course, 3/4" stone, 3"	2794	SY	$	4.41	$	12,323.50	Means
Binder course, 3" thick	2794	SY	$	5.15	$	14,391.39	Means
Top course, 3" thick	2794	SY	$	5.30	$	14,810.56	Means
				Subtotal		**$41,500**	
Site Restoration							
Topsoil, 4" deep, furnish & place	22	SY	$	3.03	$	67.33	Means
Seed, utility mix, push spreader	0.2	MSF	$	43.50	$	8.70	Means
				Subtotal		**$100**	
				Capital Cost Subtotal		**$97,800**	
Project Management and Engineering Design			15%			$14,700	
Construction Oversight			10%			$9,800	
Miscellaneous			10%			$9,800	
Contingency			20%			$19,600	
				Capital Cost Total		**$152,000**	

TABLE 6

PRELIMINARY COST ESTIMATE
ALTERNATIVE 3
ASPHALT CAPS

Elements	Quantity	Unit	Unit Cost	Cost	Source
ANNUAL OPERATION AND MAINTENANCE					
Groundwater Monitoring					
5 monitoring wells annually					
Sampling Labor	8	MH	$50.00	$400	Estimate
Analysis	5	Wells	$600.00	$3,000	Vendor
Reporting	1	Report	$2,000.00	$2,000	Estimate
			Subtotal	**$5,400**	
			Short Term O&M Subtotal	**$5,400**	
		Project Management	15%	$800	
		Miscellaneous	10%	$500	
		Contingency	20%	$1,100	
			Short Term O&M Total	**$8,000**	
			Present Worth Short Term O&M, 5 Years, 5% Interest	**$35,000**	
Cap Inspection and Maintenance					
Annual inspection					
Labor	16	MH	$50.00	$800	Estimate
Maintenance					
Hot patch, 6" thick	2,515	SF	$1.36	$3,420	Means
			Subtotal	**$4,200**	
			Long Term O&M Subtotal	**$4,200**	
		Project Management	15%	$600	
		Miscellaneous	10%	$400	
		Contingency	20%	$800	
			Long Term O&M Total	**$6,000**	
			Present Worth Long Term O&M, 30 Years, 5% Interest	**$92,000**	
			TOTAL PRESENT WORTH OF ALTERNATIVE 3	**$280,000**	

Sources:
ECHOS - *Environmental Remediation Cost Data - Assemblies, 6th Annual Edition*, R.S. Means Company, Inc., 2000
Means - *Heavy Construction Cost Data, 14th Annual Edition*, R.S. Means Company, Inc., 2000
Vendor - Vendor quote
Estimate - Engineering judgement

TABLE 7

PRELIMINARY COST ESTIMATE
ALTERNATIVE 3A
ASPHALT CAP OVER SUBSURFACE SOIL

Elements	Quantity	Unit	Unit Cost	Cost	Source
CAPITAL COSTS					
Institutional Actions					
Fences and signs					
6-foot galvanized chain-link fence	375	LF	$ 20.62	$ 7,732.50	ECHOS
6-foot swing gate, 20-foot double	2	EA	$ 1,425.00	$ 2,850.00	MEANS
Land use restrictions					
Deed recording fees	1	LS	$ 100.00	$ 100.00	Estimate
Coordination	40	HR	$ 50.00	$ 2,000.00	Estimate
Attorney fees	40	HR	$ 200.00	$ 8,000.00	Estimate
			Subtotal	**$20,700**	
Install New Monitoring Wells					
Two wells to deep groundwater					
2-inch PVC casing	110	LF	$ 7.52	$ 827.20	ECHOS
2-inch PVC screen	20	LF	$ 10.73	$ 214.60	ECHOS
2-inch PVC plug	3	EA	$ 14.67	$ 44.01	ECHOS
Filter pack	20	LF	$ 8.15	$ 163.00	ECHOS
Grout	110	LF	$ 0.97	$ 106.70	ECHOS
Bentonite seal	3	EA	$ 29.75	$ 89.25	ECHOS
Drill 8" H.S.A.	130	LF	$ 17.86	$ 2,321.80	ECHOS
Cover	3	EA	$ 160.51	$ 481.53	ECHOS
			Subtotal	**$4,200**	
Sediment Removal					
Catchbasins, manholes, truck bay trench and sump					
Remove sediment	5	CY	$ 119.00	$ 595.00	Means
Dewater sediment	9	TON	$ 49.00	$ 428.75	ECHOS
			Subtotal	**$1,000**	
Surface Soil Removal					
Soil pile excavation					
Excavation	3	HR	$ 100.78	$ 298.61	ECHOS
Backhoe mob/demob	1	EA	$ 430.00	$ 430.00	Means
Surface excavation and backfill					
Surface soil excavation	1	HR	$ 100.78	$ 100.78	ECHOS
Unclassified fill, delivered, off-site	17	CY	$ 4.77	$ 79.50	ECHOS
Spread/compact large areas, 6-inch lifts	17	CY	$ 0.98	$ 16.33	ECHOS
Confirmatory samples from base of excavation	2	EA	$ 90.00	$ 180.00	Vendor
			Subtotal	**$1,100**	

TABLE 7

PRELIMINARY COST ESTIMATE
ALTERNATIVE 3A
ASPHALT CAP OVER SUBSURFACE SOIL

Elements	Quantity	Unit	Unit Cost	Cost	Source
Sewers					
Cleaning					
Clean (jet rodder)	2	DAY	$ 3,700.00	$ 7,400.00	Vendor
Water treatment - mobilize/demobilize	1	EA	$ 4,500.00	$ 4,500.00	Vendor
Water treatment - operation	2	DAY	$ 1,000.00	$ 2,000.00	Vendor
Equipment decon	1	EA	$ 3,200.00	$ 3,200.00	Vendor
Video inspect after cleaning	1	EA	$ 1,300.00	$ 1,300.00	Vendor
Seal interior floor drain to storm sewer	1	EA	$ 160.00	$ 160.00	Means
Lining					
Line with flexible felt resin - 4 inch	110	LF	$ 30.00	$ 3,300.00	Means
Line with flexible felt resin - 8 inch	100	LF	$ 40.00	$ 4,000.00	Means
			Subtotal	**$25,900**	
Transportation and Disposal					
Soil and Sediment					
Roll-off spot fee plus 1 month rental	1	EA	$ 800.00	$ 800.00	Vendor
Load	111	CY	$ 2.98	$ 329.46	ECHOS
Transport and dispose < 50 mg/kg PCBs	102	TON	$ 30.00	$ 3,045.00	Vendor
Transport > 50 mg/kg PCBs	6	Load	$ 510.00	$ 3,060.00	Vendor
Dispose > 50 mg/kg PCBs	92	TON	$ 105.00	$ 9,657.08	Vendor
Waste characterization samples	1	EA	$ 600.00	$ 600.00	Vendor
Liquids					
Treat	0.5	DAY	$ 1,000.00	$ 500.00	Vendor
			Subtotal	**$ 18,000**	
Asphalt Cap					
Cap Construction					
Base course, 3/4" stone, 3"	350	SY	$ 4.41	$ 1,543.50	Means
Binder course, 3" thick	350	SY	$ 5.15	$ 1,802.50	Means
Top course, 3" thick	350	SY	$ 5.30	$ 1,855.00	Means
			Subtotal	**$5,200**	
Site Restoration					
Topsoil, 4" deep, furnish & place	50	SY	$ 3.03	$ 151.50	Means
Seed, utility mix, push spreader	0.5	MSF	$ 43.50	$ 19.58	Means
			Subtotal	**$200**	
			Capital Cost Subtotal	**$76,300**	
Project Management and Engineering Design			15%	$11,400	
Construction Oversight			10%	$7,600	
Miscellaneous			10%	$7,600	
Contingency			20%	$15,300	
			Capital Cost Total	**$118,000**	

TABLE 7

PRELIMINARY COST ESTIMATE
ALTERNATIVE 3A
ASPHALT CAP OVER SUBSURFACE SOIL

Elements	Quantity	Unit	Unit Cost	Cost	Source
ANNUAL OPERATION AND MAINTENANCE					
Groundwater Monitoring					
5 monitoring wells annually					
Sampling Labor	8	MH	$50.00	$400	Estimate
Analysis	5	Wells	$600.00	$3,000	Vendor
Reporting	1	Report	$2,000.00	$2,000	Estimate
			Subtotal	**$5,400**	
			Short Term O&M Subtotal	**$5,400**	
	Project Management	15%		$800	
	Miscellaneous	10%		$500	
	Contingency	20%		$1,100	
			Short Term O&M Total	**$8,000**	
			Present Worth Short Term O&M, 5 Years, 5% Interest	**$35,000**	
Cap Inspection and Maintenance					
Annual inspection					
Labor	12	MH	$50.00	$600	Estimate
Maintenance					
Hot patch, 6" thick	315	SF	$1.36	$430	Means
			Subtotal	**$1,000**	
			Long Term O&M Subtotal	**$1,000**	
	Project Management	15%		$200	
	Miscellaneous	10%		$100	
	Contingency	20%		$200	
			Long Term O&M Total	**$2,000**	
			Present Worth Long Term O&M, 30 Years, 5% Interest	**$31,000**	
			TOTAL PRESENT WORTH OF ALTERNATIVE 3A	**$180,000**	

Sources:
ECHOS - *Environmental Remediation Cost Data - Assemblies, 6th Annual Edition*, R.S. Means Company, Inc., 2000
Means - *Heavy Construction Cost Data, 14th Annual Edition*, R.S. Means Company, Inc., 2000
Vendor - Vendor quote
Estimate - Engineering judgement

TABLE 8

PRELIMINARY COST ESTIMATE
ALTERNATIVE 4
SURFACE AND SUBSURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

Elements	Quantity	Unit	Unit Cost	Cost	Source
CAPITAL COSTS					
Install New Monitoring Wells					
Two wells to deep groundwater					
2-inch PVC casing	110	LF	$ 7.52	$ 827.20	ECHOS
2-inch PVC screen	20	LF	$ 10.73	$ 214.60	ECHOS
2-inch PVC plug	3	EA	$ 14.67	$ 44.01	ECHOS
Filter pack	20	LF	$ 8.15	$ 163.00	ECHOS
Grout	110	LF	$ 0.97	$ 106.70	ECHOS
Bentonite seal	3	EA	$ 29.75	$ 89.25	ECHOS
Drill 8" H.S.A.	130	LF	$ 17.86	$ 2,321.80	ECHOS
Cover	3	EA	$ 160.51	$ 481.53	ECHOS
			Subtotal	**$4,200**	
Sediment Removal					
Catchbasins, manholes, truck bay trench and sump					
Remove sediment	5	CY	$ 119.00	$ 595.00	Means
Dewater sediment	9	TON	$ 49.00	$ 428.75	ECHOS
			Subtotal	**$1,000**	
Surface Soil Removal					
Soil pile excavation					
Excavation	3	HR	$ 100.78	$ 298.61	ECHOS
Backhoe mob/demob	1	EA	$ 430.00	$ 430.00	Means
Surface excavation and backfill					
Pavement removal	372	SY	$ 4.15	$ 1,544.72	Means
Surface soil excavation	26	HR	$ 100.78	$ 2,656.36	ECHOS
Unclassified fill, delivered, off-site	791	CY	$ 4.77	$ 3,771.83	ECHOS
Spread/compact large areas, 6-inch lifts	791	CY	$ 0.98	$ 774.93	ECHOS
Confirmatory samples from base of excavation	25	EA	$ 90.00	$ 2,250.00	Vendor
			Subtotal	**$11,700**	
Subsurface Soil Removal					
Excavation and backfill					
Excavation	15	HR	$ 100.78	$ 1,526.63	ECHOS
Dewater soil	171	TON	$ 49.00	$ 8,384.44	ECHOS
Unclassified fill, delivered, off-site	15	CY	$ 4.77	$ 72.26	ECHOS
Spread/compact large areas, 6-inch lifts	15	CY	$ 0.98	$ 14.85	ECHOS
Confirmatory samples from base of excavation	3	EA	$ 175.00	$ 525.00	Vendor
			Subtotal	**$10,500**	

TABLE 8

PRELIMINARY COST ESTIMATE
ALTERNATIVE 4
SURFACE AND SUBSURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

Elements	Quantity	Unit	Unit Cost	Cost	Source
Sewers					
Cleaning					
Clean (jet rodder)	2	DAY	$ 3,700.00	$ 7,400.00	Vendor
Water treatment - mobilize/demobilize	1	EA	$ 4,500.00	$ 4,500.00	Vendor
Water treatment - operation	2	DAY	$ 1,000.00	$ 2,000.00	Vendor
Equipment decon	1	EA	$ 3,200.00	$ 3,200.00	Vendor
Video inspect after cleaning	1	EA	$ 1,300.00	$ 1,300.00	Vendor
Seal interior floor drain to storm sewer	1	EA	$ 160.00	$ 160.00	Means
Replace Sewers					
4-inch PVC pipe sanitary	80	LF	$ 6.49	$ 519.20	ECHOS
8-inch corrugated metal storm	80	LF	$ 7.16	$ 572.80	ECHOS
3-9 lb magnesium anodes, cathodic protection point	1	EA	$ 580.22	$ 580.22	ECHOS
Dispose removed pipe	0.25	TON	$ 156.67	$ 39.17	ECHOS
			Subtotal	**$20,300**	
Transportation and Disposal					
Asphalt					
Load	124	CY	$ 2.98	$ 369.74	ECHOS
Transport and dispose	217	TON	$ 30.00	$ 6,513.89	Vendor
Waste characterization sample	1	EA	$ 600.00	$ 600.00	Vendor
Soil and Sediment					
Roll-off spot fee plus 2 months rental	1	EA	$ 1,200.00	$ 1,200.00	Vendor
Load	1,339	CY	$ 2.98	$ 3,990.44	ECHOS
Transport and dispose < 50 mg/kg PCBs	2,095	TON	$ 30.00	$ 62,836.67	Vendor
Transport > 50 mg/kg PCBs	15	Load	$ 510.00	$ 7,650.00	Vendor
Dispose > 50 mg/kg PCBs	249	TON	$ 105.00	$ 26,126.53	Vendor
Waste characterization samples	3	EA	$ 600.00	$ 1,800.00	Vendor
Liquids					
Treat	2	DAY	$ 1,000.00	$ 2,000.00	Vendor
			Subtotal	**$ 113,100**	
Site Restoration					
Topsoil, 4" deep, furnish & place	2,022	SY	$ 3.03	$ 6,127.33	Means
Seed, utility mix, 7 lb/msf, tractor	18	MSF	$ 18.95	$ 344.89	Means
Asphalt pavement	350	SY	$ 33.50	$ 11,725.00	Means
			Subtotal	**$18,200**	
			Capital Cost Subtotal	**$179,000**	
Project Management and Engineering Design			15%	$26,900	
Construction Oversight			10%	$17,900	
Miscellaneous			10%	$17,900	
Contingency			20%	$35,800	
			Capital Cost Total	**$278,000**	

TABLE 8

PRELIMINARY COST ESTIMATE
ALTERNATIVE 4
SURFACE AND SUBSURFACE SOIL EXCAVATION AND OFF-SITE DISPOSAL

Elements	Quantity	Unit	Unit Cost	Cost	Source
ANNUAL OPERATION AND MAINTENANCE					
Groundwater Monitoring					
3 monitoring wells annually for 5 years					
Sampling Labor	8	MH	$50.00	$400	Estimate
Analysis	3	Wells	$600.00	$1,800	Vendor
Reporting	1	Report	$2,000.00	$2,000	Estimate
			Subtotal	**$4,200**	
			Short Term O&M Subtotal	**$4,200**	
	Project Management		15%	$600	
	Miscellaneous		10%	$400	
	Contingency		20%	$800	
			Short Term O&M Total	**$6,000**	
			Present Worth Short Term O&M, 5 Years, 5% Interest	**$26,000**	
			TOTAL PRESENT WORTH OF ALTERNATIVE 4	**$300,000**	

Sources:
ECHOS - *Environmental Remediation Cost Data - Assemblies, 6th Annual Edition*, R.S. Means Company, Inc., 2000
Means - *Heavy Construction Cost Data, 14th Annual Edition*, R.S. Means Company, Inc., 2000
Vendor - Vendor quote
Estimate - Engineering judgement

TABLE 9

PRELIMINARY COST ESTIMATE
ALTERNATIVE 5
ON-SITE THERMAL DESORPTION

Elements	Quantity	Unit	Unit Cost	Cost	Source
CAPITAL COSTS					
Install New Monitoring Wells					
Two wells to deep groundwater					
2-inch PVC casing	110	LF	$ 7.52	$ 827.20	ECHOS
2-inch PVC screen	20	LF	$ 10.73	$ 214.60	ECHOS
2-inch PVC plug	3	EA	$ 14.67	$ 44.01	ECHOS
Filter pack	20	LF	$ 8.15	$ 163.00	ECHOS
Grout	110	LF	$ 0.97	$ 106.70	ECHOS
Bentonite seal	3	EA	$ 29.75	$ 89.25	ECHOS
Drill 8" H.S.A.	130	LF	$ 17.86	$ 2,321.80	ECHOS
Cover	3	EA	$ 160.51	$ 481.53	ECHOS
			Subtotal	**$4,200**	
Sediment Removal					
Catchbasins, manholes, truck bay trench and sump					
Remove sediment	5	CY	$ 119.00	$ 595.00	Means
Dewater sediment	9	TON	$ 49.00	$ 428.75	ECHOS
			Subtotal	**$1,000**	
Surface Soil Removal					
Soil pile excavation					
Excavation	3	HR	$ 100.78	$ 298.61	ECHOS
Backhoe mob/demob	1	EA	$ 430.00	$ 430.00	Means
Surface excavation and backfill					
Pavement removal	350	SY	$ 4.15	$ 1,452.50	Means
Surface soil excavation	26	HR	$ 100.78	$ 2,656.36	ECHOS
Spread/compact large areas, 6-inch lifts	791	CY	$ 0.98	$ 774.93	ECHOS
Confirmatory samples from base of excavation	25	EA	$ 90.00	$ 2,250.00	Vendor
			Subtotal	**$7,900**	
Subsurface Soil Removal					
Excavation and backfill					
Excavation	15	HR	$ 100.78	$ 1,526.63	ECHOS
Dewater soil	171	TON	$ 49.00	$ 8,384.44	ECHOS
Spread/compact large areas, 6-inch lifts	15	CY	$ 0.98	$ 14.85	ECHOS
Confirmatory samples from base of excavation	3	EA	$ 175.00	$ 525.00	Vendor
			Subtotal	**$10,500**	

TABLE 9

PRELIMINARY COST ESTIMATE
ALTERNATIVE 5
ON-SITE THERMAL DESORPTION

Elements	Quantity	Unit	Unit Cost	Cost	Source
Sewers					
Cleaning					
Clean (jet rodder)	2	DAY	$ 3,700.00	$ 7,400.00	Vendor
Water treatment - mobilize/demobilize	1	EA	$ 4,500.00	$ 4,500.00	Vendor
Water treatment - operation	2	DAY	$ 1,000.00	$ 2,000.00	Vendor
Equipment decon	1	EA	$ 3,200.00	$ 3,200.00	Vendor
Video inspect after cleaning	1	EA	$ 1,300.00	$ 1,300.00	Vendor
Seal interior floor drain to storm sewer	1	EA	$ 160.00	$ 160.00	Means
Replace Sewers					
4-inch PVC pipe sanitary	80	LF	$ 6.49	$ 519.20	ECHOS
8-inch corrugated metal storm	80	LF	$ 7.16	$ 572.80	ECHOS
3-9 lb magnesium anodes, cathodic protection point	1	EA	$ 580.22	$ 580.22	ECHOS
Dispose removed pipe	0.25	TON	$ 156.67	$ 39.17	ECHOS
			Subtotal	**$20,300**	
Transportation and Disposal					
Asphalt					
Load	117	CY	$ 2.98	$ 347.67	ECHOS
Transport and dispose	204	TON	$ 30.00	$ 6,125.00	Vendor
Waste characterization sample	1	EA	$ 600.00	$ 600.00	Vendor
Liquids					
Treat	2	DAY	$ 1,000.00	$ 2,000.00	Vendor
			Subtotal	**$ 9,100**	
Thermal Desorption					
916, 1.5 CY wheel loader	234	HR	$ 100.78	$ 23,616.58	ECHOS
Permitting/engineering for site	1	EA	$ 37,131.00	$ 37,131.00	ECHOS
Indirect firing, rental/operations	2,343	TON	$ 94.23	$ 220,816.66	ECHOS
Minimum mob/demob charge for sm portable unit	1	EA	$ 5,304.00	$ 5,304.00	ECHOS
Fixed Costs	1	EA	$ 102,500.00	$ 102,500.00	ECHOS
Service Contract	2,343	TON	$ 153.75	$ 360,294.62	ECHOS
			Subtotal	**$749,700**	
Site Restoration					
Topsoil, 4" deep, furnish & place	2,022	SY	$ 3.03	$ 6,127.33	Means
Seed, utility mix, 7 lb/msf, tractor	18	MSF	$ 18.95	$ 344.89	Means
Asphalt pavement	350	SY	$ 33.50	$ 11,725.00	Means
			Subtotal	**$18,200**	
			Capital Cost Subtotal	**$820,900**	
Project Management and Engineering Design			15%	$123,100	
Construction Oversight			10%	$82,100	
Miscellaneous			10%	$82,100	
Contingency			20%	$164,200	
			Capital Cost Total	**$1,272,000**	

TABLE 9

PRELIMINARY COST ESTIMATE
ALTERNATIVE 5
ON-SITE THERMAL DESORPTION

Elements	Quantity	Unit	Unit Cost	Cost	Source
ANNUAL OPERATION AND MAINTENANCE					
Groundwater Monitoring					
3 monitoring wells annually for 5 years					
Sampling Labor	8	MH	$50.00	$400	Estimate
Analysis	3	Wells	$600.00	$1,800	Vendor
Reporting	1	Report	$2,000.00	$2,000	Estimate
			Subtotal	**$4,200**	
			Short Term O&M Subtotal	**$4,200**	
	Project Management		15%	$600	
	Miscellaneous		10%	$400	
	Contingency		20%	$800	
			Short Term O&M Total	**$6,000**	
			Present Worth Short Term O&M, 5 Years, 5% Interest	**$26,000**	
			TOTAL PRESENT WORTH OF ALTERNATIVE 5	**$1,300,000**	

Sources:

ECHOS - *Environmental Remediation Cost Data - Assemblies, 6th Annual Edition*, R.S. Means Company, Inc., 2000
Means - *Heavy Construction Cost Data, 14th Annual Edition*, R.S. Means Company, Inc., 2000
Vendor - Vendor quote
Estimate - Engineering judgement

TABLE 10

SUMMARY OF ESTIMATED COSTS FOR CORRECTIVE MEASURE ALTERNATIVES

GENERAL ELECTRIC APPARATUS SERVICE CENTER
175 MILENS ROAD
TONAWANDA, NEW YORK

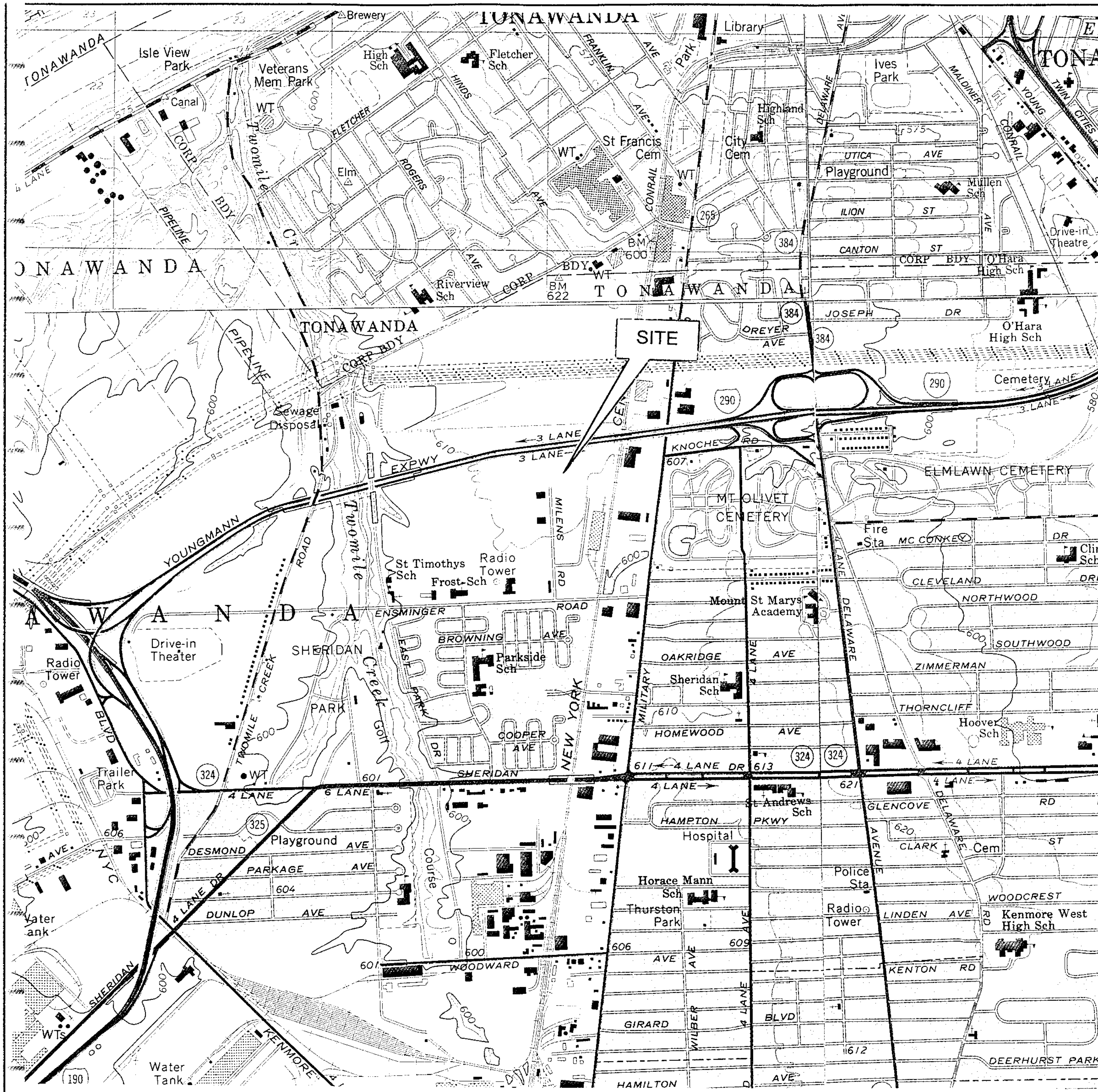
	ALTERNATIVE DESCRIPTION	CAPITAL COST	ANNUAL O&M COSTS	PRESENT WORTH OF 5 YEARS OF SHORT TERM O&M COSTS	PRESENT WORTH OF 30 YEARS OF LONG TERM O&M COSTS	TOTAL PRESENT WORTH
1.	No Action with Access Controls	$40,000	$8,000	$35,000		**$80,000**
2.	Surface Soil Excavation and Off-Site Disposal	$223,000	$8,000	$35,000		**$260,000**
3.	Asphalt Caps	$152,000	$14,000	$35,000	$92,000	**$280,000**
3A.	Asphalt Cap over Subsurface Soil	$118,000	$10,000	$35,000	$31,000	**$180,000**
4.	Surface and Subsurface Soil Excavation and Off-Site Disposal	$278,000	$6,000	$26,000		**$300,000**
5.	On-Site Thermal Desorption	$1,272,000	$6,000	$26,000		**$1,300,000**

TABLE 11

COMPARISON OF CORRECTIVE MEASURE ALTERNATIVES

GE APPARATUS SERVICE CENTER
TONAWANDA, NEW YORK

Alternative Description	Technical				Environmental	Human Health	Institutional
	Performance	*Reliability*	*Implementability*	*Safety*			
Alternative 1 No Action with Access Controls	• Does not address PCB- or VOC-impacted soil, sediment, or perched groundwater.	• Does not apply.	• Not difficult. • Estimated time to construct: 2 weeks • Monitor five wells for five years.	• No direct risk from implementation.	• Does not address four exposure pathways.	• Significant risk of direct contact remains.	• Does not comply with TSCA or NYSDEC RSCOs for soil. • Public reaction is anticipated to be unfavorable.
Alternative 2 Surface Soil Excavation and Off-Site Disposal	• Addresses impacted surface soil, sewers, and sediments.	• Technologies have proven reliable at similar sites.	• Not difficult. • Estimated time to construct: 3 months. • Monitor five wells for five years.	• Low risk from implementation.	• Eliminates risk of direct contact. • Reduces risk of off-site migration and infiltration through impacted soil. • Does not address potential migration of perched groundwater. • Impacted materials are properly disposed in an off-site landfill.	• Eliminates risk of direct contact. • Remaining perched groundwater is unlikely to impact a drinking water source.	• Complies with TSCA and NYSDEC RSCOs for surface soil and sediments. • Public reaction is anticipated to be favorable, with reservations about impacted media left in place.
Alternative 3 Asphalt Caps	• Addresses impacted surface and subsurface soil, sewers, and sediments.	• Technologies have proven reliable at similar sites. • Cap reliability depends on regular maintenance.	• Not difficult. • Estimated time to construct: 3 months. • Monitor five wells for five years.	• Low risk from implementation.	• Eliminates risk of direct contact. • Reduces risk of off-site migration and infiltration through impacted soil. • Reduces potential migration of perched groundwater by reducing infiltration. • Impacted materials are properly disposed in an off-site landfill or capped on-site.	• Eliminates risk of direct contact. • Remaining perched groundwater is unlikely to impact a drinking water source.	• Complies with TSCA and NYSDEC RSCOs for surface soil, subsurface soil, and sediments. • Public reaction is anticipated to be favorable, with reservations about impacted media left in place.
Alternative 3A Asphalt Cap over Subsurface Soil	• Addresses impacted surface and subsurface soil, sewers, and sediments.	• Technologies have proven reliable at similar sites. • Cap reliability depends on regular maintenance.	• Not difficult. • Estimated time to construct: 3 months. • Monitor five wells for five years.	• Low risk from implementation.	• Reduces risk of direct contact. • Reduces risk of off-site migration and infiltration through impacted soil. • Reduces potential migration of perched groundwater by reducing infiltration. • Impacted materials are properly disposed in an off-site landfill, capped on-site, or enclosed by fences.	• Reduces risk of direct contact. • Remaining perched groundwater is unlikely to impact a drinking water source.	• Complies with TSCA or NYSDEC RSCOs for surface soil, subsurface soil, and sediments. • Public reaction is anticipated to be favorable, with reservations about impacted media left in place.
Alternative 4 Surface and Subsurface Soil Excavation and Off-Site Disposal	• Addresses impacted surface and subsurface soil, sewers, and sediments.	• Technologies have proven reliable at similar sites.	• Not difficult. • Estimated time to construct: 3 months. • Monitor three wells for five years.	• Low risk from implementation.	• Eliminates risk of direct contact, off-site migration, infiltration through impacted soil, and migration of perched groundwater. • Impacted materials are properly disposed in an off-site landfill.	• Eliminates risk of direct contact and migration of perched groundwater.	• Complies with TSCA and NYSDEC RSCOs for surface soil, subsurface soil, and sediments. • Public reaction is anticipated to be favorable.
Alternative 5 On-Site Thermal Desorption	• Addresses impacted surface and subsurface soil, sewers, and sediments.	• Technologies have proven reliable at similar sites. • Requires more operation and maintenance than other alternatives.	• More difficult. • Estimated time to construct: 4 months. • Monitor three wells for five years. • Will significantly disrupt service center operations.	• Low risk from implementation.	• Eliminates risk of direct contact, off-site migration, infiltration through impacted soil, and migration of perched groundwater. • Impacted materials are treated to remove and destroy contaminants.	• Eliminates risk of direct contact and migration of perched groundwater.	• Complies with TSCA and NYSDEC RSCOs for surface soil, subsurface soil, and sediments. • Public reaction is anticipated to be favorable towards cleanup, but unfavorable towards disruption of site activity and odor problems associated with HTTD.



CONTOUR INTERVAL = 10 FEET

REFERENCE
USGS 7.5 MINUTE TOPOGRAPHIC MAPS:
BUFFALO NORTHWEST QUADRANGLE 1965
BUFFALO NORTHEAST QUADRANGLE 1965
TONAWANDA WEST QUADRANGLE 1980
TONAWANDA EAST QUADRANGLE 1980

QUADRANGLE LOCATION

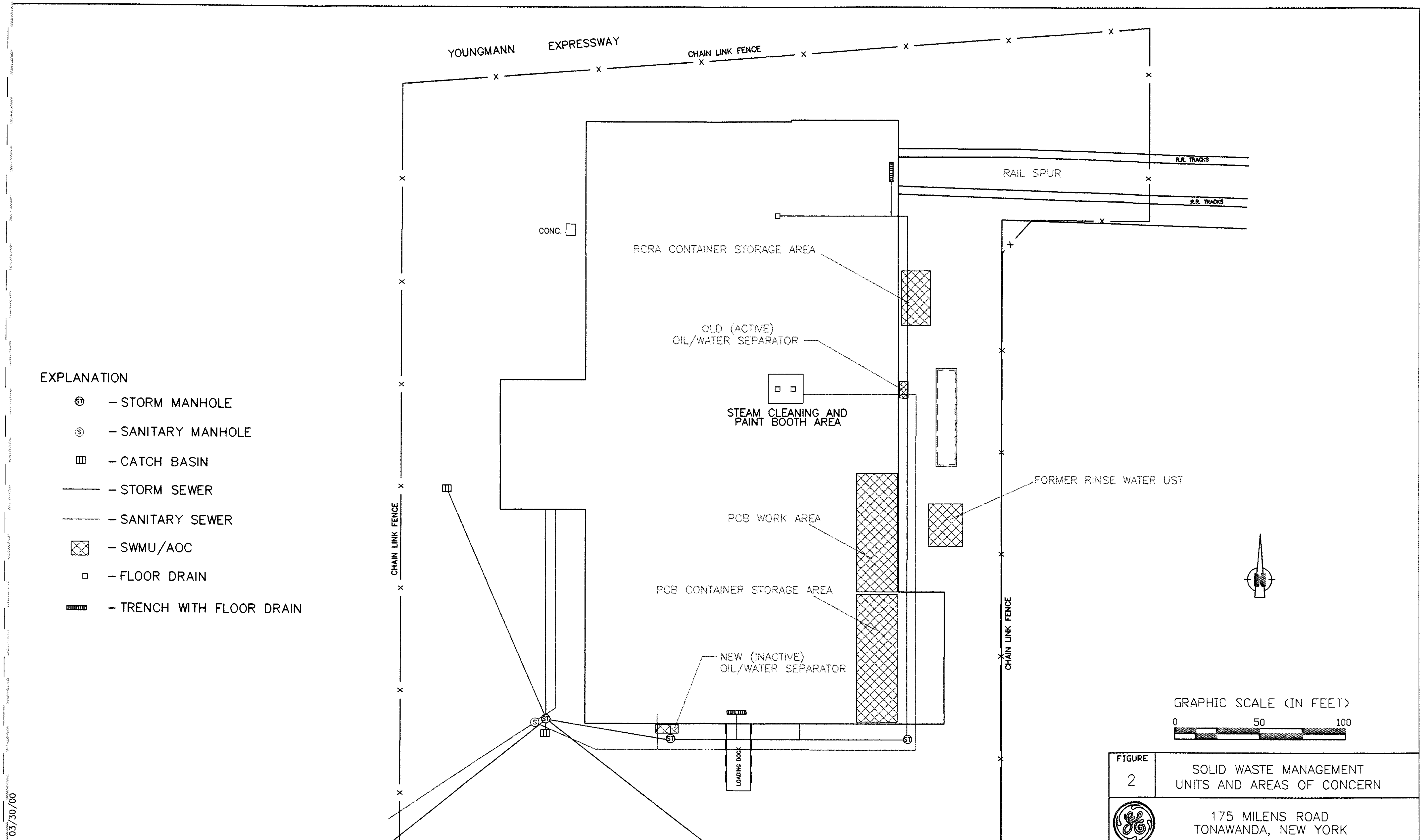
SCALE: 1" = 2000'

FIGURE 1

SITE LOCATION

175 MILENS ROAD
TONAWANDA, NEW YORK

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY
CLIFTON PARK, NEW YORK



SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

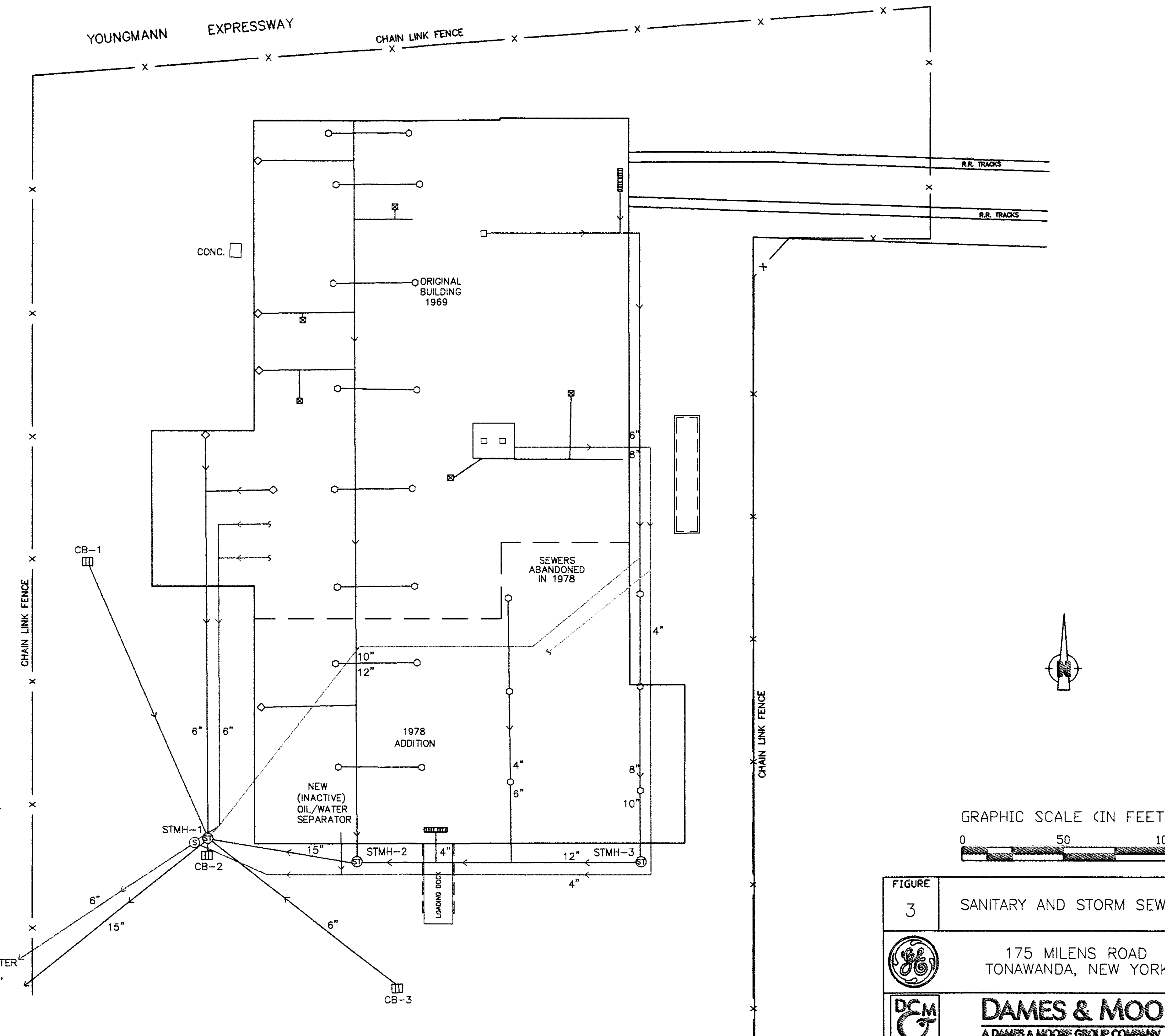
FIGURE 2

SOLID WASTE MANAGEMENT UNITS AND AREAS OF CONCERN

175 MILENS ROAD
TONAWANDA, NEW YORK

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY
CLIFTON PARK, NEW YORK

85030-42 03/30/00



EXPLANATION

- STORM MANHOLE
- SANITARY MANHOLE
- CATCH BASIN
- STORM SEWER
- SANITARY SEWER
- TRENCH
- FLOOR DRAIN
- PLUGGED FLOOR DRAIN
- ABANDONED STORM SEWER
- ABANDONED SANITARY SEWER
- HUB DRAIN 6" ABOVE FLOOR
- ROOF DRAIN

SOURCES: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998. "GENERAL ELECTRIC COMPANY APPARATUS SERVICE BUSINESS DIVISION SERVICE SHOP ADDITION, TOWN OF TONAWANDA, NEW YORK, PLUMBING & DRAINAGE FLOOR PLAN AND SITE PLAN" CANNON DESIGN, INC, APRIL 1, 1977. "GENERAL ELECTRIC APPARATUS SERVICE SHOP, TOWN OF TONAWANDA, NEW YORK, EXHIBIT B" GEORGE H. DRAKE INC. PLUMBING, SEPTEMBER 10, 1974.

FIGURE 3	SANITARY AND STORM SEWERS
	175 MILENS ROAD TONAWANDA, NEW YORK
DCM GROUP	DAMES & MOORE A DAMES & MOORE GROUP COMPANY CLIFTON PARK, NEW YORK

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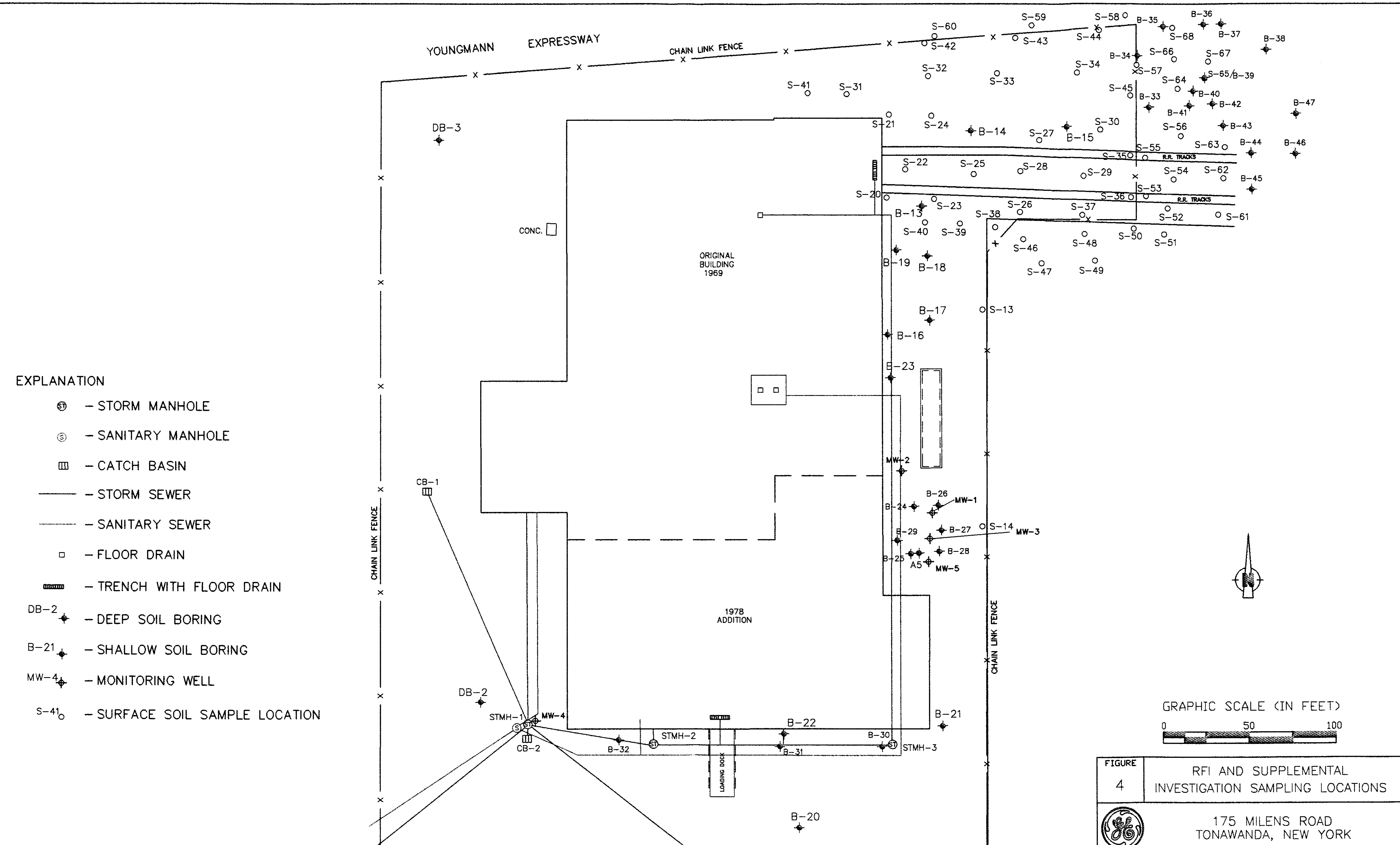
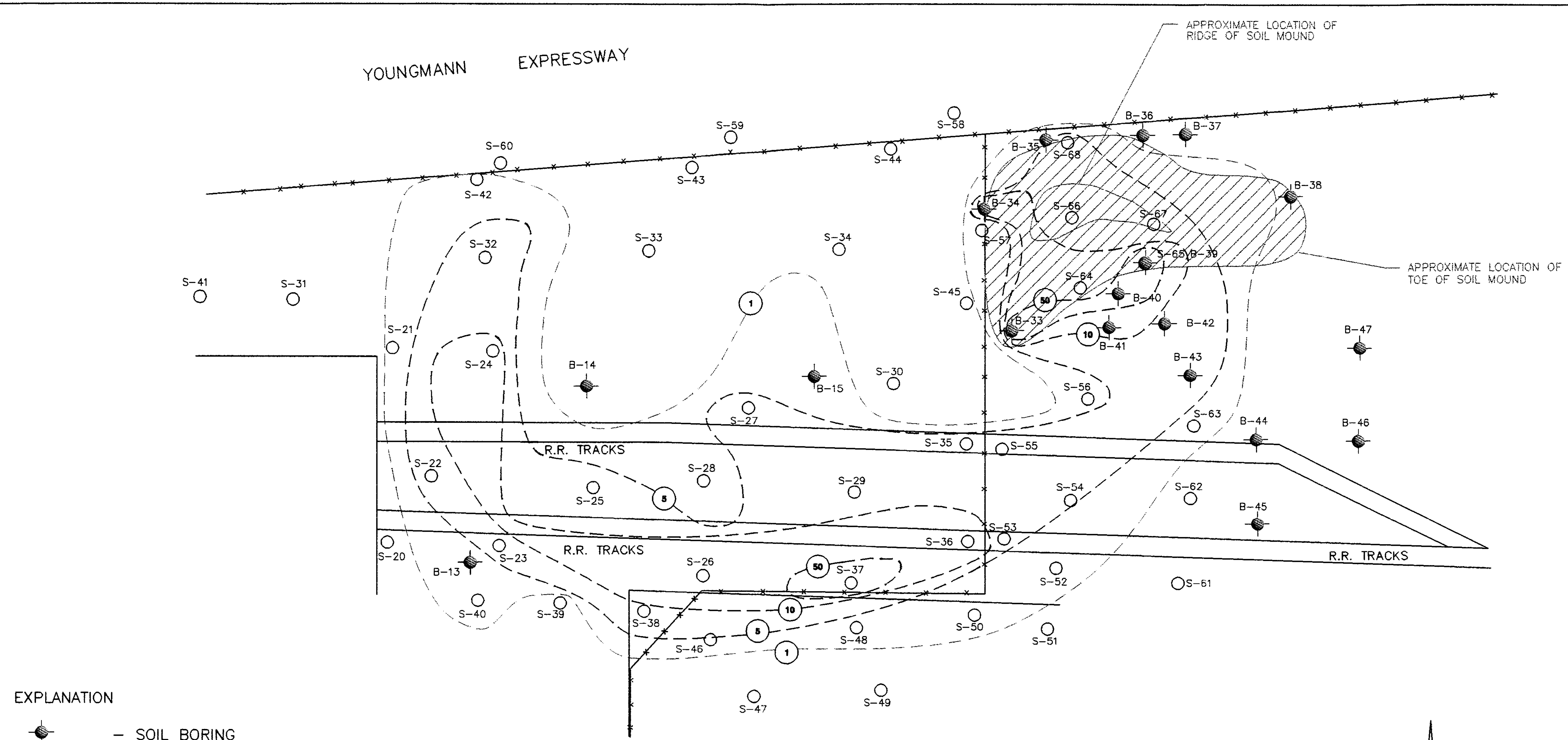


SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

85030-25 03/31/00



EXPLANATION

- SOIL BORING
- SURFACE SOIL SAMPLE
- FENCE LINE

CONTOUR LINE

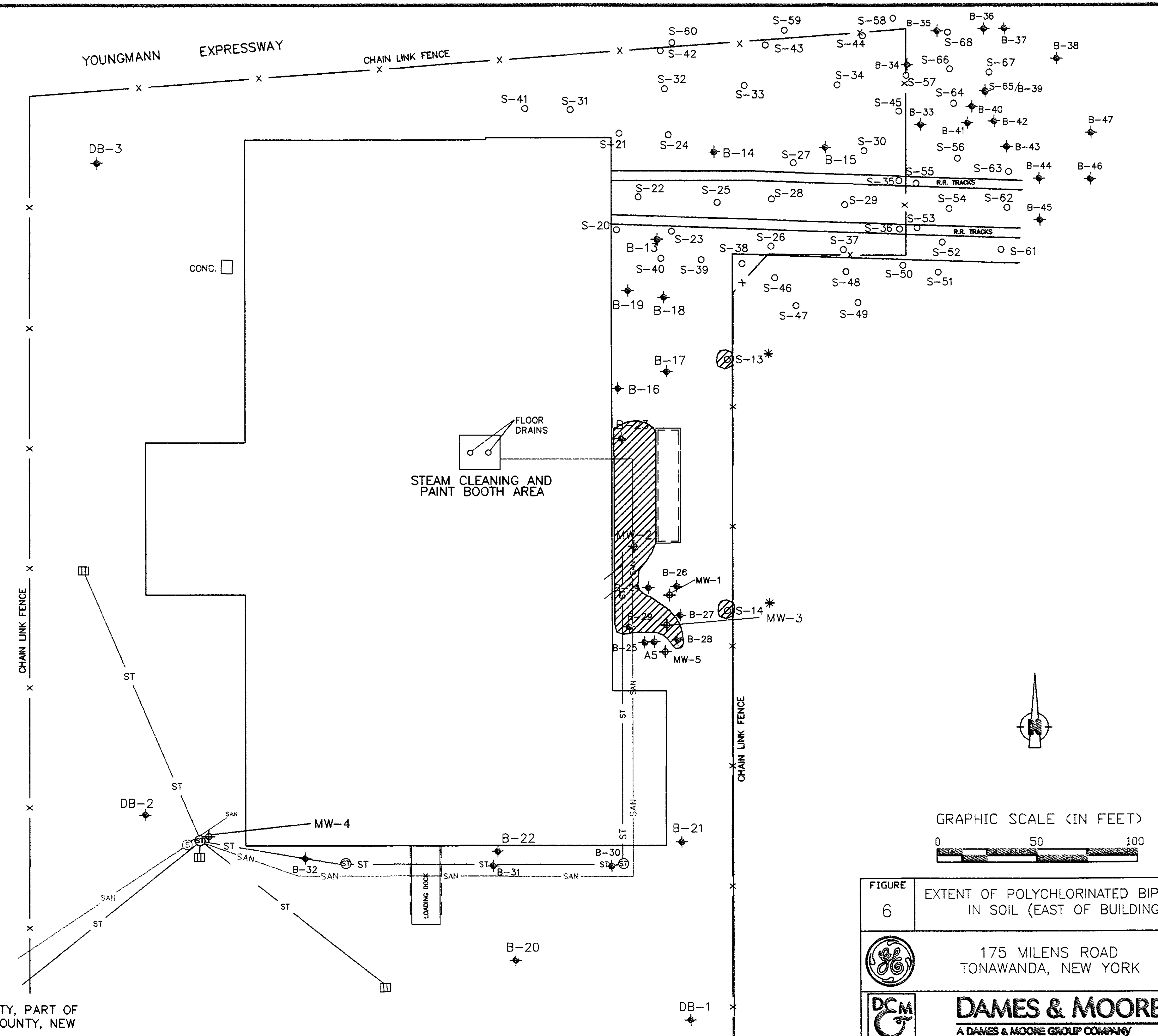
PCB CONCENTRATION CONTOUR LINE VALUE (mg/kg)

NA – NOT ANALYZED

SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

85030-47 04/11/00

FIGURE 5	EXTENT OF PCB-IMPACTED SURFACE SOILS
	175 MILENS ROAD TONAWANDA, NEW YORK
DCM GROUP	DAMES & MOORE A DAMES & MOORE GROUP COMPANY CLIFTON PARK, NEW YORK

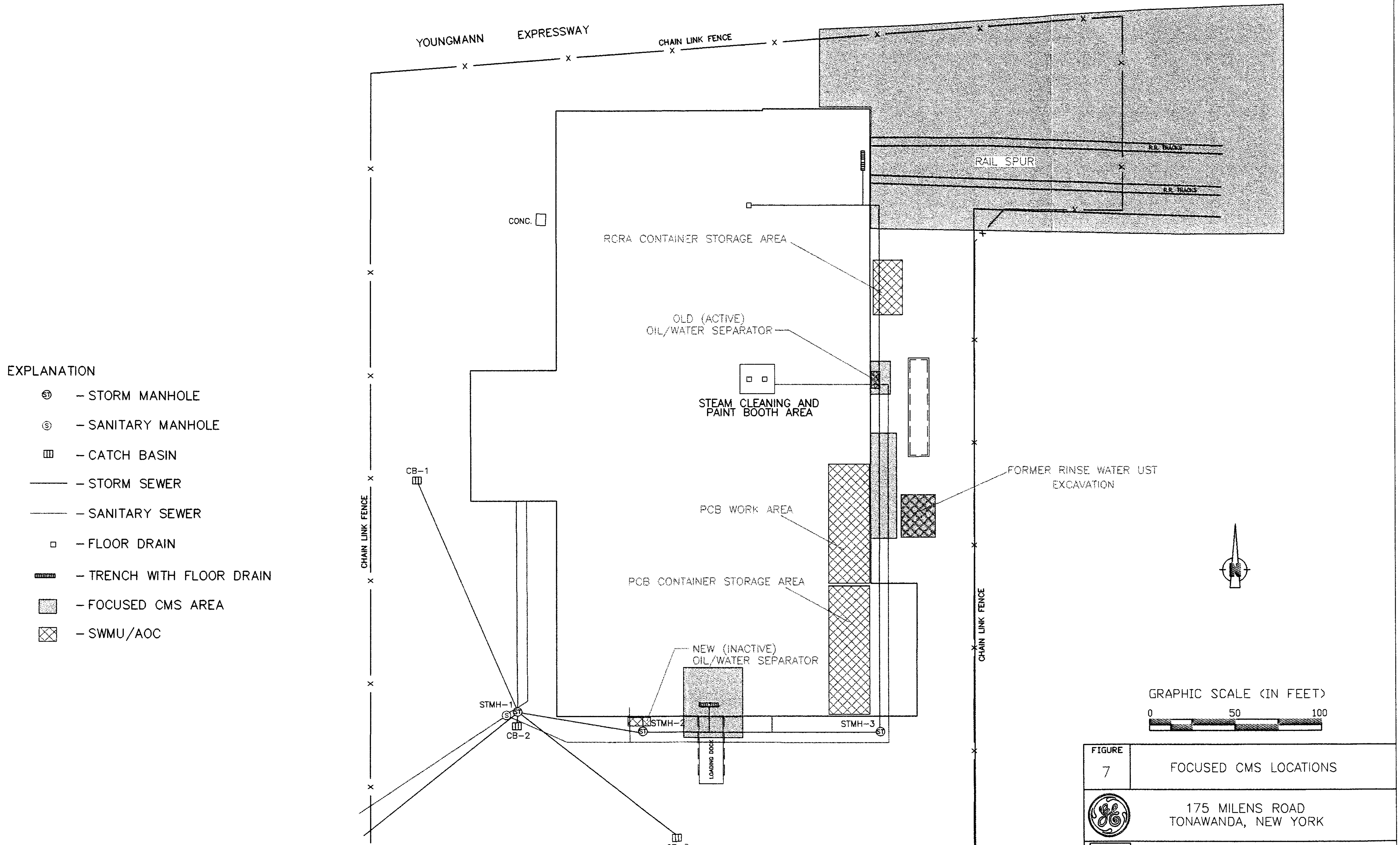


EXPLANATION

- STORM MANHOLE
- SANITARY MANHOLE
- CATCH BASIN
- DB-2 – DEEP SOIL BORING
- B-21 – SHALLOW SOIL BORING
- MW-4 – MONITORING WELL
- S-41 – SURFACE SOIL SAMPLE LOCATION
- AREA WITH POLYCHLORINATED BIPHENYLS CONCENTRATIONS ABOVE NYSDEC RECOMMENDED SOIL CLEANUP OBJECTIVES
- S-13* – 1986 LMS SURFACE SOIL SAMPLE LOCATION

SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

FIGURE	
6	EXTENT OF POLYCHLORINATED BIPHENYLS IN SOIL (EAST OF BUILDING)
	175 MILENS ROAD TONAWANDA, NEW YORK
D&M GROUP	DAMES & MOORE A DAMES & MOORE GROUP COMPANY CLIFTON PARK, NEW YORK



SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

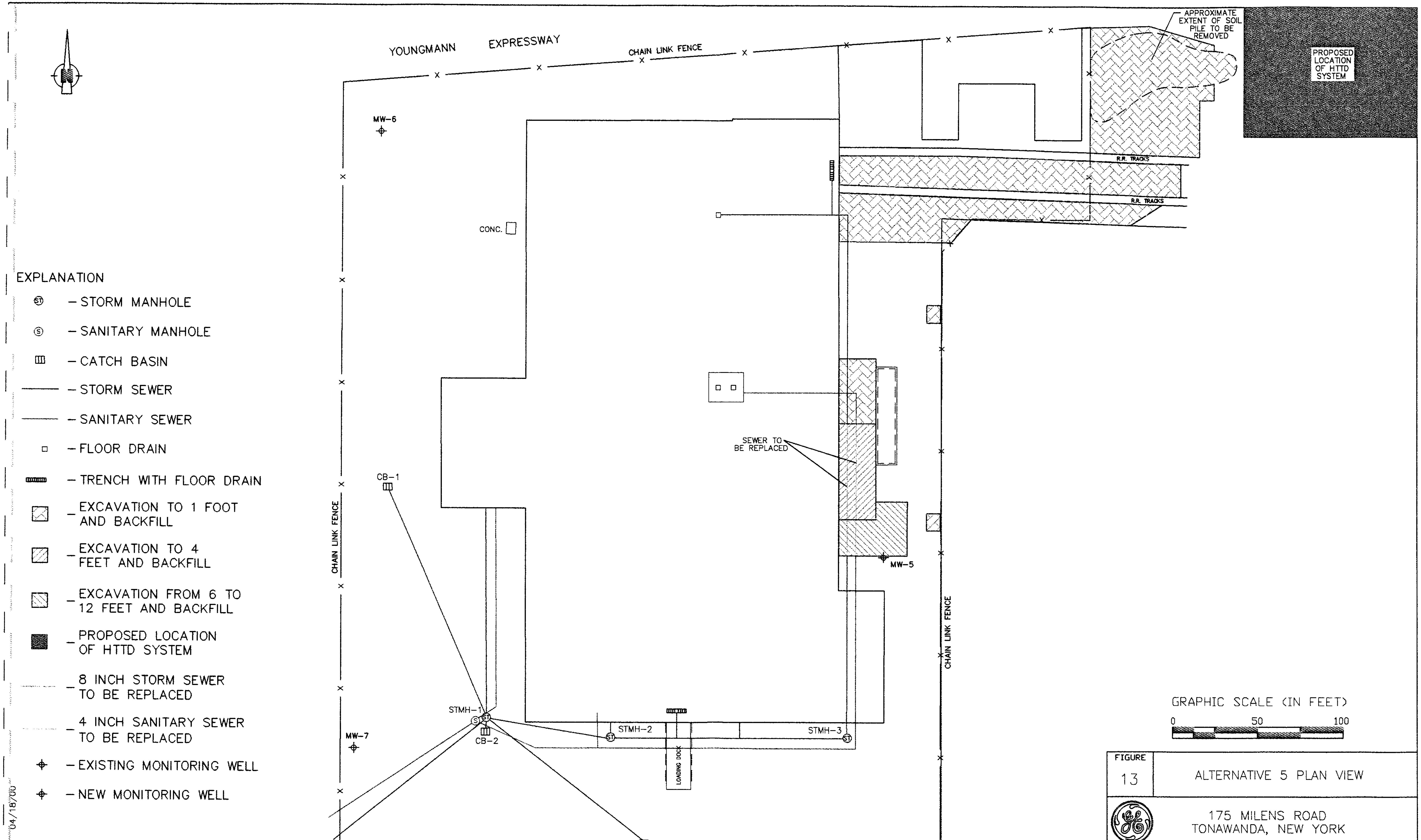
FIGURE 7

FOCUSED CMS LOCATIONS

175 MILENS ROAD
TONAWANDA, NEW YORK

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY
CLIFTON PARK, NEW YORK

85030-28 03/31/00



SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

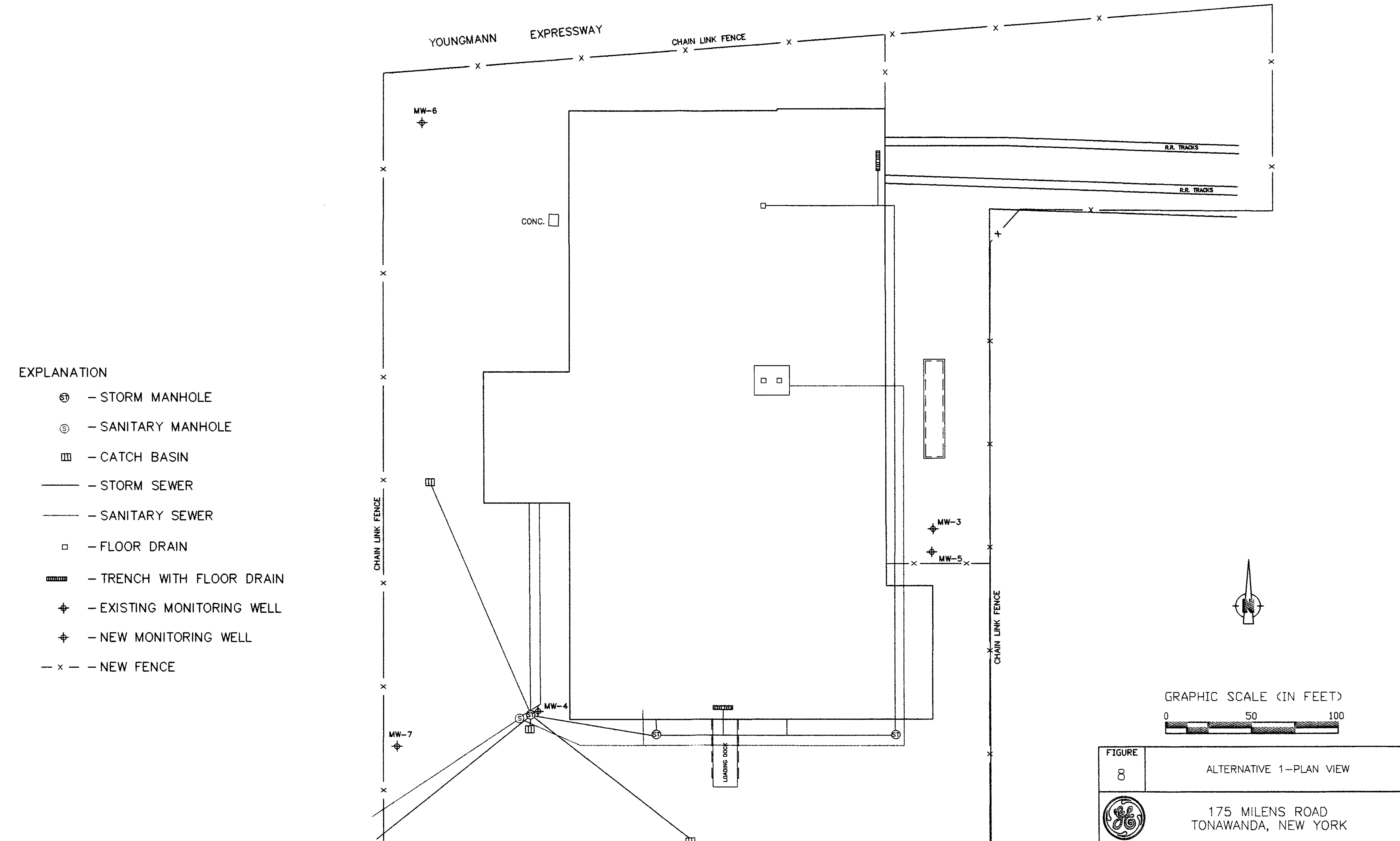
85030-43 04/18/00

FIGURE 13

ALTERNATIVE 5 PLAN VIEW

175 MILENS ROAD
TONAWANDA, NEW YORK

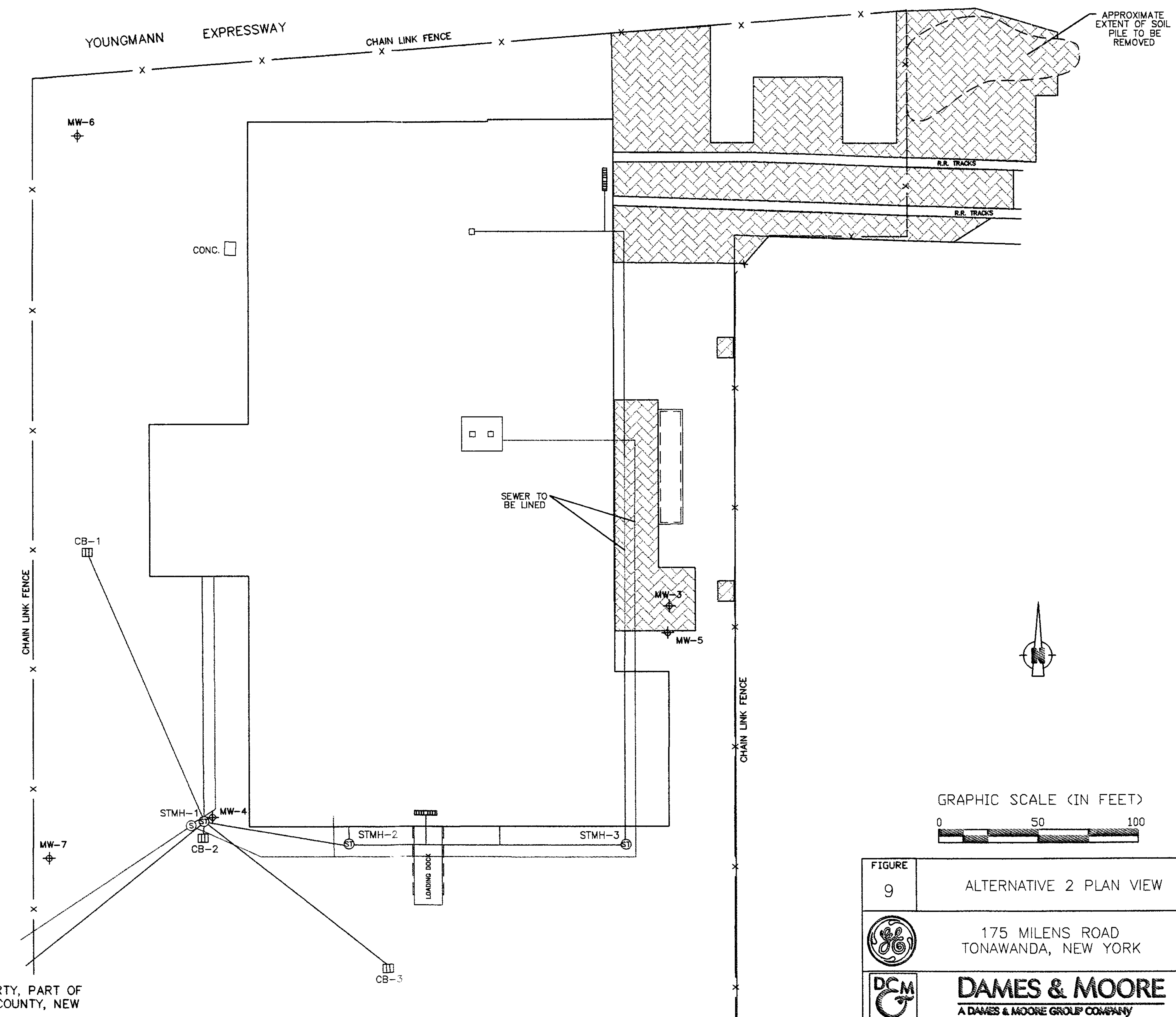
DAMES & MOORE
A DAMES & MOORE GROUP COMPANY
CLIFTON PARK, NEW YORK



SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

85030-41 03/31/00

FIGURE 8	ALTERNATIVE 1–PLAN VIEW
	175 MILENS ROAD TONAWANDA, NEW YORK
DCM GROUP	DAMES & MOORE A DAMES & MOORE GROUP COMPANY CLIFTON PARK, NEW YORK



EXPLANATION

- ST – STORM MANHOLE
- S – SANITARY MANHOLE
- – CATCH BASIN
- – STORM SEWER
- – SANITARY SEWER
- – FLOOR DRAIN
- – TRENCH WITH FLOOR DRAIN
- – EXCAVATION TO 1 FOOT AND BACKFILL
- – STORM SEWER TO BE LINED
- – SANITARY SEWER TO BE LINED
- – EXISTING MONITORING WELL
- – NEW MONITORING WELL

SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

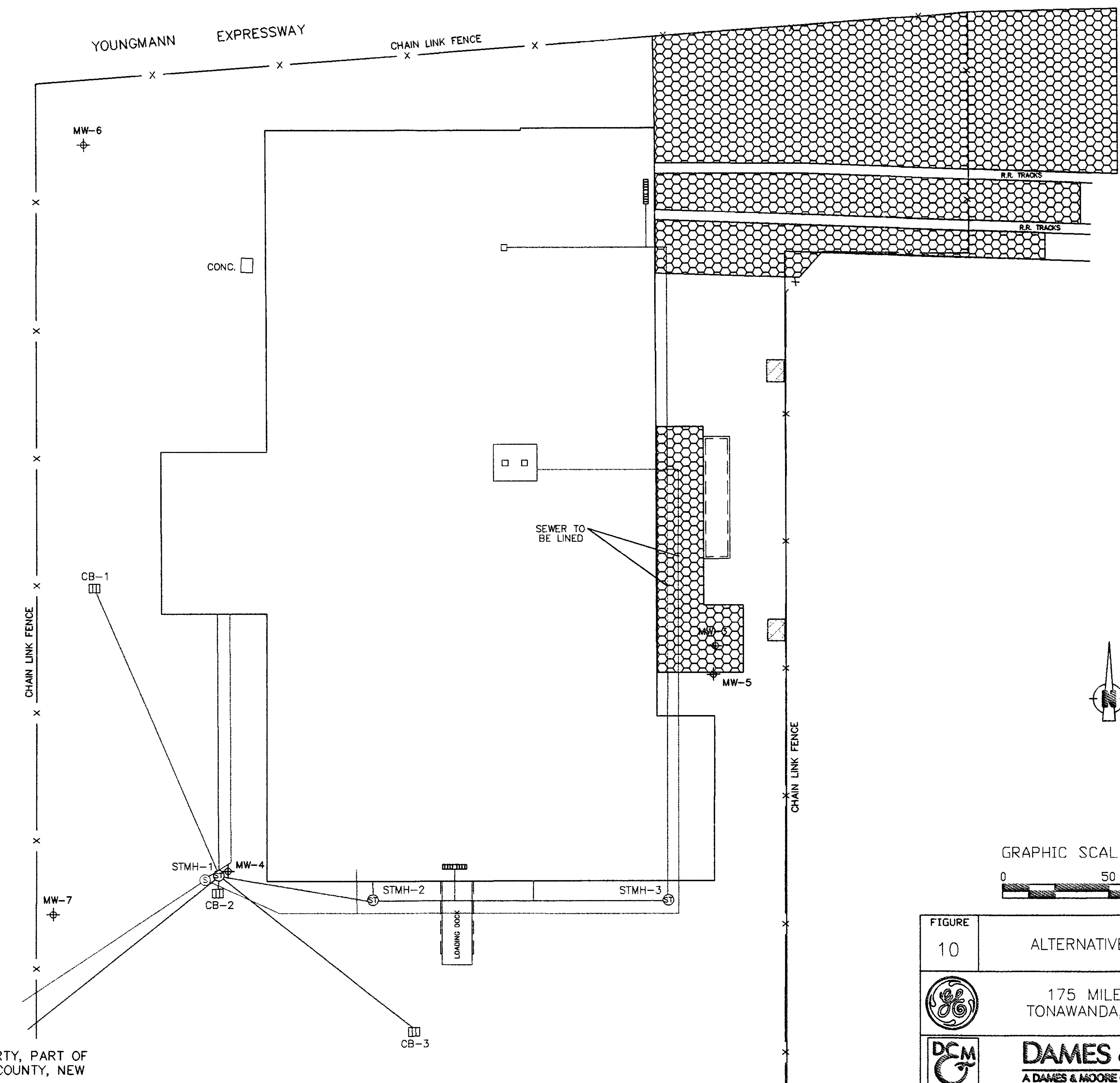
85030-29 03/31/00

FIGURE 9

ALTERNATIVE 2 PLAN VIEW

175 MILENS ROAD
TONAWANDA, NEW YORK

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY
CLIFTON PARK, NEW YORK



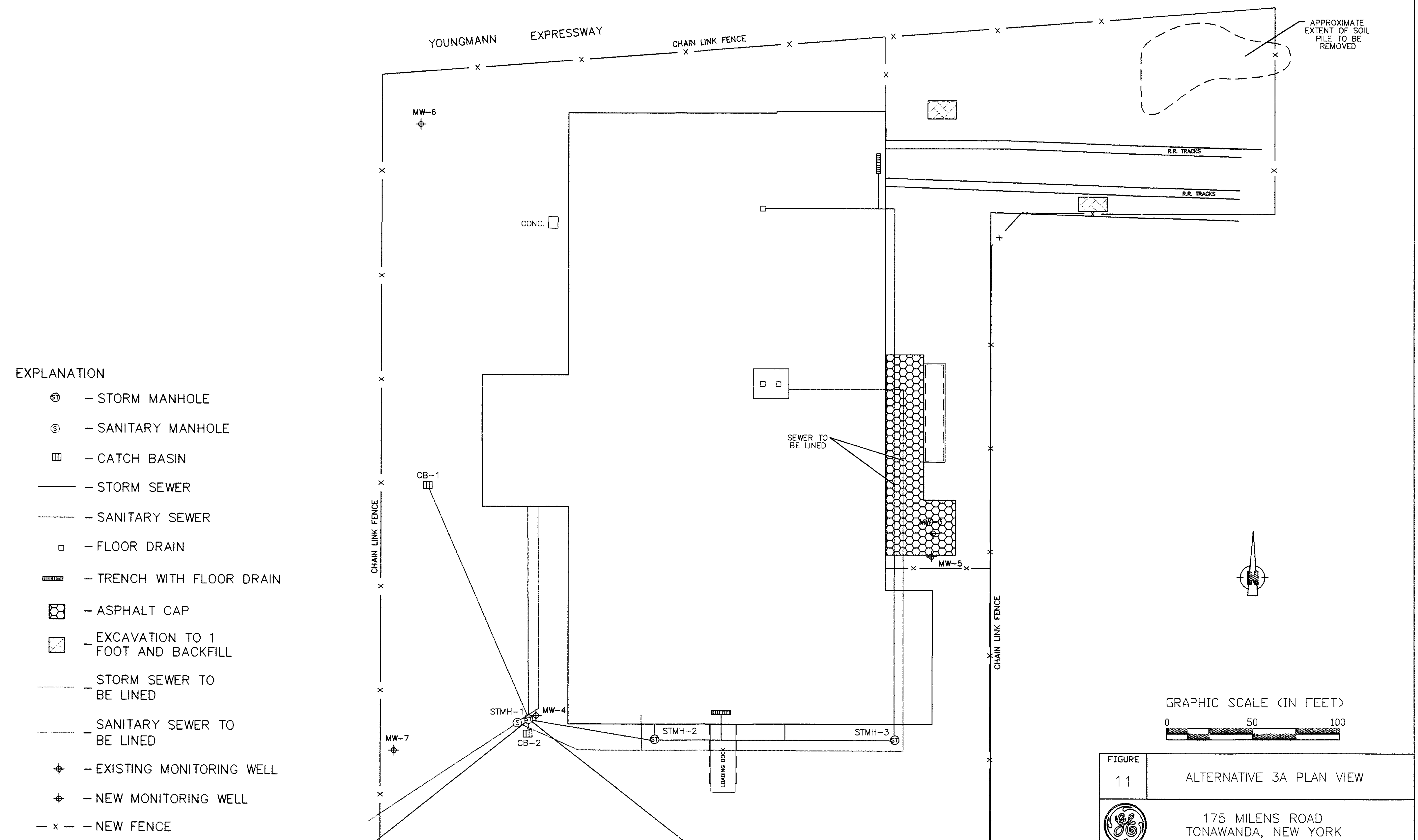
EXPLANATION

- STORM MANHOLE
- SANITARY MANHOLE
- CATCH BASIN
- STORM SEWER
- SANITARY SEWER
- FLOOR DRAIN
- TRENCH WITH FLOOR DRAIN
- ASPHALT CAP
- EXCAVATION TO 1 FOOT AND BACKFILL
- STORM SEWER TO BE LINED
- SANITARY SEWER TO BE LINED
- EXISTING MONITORING WELL
- NEW MONITORING WELL

SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

FIGURE 10	ALTERNATIVE 3 PLAN VIEW
	175 MILENS ROAD TONAWANDA, NEW YORK
D&M GROUP	DAMES & MOORE A DAMES & MOORE GROUP COMPANY CLIFTON PARK, NEW YORK

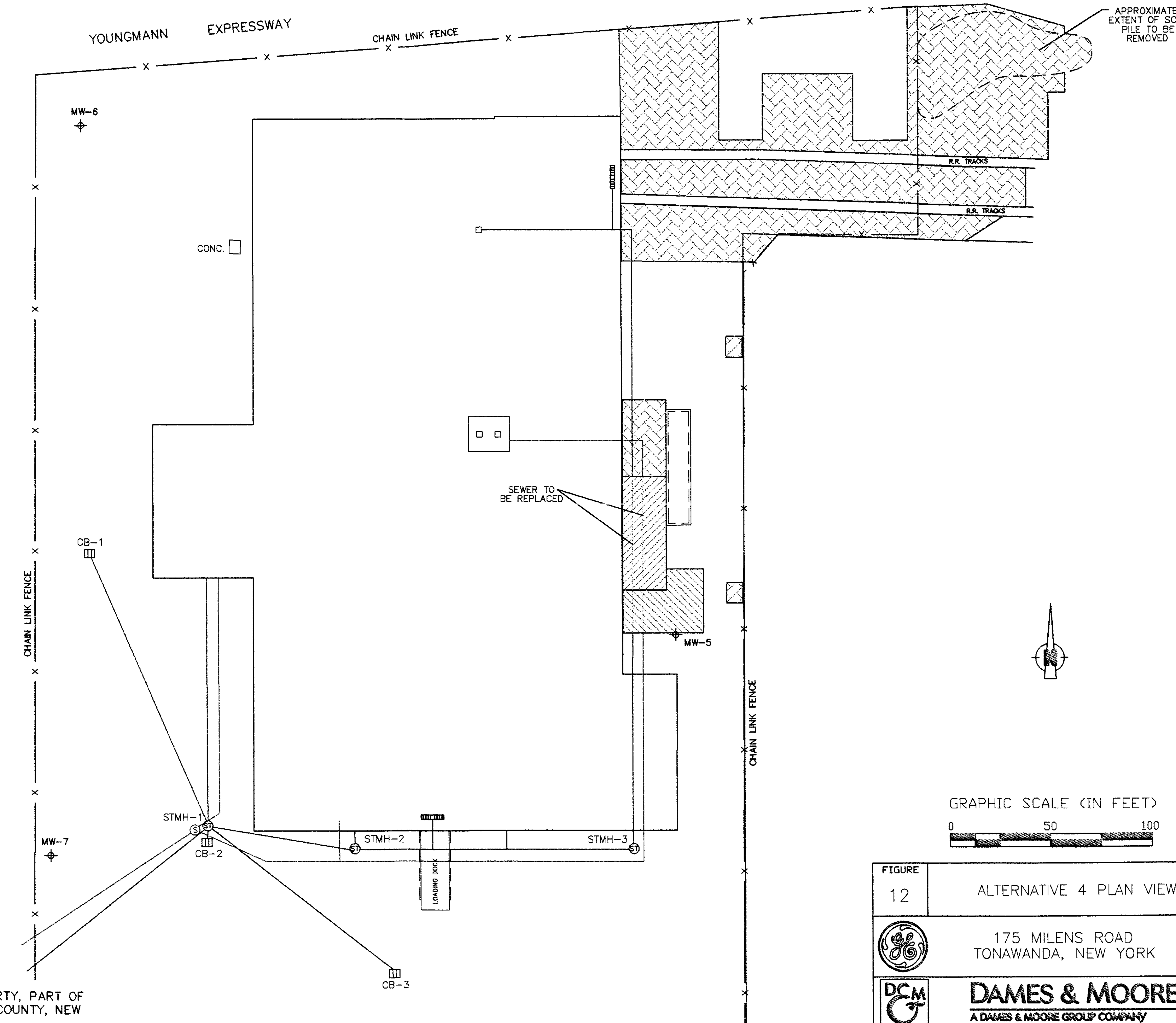
83030-30 04/13/00



SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

FIGURE 11	ALTERNATIVE 3A PLAN VIEW
	175 MILENS ROAD TONAWANDA, NEW YORK
DCM GROUP	DAMES & MOORE A DAMES & MOORE GROUP COMPANY CLIFTON PARK, NEW YORK

85030-49 04/20/00



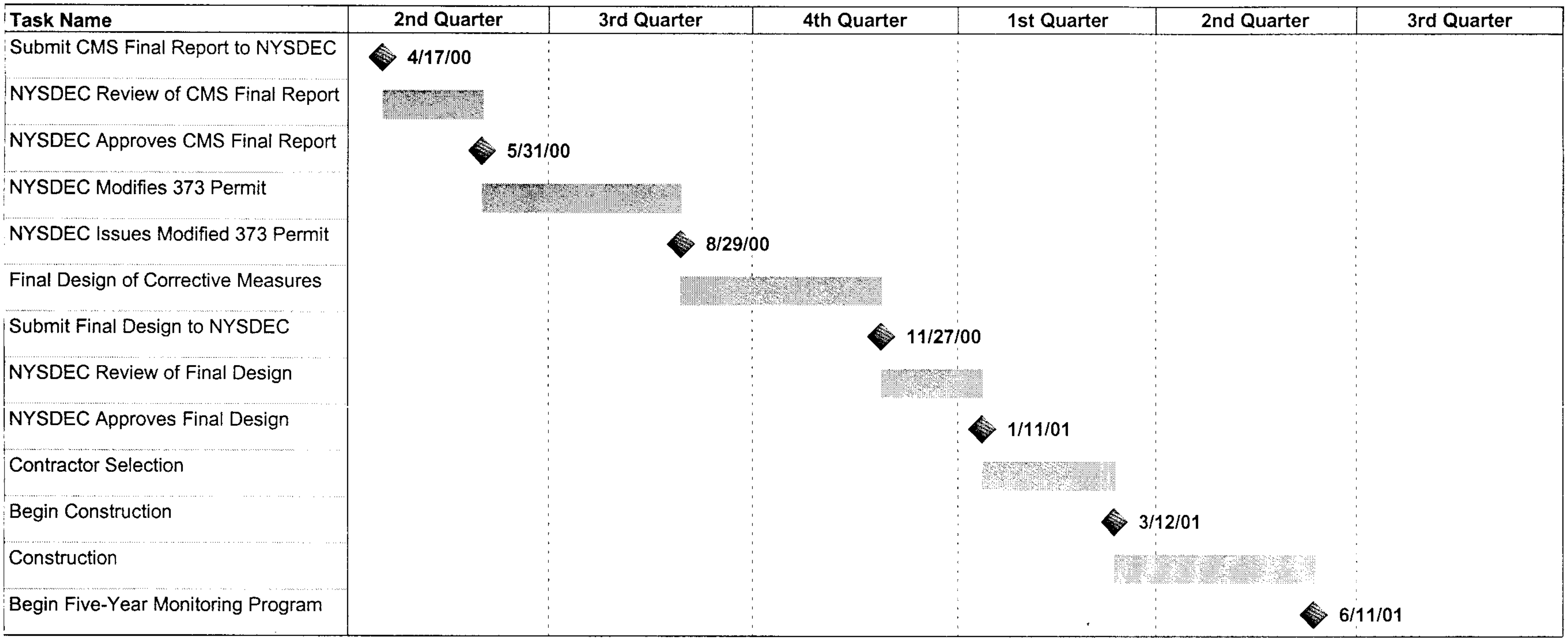
EXPLANATION

- STORM MANHOLE
- SANITARY MANHOLE
- CATCH BASIN
- STORM SEWER
- SANITARY SEWER
- FLOOR DRAIN
- TRENCH WITH FLOOR DRAIN
- EXCAVATION TO 1 FOOT AND BACKFILL
- EXCAVATION TO 4 FEET AND BACKFILL
- EXCAVATION FROM 6 TO 12 FEET AND BACKFILL
- 8 INCH STORM SEWER TO BE REPLACED
- 4 INCH SANITARY SEWER TO BE REPLACED
- EXISTING MONITORING WELL
- NEW MONITORING WELL

SOURCE: "MAP OF GENERAL ELECTRIC SERVICE CENTER PROPERTY, PART OF LOT 45, TOWNSHIP 12, RANGE 8, TOWN OF TONAWANDA, ERIE COUNTY, NEW YORK" KRIEBEL ASSOCIATES, JULY 29, 1998.

FIGURE 12	ALTERNATIVE 4 PLAN VIEW
	175 MILENS ROAD TONAWANDA, NEW YORK
DCM GROUP	DAMES & MOORE A DAMES & MOORE GROUP COMPANY CLIFTON PARK, NEW YORK

85030-31 04/18/00



TITLE ANTICIPATED CORRECTIVE MEASURE IMPLEMENTATION SCHEDULE

175 MILENS ROAD
TONAWANDA, NEW YORK

D&M GROUP

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

SCALE	NONE	DWN. BY	RGM	JOB NO.	28171-733
DATE	04/18/00	APPR. BY	DP	FIG. NO.	14

FRAME