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SDMS 159153 159154

Corporate Environmental Programs
General Electric Company
100 Woodlawn Avenue, Pittsfield, MA 01201

November 17, 2000

Transmitted Via FedEx

Bryan Olson
EPA Project Coordinator
U.S. Environmental Protection Agency
One Congress Street, Suite 1100
Boston, MA 02214-2023

Re: GE-Pittsfield/Housatonic River Site
Upper ½-Mile Reach Removal Action (GECD800)
Results of Cell G2 NAPL Investigation and Proposal to Address Presence of LNAPL in Cell G2

Dear Mr. Olson:

Enclosed is a document entitled *Results of Cell G2 NAPL Investigation and Proposal to Address Presence of LNAPL in Cell G2*. This document presents the results of the recent investigations to delineate the extent of non-aqueous-phase liquid (NAPL) encountered in Cell G2 during the Upper ½-Mile Reach Removal Action. Preliminary results of this investigation were presented in a draft investigation report submitted to EPA on November 7, 2000. The enclosed submittal includes the final version of the previously submitted report as well as more recent results from four additional borings taken along the bank in Cell G2 on November 10, 2000. This submittal additionally sets forth General Electric's proposal and schedule for further response actions to address the light NAPL (LNAPL) encountered in the downstream portion of Cell G2. In general, this proposal involves installation of a new sheetpile barrier wall and additional excavation of LNAPL-impacted materials.

As I have previously discussed with EPA, it was anticipated that the Lyman Street source control barrier wall was to be installed this fall as part of GE's ongoing source control program such that the wall would be installed prior to the Upper ½-Mile Reach Removal Action activities occurring in the adjacent section of the river. In order to minimize the delay associated with the installation of the sheetpile barrier wall adjacent to Cell G2 (and, as described in the attached document, potentially adjacent to a portion of Cell G3), GE proposes to use a portion of the Waterloo sheetpiling that was slated for the Lyman Street source control barrier wall at Cell G2. This sheetpile is currently manufactured and waiting to be cut at the factory to the correct length and to have the foot plates welded on. Use of this sheetpile should reduce the sheetpile procurement process by about two weeks. GE will replace the Waterloo sheetpile used at Cell G2, and possibly at Cell G3, so that the appropriate amount of sheetpiling is available for use to construct the Lyman Street source control barrier. Rather than constructing the Lyman Street source control barrier this fall, GE proposes to use that sheetpile as a material stockpile for potential use at other locations along the Upper ½ Mile Reach on an as-needed basis. Having this material stockpile available for potential future use during the implementation of the Upper ½ Mile Reach Removal Action should reduce the impact to the project schedule if Waterloo sheetpiling is needed at other locations. The Lyman Street source control barrier would then be constructed just prior to the performance of the Upper ½ Mile Removal Action activities in the adjacent section of the river. We do not anticipate that this shift in the installation of the Lyman Street barrier wall will impact the Upper ½-Mile Reach Removal Action schedule.

Please call me if you have any questions.

Sincerely yours,

Andrew T. Silfer, P.E.
GE Project Coordinator

Enclosure

cc: Mark Barash, DOI
Robert Bell, MDEP
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GENERAL ELECTRIC COMPANY – PITTSFIELD, MASSACHUSETTS
UPPER ½-MILE REACH REMOVAL ACTION

RESULTS OF CELL G2 NAPL INVESTIGATION AND PROPOSAL TO ADDRESS PRESENCE OF LNAPL IN CELL G2

I. INTRODUCTION

On October 12, 2000, during the performance of remediation activities in Cell G2, the General Electric Company (GE) visually observed a small amount of dense non-aqueous phase liquid (DNAPL) of unknown composition in sediment in the center portion of that cell. The observation was reported to the National Response Center (NRC), the United States Environmental Protection Agency (USEPA), and the Massachusetts Department of Environmental Protection (MDEP). A sample of the DNAPL was obtained on October 12, 2000 (G2-OIL-1) and found to contain polychlorinated biphenyls (PCBs) at 339,000 parts per million (ppm) (Aroclor 1260), chlorobenzene at 48.7 ppm, 1,2,4-trichlorobenzene at 83,400 ppm, and 1,4-dichlorobenzene at 44,000 ppm (see Table 1). On October 13, 2000, to proactively investigate and delineate the limits of the PCB-containing DNAPL, GE, with verbal approval from the USEPA, installed 8 sediment borings in Cell G2 (see Figure 1). Details pertaining to the investigation of the PCB-containing DNAPL and results for these 8 borings are discussed in Section II.

On October 16, 2000, GE visually observed a surface sheen of unknown composition at the bottom of the excavated slope in the downstream portion of Cell G2. This observation was also reported to the NRC, USEPA, and MDEP. A sediment sample in this area was obtained on October 16, 2000 (HR-G2-SS-1) and found to contain polyaromatic hydrocarbons (PAHs), such as acenapthene at 2,200 ppm, anthracene at 2,190 ppm, benzo(a)anthracene at 1,560 ppm, benzo(a)pyrene at 1,290 ppm, phenanthrene at 7,680 ppm, etc. (see Table 2 for the analytical results of this sample). These constituents are indicative of coal-tar-related wastes. PCBs were not detected in this sample.

To further evaluate the nature and extent of the coal-tar-impacted materials, between October 18, 2000 and October 20, 2000, and on November 10, 2000 GE, with verbal approval from the USEPA, installed 17 soil borings (see Figures 1 and 2) along the banks of Cell G2 and Cell G3. Details pertaining to the investigation and results for these 17 borings are discussed in Section III. Sections IV through VI presents GE's proposal to address the coal-tar impacted materials and Section VII presents the schedule.

II. SUMMARY OF DNAPL INVESTIGATION AND RESULTS

GE performed DNAPL investigation activities in the center portion of Cell G2 on October 13, 2000 with oversight from USEPA representatives. This program resulted in the installation of 8 sediment borings using manual sediment core sampling techniques (HR-G2-SB7 through HR-G2-SB14). The surveyed sediment boring locations are shown on Figure 1. Following recovery, the sediments were continuously described and logged in the field. The resulting boring logs were developed and are included as Attachment A to this document. The sediment samples were characterized with regard to the potential presence of DNAPL based on visual descriptions and/or odors. Based on the presence of staining, sheens, and/or odors, select increments from four sediment borings (HR-G2-SB10, HR-G2-SB11, HR-G2-SB12, and HR-G2-SB13) were analyzed for PCBs. The analytical results indicated PCBs ranging in concentration from 3.52 ppm (with a duplicate result of 2.76 ppm) to 3,100 ppm. These results are shown on Table 3. The results of

the investigation indicated that the PCB DNAPL observed in the bottom of Cell G2 did not appear to be associated with a significant source area.

Excavation activities in this area initially proceeded on October 18, 2000, in accordance with the requirements of the *Removal Action Work Plan – Upper ½-Mile Reach of Housatonic River* (Work Plan; BBL, August 1999). Based on visual observations, the DNAPL-impacted materials were removed through the excavation activities in this area. Following completion of excavation activities, and prior to restoration activities in this area, there was a loss of hydraulic control and the work area filled with water. Hydraulic control was regained on November 8, 2000 and the area where the PCB DNAPL was observed was re-excavated on November 9, 2000 and observed for the presence of DNAPL. DNAPL was not observed in this area either in the sediment or emanating from the adjacent riverbank. Therefore, this area will be restored in accordance with the requirements set forth in the Work Plan. To complete the restoration of the upstream portion of Cell G2, an intermediate cut-off sheetpile wall will be installed to isolate that portion of the cell (see Figure 5). This will allow restoration activities to be expedited and will reduce the risk of recontamination.

III. SUMMARY OF COAL-TAR INVESTIGATION AND RESULTS

GE performed an investigation program in the downstream and center portions of Cell G2 and along the bank in Cell G3 between October 18 and October 20, 2000 and on November 10, 2000 in order to determine the extent of the coal-tar-impacted materials observed in the downstream section of Cell G2 and to anticipate its possible presence in Cell G3. This program was overseen by USEPA representatives. This program resulted in the installation of 17 soil borings (HR-G2-SB15 through HR-G2-SB26) using mechanical and manual AMS probe and manual core sampling techniques. The surveyed soil boring locations are shown on Figures 1 and 2. Figure 1 also shows six borings (HR-G2-SB1 through HR-G2-SB6) in the upstream portion of Cell G2 that were installed as part of investigations in the Cell G1/G2 area. Similar to the DNAPL investigation, the recovered soils from these 17 borings were continuously logged and boring logs were developed (included in Attachment A to this document). The soil samples were characterized with regard to the potential presence of NAPL based on visual descriptions and/or odors. Geologic cross-sections of this area have also been developed and are shown in Figures 3 and 4.

A total of 9 soil borings were installed in the lower bank area in the vicinity of where the coal-tar sheen was observed (HR-G2-SB15, HR-G2-SB16, HR-G2-SB17, HR-G2-SB18, HR-G2-SB19, HR-G2-SB23, HR-G2-SB24, HR-G2-SB25, and HR-G2-SB26). Based on staining, sheens, and/or odors, eight soil samples were collected from these borings (HR-G2-SB15, HR-G2-SB16, HR-G2-SB17, HR-G2-SB18, HR-G2-SB24 (2 soil samples), HR-G2-SB25, and HR-G2-SB26) and analyzed for PCBs, VOCs, and SVOCs. The analytical results indicate the presence of PCBs ranging from 0.049 ppm to 554 ppm, as well as the presence of PAHs, such as 2-methylnaphthalene up to 18.6 ppm, acenapthene up to 36.7 ppm, benzo(a)anthracene up to 17.4 ppm, benzo(a)pyrene up to 15.6 ppm, benzo(b)fluoranthene up to 11.5 ppm, naphthalene up to 29.4 ppm, etc. (see Table 4 for a summary of detected constituents). In addition, in order to determine the depth to till, three deep soil borings were installed (HR-G2-SB20, HR-G2-SB21, and HR-G2-SB22). Till was encountered in the upper portion of the bank in this area at elevations ranging from 940 to 949 feet (see Attachment A for boring logs).

Five additional soil borings were installed along the bank of Cell G3 (HR-G3-SB1, HR-G3-SB2, HR-G3-SB3, HR-G3-SB4, and HR-G3-SB5) to proactively determine the potential presence of NAPL adjacent to Cell G3 and the potential need for additional activities in this area. Based on

staining, sheens, and/or odors, three soil samples were collected from these borings (HR-G3-SB3, HR-G3-SB4, and HR-G3-SB5) and analyzed for PCBs, VOCs, and SVOCs. The analytical results indicate the presence of PCBs ranging from 6.2 ppm to 11 ppm, as well as the presence of PAHs, such as benzo(a)anthracene up to 2.3 ppm, benzo(a)pyrene up to 1.8 ppm, benzo(b)fluoranthene up to 1.7 ppm, and indeno(1,2,3-cd)pyrene up to 0.73 ppm (see Table 5 for a summary of detected constituents). NAPL was not observed in these five soil borings.

Two of the soil boring investigation locations in Cell G2, (HR-G2-SB16 and HR-G2-SB17) were selected for the installation of well points (G2-PZ-1 and G2-PZ-2, respectively). Table 6 summarizes the well point construction details. The well points were installed on October 19, 2000, and have been monitored daily since October 23, 2000 for the presence of NAPL. The results of these monitoring activities are presented in Table 7. As indicated on Table 7, a light NAPL (LNAPL) has been observed in one well point (PZ-G2-2, at a thickness of up to 0.06 feet). Additionally, on November 7, 2000 the well points were each raised by one foot in order to ensure that the screened sections straddle the water table; however, significant changes in the presence or thickness of LNAPL were not observed.

IV. PROPOSED SHEETPILE BARRIER WALL INSTALLATION

Based on the results of the investigations within the Cell G2 excavation area, it appears that a portion of the bank in this area contains coal-tar-related LNAPL-impacted materials. As a result, supplemental containment measures are proposed to further address the potential for future releases of LNAPL to the Housatonic River at this location. The primary component of the proposed supplemental containment measure is the installation of a physical containment barrier along and parallel to a portion of the Housatonic River riverbank. Specifically, GE proposes the installation of an approximately 105-foot long steel sheetpile wall parallel to and along the edge of the river, as shown on Figure 5.

The proposed containment barrier will be constructed of a steel sheetpile wall with sealable joints. This type of steel sheetpiling has been successfully installed at three previous locations along this ½-Mile Reach of River: GE's Building 68 area; East Street Area 2 – South; and adjacent to the 64W-oil/water separator as part of activities to address DNAPL in Cell G1. The sheetpile wall will be constructed of Waterloo brand, heavy-wall, sealable sheetpiling (WEZ95) manufactured by Canadian Metal Rolling Mills under license to the University of Waterloo. The sheeting will be driven into place with a vibratory or impact hammer. Since there may be additional excavation activities performed in the vicinity of the containment barrier, and to avoid potential joint damage that may be caused by construction-related impacts, the sheetpile joints will be left ungrouted until the completion of sediment excavation activities (further discussed in Section V). Structural calculations regarding the long-term stability of the sheetpile wall are provided in Attachment B. These calculations show that the sheetpile wall will be stable under long-term (restored) conditions.

The location and depth of the proposed containment barrier were conservatively selected, based on the results of field investigations and observations, to include those areas (both vertically and horizontally) where coal-tar LNAPL has been identified or may be potentially present. Once this area was determined, several other technical and operational factors were considered in the detailed design activities. These factors include possible impacts to the existing hydrogeologic conditions in the area, possible effects of future river flooding on the migration/containment of LNAPL, laboratory analytical results, historic groundwater elevations, typical river elevations, and existing bank geometry. The actual alignment of the containment barrier may be adjusted

somewhat during construction based on actual field conditions; however, these field adjustments are not anticipated to be significant.

Horizontal Extent

The horizontal extent of the proposed containment barrier is shown on Figure 5. The wall will be located parallel to the river ranging from approximately 5 to 10 feet up the bank measured horizontally from the water edge (at elevation 972). This location has been selected based on a review of information obtained from the recent investigations summarized in Section III. Using this information, the location of the proposed containment barrier was established to include known areas of LNAPL that could potentially migrate toward the river. The areas of LNAPL-impacted materials were determined based on the analytical data and information from the borings and well points (i.e., sheens and odors noted in HR-G2-SB16 and HR-G2-SB17 and LNAPL observed in HR-G2-PZ2) as well as the observation of LNAPL seeping into the excavation from the base of the bank between borings HR-G2-SSB15 and HR-G2-SB17. The nature of this LNAPL was confirmed by the analytical results obtained from sample HR-G2-SS1.

As shown on Figure 5, the barrier will encompass an existing 12-inch diameter corrugated metal pipe. Prior to the installation of the sheetpile wall, the pipe will be located and evaluated to determine if any impacts would exist if the pipe were abandoned. If there are any impacts, GE will evaluate and propose a modification to the pipe configuration to the USEPA prior to sheetpile wall installation activities.

Wing walls angled at 45° will extend up the bank approximately 15 feet at both ends of the proposed barrier wall. Based on these design parameters, the length of the proposed containment barrier along the riverbank will be approximately 75 feet. With the addition of the wing walls, the overall length of the proposed containment barrier will be approximately 105 feet.

Additionally, GE proposes to perform the majority of the sediment removal activities described in the Work Plan in Cell G3 concurrent with the installation of the sheetpile barrier wall to determine if the sheetpile wall should extend in the downstream direction. Currently, the borings associated with Cell G3 do not indicate a potential LNAPL source in the bank adjacent to Cell G3. To further evaluate this, to the extent practicable, Cell G3 sediment removal activities will be completed concurrently with the barrier wall installation so that visual observations of the bank in this area may occur. In the event that a potential LNAPL source is observed in Cell G3, the barrier wall may be extended in the downstream direction after consultation with USEPA. (If this situation were to occur, the downstream wingwall would not be installed as shown on Figure 5, but would be installed at the downstream end of the barrier wall). This would avoid potential damage to the sealed joints of the barrier wall adjacent to Cell G2 that could occur if the wall was to be extended at a later time.

Based on USEPA's verbal approval of the approach of combining the downstream section of Cell G2 with Cell G3, in order to facilitate the visual observation of the riverbank adjacent to Cell G3, MTI began the installation of the Cell G3 downstream cutoff wall on November 16, 2000. It should be noted that performing the removal activities in this manner will be out of the sequence described in the Operations Plan (i.e., cells on the south side of the river being completed before the adjacent cell on the north side) and thus it will be necessary to swing the materials being removed from Cell F3 over the restored Cell G3. Additional precautions, such as not over-filling the transfer hopper and inspection and manual cleaning of the hopper before moving it, may be implemented, as required.

Vertical Extent

Several considerations were taken into account in selecting the vertical extent of the proposed containment barrier, including the results from recent investigations; historic, current, and predicted groundwater hydraulics; and geotechnical considerations. From this information, it is anticipated that the vertical extent of the containment barrier will extend to approximately elevation 950. The proposed upper elevation of the containment barrier is 975 feet. The top elevation of sheetpile wall was selected based on the existing bank elevations in this area and the predicted groundwater hydraulics.

This type of sheetpile barrier wall is considered a "hanging" wall because its base is not tied into a less permeable layer (i.e., till) and it is designed for control of LNAPL without significantly affecting the groundwater hydraulics. Based on 1) the position of the staining/sheens in borings HR-G2-SB16 and HR-G2-SB17; 2) the observation of LNAPL in HR-G2-PZ2; 3) the observation of LNAPL seeping into the excavation area; and 4) the absence of any DNAPL-impacted materials at the till surface (HR-G2-SB20 through HR-G2-SB22) it appears that control of the LNAPL using a "hanging" wall design is appropriate. To evaluate the effects of the sheetpile barrier wall, the groundwater hydraulics associated with typical hydrogeologic conditions in this area were modeled by BBL using the publicly available and well-documented MODFLOW program (Attachment C). The results of the modeling effort indicate that the groundwater mounding caused by the installation of the sheetpile barrier wall would be minor (approximately 0.3 feet). As a result, groundwater recovery behind the wall is not anticipated. In the event that groundwater recovery becomes necessary, the modeling indicates that a pumping rate of 10 gallons per minute (gpm) at a well immediately north of the wall would control the groundwater mounding effects.

V. PROPOSED ADDITIONAL EXCAVATION

Following installation of the sheetpile barrier wall, additional excavation will be performed in Cell G2. Excavation will begin in the area between the barrier wall and the river where sheens and/or stained soils have been observed. Impacted materials will be excavated based on visual observations of staining, sheens, and/or LNAPL until they have been removed or until the maximum extent and depth, as shown on Figures 5, 6, and 7 has been reached. Based on the soil borings and structural considerations, it is anticipated that maximum safe excavation depth in this area will be an elevation of 965 feet. However, if the excavation becomes unsafe due to "boils," the maximum excavation depth may be further limited. The Remediation Contractor will have responsibility for the structural stability of the excavation and will evaluate the maximum possible depth to which excavation may be performed, based on conditions observed in the field. In the event the maximum excavation depth has been reached and LNAPL-impacted materials remain, the situation will be discussed with USEPA's On-Scene Coordinator and an appropriate response will be formulated.

Excavated materials that are observed to contain LNAPL will be separately managed and will be subject to off-site disposal. Excavated materials that are not observed to contain LNAPL will be placed in the On-Plant Consolidation Areas (OPCAs).

Following completion of excavation activities in Cell G2, the area will be restored in a similar manner to the restoration in Cell G1. Figures 6 and 7 provide cross-sections of the proposed restoration. To avoid potential joint damage that may be caused by construction-related impacts, the area in front of the sheetpile wall will be restored to a minimum elevation of 967 prior to

grouting of the sheetpile joints. Following backfill to this level, the sheetpile joints will be grouted and restoration activities will be completed.

VI. PROPOSED FUTURE MONITORING ACTIVITIES

Following the completion of restoration activities associated with Cell G2, GE proposes to install three monitoring wells on the landward side (i.e., north) of the proposed containment barrier, as shown on Figure 5. GE proposes to install 2 monitoring wells at the east and west ends of the proposed containment barrier, as well as one monitoring well between the ends of the containment barrier. The installation of the monitoring wells will be accomplished using standard hollow-stem auger (HSA) methods. A minimum distance of 10 feet will be maintained undisturbed between the containment barrier and the edge of the auger.

During well installation, construction details and actual field measurements will be recorded by a supervising geologist and all materials used (e.g., screen and riser footage, bags of bentonite, cement, and sand) will be tabulated in a field logbook. The monitoring well will be installed using 2-inch diameter PVC risers and slotted screens with above grade protective casings. A monitoring well construction detail will be prepared for each well following installation. The three wells will be advanced to an approximate elevation of 965 feet above mean sea level (AMSL) and the screens will extend from an elevation of approximately 965 feet to 975 feet AMSL. Following well installation, the wells will be locked and the area will be restored to its existing condition. After a period of at least 24 hours after well installation, the wells will be developed using alternating surging and pumping methods. Well installation and development activities will be performed in accordance with the *Field Sampling Plan/Quality Assurance Project Plan* (FSP/QAPP) (approved October 17, 2000).

Following well development, GE will initially monitor the perimeter wells on a weekly basis for four weeks to confirm that LNAPL is not present outside the limits of the containment barrier. In addition, GE will monitor the center well on a weekly basis for four weeks for the presence of LNAPL or DNAPL and to assess whether additional investigative or response actions are appropriate. GE anticipates that installation of these wells will be initiated within two weeks following the completion and restoration activities. GE will submit an evaluation of the results of the first four weekly monitoring events and the potential need for additional investigative or response actions in this area (including the appropriateness of further monitoring of these wells) within 6 weeks following initiation of weekly monitoring of the wells. In addition, monitoring results will be included in monthly status reports for the GE-Pittsfield/Housatonic River Site.

VII. SCHEDULE

The proposed activities outlined herein will be implemented following USEPA's approval of this proposal. It is anticipated that, following USEPA's approval of this proposal, sheetpile wall installation, excavation, and restoration activities within Cell G2 will be completed within a 5 – 7 week time frame assuming that no significant unanticipated obstacles are encountered. To the extent that USEPA can give verbal approval of the described length and vertical extent of the barrier wall, the lead time associated with procuring the Waterloo sheetpiling may be reduced. Additionally, following USEPA's approval of this proposal, the well points will be abandoned. GE will continue to maintain oil absorbent booms and pads as needed within Cell G2.

Tables

TABLE 1

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

CELL G2 DNAPL OIL SAMPLE DATA RESULTS

(Results are presented in parts per million, ppm)

Parameter / Sample ID: / Date Collected:	G2-OIL-1 10/12/00
PCBs	
Aroclor-1260	339000
Total PCBs	339000
Volatile Organics	
Chlorobenzene	48.7
Semivolatile Organics	
1,2,4-Trichlorobenzene	83400
1,4-Dichlorobenzene	44000

Notes:

1. Samples were collected by Blasland, Bouck & Lee, Inc. and submitted to Northeast Analytical, Inc. for analysis of PCBs, volatiles, and semivolatiles.
2. Only detected constituents are summarized.

TABLE 2

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

CELL G2 SEDIMENT SAMPLE DATA RESULTS

(Results are presented in dry-weight parts per million, ppm)

Parameter / Sample ID: / Date Collected:	HR-G2-SS-1 10/16/00
PCBs	
None Detected	--
Volatile Organics	
None Detected	--
Semivolatile Organics	
1,3-Dichlorobenzene	17.4
1,4-Dichlorobenzene	38.6
2,4-Dinitrotoluene	21.2
Acenaphthene	2200
Acenaphthylene	129
Anthracene	2190
Benzo(a)anthracene	1560
Benzo(a)pyrene	1290
Benzo(b)fluoranthene	1010
Benzo(g,h,i)perylene	441
Benzo(k)fluoranthene	150
Chrysene	927
Dibenzo(a,h)anthracene	56.9
Dibenzofuran	26.6
Fluoranthene	2900
Fluorene	1560
Indeno(1,2,3-cd)pyrene	189
Naphthalene	15.1
Phenanthrene	7680
Pyrene	4490

Notes:

1. Samples were collected by Blasland, Bouck & Lee, Inc. and submitted to Northeast Analytical, Inc. for analysis of PCBs, volatiles, and semivolatiles.
2. Only detected constituents are summarized.

TABLE 3

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

CELL G2 SEDIMENT SAMPLE DATA RESULTS

(Results are presented in dry-weight parts per million, ppm)

Parameter	Sample ID: / Sample Depth(Feet): / Date Collected:	HR-G2-SB10 0.5-1 10/13/00	HR-G2-SB11 1-1.4 10/13/00	HR-G2-SB12 1.7-2 10/13/00	HR-G2-SB13 1-1.4 10/13/00
PCBs					
Aroclor 1260		3.52 AGB [2.76 AGB]	3100 AGB	1630 AGB	2290 AGB
Total PCBs		3.52 AGB [2.76 AGB]	3100 AGB	1630 AGB	2290 AGB

Notes:

1. Samples were collected by Blasland, Bouck & Lee, Inc. and submitted to Northeast Analytical, Inc. for analysis of PCBs.
2. ND - Analyte was not detected. The value in parentheses is the associated detection limit.
3. AG - Aroclor 1260 is being reported as the best Aroclor match. The sample exhibits an altered PCB pattern.
4. B - Analyte was also detected in the associated method blank.
5. Only detected constituents are summarized.

TABLE 4

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

CELL G2 SOIL BORING SAMPLE DATA RESULTS

(Results are presented in dry-weight parts per million, ppm)

Parameter	Sample ID: / Sample Depth(Feet): / Date Collected:	HR-G2-SB-15 8-9 10/18/00	HR-G2-SB-16 6-8 10/18/00	HR-G2-SB-17 4-6 10/18/00	HR-G2-SB-18 8-10 10/19/00
PCBs					
Aroclor 1242		ND(0.0595)	5.07 PD	27.0 PD	ND(0.051)
Aroclor 1254		ND(0.0595)	65.6 AF	220 AF	ND(0.051)
Aroclor-1260		0.0988 AG	99.0 AG	307 AG	ND(0.051)
Total PCBs		0.0988	170	554	ND(0.051)
Volatile Organics					
Chlorobenzene		ND(1.25)	12.8	ND(1.83)	ND(0.0526)
Ethylbenzene		ND(1.25)	ND(1.58)	2.35	ND(0.0526)
Semivolatile Organics					
1,4-Dichlorobenzene		ND(0.426)	2.27	ND(6.25)	ND(0.356)
2-Methylnaphthalene		ND(0.426)	1.41	18.6	ND(0.356)
Acenapthene		0.455	2.90	36.7	ND(0.356)
Anthracene		ND(0.426)	1.31	31.0	ND(0.356)
Benzo(a)anthracene		ND(0.426)	0.784	17.4	ND(0.356)
Benzo(a)pyrene		ND(0.426)	0.556	15.6	ND(0.356)
Benzo(b)fluoranthene		ND(0.426)	0.741	11.5	ND(0.356)
Carbazole		ND(0.426)	0.577	ND(6.25)	ND(0.356)
Chrysene		ND(0.426)	0.707	12.3	ND(0.356)
Fluoranthene		ND(0.426)	2.08	29.6	ND(0.356)
Fluorene		ND(0.426)	1.30	19.3	ND(0.356)
Naphthalene		ND(0.426)	1.28	29.4	ND(0.356)
Phenanthrene		ND(0.426)	4.00	96.3	ND(0.356)
Pyrene		ND(0.426)	2.67	77.4	ND(0.356)

see notes of Page 2

TABLE 4

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

CELL G2 SOIL BORING SAMPLE DATA RESULTS

(Results are presented in dry-weight parts per million, ppm)

Parameter	Sample ID: / Sample Depth(Feet): / Date Collected:	HR-G2-SB-24 3.9-5 11/10/00	HR-G2-SB-24 8.5-9 11/10/00	HR-G2-SB-25 8-10 11/10/00	HR-G2-SB-26 11-12 11/10/00
PCBs					
Aroclor-1260		62 [120]	ND(0.057)	0.049	ND(0.048)
Total PCBs		62 [120]	ND(0.057)	0.049	ND(0.048)
Volatile Organics					
Acetone		0.10 [0.059]	0.040	ND(0.028)	0.042
Chlorobenzene		0.082 [0.043]	0.23	ND(0.0070)	0.0090
Toluene		0.011 [0.045]	0.023	ND(0.0070)	ND(0.0071)
Semivolatile Organics					
1,3-Dichlorobenzene		0.22 J [ND(0.56)]	0.14 J	ND(0.47)	ND(0.48)
1,4-Dichlorobenzene		1.0 [0.47 J]	1.5	ND(0.47)	ND(0.48)
Benzo(a)anthracene		0.35 J [0.18 J]	ND(0.57)	ND(0.47)	ND(0.48)
Benzo(a)pyrene		0.43 J [0.18 J]	ND(0.57)	ND(0.47)	ND(0.48)
Benzo(b)fluoranthene		0.50 J [0.31 J]	ND(0.57)	ND(0.47)	ND(0.48)
Benzo(g,h,i)perylene		0.16 J [ND(0.56)]	ND(0.57)	ND(0.47)	ND(0.48)
Benzo(k)fluoranthene		0.28 J [ND(0.56)]	ND(0.57)	ND(0.47)	ND(0.48)
Chrysene		0.45 J [0.26 J]	ND(0.57)	ND(0.47)	ND(0.48)
Fluoranthene		0.64 J [0.37 J]	ND(0.57)	ND(0.47)	ND(0.48)
Indeno(1,2,3-cd)pyrene		0.17 J [ND(0.56)]	ND(0.57)	ND(0.47)	ND(0.48)
Phenanthrene		0.20 J [0.14 J]	ND(0.57)	ND(0.47)	ND(0.48)
Pyrene		1.4 [0.77]	ND(0.57)	ND(0.47)	ND(0.48)

Notes:

1. Samples were collected by Blasland, Bouck & Lee, Inc. and submitted to CT&E and Northeast Analytical, Inc. for analysis of PCBs, volatiles, and semivolatiles.
2. Only constituents detected in at least one sample are summarized.
3. AG - Aroclor 1260 is being reported as the best Aroclor match. The sample exhibits an altered PCB pattern.
4. AF - Aroclor 1254 is being reported as the best Aroclor match. The sample exhibits an altered PCB pattern.
5. PD - Aroclor 1242 is being used to report an altered PCB pattern exhibited by the sample. Actual Aroclor 1242 is not present in the sample, but is reported to more accurately quantify PCB present in sample that has undergone environmental alteration.
6. J - Indicates an estimated value less than the practical quantitation limit (PQL).
7. ND - Analyte was not detected. The value in parentheses is the associated detection limit.
8. Duplicate results are presented in brackets.

TABLE 5

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH HOUSATONIC RIVER

CELL G3 SOIL BORING SAMPLE DATA RESULTS

(Results are presented in dry-weight parts per million, ppm)

Parameter	Sample ID: / Sample Depth(Feet): / Date Collected:	HR-G3-SB-3 5.5 - 6 10/20/00	HR-G3-SB-4 5.5 - 6 10/20/00	HR-G3-SB-5 4 - 5.5 10/20/00
Volatile Organics				
Chlorobenzene		0.11	0.017	0.060 [0.084]
PCBs				
Aroclor-1260		7.3	6.2	11 [10]
Total PCBs		7.3	6.2	11 [10]
Semivolatile Organics				
2-Methylnaphthalene		0.76	ND(0.63)	ND(0.58) [ND(0.58)]
Acenaphthene		4.4	ND(0.63)	ND(0.58) [ND(0.58)]
Anthracene		3.9	ND(0.63)	ND(0.58) [ND(0.58)]
Benzo(a)anthracene		2.3	ND(0.63)	ND(0.58) [ND(0.58)]
Benzo(a)pyrene		1.8	ND(0.63)	ND(0.58) [ND(0.58)]
Benzo(b)fluoranthene		1.7	ND(0.63)	ND(0.58) [ND(0.58)]
Benzo(g,h,i)perylene		0.60	ND(0.63)	ND(0.58) [ND(0.58)]
Benzo(k)fluoranthene		0.81	ND(0.63)	ND(0.58) [ND(0.58)]
Chrysene		2.4	ND(0.63)	ND(0.58) [ND(0.58)]
Dibenzofuran		0.56	ND(0.63)	ND(0.58) [ND(0.58)]
Fluoranthene		4.1	ND(0.63)	ND(0.58) [ND(0.58)]
Fluorene		3.1	ND(0.63)	ND(0.58) [ND(0.58)]
Indeno(1,2,3-cd)pyrene		0.73	ND(0.63)	ND(0.58) [ND(0.58)]
Naphthalene		0.80	ND(0.63)	ND(0.58) [ND(0.58)]
Phenanthrene		9.4	ND(0.63)	ND(0.58) [ND(0.58)]
Pyrene		6.3	ND(0.63)	ND(0.58) [ND(0.58)]

Notes:

1. Samples were collected by Blasland, Bouck & Lee, Inc. and submitted to CT&E Environmental Services, Inc. for analysis of PCBs, volatiles, and semivolatiles.
2. Only constituents detected in at least one sample are summarized.
3. ND - Analyte was not detected. The value in parentheses is the associated detection limit.

TABLE 6

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

CELL G2 PIEZOMETER CONSTRUCTION DETAILS

Piezometer ID.	Ground Elevation (Feet AMSL)	Measuring Point Elevation (Feet AMSL)	Screen Depth (Feet)	Screen Elevation (Feet)
G2-PZ-1	975.47	976.97	4-8	971.47-967.47
G2-PZ-2	974.61	977.11	3-7	971.61-967.61

Notes:

1. Piezometers were installed by Blasland, Bouck & Lee, Incorporated on October 19, 2000, utilizing a jackhammer and macrocores fitted with dedicated disposable steel knockout tips.
2. Piezometers were constructed with 1-inch inside diameter PVC screens and risers.
4. Piezometers G2-PZ-1 and G2-PZ-2 were each raised by one foot on 11/7/00. The measuring point and screen elevations shown above reflect this adjustment.

TABLE 7

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS

REMOVAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

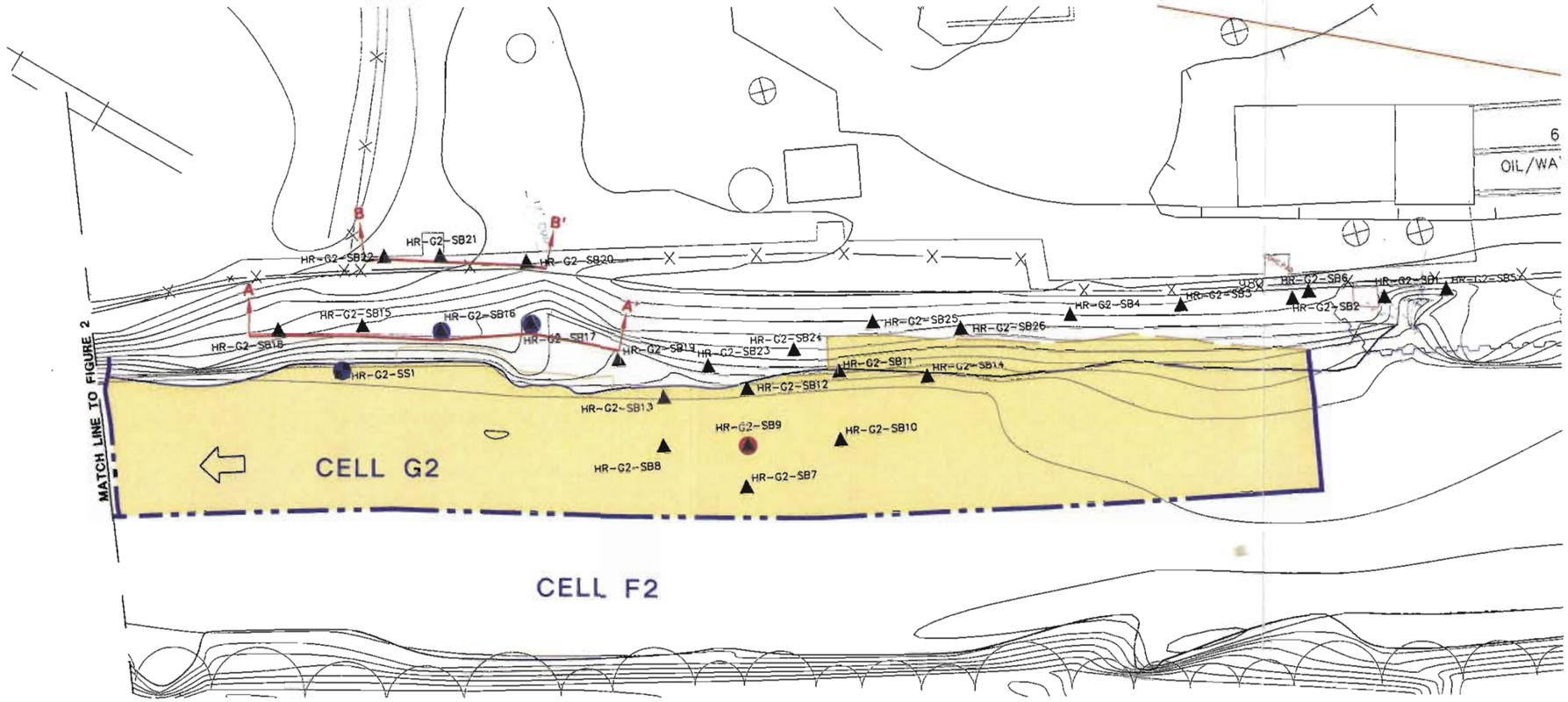
CELL G2 PIEZOMETER MONITORING RESULTS

Piezometer ID.	Date	Ground Elevation (Feet AMSL)	Measuring Point Elevation (Feet AMSL)	Depth to Water (Feet below MP)	Depth to NAPL (Feet below MP)	NAPL Thickness (Feet)	Groundwater Elevation (Feet AMSL)
G2-PZ-1	10/23/00	975.47	975.97	5.46	ND	0.00	970.51
G2-PZ-1	10/24/00	975.47	975.97	6.51	ND	0.00	969.46
G2-PZ-1	10/25/00	975.47	975.97	4.99	ND	0.00	970.98
G2-PZ-1	10/26/00	975.47	975.97	5.44	ND	0.00	970.53
G2-PZ-1	10/27/00	975.47	975.97	4.76	ND	0.00	971.21
G2-PZ-1	10/30/00	975.47	975.97	4.78	ND	0.00	971.19
G2-PZ-1	10/31/00	975.47	975.97	4.90	ND	0.00	971.07
G2-PZ-1	11/1/00	975.47	975.97	5.01	ND	0.00	970.96
G2-PZ-1	11/2/00	975.47	975.97	5.09	ND	0.00	970.88
G2-PZ-1	11/3/00	975.47	975.97	5.15	ND	0.00	970.82
G2-PZ-1	11/6/00	975.47	975.97	5.01	ND	0.00	970.96
G2-PZ-1	11/7/00	975.47	975.97	5.08	ND	0.00	970.89
G2-PZ-1	11/8/00	975.47	976.97	6.92	ND	0.00	970.05
G2-PZ-1	11/10/00	975.47	976.97	7.96	ND	0.00	969.01
G2-PZ-1	11/13/00	975.47	976.97	7.95	ND	0.00	969.02
G2-PZ-1	11/14/00	975.47	976.97	7.97	ND	0.00	969.00
G2-PZ-1	11/15/00	975.47	976.97	7.86	ND	0.00	969.11
G2-PZ-1	11/16/00	975.47	976.97	7.87	ND	0.00	969.10
G2-PZ-2	10/23/00	974.61	976.11	5.93	ND	0.00	970.18
G2-PZ-2	10/24/00	974.61	976.11	7.12	7.11	0.01	969.00
G2-PZ-2	10/25/00	974.61	976.11	5.29	ND	0.00	970.82
G2-PZ-2	10/26/00	974.61	976.11	5.89	5.88	0.01	970.23
G2-PZ-2	10/27/00	974.61	976.11	5.01	ND	0.00	971.10
G2-PZ-2	10/30/00	974.61	976.11	5.04	ND	0.00	971.07
G2-PZ-2	10/31/00	974.61	976.11	5.18	5.17	0.01	970.94
G2-PZ-2	11/1/00	974.61	976.11	5.36	5.30	0.06	970.81
G2-PZ-2	11/2/00	974.61	976.11	5.45	5.41	0.04	970.70
G2-PZ-2	11/3/00	974.61	976.11	5.52	ND	0.00	970.59
G2-PZ-2	11/6/00	974.61	976.11	5.31	5.29	0.02	970.82
G2-PZ-2	11/7/00	974.61	976.11	5.41	5.40	0.01	970.71
G2-PZ-2	11/8/00	974.61	977.11	7.90	7.87	0.03	969.24
G2-PZ-2	11/10/00	974.61	977.11	7.52	7.50	0.02	969.61
G2-PZ-2	11/13/00	974.61	977.11	8.86	ND	0.00	968.25
G2-PZ-2	11/14/00	974.61	977.11	8.88	ND	0.00	968.23
G2-PZ-2	11/15/00	974.61	977.11	9.03	9.02	0.01	968.09
G2-PZ-2	11/16/00	974.61	977.11	9.04	9.03	0.01	968.08

Notes:

1. Piezometers were installed by Blasland, Bouck & Lee, Incorporated on October 19, 2000, utilizing a jackhammer and macrocores fitted with dedicated disposable steel knockout tips.
2. Piezometers were constructed with 1-inch inside diameter PVC screens and risers.
3. Approximately 5 ml of LNAPL was removed from G2-PZ-2 during a sampling attempt prior to gauging on 11/3/00.
4. Piezometers G2-PZ-1 and G2-PZ-2 were each raised by one foot following data collection on 11/7/00 in order to ensure that the screened sections straddle the water table. Data beginning on 11/8/00 reflects this adjustment.

Figures



NOTES:

1. MAPPING IS BEST AVAILABLE INFORMATION AS OF 12/10/98 BASED ON MAPPING PROVIDED BY LOCKWOOD MAPPING, INC. PREPARED FROM 1990 AERIAL PHOTOGRAPHY; DATA PROVIDED BY GENERAL ELECTRIC; AND BLASLAND AND BOUCK, P.C. CONSTRUCTION PLANS. RIVERBANK AND RIVER BED TOPOGRAPHIC INFORMATION PROVIDED BBL FROM OCTOBER 12–23, 1998 FIELD SURVEY.
2. CELL LOCATIONS AND DISTANCES ARE APPROXIMATE.

LEGEND:

- UPPER 1/2–MILE REMOVAL AREAS IN PROGRESS
- EXISTING CONTAINMENT BARRIER LOCATION
- REMOVAL CELL
- ▲ HR–G2–SB18 — SOIL/SEDIMENT BORING
- HR–G2–SS1 — SURFACE SEDIMENT SAMPLE
- PCB DNAPL OBSERVED
- COAL TAR OIL POTENTIALLY PRESENT
- A A' — CROSS–SECTION LOCATION

0 30' 60'
GRAPHIC SCALE

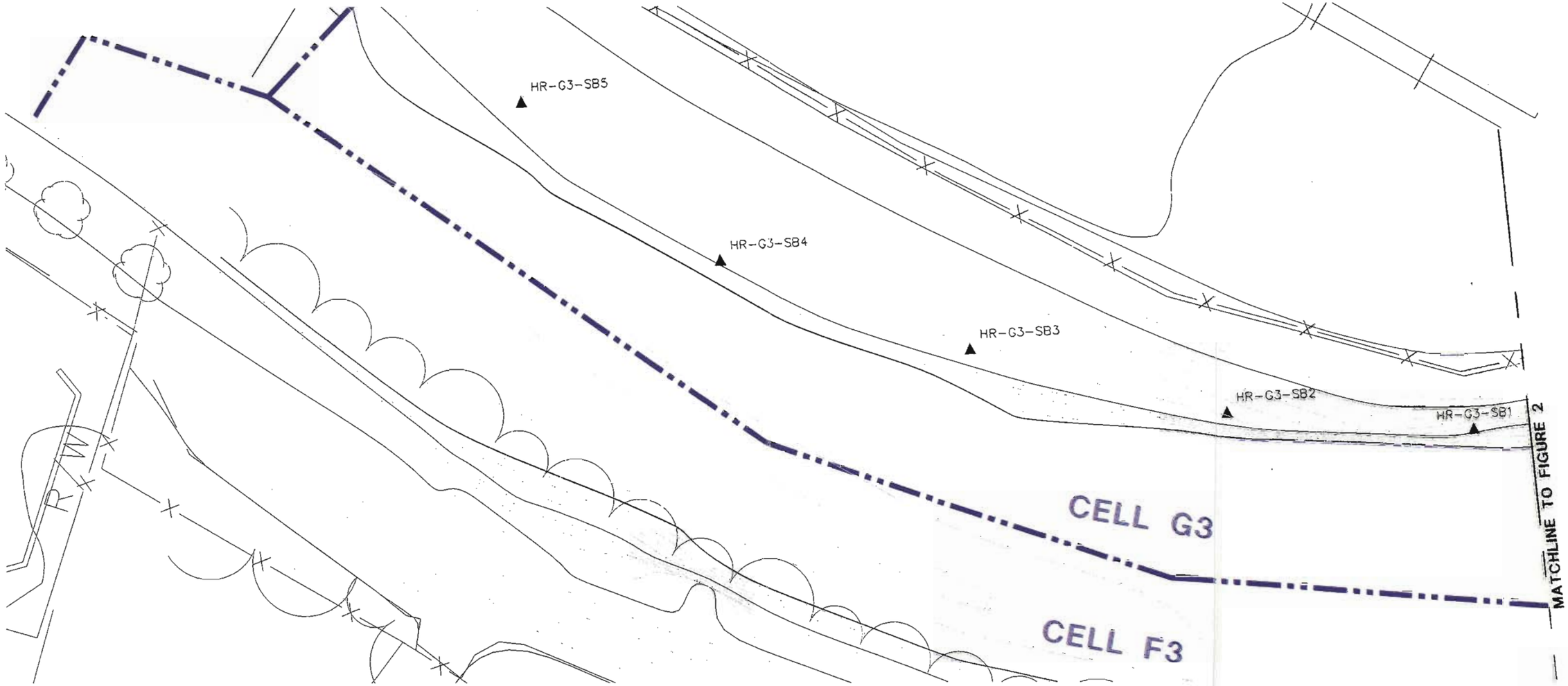
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
REMEDIAL ACTION – UPPER 1/2–MILE REACH OF HOUSATONIC RIVER

CELL G2 NAPL INVESTIGATION AREA

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

FIGURE 1

20197X18, 20197X20.DWG
P: G01/PCP
11/14/00 SYR-54-GMS SDL NES
20197030/CELLG2/20197001.DWG



NOTES:

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2. CELL LOCATIONS AND DISTANCES ARE APPROXIMATE.

LEGEND:

REMOVAL CELL

▲HR-G3-SB1 SOIL BORING

0 20' 40'

GRAPHIC SCALE

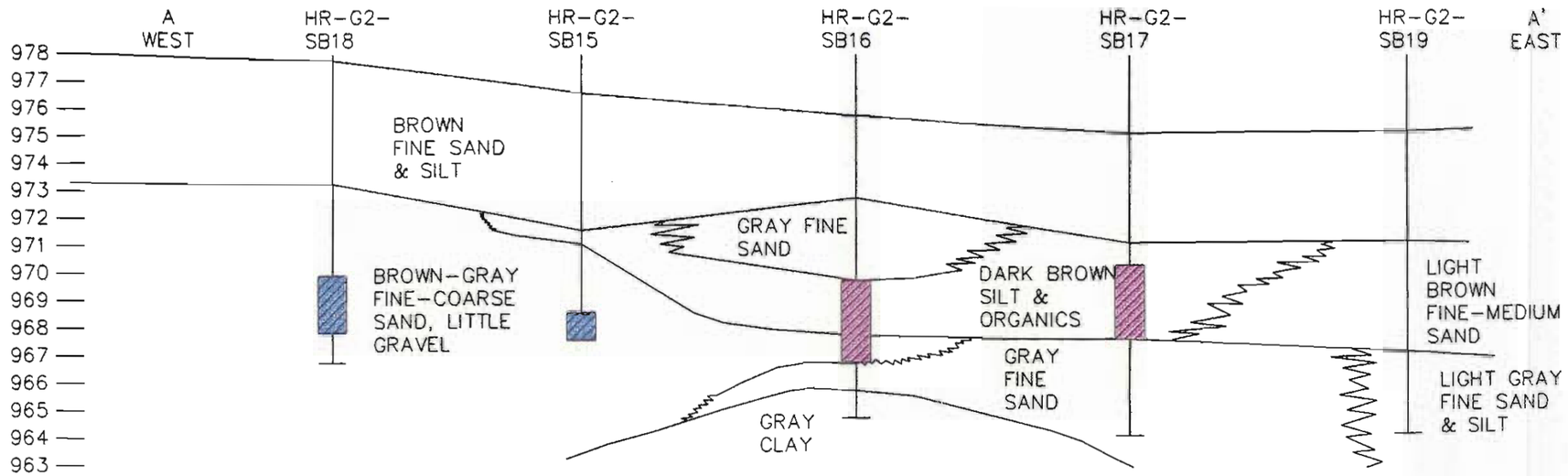
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
REMEDIAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

CELL G3
NAPL INVESTIGATION AREA

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

FIGURE 2

20197X1B, 20197X20.DWG
P: 15L-0, 15L-02B.PCP
10/31/00 SYR-54-GMS NES SDL
20197030/CELLG2/20197G02.DWG



0 5' 10'

SCALE: 1"=5'

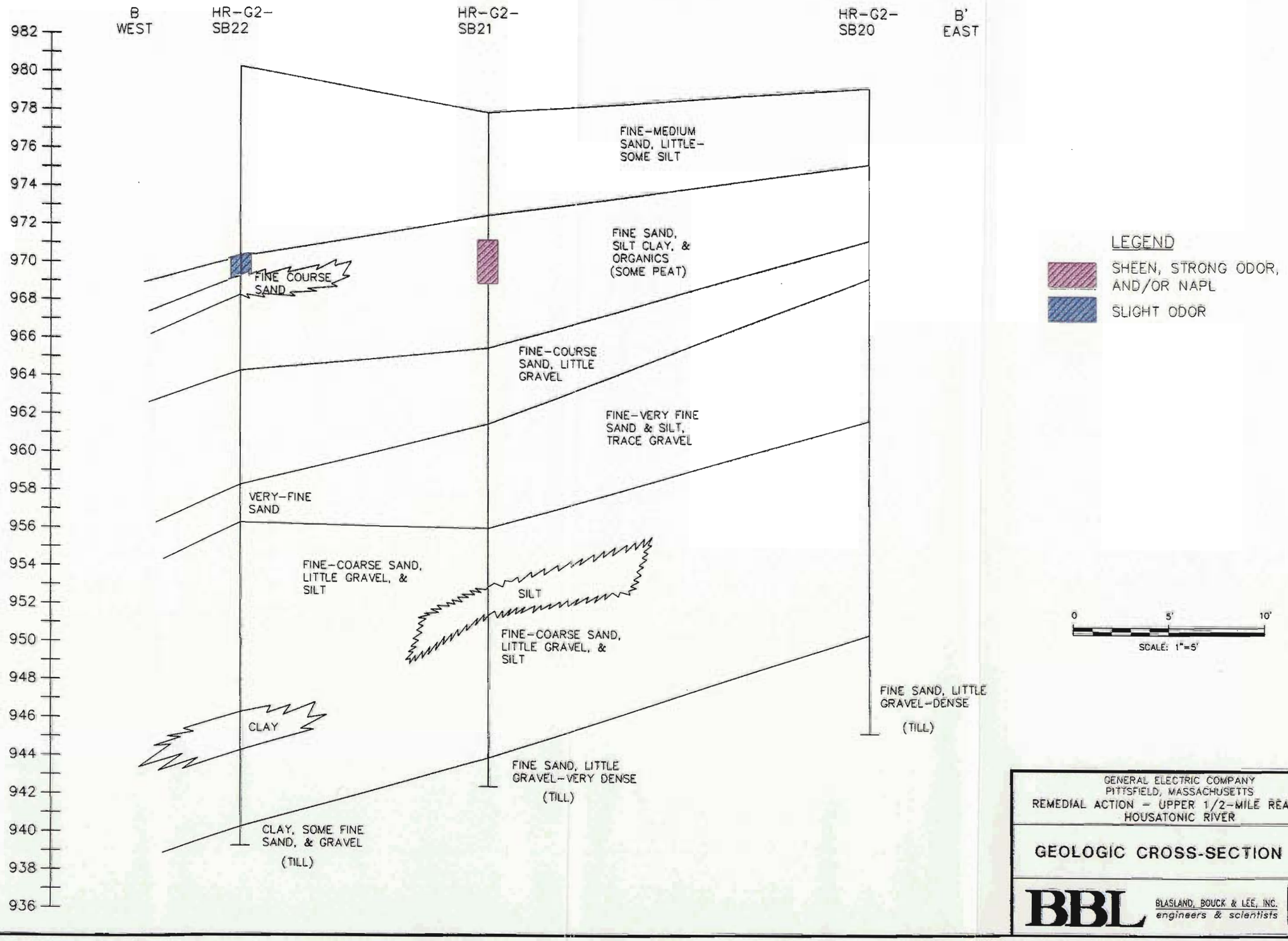
20197X1A.DWG, 20197X1B.DWG,
P: 15L-D, 15L-D2B.PCP
10/30/00 SYR-54-SDL
20197030/B15S.DWG

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
REMEDIAL ACTION – UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

GEOLOGIC CROSS-SECTION A-A'

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

FIGURE
3



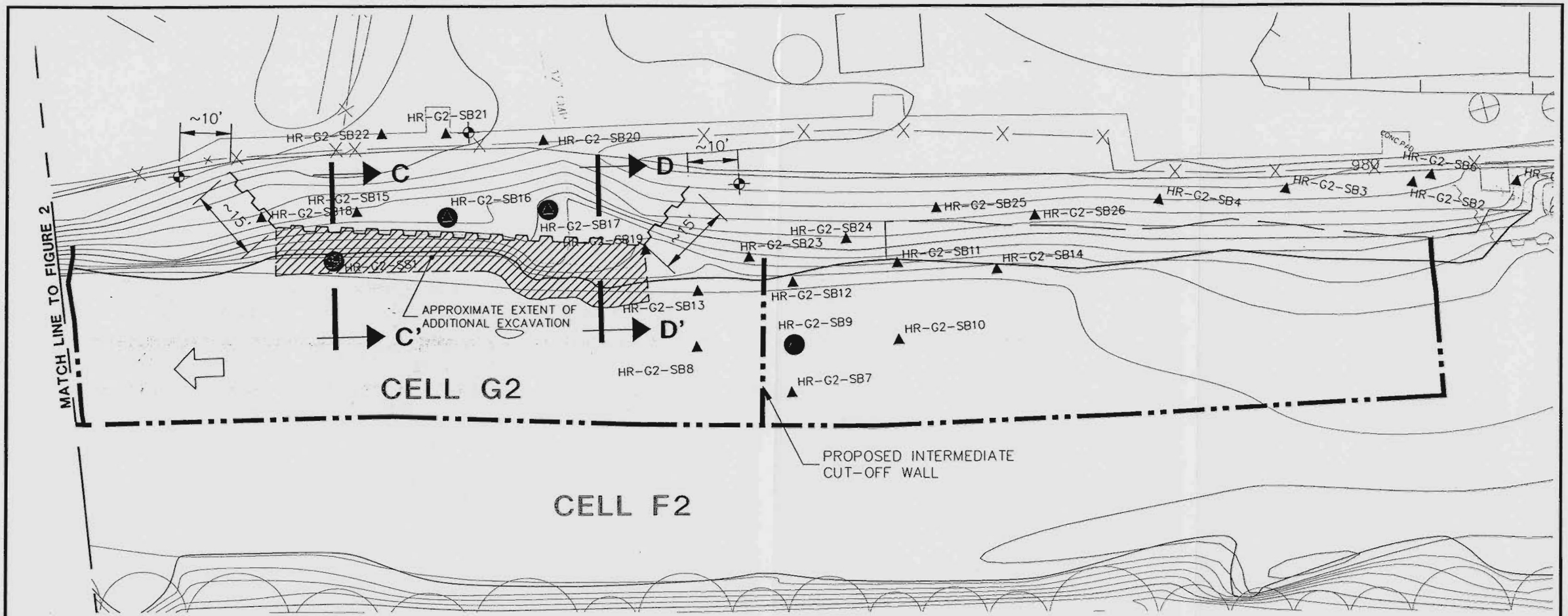
20197X1A.DWG, 20197X1B.DWG,
P: 15L-0, 15L-02B.PCP
10/31/00 SYR-54-SDL
20197030/B1ST.DWG

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
REMEDIAL ACTION - UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

GEOLOGIC CROSS-SECTION B-B'

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

FIGURE 4



NOTES:

1. MAPPING IS BEST AVAILABLE INFORMATION AS OF 12/10/98 BASED ON MAPPING PROVIDED BY LOCKWOOD MAPPING, INC. PREPARED FROM 1990 AERIAL PHOTOGRAPHY; DATA PROVIDED BY GENERAL ELECTRIC; AND BLASLAND AND BOUCK, P.C. CONSTRUCTION PLANS. RIVERBANK AND RIVER BED TOPOGRAPHIC INFORMATION PROVIDED BBL FROM OCTOBER 12–23, 1998 FIELD SURVEY.
2. CELL LOCATIONS AND DISTANCES ARE APPROXIMATE.

LEGEND:

- UPPER 1/2–MILE REMOVAL AREAS IN PROGRESS
- EXISTING CONTAINMENT BARRIER LOCATION
- REMOVAL CELL
- ▲ HR–G2–SB18 — SOIL/SEDIMENT BORING
- ■ HR–G2–SS1 — SURFACE SEDIMENT SAMPLE
- PCB DNAPL OBSERVED
- COAL TAR OIL POTENTIALLY PRESENT
- PROPOSED CONTAINMENT BARRIER LOCATION
- PROPOSED MONITORING WELL LOCATION
- PROPOSED ADDITIONAL EXCAVATION TO AN INITIAL DEPTH OF APPROXIMATELY 4 FEET (ELEVATION 967) AND MAXIMUM DEPTH (BASED ON VISUAL OBSERVATIONS) OF APPROXIMATELY 6 FEET (ELEVATION 965)

0 20' 40'
GRAPHIC SCALE

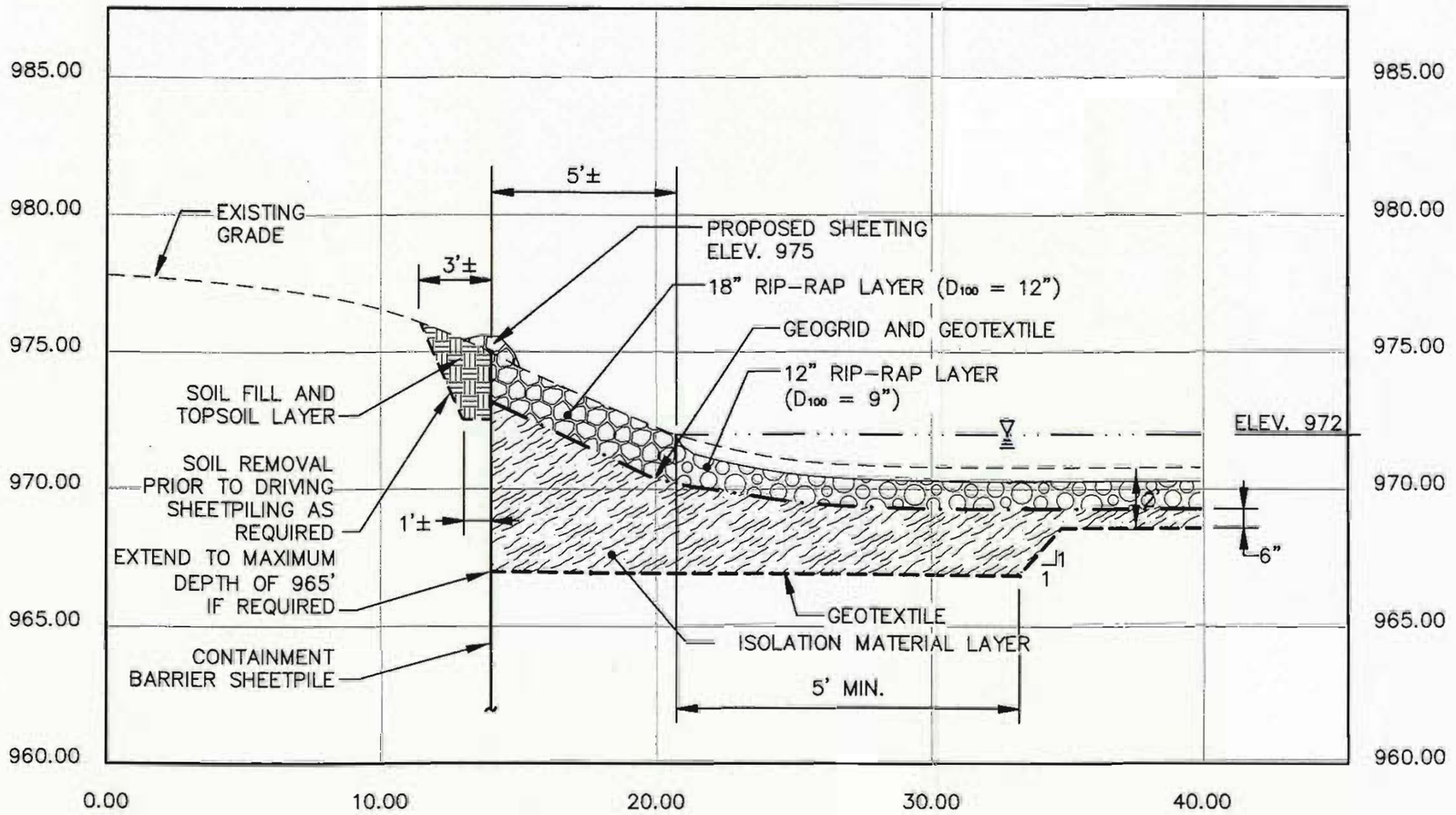
GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
REMEDIAL ACTION – UPPER 1/2–MILE REACH OF HOUSATONIC RIVER

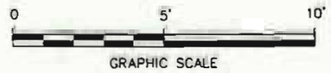
CELL G2 NAPL INVESTIGATION AREA - PROPOSED ACTIVITIES

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

FIGURE 5

20197X1B, 20197X20.DWG
P: D2BL.PCP
11/16/00 SYR-54-GMS SDL NES
20197030/CELLG2/20197G03.DWG





SECTION C-C'

SCALE: HORIZ. 1"=5'
VERT. 1"=5'

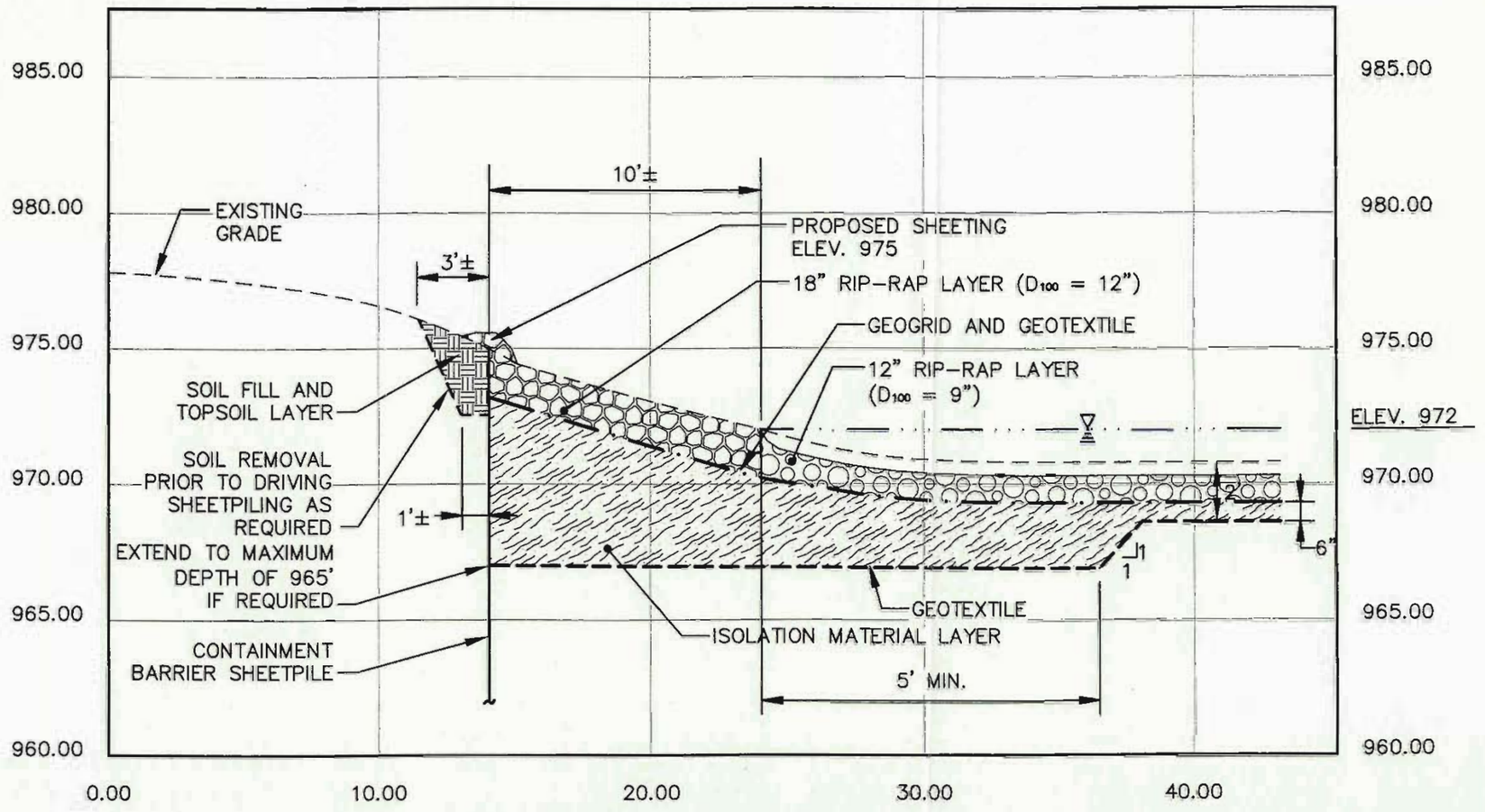
X: NONE
L: ON=*, OFF=REF
P: XS/BL
11/14/00 SYR-54-RCB KMD NES
20197030/CELLG2/20197G05.DWG

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
REMOVAL ACTION
UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

RESTORATION CROSS-SECTION C-C'

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

FIGURE **6**



SECTION D-D'

SCALE: HORIZ. 1"=5'

0 5' 10'

GRAPHIC SCALE

X: NONE
L: ON=*, OFF=REF
P: XS/BL
11/14/00 SYR-54-RCB KMD NES
20197030/CELLG2/20197G06.DWG

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
REMOVAL ACTION
UPPER 1/2-MILE REACH OF HOUSATONIC RIVER

RESTORATION CROSS-SECTION D-D'

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

FIGURE 7

Attachments

Attachment A

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Soil Boring Logs

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 14.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 533059.72
EASTING: 132728.06
GROUND ELEVATION: 977.01

BORING ID: HR-G2-SB-1

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	977.01	0-4	2.8				Dark brown fine SAND and SILT, trace fine Gravel.
1	976.01						
2	975.01						2.0' (975.01')
							Brown coarse-fine SAND, trace Silt and fine-medium Gravel.
3	974.01						
4	973.01	4-8	2.6				4.0' (973.01')
							Dark brown coarse SAND and fine GRAVEL, black stain and sheen, petroleum odor.
5	972.01						
6	971.01						
7	970.01						
8	969.01	8-12	2.2				8.0' (969.01')
							Dark brown coarse SAND and SILT, little fine Gravel, saturated.
9	968.01						
10	967.01						
							Description continued on Page 2.

REMARKS:
Boring backfilled to to surface with bentonite.
Analytical samples collected from4-6 feet.

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 14.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 533059.72
EASTING: 132728.06
GROUND ELEVATION: 977.01

BORING ID: HR-G2-SB-1
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	967.01	8-12	2.2				Dark brown coarse SAND and SILT, little fine Gravel, saturated.
11	966.01						
12	965.01	12-14	1.4				12.0' (965.01')
							Brown-gray coarse SAND, some fine Gravel.
13	964.01						
14	963.01						Boring terminated at 14.0 feet (963.01 feet)
15							
16							
17							
18							
19							
20							

REMARKS:
Boring backfilled to to surface with bentonite.
Analytical samples collected from4-6 feet.

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 14.5 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 533049.15
EASTING: 132710.22
GROUND ELEVATION: 978.56

BORING ID: HR-G2-SB-2

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	978.56	0-4	3.1				Brown-light brown fine-coarse SAND, trace fine Gravel.
1	977.56						
2	976.56						2.0' (976.56)
							Light brown fine-coarse SAND.
3	975.56						
4	974.56	4-8	2.4				Saturated at 4 feet
5	973.56						
6	972.56						6.0' (972.56)
7	971.56						Light gray-brown fine SAND, little Silt lenses, slight petroleum odor.
8	970.56	8-12	3.4				8.0' (970.56)
9	969.56						Olive-gray SILT, saturated.
10	968.56						
							Description continued on Page 2.

REMARKS:
Boring backfilled to to surface with bentonite.
Analytical samples collected from 6-8 feet.

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 14.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 533049.15
EASTING: 132710.22
GROUND ELEVATION: 978.56

BORING ID: HR-G2-SB-2
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	968.56	8-12	3.4				Olive-gray SILT, saturated.
11	967.56						
12	966.56	12-14	2.0				
							12.0' (966.56')
							Gray SILT and GRAVEL, saturated.
13	965.56						
14	964.56						
15							Boring terminated at 14.5 feet (964.56 feet)
16							
17							
18							
19							
20							

REMARKS:
Boring backfilled to to surface with bentonite.
Analytical samples collected from 6-8 feet.

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 14.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 533035.32
EASTING: 132688.69
GROUND ELEVATION: 978.56

BORING ID: HR-G2-SB-3
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	978.56	0-4	3.2				Dark brown fine-medium SAND, some Silt, trace fine Gravel and Organics.
1	977.56						
2	976.56						
							2.0' (976.56)
							Light brown coarse SAND, little fine Gravel.
3	975.56						
4	974.56	4-8	3.9				
5	973.56						
6	972.56						
							6.0' 972.56)
							Dark gray SILT and SAND, trace iron staining.
7	971.56						
8	970.56	8-12	4.0				
							8.0' (970.56)
							Gray fine-medium SAND, some Silt.
9	969.56						
10	968.56						
							Description continued on Page 2.

REMARKS:
Boring backfilled to to surface with bentonite.

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 14.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 533035.32
EASTING: 132688.69
GROUND ELEVATION: 978.56

BORING ID: HR-G2-SB-3
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	968.56	8-12	4.0				Gray fine-medium SAND, some Silt.
11	967.56						
12	966.56	12-14	2.5				
13	965.56						
14	964.56						
15							Boring terminated at 14.5 feet (964.06 feet)
16							
17							
18							
19							
20							

REMARKS:
Boring backfilled to to surface with bentonite.

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 14.5 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 533145.05
EASTING: 132997.14
GROUND ELEVATION: 978.07

BORING ID: HR-G2-SB-4

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	978.07	0-4	3.4				Dark brown fine SAND and SILT.
1	977.07						
2	976.07						2.0' (976.07')
							Light brown fine SAND and SILT, trace fine Gravel.
3	975.07						
4	974.07	4-8	3.9				4.0' (974.07')
							Light gray coarse-fine SAND, saturated.
5	973.07						
6	972.07						
7	971.07						
8	970.07	8-12	3.8				
9	969.07						
10	968.07						
							Description continued on Page 2.

REMARKS:
Boring backfilled to to surface with bentonite.
Analytical samples collected from 12-14.5 feet.

DATE STARTED: 6/16/2000
DATE FINISHED: 6/16/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 14.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 533145.05
EASTING: 132997.14
GROUND ELEVATION: 978.07

BORING ID: HR-G2-SB-4
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	968.07	8-12	3.8				Light gray coarse-fine SAND, saturated. 10.0' (968.07')
							Light brown SILT, some gray-brown coloring.
11	967.07						
12	966.07	12-14	2.5				12.0' (966.07')
							Light brown fine SAND and SILT, slight odor.
13	965.07						
14	964.07						
15	963.07						Boring terminated at 14.5 feet (963.57 feet)
16							
17							
18							
19							
20							

REMARKS:
Boring backfilled to to surface with bentonite.
Analytical samples collected from 12-14.5 feet.

DATE STARTED: 6/30/2000
DATE FINISHED: 6/30/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE:AMS Power Probe

BOREHOLE DEPTH: 24.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING:
EASTING:
GROUND ELEVATION: 977.06

BORING ID: HR-G2-SB-5

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	977.06						0- to 20-feet: Not Sampled.
20	957.06	20-22					20.0' (957.06')
							Brown medium-coarse SAND, trace fine-medium Gravel, slight odor.
21	956.06						
22	955.06	22-24					22.0' (955.06')
							Olive-brown SILT and CLAY, trace fine-coarse Gravel (TILL).
23	954.06						
24	953.06						
							Boring terminated at 24.0 feet (953.06 feet)
25	952.06						
26							
27							
28							
29							

REMARKS:

DATE STARTED: 6/30/2000
DATE FINISHED: 6/30/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE:AMS Power Probe

BOREHOLE DEPTH: 24.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING:
EASTING:
GROUND ELEVATION: 978.43

BORING ID: HR-G2-SB-6

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	978.43						0- to 20-feet: Not Sampled.
20	958.43	20-24	4.0				20.0' (958.43')
							Dark brown coarse SAND and medium GRAVEL, trace fine Sand.
21	957.43						
22	956.43						
23	955.43						23.0' (955.43')
							Olive-brown SILT and CLAY, little medium Gravel (TILL).
24	954.43						
							Boring terminated at 24.0 feet (954.43 feet)
25	953.43						
26							
27							
28							
29							

REMARKS:

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532950.50
EASTING: 132623.70
GROUND ELEVATION: 969.48

BORING ID: HR-G2-SB-7

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	969.48	0-4	2.2				Light brown fine SAND, some Silt, little medium Gravel, wet.
1	968.48						
							1.25' (968.23')
2	967.48						Light brown fine SAND, some Silt, wet.
							2.0' (967.48')
							Light brown fine SAND, some Silt, little medium Gravel, wet.
3	966.48						
4	965.48						
							Boring terminated at 4.0 feet (965.48 feet)
5							
6							
7							
8							
9							
10							

REMARKS:
No analytical samples collected.

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532948.96
EASTING: 132602.59
GROUND ELEVATION: 969.78

BORING ID: HR-G2-SB-8

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	969.78	0-4	2.3				Light brown fine SAND and SILT, wet.
1	968.78						0.83' (968.95')
							Light brown fine-medium SAND, trace medium Gravel, wet.
2	967.78						1.83' (966.95')
							Light brown medium-coarse SAND, some Silt, trace fine-medium Gravel, wet.
3	966.78						
4	965.78						
							Boring terminated at 4.0 feet (965.78 feet)
5							
6							
7							
8							
9							
10							

REMARKS:
No analytical samples collected.

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532959.27
EASTING: 132619.17
GROUND ELEVATION: 969.25

BORING ID: HR-G2-SB-9

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	969.25	0-4	2.2				Light brown fine SAND, some Silt, trace medium Gravel, wet.
1	968.25						1.0' (968.25')
							Light brown fine SAND, some Silt, trace medium-coarse Sand and fine-medium Gravel, wet.
2	967.25						
3	966.25						
4	965.25						
							Boring terminated at 4.0 feet (965.25 feet)
5							
6							
7							
8							
9							
10							

REMARKS:
No analytical samples collected.

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532970.44
EASTING: 132636.95
GROUND ELEVATION: 968.89

BORING ID: HR-G2-SB-10
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	968.89	0-4	3.7				Light brown fine SAND, trace Silt, wet.
							0.5' (968.39')
1	967.89						Light brown medium-coarse SAND, trace fine-medium Gravel, wet, slight odor.
							1.0' (967.89')
2	966.89						Light brown fine SAND, some Silt, wet.
							1.5' (967.39')
3	965.89						Light gray medium SAND, some Silt, little medium Gravel, wet.
							2.17' (966.72')
4	964.89						Light brown fine SAND, some Silt, wet.
							Boring terminated at 4.0 feet (964.89)
5							
6							
7							
8							
9							
10							

REMARKS:
Analytical sample and duplicate sample collected from 0.5-1 feet.

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532983.73
EASTING: 132628.84
GROUND ELEVATION: 971.31

BORING ID: HR-G2-SB-11
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	971.31	0-4	3.5				Light brown fine SAND, trace Silt, Organics, and fine Gravel, wet.
1	970.31						1.0' (970.31')
							Brown fine-medium GRAVEL, trace fine Sand, wet, slight odor.
2	969.31						1.42' (969.89')
							Light brown fine SAND, some Silt, trace fine Gravel, wet.
3	968.31						
4	967.31						
							Boring terminated at 4.0 feet (967.31 feet)
5							
6							
7							
8							
9							
10							

REMARKS:
Analytical sample collected from 1.0-1.42 feet.

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532969.88
EASTING: 132612.61
GROUND ELEVATION: 970.74

BORING ID: HR-G2-SB-12
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	970.74	0-4	2.2				Light brown fine-medium SAND, little fine-medium Gravel, trace Silt, wet.
							1.67' (969.07')
1	969.74						Light brown coarse SAND, wet, slight staining and odor.
							2.0' (968.74')
2	968.74						Light brown fine SAND, some Silt, wet.
3	967.74						
4	966.74						Boring terminated at 4.0 feet (966.74 feet)
5							
6							
7							
8							
9							
10							

REMARKS:
Analytical sample and MS/MSD samples collected from 1.67-2 feet.

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532958.83
EASTING: 132597.07
GROUND ELEVATION: 970.83

BORING ID: HR-G2-SB-13

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	970.83	0-4	2.5				Light brown coarse SAND, little fine-medium Gravel, wet.
							1.0' (969.83')
1	969.83						Light brown coarse SAND, trace fine Gravel, wet, slight staining and odor.
							1.42' (969.36')
2	968.83						Light brown-gray fine SAND, some Silt, wet.
							2.25' (968.58')
3	967.83						Light brown-gray fine SAND, some Silt, little coarse Gravel, wet.
4	966.83						Boring terminated at 4.0 feet (966.83 feet)
5							
6							
7							
8							
9							
10							

REMARKS:
Analytical sample collected from 1.0-1.42 feet.

DATE STARTED: 10/13/2000
DATE FINISHED: 10/13/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet Lexan Tube
RIG TYPE: Manual Core Driver

BOREHOLE DEPTH: 4.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532992.60
EASTING: 132646.82
GROUND ELEVATION: 971.31

BORING ID: HR-G2-SB-14

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	971.31	0-4	2.5				Light brown-gray fine SAND, trace Organics, wet.
1	970.31						1.17' (970.14')
							Light gray fine-medium GRAVEL, wet.
							1.42' (969.89')
2	969.31						Light brown fine SAND, some Silt, wet.
3	968.31						
4	967.31						
							Boring terminated at 4.0 feet (967.31 feet)
5							
6							
7							
8							
9							
10							

REMARKS:
No analytical samples collected.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 9.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532938.51
EASTING: 132529.78
GROUND ELEVATION: 976.60

BORING ID: HR-G2-SB-15
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	976.60	0-4	4.0				Brown fine SAND and SILT.
1	975.60						
2	974.60						
3	973.60						
4	972.60	4-8	4.0				
5	971.60						
							5.0' (971.60')
							Dark brown SILT and ORGANICS.
6	970.60						5.5' (971.10')
							Gray-brown fine-coarse SAND.
7	969.60						
8	968.60						
							8.0' (968.60')
							Dark gray-brown fine-coarse SAND, slight odor.
9	967.60						
							Boring terminated at 9.0 feet (967.60 feet)
10							

REMARKS:
No analytical samples collected.
Encountered refusal at 9 feet during four sampling attempts.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532946.89
EASTING: 132545.87
GROUND ELEVATION: 975.79

BORING ID: HR-G2-SB-16

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.79	0-4	4.0				Brown fine SAND and SILT.
1	974.79						
2	973.79						
3	972.79						3.0' (972.79')
							Gray fine SAND.
4	971.79	4-8	4.0				
5	970.79						
6	969.79						
							6.0' (969.79')
							Dark brown -black SILT, strong odor.
7	968.79						
8	967.79						
							8.0' (967.79')
							Dark brown -black fine-coarse SAND, strong odor.
9	966.79						9.0' (966.79')
							Gray fine SAND.
10	965.79						10.0' (965.79')
							Gray CLAY.
11	964.79						Boring terminated at 11.0 feet (964.79 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532958.27
EASTING: 132562.77
GROUND ELEVATION: 975.16

BORING ID: HR-G2-SB-17
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.16	0-4	4.0				Brown fine SAND and SILT.
1	974.16						
2	973.16						
3	972.16						
4	971.16	4-8	4.0				4.0' (971.16')
							Dark brown -black SILT, strong odor, sheen.
5	970.16						
6	969.16						6.0' (969.16')
							Dark gray SILT, strong odor.
7	968.16						
							7.5' (967.66')
8	967.16	8-11	3.0				Gray-brown fine SAND.
9	966.16						
10	965.16						
11	964.16						Boring terminated at 11.0 feet (964.16 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532928.06
EASTING: 132513.74
GROUND ELEVATION: 977.80

BORING ID: HR-G2-SB-18
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	977.80	0-4	4.0				Dark brown fine SAND, some Silt, trace Organics.
1	976.80						
2	975.80						
3	974.80						
4	973.80	4-8	4.0				4.0' (973.80')
							Dark brown fine SAND, some Silt.
							4.5' (973.30')
5	972.80						Light brown coarse SAND, little fine Gravel, wet.
6	971.80						
7	970.80						
							7.6' (970.20')
8	969.80	8-11	3.0				Dark brown-black coarse SAND, trace medium-coarse Gravel, wet.
							8.0' (969.80')
9	968.80						Dark brown-black fine-medium SAND, wet, slight odor.
10	967.80						10.0 (967.80')
							Light brown fine-coarse SAND and fine GRAVEL, wet.
11	966.80						Boring terminated at 11.0 feet (966.80 feet)

REMARKS:
Analytical sample collected from 8-10 feet.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532960.87
EASTING: 132584.00
GROUND ELEVATION: 975.25

BORING ID: HR-G2-SB-19
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.25	0-4	4.0				Light brown fine SAND and SILT, trace fine Gravel and Organics.
1	974.25						
2	973.25						
3	972.25						
4	971.25	4-8	4.0				4.0' (971.25')
							Light brown fine-medium SAND, trace Silt and fine-medium Gravel, wet.
5	970.25						
6	969.25						
7	968.25						
8	967.25	8-11	3.0				8.0' (967.25')
							Light gray fine SAND and SILT, wet.
9	966.25						
10	965.25						
11	964.25						Boring terminated at 11.0 feet (964.25 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 34 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	979.09	0-4	3.2				Dark brown fine-medium SAND, trace fine Gravel.
1	978.09						
2	977.09						
3	976.09						
4	975.09	4-8	3.1				4.0' (975.09')
							Dark brown fine SAND, little Organics.
5	974.09						5.0' (974.09')
							Light gray fine-medium SAND, little Organics, layered.
6	973.09						
7	972.09						
8	971.09	8-12	3.0				8.0' (971.09')
							Light brown coarse SAND, little medium Gravel, trace fine Sand, wet at 8 feet.
9	970.09						
10	969.09						
							Description continued on Page 2.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 34 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	969.09	8-12	3.0				Light brown coarse SAND, little medium Gravel, trace fine Sand, wet.
							10.0' (969.09')
							Light gray fine SAND, wet.
11	968.09						
12	967.09	12-16	4.0				
							12.0' (967.09')
							Light gray fine SAND, trace fine Gravel, wet.
13	966.09						
							13.0' (966.09')
							Light gray SILT and fine SAND, little medium-coarse Gravel, wet.
14	965.09						
15	964.09						
16	963.09	16-20	3.2				
							16.0' (963.09')
							Light gray fine SAND, some Silt, little coarse Gravel, wet.
17	962.09						
							17.0' (962.09')
							Dark gray fine SAND, wet.
							17.5' (961.59')
18	961.09						Light brown coarse SAND,little medium-coarse Gravel, wet.
19	960.09						
20	959.09	20-24	4.0				
							Description continued on Page 3.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 34 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
20	959.09	20-24	3.3				Light brown coarse SAND, little medium-coarse Gravel. 20.0' (959.09')
							Dark brown medium SAND, trace fine Gravel. 20.5' (958.59')
							Light brown medium-coarse GRAVEL.
21	958.09						
22	957.09						22.0' (957.09')
							Light gray coarse SAND, little medium Gravel, trace fine Sand.
23	956.09						
24	955.09	24-28	0.0				24.0' (955.09')
							No recovery from 24 to 28 feet
25	954.09						
26	953.09						
27	952.09						
28	951.09	28-31	1.8				28.0' (951.09')
							Light brown fine SAND, little medium Gravel.
29	950.09						28.8' (950.29')
							Olive-brown fine SAND, little fine Gravel, dense (Till).
30	949.09						
							Description continued on Page 4.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 34 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
30	949.09	28-31	1.8				Olive-brown fine SAND, little fine Gravel, dense (Till).
31	948.09	31-34	2.4				
32	947.09						
33	946.09						
34	945.09						
							Boring terminated at 34 feet (945.09 feet)
35	944.09						
36	943.09						
37	942.09						
38	941.09						
39	940.09						
40	939.09						

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 35.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	977.81	0-4	2.9				Brown fine SAND, little Silt, trace fine Gravel.
1	976.81						
2	975.81						
3	974.81						
							3.5' (974.31')
4	973.81	4-8	3.5				Brown fine SAND, little Silt, trace coarse Gravel. 4.0' (973.81')
							Brown fine SAND, trace fine Gravel and Organics.
5	972.81						
							5.4' (972.41')
6	971.81						Brown fine SAND and SILT, some Organics.
7	970.81						
							7.6' (970.21')
8	969.81	8-12	2.5				Black CLAY and SILT, odor. 7.9' (969.91')
							Gray fine SAND, moist, wet at 8 feet. 8.2' (969.61')
							Black CLAY and SILT, trace Organics, wet.
9	968.81						8.5' (969.31')
							Black fine SAND, some Clay and Silt, strong odor, sheen, trace black NAPL. 9.1' (968.71')
10	967.81						Gray fine SAND, little Silt, wet.
							Description continued on Page 2.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 35.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	967.81	8-12	2.5				Gray fine SAND, little Silt, wet.
							10.5' (967.31')
11	966.81						Gray CLAY, wet.
12	965.81	12-16	3.2				
							12.0' (965.81')
							Gray fine SAND, wet 12.2' (965.61')
							Gray CLAY, little fine Sand, wet 12.4' (965.41')
13	964.81						Gray-brown fine-coarse SAND, little fine-coarse Gravel, wet.
14	963.81						
15	962.81						
16	961.81	16-20	4.0				
							16.4' (961.41')
17	960.81						Gray SILT, little very fine Sand, wet.
18	959.81						
19	958.81						
20	957.81	20-24	3.3				
							Description continued on Page 3.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 35.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
20	957.81	20-24	3.3				Gray SILT, little very fine Sand, wet. 20.0' (957.81')
							Gray fine SAND, little medium Sand, wet. 20.3' (957.51')
							Gray SILT, trace fine Sand, wet.
21	956.81						
22	955.81						21.9' (955.91')
							Gray medium-coarse SAND, some fine-coarse Gravel, wet.
23	954.81						
24	953.81	24-28	4.0				24.0' (953.81')
							Gray fine-coarse SAND, little fine Gravel, wet.
25	952.81						25.0' (952.81')
							Gray SILT, wet.
26	951.81						
							26.5' (951.31')
27	950.81						Gray fine-coarse SAND, some Silt, little fine Gravel, wet.
28	949.81	28-32	2.5				28.0' (949.81')
							Gray coarse SAND and fine-coarse GRAVEL, wet.
29	948.81						
30	947.81						
							Description continued on Page 4.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 35.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
30	947.81	28-32	2.5				Gray coarse SAND and fine-coarse GRAVEL, wet.
31	946.81						
32	945.81	32-34	N/A				32.0' (945.81')
							Light gray fine-medium SAND, trace Silt, loose.
33	944.81						
34	943.81	34-36	1.5				34.0' (943.81')
							Olive-brown fine SAND, little fine Gravel, very dense (Till).
35	942.81						
36	941.81						Boring terminated at 35.5 feet (942.31 feet)
37	940.81						
38	939.81						
39	938.81						
40	937.81						

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 41 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	980.22	0-4	3.2				Brown fine SAND, some Silt.
1	979.22						
2	978.22						
3	977.22						
4	976.22	4-8	3.6				4.0' (976.22')
							Light-medium brown fine SAND.
5	975.22						
6	974.22						
7	973.22						
8	972.22	8-12	2.8				8.0' (972.22')
							Brown fine-medium SAND.
9	971.22						
10	970.22						
							Description continued on Page 2.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 41 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	970.22	8-12	2.8				Brown fine-medium SAND. 10.0' (970.22')
							Black fine SAND, some burnt wood, odor.
11	969.22						11.0' (969.22')
							Dark Gray fine-coarse SAND.
12	968.22	12-16	4.0				12.0' (968.22')
							Gray-brown fine SAND, wet.
13	967.22						
14	966.22						14.0' (966.22')
							Brown SILT and ORGANICS (Peat).
15	965.22						15.0' (965.22')
							Brown fine-medium SAND.
16	964.22	16-20	3.1				16.0' (964.22')
							Gray fine-medium SAND, some coarse Sand, wet.
17	963.22						
18	962.22						
19	961.22						
20	960.22	20-24	4.0				
							Description continued on Page 3.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 41 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
20	960.22	20-24	4.0				Gray fine-medium SAND, some coarse Sand, wet. 20.0' (960.22')
							Gray fine-medium SAND, wet.
21	959.22						
22	958.22						22.0' (958.22')
							Gray very fine SAND, compact.
23	957.22						
24	956.22	24-28	4.0				24.0' (956.22')
							Gray-brown fine-coarse SAND.
25	955.22						
26	954.22						
27	953.22						
28	952.22	28-32	3.6				
29	951.22						
30	950.22						
							Description continued on Page 4.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 41 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
30	950.22	28-32	3.6				Gray-brown fine-coarse SAND.
31	949.22						
32	948.22	32-36	4.0				
33	947.22						
34	946.22						34.0' (946.22')
							Light gray CLAY, some Silt, little Sand and coarse Gravel.
35	945.22						
36	944.22	36-40	3.6				36.0' (944.22')
							Gray fine-coarse SAND.
37	943.22						
38	942.22						
39	941.22						
40	940.22	40-41	1.0				40.0' (940.22')
							Light gray CLAY, some fine Sand and Gravel (Till).
41	939.22						Boring terminated at 41 feet (939.22 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 11/10/2000
DATE FINISHED: 11/10/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 12.0 Feet
DESCRIPTIONS BY: Brett Kamienski
NORTHING: 532969.86
EASTING: 132602.42
GROUND ELEVATION: 974.82

BORING ID: HR-G2-SB-23
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	974.82	0-4	2.5				Brown fine-coarse SAND, trace Silt.
1	973.82						
2	972.82						2.0' (972.82')
							Brown fine-coarse SAND, trace Silt and Organics.
3	971.82						
4	970.82	4-8	2.9				Trace fine Gravel at 3.8 feet. 4.0' (970.82')
							Brown-light brown coarse SAND, some fine Gravel.
5	969.82						5.0' (969.82')
							Brown-light brown coarse SAND, some fine Gravel, trace wood debris.
6	968.82						6.0' (968.82')
							Light brown coarse SAND, some fine Gravel, wet.
7	967.82						7.0' (967.82')
							Light brown fine SAND and SILT, wet.
8	966.82	8-12	3.5				
9	965.82						
10	964.82						10.0' (964.82')
							Light brown SILT, wet.
11	963.82						11.0' (963.82')
							Light brown coarse SAND and fine-medium GRAVEL, wet. 11.5' (963.32')
							Light brown fine SAND and SILT, wet.
12	962.82						Boring terminated at 12.0 feet (962.82 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 11/10/2000
DATE FINISHED: 11/10/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 12.0 Feet

DESCRIPTIONS BY: Brett Kamienski

NORTHING: 532982.84
EASTING: 132617.47
GROUND ELEVATION: 975.61

BORING ID: HR-G2-SB-24

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.61	0-4	2.5				Brown fine-coarse SAND, trace Silt and wood debris.
1	974.61						
2	973.61						2.0' (973.61')
							Brown-light brown fine-coarse SAND.
3	972.61						
							3.5' (972.11')
4	971.61	4-8	3.1				Brown-light brown fine-coarse SAND, trace Organics, slight odor.
							4.0' (971.61')
5	970.61						Dark brown fine-coarse SAND,trace Silt, stained (4.0-5.0'), strong odor (4.0-4.5'), saturated at 4.5 feet.
6	969.61						6.0' (969.61')
							Light brown coarse SAND, some fine Gravel, wet.
7	968.61						
8	967.61	8-12	4.0				8.0' (967.61')
							Brown-light brown coarse SAND, trace fine Sand, wet.
9	966.61						
10	965.61						10.0' (965.61')
							Light brown fine SAND, trace Silt, wet.
11	964.61						
12	963.61						Boring terminated at 12.0 feet (963.61 feet)

REMARKS:
Analytical samples collectedfrom 3.9-5.0 feet and 8.5-9.0 feet. Duplicate sample (DUP-1) and MS/MSD collected from 3.9-5.0 feet.

DATE STARTED: 11/10/2000
DATE FINISHED: 11/10/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 12.0 Feet

DESCRIPTIONS BY: Brett Kamienski

NORTHING: 532997.21
EASTING: 132629.98
GROUND ELEVATION: 976.40

BORING ID: HR-G2-SB-25

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	976.40	0-4	2.4				Dark brown-brown fine-coarse SAND, trace Organics.
1	975.40						
2	974.40						2.0' (974.40')
							Light brown fine SAND, trace Silt.
3	973.40						
4	972.40	4-8	1.5				4.0' (972.40')
							Dark brown fine SAND and SILT.
5	971.40						
6	970.40						6.0' (970.40')
							Brown fine SAND, trace coarse Sand and wood debris.
7	969.40						7.0' (969.40')
							Light brown coarse SAND, trace fine Gravel, wet.
8	968.40	8-12	2.5				8.0' (968.40')
							Brown coarse SAND, some fine-medium Gravel, wet.
9	967.40						9.0' (967.40')
							Brown coarse-fine SAND,trace Silt, wet.
10	966.40						10.0' (966.40')
							Light brown fine SAND and SILT, wet.
11	965.40						
12	964.40						Boring terminated at 12.0 feet (964.40 feet)

REMARKS:
Analytical samples collectedfrom 8.0-10.0 feet.

DATE STARTED: 11/10/2000
DATE FINISHED: 11/10/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 12.0 Feet
DESCRIPTIONS BY: Brett Kamienski
NORTHING: 533005.76
EASTING: 132647.93
GROUND ELEVATION: 977.00

BORING ID: HR-G2-SB-26
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	977.00	0-4	2.4				Brown-light brown fine SAND, trace Silt and Organics.
1	976.00						
2	975.00						2.0' (975.00')
							Brown-light brown fine SAND, trace Silt, Organics, and fine Gravel.
3	974.00						
4	973.00	4-8	3.0				4.0' (973.00')
							Light brown fine SAND and SILT, trace wood debris.
5	972.00						5.0' (972.00')
							Light brown coarse SAND and fine GRAVEL.
6	971.00						
7	970.00						
8	969.00	8-12	3.1				8.0' (969.00')
							Light brown-gray coarse SAND and fine GRAVEL, wet.
9	968.00						
10	967.00						10.0' (967.00')
							Light brown fine SAND and SILT, wet.
11	966.00						11.0' (966.00')
							Light brown fine SAND and SILT, wet, black staining in veins, slight odor.
12	965.00						Boring terminated at 12.0 feet (965.00 feet)

REMARKS:
Analytical samples collectedfrom 11.0-12.0 feet.

DATE STARTED: 10/20/2000
DATE FINISHED: 10/20/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 10.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532895.24
EASTING: 132473.54
GROUND ELEVATION: 976.57

BORING ID: HR-G3-SB-1

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	976.57	0-4	4.0				Light brown fine SAND, some Silt, trace fine-medium Gravel.
1	975.57						
2	974.57						
3	973.57						
4	972.57	4-8	4.0				4.0' (972.57')
							Light brown medium-coarse SAND, trace Organics.
5	971.57						
6	970.57						
							6.0' (970.57')
							Light gray medium-coarse SAND trace-little fine-coarse Gravel.
7	969.57						
8	968.57	8-10	2.0				
9	967.57						
10	966.57						
							Boring terminated at 10.0 feet (966.57 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/20/2000
DATE FINISHED: 10/20/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 10.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532874.60
EASTING: 132431.14
GROUND ELEVATION: 976.10

BORING ID: HR-G3-SB-2
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	976.10	0-4	4.0				Light brown fine SAND, some Silt, trace Organics and fine Gravel.
1	975.10						
2	974.10						
3	973.10						
4	972.10	4-8	4.0				4.0' (972.10')
							Light gray medium-coarse SAND, little fine Gravel.
5	971.10						
6	970.10						
7	969.10						
8	968.10	8-10	2.0				8.0' (968.10')
							Dark brown fine SAND, some Silt, little Organics.
9	967.10						
10	966.10						
							Boring terminated at 10.0 feet (966.10 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/20/2000
DATE FINISHED: 10/20/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 10.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532860.73
EASTING: 132382.11
GROUND ELEVATION: 975.90

BORING ID: HR-G3-SB-3

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.90	0-4	4.0				Light brown fine SAND and SILT, trace Organics and fine Gravel.
1	974.90						
2	973.90						
3	972.90						
4	971.90	4-8	4.0				4.0' (971.90')
							Light brown fine-coarse SAND, trace fine-medium Gravel.
5	970.90						
							5.5' (970.40')
6	969.90						Dark gray fine SAND and SILT, trace fine-medium Gravel, slight odor.
							6.0' (969.90')
7	968.90						Light gray fine-coarse SAND, some Silt.
8	967.90	8-10	2.0				
							8.0' (967.90')
9	966.90						Dark brown fine SAND, some Silt, little Organics.
10	965.90						
							Boring terminated at 10.0 feet (965.90 feet)

REMARKS:
Analytical samples collected from 5.5 - 6.0 feet.

DATE STARTED: 10/20/2000
DATE FINISHED: 10/20/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 10.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532851.68
EASTING: 132331.90
GROUND ELEVATION: 975.71

BORING ID: HR-G3-SB-4

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.71	0-4	4.0				Light brown fine SAND, some Silt, trace fine-medium Gravel.
1	974.71						
2	973.71						
3	972.71						
4	971.71	4-8	4.0				4.0' (971.71')
							Light brown coarse SAND, trace fine-medium Gravel.
5	970.71						
							5.5' (970.21')
6	969.71						Dark gray fine SAND and SILT, trace fine Gravel and Organics, odor.
							6.0' (969.71')
7	968.71						Light gray fine-coarse SAND, trace Silt.
							7.5' (968.21')
8	967.71	8-10	2.0				Dark brown fine SAND, some Silt, little Organics.
9	966.71						
10	965.71						
							Boring terminated at 10.0 feet (965.71 feet)

REMARKS:
Analytical samples collected from 5.5 - 6.0 feet.

DATE STARTED: 10/20/2000
DATE FINISHED: 10/20/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 10.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532858.86
EASTING: 132283.65
GROUND ELEVATION: 975.64

BORING ID: HR-G3-SB-5

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.64	0-4	4.0				Light brown fine-medium SAND, trace fine Gravel.
1	974.64						
2	973.64						
3	972.64						
4	971.64	4-8	4.0				4.0' (971.64')
							Light brown medium-coarse SAND, trace Organics, slight odor.
							4.5' (971.14')
5	970.64						Light gray fine SAND, some Silt, slight odor.
							5.5' (970.14')
6	969.64						Light brown medium-coarse SAND, little fine-medium Gravel.
7	968.64						
8	967.64	8-10	2.0				
9	966.64						
10	965.64						
							Boring terminated at 10.0 feet (965.64 feet)

REMARKS:
Analytical samples collected from 4 - 5.5 feet.

Attachment B

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Structural Calculations

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

CALCULATION SHEET

PROJECT NO. 20197.071

CLIENT: GE SUBJECT: Sheetpile Design Calculations
Case 1: Permanent Condition assuming ϕ = 35 degrees
PREPARED BY: RDD DATE: 11/9/00
REVIEWED BY: DATE:

PROJECT: Cell G2 NAPL Area, Upper 1/2-Mile Reach of Housatonic River

TASK

To calculate the required embedment depth, maximum moment, and section modulus for a sheetpile wall supporting a slope with a top of elevation of 982 feet with a slope at the angle of repose. The sheetpile wall has a top elevation of 975 feet. The river is assumed to be at elevation 972 feet.

REFERENCES

1. NAVAFAC DM-7, March 1971.

2. Das, B. M. (1990). Principles of Foundation Engineering, 2nd Edition, PWS-Kent Publishing Company.

ASSUMPTIONS AND PARAMETERS

Soil friction angle, ϕ =	35	degree
Soil unit weight, γ =	125	pcf
Buoyant soil unit weight, γ' =	62.6	pcf
Unit weight of water =	62.4	pcf
U/S contact elevation =	975	feet
Groundwater elevation =	975	feet
Riverside contact elevation =	971	feet

FIGURES

Figure 1 - Net Pressure Diagram - Permanent Case
Note: Refer to Figure 6, Cell G1 DNAPL Area - Proposed Activities, for approximate location of the sheetpile wall.

ATTACHMENTS

Attachment 1 - Photocopies of pages from Reference 2
Attachement 2 - Photocopies of pages from reference 1
Attachement 3 - Site Geotechnical Information, contains borehole logs (BBL, June 2000), and interpreted top of till contours (Golder, September 1998).

CALCULATIONS

References	Calculations		Unit
	Global parameters:		
	Soil unit weight, γ	125	pcf
	Buoyant soil unit weight, γ'	62.6	pcf
	Calculate coefficient of passive pressure, Kp:		
Refer to Sheet 1, Attachment 2 (Ref. 1)	Wall friction angle, δ	14	degree
	Soil internal friction angle, ϕ	35	degree
	Slope angle on the riverside, β	0	degree
Refer to Figure 5, Sheet 2, Attachment 2 (Ref. 1)	for β/ϕ	0.00	
	for δ/ϕ	-0.4	
	Reduction factor, R	0.603	
	Kp for δ/ϕ = -1	10	
	Therefore, Kp = R*(Kp for δ/ϕ = -1)	6.03	
	Calculate coefficient of active pressure, Ka		
	Soil internal friction angle, ϕ	0.61	radians
	Slope angle on the u/s side, β	0.61	radians
	Wall friction angle, δ	0.24	radians
	Slope of wall agains vertical, θ	0	radians
Refer to Sheet 3, Attachment 2 (Ref. 1)	$ka = \cos^2\phi / \cos\delta * [1 + ((\sin(\phi+\delta)*\sin(\phi-\beta)/(\cos\delta*\cos(-\beta)))^{0.5}]^2$	0.89	
Refer to Figure 1	**Active pressures and forces acting on wall:**		
	Exposed wall height above water table, L1	0	feet
	Exposed wall height below water table, L2	4	
	$p1 = \gamma * L_1 * Ka$	0	psf
	$p2 = p1 + \gamma' * L_2 * Ka + \gamma_{H2O} * L_2$	423	psf
	Location of zero net pressure, L3 = p2/(γ'*(Kp-Ka))	1.3	feet
	P = 0.5p1*L1 +0.5*(p1+p2)*L2+ 0.5p2*L3	1114	lb
	location, z1 = (0.5*p1*L1*(L3 +L2+ L1/3) + p1*L2*(L3+L2/2)+0.5*(γ' *Ka*L2)*L2*(L3+l2/3)+0.5*γ_{H2O}*L2^2*(L3+L2/3)+0.5*p2*L3*(2*L3/3))/P	2.2	feet
	$p5 = \gamma * L1 * Kp + \gamma' * L2 * Kp + \gamma_{H2O} * L2 + \gamma' * L3 * (Kp-Ka)$	2184	psf

CLIENT: GE SUBJECT: Sheetpile Design Calculations
Case 1: Permanent Condition assuming ϕ = 35 degrees
PREPARED BY: RDD DATE: 11/9/00
REVIEWED BY: DATE:

PROJECT: Cell G2 NAPL Area, Upper 1/2-Mile Reach of Housatonic River

References	Calculations		Unit
	A1 = p5/(γ' *(Kp-Ka))	6.54	
	A2 = 8*P/(γ' *(Kp - Ka))	26.67	
	A3 = 6*P*(2*z1*γ' *(kp-Ka)+p5)/(γ')^2*(Kp-Ka)^2	217.94	
	A4 = P*(6*z1*p5+4P)/((γ')^2*(Kp-Ka)^2)	329.45	
	L4^4 + A1*L4^3 - A2*L4^2 -A3*L4 - A4 = 0		
	By Trial and error:		
	L4: 6 → Equation for L4: 111 L4: 5.9 → Equation for L4: 11 L4: 5 → Equation for L4: -643		
	Therefore, L4	5.9	feet
	p3 = L4*(Kp-Ka)*γ'	1972	psf
	p4 = p5 + γ' *L4*(Kp-Ka)	4156	psf
	L5 = (0.5P3L4-P)/(0.5(p3+p4))	1.54	feet
	Embedment depth, D = L3+L4	7.2	feet
	Sheetpile bottom elevation at FS =1	963.8	feet
	Increase embedment depth by 40 percent for FS = 2.0	10.0	feet
	Sheetpile botoom elevation at FS = 2.0	961.0	feet
	Calculate maximum bending moment		
	Location of maximum bending moment, z' = (2*P/((Kp-Ka)*γ')^0.5)	2.58	feet
	Maximum bending moment, Mmax = P*(z1+z') - (0.5*γ' *(z')^2*(Kp-Ka))*1/3*z'	4346 52152	lb-ft/ft lb-in/ft
	Required Section Modulus, S = Mmax/fb	2.09	in^3
	Where, fb = 25 ksi for allowable stress on σy = 36 ksi steel.		

Conclusions

For an u/s bank contact elevation of 975 feet and the riverside elevation of 971 feet, the required sheeting bottom elevations are 963.8 ft for FS=1 and 961.0 feet for FS=2.0. Therefore, use 961.0 feet as the design bottom elevation of the sheeting based on limit equilibrium considerations.

Figures

Attachment 1

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Photocopies of Pages from Ref. 2

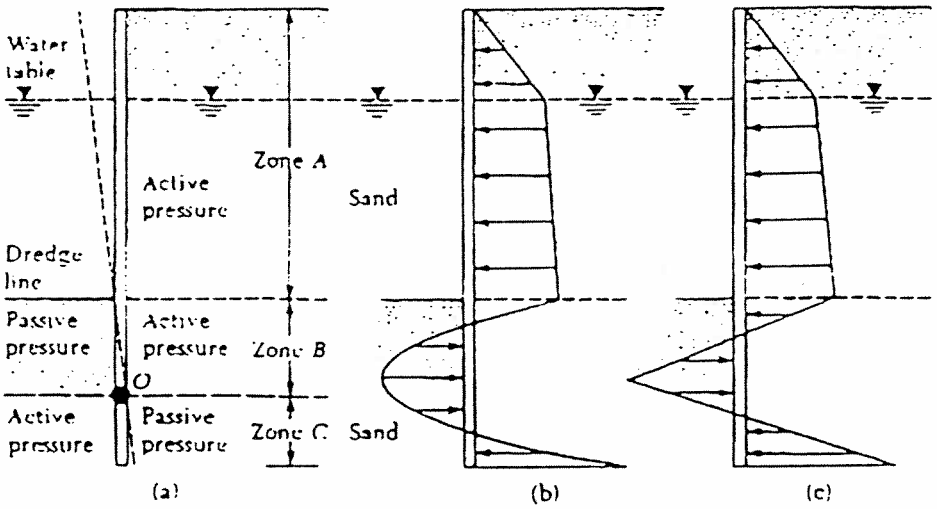


Figure 6.6 Cantilever sheet pile penetrating sand

The following sections (Sections 6.3 through 6.6) present the mathematical formulation of the analysis of cantilever sheet pile walls. Note that, in some waterfront structures, the water level may fluctuate as the result of tidal effects. Care should be taken in determining the water level that will affect the net pressure diagram.

3 Cantilever Sheet Piling Penetrating Sandy Soils

To develop the relationships for the proper depth of embedment of sheet piles driven into a granular soil, we refer to Figure 6.7a. The soil retained by the sheet piling above the dredge line is also sand. The water table is located at a depth of L_1 below the top of the wall. Let the angle of friction of the sand be ϕ. The intensity of the active pressure at a depth $z = L_1$ can be given as

$$p_1 = \gamma L_1 K_a \tag{6.1}$$

where K_a = Rankine active pressure coefficient = $\tan^2(45 - \phi/2)$
γ = unit weight of soil above the water table

Similarly, the active pressure at a depth of $z = L_1 + L_2$ (that is, at the level of the dredge line) is equal to

$$p_2 = (\gamma L_1 + \gamma' L_2) K_a \tag{6.2}$$

where γ' = effective unit weight of soil = $\gamma_{sat} - \gamma_w$

Note that, at the level of the dredge line, the hydrostatic pressures from both sides of the wall are of the same magnitude and cancel each other.

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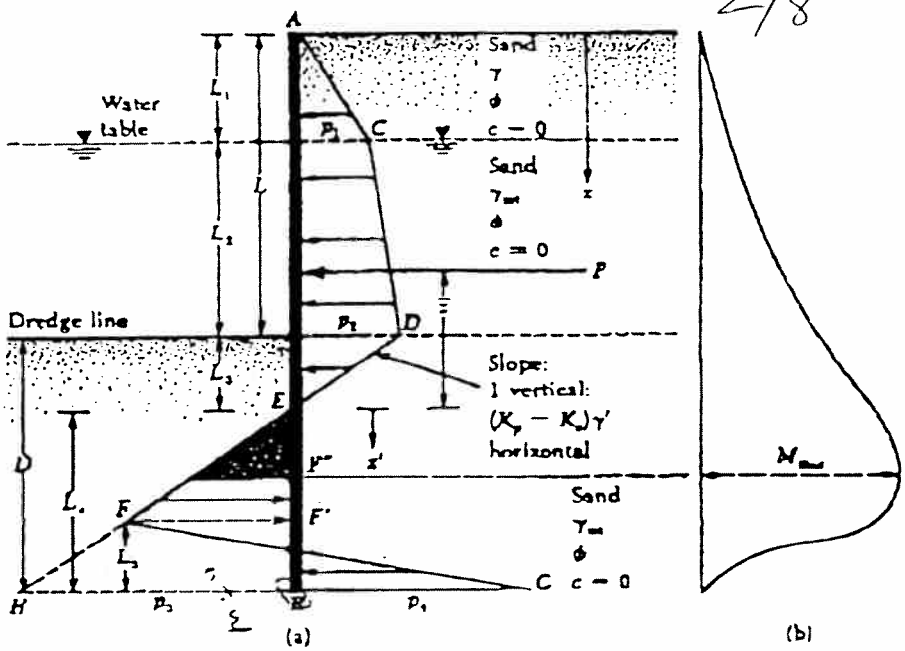

Figure 6.7 Cantilever sheet pile penetrating sand: (a) variation of net pressure diagram, (b) variation of moment

In order to determine the net lateral pressure below the dredge line up to the point of rotation O, as shown in Figure 6.6a, one has to consider the passive pressure acting from the left side (water side) toward the right side (land side) and also the active pressure acting from the right side toward the left side of the wall. For such cases, ignoring the hydrostatic pressure from both sides of the wall, the active pressure at a depth z can be given as

$$p_a = [\gamma L_1 + \gamma' L_2 + \gamma'(z - L_1 - L_2)]K_a \tag{6.3}$$

Also, the passive pressure at that depth z is equal to

$$p_p = \gamma'(z - L_1 - L_2)K_p \tag{6.4}$$

where K_p = Rankine passive pressure coefficient = $\tan^2(45 + \phi/2)$

Hence, combining Eqs. (6.3) and (6.4), the net lateral pressure can be obtained as

$$\begin{aligned} p &= p_a - p_p = (\gamma L_1 + \gamma' L_2)K_a - \gamma'(z - L_1 - L_2)(K_p - K_a) \\ &= p_2 - \gamma'(z - L)(K_p - K_a) \end{aligned} \tag{6.5}$$

where $L = L_1 + L_2$

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The net pressure, p, becomes equal to zero at a depth L_3 below the dredge line; or

$$p_2 - \gamma'(z - L)(K_p - K_a) = 0$$

or

$$(z - L) = L_3 = \frac{p_2}{\gamma'(K_p - K_a)} \tag{6.6}$$

From the preceding equation, it is apparent that the slope of the net pressure distribution line DEF is 1 vertical to $(K_p - K_a)\gamma'$ horizontal. So, in the pressure diagram

$$\overline{HB} = p_3 = L_4(K_p - K_a)\gamma' \tag{6.7}$$

At the bottom of the sheet pile, passive pressure (p_p) acts from the right toward the left side, and active pressure acts from the left toward the right side of the sheet pile. So, at $z = L + D$

$$p_p = (\gamma L_1 + \gamma' L_2 + \gamma' D)K_p \tag{6.8}$$

At the same depth

$$p_a = \gamma' D K_a \tag{6.9}$$

Hence, the net lateral pressure at the bottom of the sheet pile is equal to

$$\begin{aligned} p_p - p_a = p_4 &= (\gamma L_1 + \gamma' L_2)K_p + \gamma' D(K_p - K_a) \\ &= (\gamma L_1 + \gamma' L_2)K_p + \gamma' L_3(K_p - K_a) + \gamma' L_4(K_p - K_a) \\ &= p_5 + \gamma' L_4(K_p - K_a) \end{aligned} \tag{6.10}$$

where $p_5 = (\gamma L_1 + \gamma' L_2)K_p + \gamma' L_3(K_p - K_a)$ (6.11)

$$D = L_3 + L_4 \tag{6.12}$$

For the stability of the wall, the principles of statics can now be applied; or

$\sum$ horizontal forces per unit length of wall $= 0$

and

$\sum$ moment of the forces per unit length of wall about point $B = 0$

For summation of the horizontal forces,

area of the pressure diagram $ACDE$ − area of $EFHB$ + area of $FHBG = 0$

or

$$P - \tfrac{1}{2}p_3 L_4 + \tfrac{1}{2}L_5(p_3 + p_4) = 0 \tag{6.13}$$

where P = area of the pressure diagram $ACDE$

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Summing the moment of all the forces about point B

$$P(L_4 + \bar{z}) - \left(\frac{1}{2} L_4 p_3\right)\left(\frac{L_4}{3}\right) + \frac{1}{2} L_5(p_3 + p_4)\left(\frac{L_5}{3}\right) = 0 \tag{6.14}$$

From Eq. (6.13)

$$L_5 = \frac{p_3 L_4 - 2P}{p_3 + p_4} \tag{6.15}$$

Combining Eqs. (6.7), (6.10), (6.14), and (6.15) and simplifying them further, one obtains the following fourth-degree equation in terms of L_4.

$$\boxed{L_4^4 + A_1 L_4^3 - A_2 L_4^2 - A_3 L_4 - A_4 = 0} \tag{6.16}$$

where

$$A_1 = \frac{p_5}{\gamma'(K_p - K_a)} \tag{6.17}$$

$$A_2 = \frac{8P}{\gamma'(K_p - K_a)} \tag{6.18}$$

$$A_3 = \frac{6P[2\bar{z}\gamma'(K_p - K_a) + p_5]}{\gamma'^2(K_p - K_a)^2} \tag{6.19}$$

$$A_4 = \frac{P(6\bar{z}p_5 + 4P)}{\gamma'^2(K_p - K_a)^2} \tag{6.20}$$

Step-by-Step Procedure for Obtaining the Pressure Diagram

Based on the preceding theory, the step-by-step procedure for obtaining the pressure diagram for a cantilever sheet pile wall penetrating a granular soil is as follows:

1. Calculate K_a and K_p.
2. Calculate p_1 [Eq. (6.1)] and p_2 [Eq. (6.2)]. *Note:* L_1 and L_2 will be given.
3. Calculate L_3 [Eq. (6.6)].
4. Calculate P.
5. Calculate $\bar{z}$ (that is, the center of pressure for the area $ACDE$) by taking the moment about E.
6. Calculate p_5 [Eq. (6.11)].
7. Calculate A_1, A_2, A_3, and A_4 [Eqs. (6.17) to (6.20)].
8. Solve Eq. (6.16) by trial and error to determine L_4.
9. Calculate p_4 [Eq. (6.10)].

10. Calculate p_3 [Eq. (6.7)].
11. Obtain L_3 from Eq. (6.15).
12. Now the pressure distribution diagram as shown in Figure 6.7a can easily be drawn.
13. Obtain the theoretical depth [Eq. (6.12)] of penetration as $L_3 + L_4$. The actual depth of penetration is increased by about 20–30%.

Note: Some designers prefer to use a factor of safety on the passive earth pressure coefficient at the beginning. In that case, in Step 1

$$K_{p(\text{design})} = \frac{K_p}{FS}$$

where FS = factor of safety (usually between 1.5 to 2)

For this type of analysis, follow Steps 1 through 12 with the value of $K_a = \tan^2(45 - \phi/2)$ and $K_{p(\text{design})}$ (instead of K_p). The actual depth of penetration can now be determined by adding L_3, obtained from Step 3, and L_4, obtained from Step 8.

Calculation of Maximum Bending Moment

The nature of variation of the moment diagram for a cantilever sheet pile wall is shown in Figure 6.7b. The maximum moment will occur between the points E and F. To obtain the maximum moment (M_{max}) per unit length of the wall, one must determine the point of zero shear. Adopting a new axis z' (with origin at point E) for zero shear

$$P = \tfrac{1}{2}(z')^2(K_p - K_a)\gamma'$$

or

$$z' = \sqrt{\frac{2P}{(K_p - K_a)\gamma'}} \tag{6.21}$$

Once the point of zero shear force is determined (point F'' in Figure 6.7a), the magnitude of the maximum moment can be obtained as

$$M_{max} = P(\bar{z} + z') - [\tfrac{1}{2}\gamma' z'^2(K_p - K_a)](\tfrac{1}{3}z') \tag{6.22}$$

The sizing of the necessary profile of the sheet piling is then made according to the allowable flexural stress of the sheet pile material, or

$$S = \frac{M_{max}}{\sigma_{all}} \tag{6.23}$$

6/8

where S = section modulus of the sheet pile required per unit length of the structure
σ_{all} = allowable flexural stress of the sheet pile

Example 6.1

Refer to Figure 6.7. For a cantilever sheet pile wall penetrating a granular soil, given: $L_1 = 2$ m, $L_2 = 3$ m. The granular soil has the following properties:

$$\phi = 32^\circ$$
$$c = 0$$
$$\gamma = 15.9 \text{ kN/m}^3$$
$$\gamma_{sat} = 19.33 \text{ kN/m}^3$$

Make the necessary calculations to determine the theoretical and actual depth of penetration. Also determine the miminum size of sheet pile (section modulus) necessary.

Solution

The step-by-step procedure given in Section 6.3 will be followed here.

Step 1

$$K_a = \tan^2\left(45 - \frac{\phi}{2}\right) = \tan^2\left(45 - \frac{32}{2}\right) = 0.307$$

$$K_p = \tan^2\left(45 + \frac{\phi}{2}\right) = 3.25$$

Step 2

$$p_1 = \gamma L_1 K_a = (15.9)(2)(0.307) = 9.763 \text{ kN/m}^2$$
$$p_2 = (\gamma L_1 + \gamma' L_2)K_a = [(15.9)(2) + (19.33 - 9.81)3]0.307$$
$$= 18.53 \text{ kN/m}^2$$

Step 3

$$L_3 = \frac{p_2}{\gamma'(K_p - K_a)} = \frac{18.53}{(19.33 - 9.81)(3.25 - 0.307)} = 0.66 \text{ m}$$

Step 4

$$P = \tfrac{1}{2}p_1 L_1 + p_1 L_2 + \tfrac{1}{2}(p_2 - p_1)L_3 + \tfrac{1}{2}p_2 L_3$$
$$= \tfrac{1}{2}(9.763)(2) + (9.763)(3) + \tfrac{1}{2}(18.53 - 9.763)3 + \tfrac{1}{2}(18.53)(0.66)$$
$$= 9.763 + 29.289 + 13.151 + 6.115 = 58.32 \text{ kN/m}$$

Step 5. Taking the moment about E

$$\bar{z} = \frac{1}{58.32}\left[9.763\left(0.66 + 3 + \frac{2}{3}\right) + 29.289\left(0.66 + \frac{3}{2}\right) + 13.151\left(0.66 + \frac{3}{3}\right) + 6.115\left(0.66 \times \frac{2}{3}\right)\right] = 2.23 \text{ m}$$

Step 6

$$p_3 = (\gamma L_1 + \gamma' L_2)K_p + \gamma' L_3(K_p - K_a)$$
$$= [(15.9)(2) + (19.33 - 9.81)3]3.25 + (19.33 - 9.81)(0.66)(3.25 - 0.307)$$
$$= 196.17 + 18.49 \approx 214.66 \text{ kN/m}^2$$

Step 7

$$A_1 = \frac{p_3}{\gamma'(K_p - K_a)} = \frac{214.66}{(9.52)(2.943)} = 7.66$$

$$A_2 = \frac{8P}{\gamma'(K_p - K_a)} = \frac{(8)(58.32)}{(9.52)(2.943)} = 16.65$$

$$A_3 = \frac{6P[2\bar{x}\gamma'(K_p - K_a) + p_3]}{\gamma'^2(K_p - K_a)^2}$$
$$= \frac{(6)(58.32)[(2)(2.23)(9.52)(2.943) + 214.66]}{(9.52)^2(2.943)^2} = 151.93$$

$$A_4 = \frac{P(6\bar{x}p_3 + 4P)}{\gamma'^2(K_p - K_a)^2}$$
$$= \frac{58.32[(6)(2.23)(214.66) + (4)(58.32)]}{(9.52)^2(2.943)^2} = 230.72$$

Step 8. From Eq. (6.16)

$$L_4^4 + 7.66L_4^3 - 16.65L_4^2 - 151.39L_4 - 230.72 = 0$$

The following table shows the solution of the preceding equation by trial and error.

Assumed L_4 (m)	Left side of Eq. (6.16)
4	−356.44
5	+178.58
4.8	+36.96

So, $L_4 \approx 4.8$ m

Step 9

$$p_4 = p_3 + \gamma' L_4(K_p - K_a)$$
$$= 214.66 + (9.52)(4.8)(2.943) = 349.14 \text{ kN/m}^2$$

Step 10

$$p_3 = \gamma'(K_p - K_a)L_4 = (9.52)(2.943)(4.8) = 134.48 \text{ kN/m}^2$$

Step 11

$$L_5 = \frac{p_3 L_4 - 2P}{p_3 + p_4} = \frac{(134.48)(4.8) - 2(58.32)}{134.48 + 349.14} = 1.09 \text{ m}$$

Step 12. The net pressure distribution diagram can now be drawn, as shown in Figure 6.7a.

Step 13. The actual depth of penetration $= 1.3(L_3 + L_4) = 1.3(0.66 + 4.8) = 7.1$ m. The theoretical depth of penetration $= 0.66 + 4.8 = 5.46$ m.

8/8

Size of Sheet Piling

Using Eq. (6.21)

$$z' = \sqrt{\frac{2P}{\gamma'(K_p - K_a)}} = \sqrt{\frac{(2)(58.32)}{9.52(2.943)}} = 2.04 \text{ m}$$

From Eq. (6.22)

$$M_{max} = P(\bar{z} + z') - \left[\frac{1}{2}\gamma' z'^2(K_p - K_a)\right]\left(\frac{z'}{3}\right)$$

$$= (58.32)(2.23 + 2.04) - \frac{1}{2}(9.52)(2.04)^2(2.943)\left(\frac{2.04}{3}\right)$$

$$= 249.03 - 39.64 = 209.39 \text{ kN-m}$$

The required section modulus of the sheet pile

$$S = \frac{M_{max}}{\sigma_{all}}$$

With $\sigma_{all} = 172.5 \text{ MN/m}^2$

$$S = \frac{209.39 \text{ kN-m}}{172.5 \times 10^3 \text{ kN/m}^2} = 1.214 \times 10^{-3} \text{ m}^3/\text{m of wall}$$

6.4 Special Cases for Cantilever Wall (Penetrating a Sandy Soil)

Following are two special cases of the mathematical formulation shown in Section 6.3.

Case 1: Sheet Pile Wall with the Absence of Water Table

In the absence of the water table, the net pressure diagram on the cantilever sheet pile wall will be as shown in Figure 6.8, which is a modified version of Figure 6.7. For this figure

$$p_2 = \gamma L K_a \tag{6.24}$$

$$p_3 = L_4(K_p - K_a)\gamma \tag{6.25}$$

$$p_4 = p_3' + \gamma L_4(K_p - K_a) \tag{6.26}$$

$$p_5 = \gamma L K_p + \gamma L_3(K_p - K_a) \tag{6.27}$$

$$L_3 = \frac{p_2}{\gamma(K_p - K_a)} = \frac{LK_a}{(K_p - K_a)} \tag{6.28}$$

$$P = \tfrac{1}{2}p_2 L + \tfrac{1}{2}p_2 L_3 \tag{6.29}$$

$$\bar{z} = L_3 + \frac{L}{3} = \frac{LK_a}{K_p - K_a} + \frac{L}{3} = \frac{L(2K_a + K_p)}{3(K_p - K_a)} \tag{6.30}$$

Attachment 2

Photocopies of Pages from Ref. 1

TABLE 1
Ultimate Friction Factors and Adhesion for Dissimilar Materials

Interface Materials	Friction factor, tan δ	Friction angle, δ degrees
Mass concrete on the following foundation materials:		
Clean sound rock	0.70	35
Clean gravel, gravel-sand mixtures, coarse sand	0.55 to 0.60	29 to 31
Clean fine to medium sand, silty medium to coarse sand, silty or clayey gravel	0.45 to 0.55	24 to 29
Clean fine sand, silty or clayey fine to medium sand	0.35 to 0.45	19 to 24
Fine sandy silt, nonplastic silt	0.30 to 0.35	17 to 19
Very stiff and hard residual or preconsolidated clay	0.40 to 0.50	22 to 26
Medium stiff and stiff clay and silty clay	0.30 to 0.35	17 to 19
(Masonry on foundation materials has same friction factors.)		
Steel sheet piles against the following soils:		
Clean gravel, gravel-sand mixtures, well-graded rock fill with spalls	0.40	22
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30	17
Silty sand, gravel or sand mixed with silt or clay	0.25	14
Fine sandy silt, nonplastic silt	0.20	11
Formed concrete or concrete sheet piling against the following soils:		
Clean gravel, gravel-sand mixture, well-graded rock fill with spalls	0.40 to 0.50	22 to 26
Clean sand, silty sand-gravel mixture, single size hard rock fill	0.30 to 0.40	17 to 22
Silty sand, gravel or sand mixed with silt or clay	0.30	17
Fine sandy silt, nonplastic silt	0.25	14
Various structural materials:		
Masonry on masonry, igneous and metamorphic rocks:		
Dressed soft rock on dressed soft rock	0.70	35
Dressed hard rock on dressed soft rock	0.65	33
Dressed hard rock on dressed hard rock	0.55	29
Masonry on wood (cross grain)	0.50	26
Steel on steel at sheet pile interlocks	0.30	17

Interface Materials (Cohesion)	Adhesion C_a (psf)
Very soft cohesive soil (0 - 250 psf)	0 - 250
Soft cohesive soil (250 - 500 psf)	250 - 500
Medium stiff cohesive soil (500 - 1000 psf)	500 - 750
Stiff cohesive soil (1000 - 2000 psf)	750 - 950
Very stiff cohesive soil (2000 - 4000 psf)	950 - 1,300

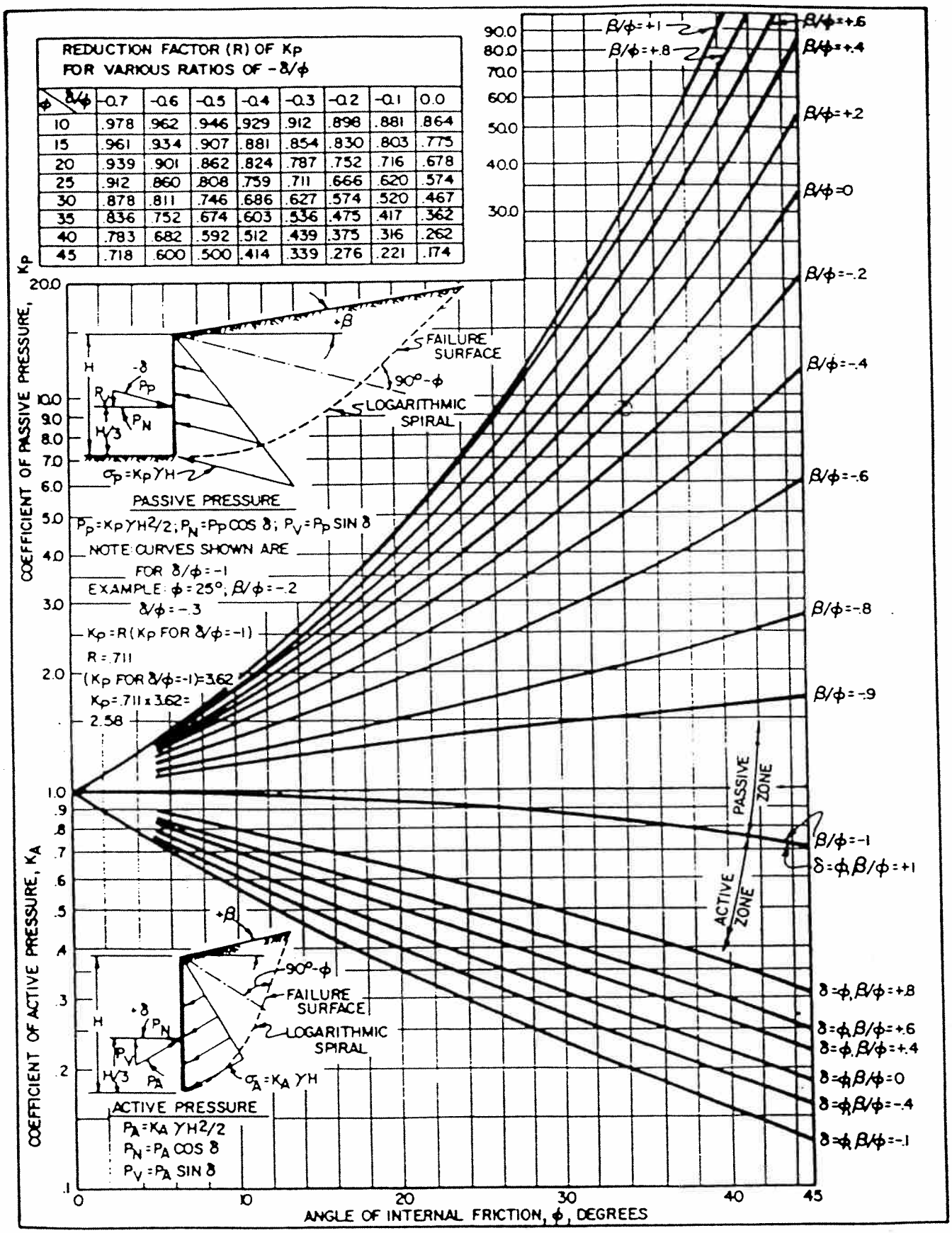
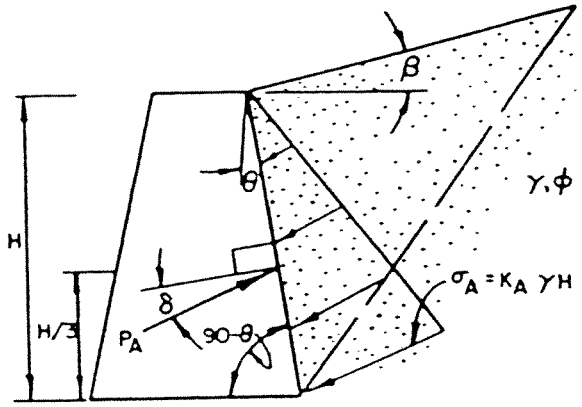
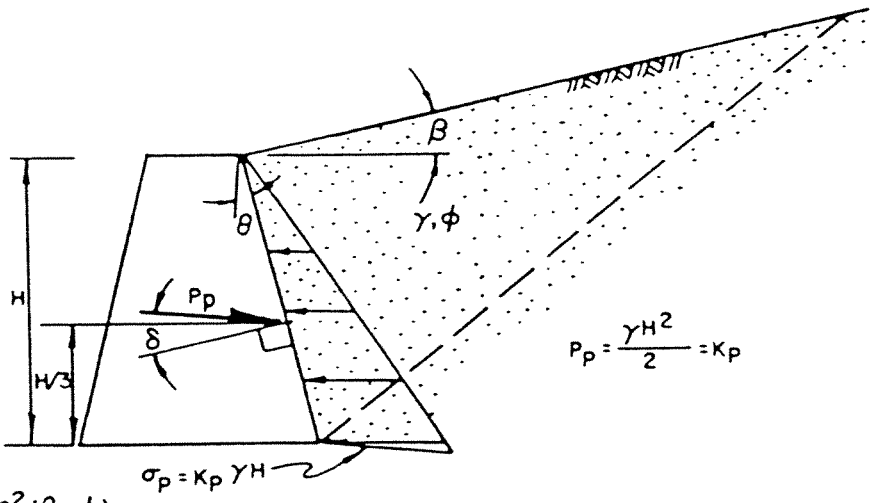


FIGURE 6
Active and Passive Coefficients with Wall Friction
(Sloping Backfill)



$$K_A = \frac{\cos^2(\phi-\theta)}{\cos^2\theta\cos(\theta+\delta)\left[1+\sqrt{\frac{\sin(\phi+\delta)\sin(\phi-\beta)}{\cos(\theta+\delta)\cos(\theta-\beta)}}\right]^2}$$



$$K_p = \frac{\cos^2(\theta+\phi)}{\cos^2\theta\cos(\theta-\delta)\left[1-\sqrt{\frac{\sin(\phi+\delta)\sin(\phi+\beta)}{\cos(\theta-\delta)\cos(\theta-\beta)}}\right]^2}$$

K_p VALUES ARE SATISFACTORY FOR $\delta \leq \phi/3$ BUT ARE UNCONSERVATIVE FOR $\delta > \phi/3$ AND THEREFORE SHOULD NOT BE USED.

FIGURE 8
Coefficients K_A and K_p for Walls with Sloping Wall and Friction, and Sloping Backfill

Attachment 3

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Site Geotechnical Information

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 9.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532938.51
EASTING: 132529.78
GROUND ELEVATION: 976.60

BORING ID: HR-G2-SB-15

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	976.60	0-4	4.0				Brown fine SAND and SILT.
1	975.60						
2	974.60						
3	973.60						
4	972.60	4-8	4.0				
5	971.60						5.0' (971.60')
							Dark brown SILT and ORGANICS.
6	970.60						5.5' (971.10') Gray-brown fine-coarse SAND.
7	969.60						
8	968.60						8.0' (968.60')
							Dark gray-brown fine-coarse SAND, slight odor.
9	967.60						
							Boring terminated at 9.0 feet (967.60 feet)
10							

REMARKS:
No analytical samples collected.
Encountered refusal at 9 feet during four sampling attempts.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532946.89
EASTING: 132545.87
GROUND ELEVATION: 975.79

BORING ID: HR-G2-SB-16
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.79	0-4	4.0				Brown fine SAND and SILT.
1	974.79						
2	973.79						
3	972.79						3.0' (972.79')
							Gray fine SAND.
4	971.79	4-8	4.0				
5	970.79						
6	969.79						
							6.0' (969.79')
							Dark brown -black SILT, strong odor.
7	968.79						
8	967.79						
							8.0' (967.79')
							Dark brown -black fine-coarse SAND, strong odor.
9	966.79						9.0' (966.79')
							Gray fine SAND.
10	965.79						10.0' (965.79')
							Gray CLAY.
11	964.79						Boring terminated at 11.0 feet (964.79 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532958.27
EASTING: 132562.77
GROUND ELEVATION: 975.16

BORING ID: HR-G2-SB-17
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.16	0-4	4.0				Brown fine SAND and SILT.
1	974.16						
2	973.16						
3	972.16						
4	971.16	4-8	4.0				4.0' (971.16')
							Dark brown -black SILT, strong odor, sheen.
5	970.16						
6	969.16						6.0' (969.16')
							Dark gray SILT, strong odor.
7	968.16						
							7.5' (967.66')
8	967.16	8-11	3.0				Gray-brown fine SAND.
9	966.16						
10	965.16						
11	964.16						Boring terminated at 11.0 feet (964.16 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532928.06
EASTING: 132513.74
GROUND ELEVATION: 977.80

BORING ID: HR-G2-SB-18

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	977.80	0-4	4.0				Dark brown fine SAND, some Silt, trace Organics.
1	976.80						
2	975.80						
3	974.80						
4	973.80	4-8	4.0				4.0' (973.80')
							Dark brown fine SAND, some Silt.
							4.5' (973.30')
5	972.80						Light brown coarse SAND, little fine Gravel, wet.
6	971.80						
7	970.80						
							7.6' (970.20')
8	969.80	8-11	3.0				Dark brown-black coarse SAND, trace medium-coarse Gravel, wet.
							8.0' (969.80')
							Dark brown-black fine-medium SAND, wet, slight odor.
9	968.80						
10	967.80						10.0 (967.80')
							Light brown fine-coarse SAND and fine GRAVEL, wet.
11	966.80						Boring terminated at 11.0 feet (966.80 feet)

REMARKS:
Analytical sample collected from 8-10 feet.

DATE STARTED: 10/18/2000
DATE FINISHED: 10/18/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 2 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 11.0 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532960.87
EASTING: 132584.00
GROUND ELEVATION: 975.25

BORING ID: HR-G2-SB-19

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	975.25	0-4	4.0				Light brown fine SAND and SILT, trace fine Gravel and Organics.
1	974.25						
2	973.25						
3	972.25						
4	971.25	4-8	4.0				4.0' (971.25')
							Light brown fine-medium SAND, trace Silt and fine-medium Gravel, wet.
5	970.25						
6	969.25						
7	968.25						
8	967.25	8-11	3.0				8.0' (967.25')
							Light gray fine SAND and SILT, wet.
9	966.25						
10	965.25						
11	964.25						Boring terminated at 11.0 feet (964.25 feet)

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 34 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	979.09	0-4	3.2				Dark brown fine-medium SAND, trace fine Gravel.
1	978.09						
2	977.09						
3	976.09						
4	975.09	4-8	3.1				4.0' (975.09')
							Dark brown fine SAND, little Organics.
5	974.09						5.0' (974.09')
							Light gray fine-medium SAND, little Organics, layered.
6	973.09						
7	972.09						
8	971.09	8-12	3.0				– 8.0' (971.09')
							Light brown coarse SAND, little medium Gravel, trace fine Sand, wet at 8 feet.
9	970.09						
10	969.09						
							Description continued on Page 2.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 34 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	969.09	8-12	3.0				Light brown coarse SAND, little medium Gravel, trace fine Sand, wet.
							10.0' (969.09')
							Light gray fine SAND, wet.
11	968.09						
12	967.09	12-16	4.0				
							12.0' (967.09')
							Light gray fine SAND, trace fine Gravel, wet.
13	966.09						
							13.0' (966.09')
							Light gray SILT and fine SAND, little medium-coarse Gravel, wet.
14	965.09						
15	964.09						
16	963.09	16-20	3.2				
							16.0' (963.09')
							Light gray fine SAND, some Silt, little coarse Gravel, wet.
17	962.09						17.0' (962.09')
							Dark gray fine SAND, wet.
							17.5' (961.59')
18	961.09						Light brown coarse SAND,little medium-coarse Gravel, wet.
19	960.09						
20	959.09	20-24	4.0				
							Description continued on Page 3.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 34 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
20	959.09	20-24	3.3				Light brown coarse SAND, little medium-coarse Gravel. 20.0' (959.09')
							Dark brown medium SAND, trace fine Gravel. 20.5' (958.59')
21	958.09						Light brown medium-coarse GRAVEL.
22	957.09						22.0' (957.09')
							Light gray coarse SAND, little medium Gravel, trace fine Sand.
23	956.09						
24	955.09	24-28	0.0				24.0' (955.09')
							No recovery from 24 to 28 feet
25	954.09						
26	953.09						
27	952.09						
28	951.09	28-31	1.8				28.0' (951.09')
							Light brown fine SAND, little medium Gravel.
29	950.09						28.8' (950.29')
							Olive-brown fine SAND, little fine Gravel, dense (Till).
30	949.09						
							Description continued on Page 4.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/25/2000
DATE FINISHED: 10/25/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 34 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532981.78
EASTING: 132571.40
GROUND ELEVATION: 979.09

BORING ID: HR-G2-SB-20
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
30	949.09	28-31	1.8				Olive-brown fine SAND, little fine Gravel, dense (Till).
31	948.09	31-34	2.4				
32	947.09						
33	946.09						
34	945.09						
							Boring terminated at 34 feet (945.09 feet)
35	944.09						
36	943.09						
37	942.09						
38	941.09						
39	940.09						
40	939.09						

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 35.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	977.81	0-4	2.9				Brown fine SAND, little Silt, trace fine Gravel.
1	976.81						
2	975.81						
3	974.81						
							3.5' (974.31')
4	973.81	4-8	3.5				Brown fine SAND, little Silt, trace coarse Gravel. 4.0' (973.81')
							Brown fine SAND, trace fine Gravel and Organics.
5	972.81						
							5.4' (972.41')
6	971.81						Brown fine SAND and SILT, some Organics.
7	970.81						
							7.6' (970.21')
8	969.81	8-12	2.5				Black CLAY and SILT, odor. 7.9' (969.91')
							Gray fine SAND, moist, wet at 8 feet. 8.2' (969.61')
							Black CLAY and SILT, trace Organics, wet. 8.5' (969.31')
9	968.81						Black fine SAND, some Clay and Silt, strong odor, sheen, trace black NAPL. 9.1' (968.71')
							Gray fine SAND, little Silt, wet.
10	967.81						
							Description continued on Page 2.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push –
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 35.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	967.81	8-12	2.5				Gray fine SAND, little Silt, wet.
							10.5' (967.31')
11	966.81						Gray CLAY, wet.
12	965.81	12-16	3.2				
							12.0' (965.81')
							Gray fine SAND, wet 12.2' (965.61')
13	964.81						Gray CLAY, little fine Sand, wet 12.4' (965.41')
							Gray-brown fine-coarse SAND, little fine-coarse Gravel, wet.
14	963.81						
15	962.81						
16	961.81	16-20	4.0				
							16.4' (961.41')
17	960.81						Gray SILT, little very fine Sand, wet.
18	959.81						
19	958.81						
20	957.81	20-24	3.3				
							Description continued on Page 3.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 35.5 Feet

DESCRIPTIONS BY: Alex Marconi

NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21

CLIENT: General Electric Company
Pittsfield, MA

SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
20	957.81	20-24	3.3				Gray SILT, little very fine Sand, wet. 20.0' (957.81')
							Gray fine SAND, little medium Sand, wet. 20.3' (957.51')
21	956.81						Gray SILT, trace fine Sand, wet.
							21.9' (955.91')
22	955.81						Gray medium-coarse SAND, some fine-coarse Gravel, wet.
23	954.81						
24	953.81	24-28	4.0				24.0' (953.81')
							Gray fine-coarse SAND, little fine Gravel, wet.
25	952.81						25.0' (952.81')
							Gray SILT, wet.
26	951.81						
							26.5' (951.31')
27	950.81						Gray fine-coarse SAND, some Silt, little fine Gravel, wet.
28	949.81	28-32	2.5				28.0' (949.81')
							Gray coarse SAND and fine-coarse GRAVEL, wet.
29	948.81						
30	947.81						
							Description continued on Page 4.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/24/2000
DATE FINISHED: 10/24/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 35.5 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532965.11
EASTING: 132555.74
GROUND ELEVATION: 977.81

BORING ID: HR-G2-SB-21
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
30	947.81	28-32	2.5				Gray coarse SAND and fine-coarse GRAVEL, wet.
31	946.81						
32	945.81	32-34	N/A				32.0' (945.81')
							Light gray fine-medium SAND, trace Silt, loose.
33	944.81						
34	943.81	34-36	1.5				34.0' (943.81')
							Olive-brown fine SAND, little fine Gravel, very dense (Till).
35	942.81						
36	941.81						Boring terminated at 35.5 feet (942.31 feet)
37	940.81						
38	939.81						
39	938.81						
40	937.81						

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: AMS Power Probe

BOREHOLE DEPTH: 41 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
0	980.22	0-4	3.2				Brown fine SAND, some Silt.
1	979.22						
2	978.22						
3	977.22						
4	976.22	4-8	3.6				4.0' (976.22')
							Light-medium brown fine SAND.
5	975.22						
6	974.22						
7	973.22						
8	972.22	8-12	2.8				8.0' (972.22')
							Brown fine-medium SAND.
9	971.22						
10	970.22						
							Description continued on Page 2.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 41 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
10	970.22	8-12	2.8				Brown fine-medium SAND. 10.0' (970.22')
							Black fine SAND, some burnt wood, odor.
11	969.22						11.0' (969.22')
							Dark Gray fine-coarse SAND.
12	968.22	12-16	4.0				12.0' (968.22')
							Gray-brown fine SAND, wet.
13	967.22						
14	966.22						14.0' (966.22')
							Brown SILT and ORGANICS (Peat).
15	965.22						15.0' (965.22')
							Brown fine-medium SAND.
16	964.22	16-20	3.1				16.0' (964.22')
							Gray fine-medium SAND, some coarse Sand, wet.
17	963.22						
18	962.22						
19	961.22						
20	960.22	20-24	4.0				
							Description continued on Page 3.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 41 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
20	960.22	20-24	4.0				Gray fine-medium SAND, some coarse Sand, wet. 20.0' (960.22')
							Gray fine-medium SAND, wet.
21	959.22						
22	958.22						22.0' (958.22')
							Gray very fine SAND, compact.
23	957.22						
24	956.22	24-28	4.0				24.0' (956.22')
							Gray-brown fine-coarse SAND.
25	955.22						
26	954.22						
27	953.22						
28	952.22	28-32	3.6				
29	951.22						
30	950.22						
							Description continued on Page 4.

REMARKS:
No analytical samples collected.

DATE STARTED: 10/23/2000
DATE FINISHED: 10/23/2000
DRILLING COMPANY: BBL
DRILLING METHOD: Direct Push
BIT SIZE: 1.5 Inch X 4 Feet
RIG TYPE: Jackhammer

BOREHOLE DEPTH: 41 Feet
DESCRIPTIONS BY: Alex Marconi
NORTHING: 532954.52
EASTING: 132526.71
GROUND ELEVATION: 980.22

BORING ID: HR-G2-SB-22
CLIENT: General Electric Company
Pittsfield, MA
SITE: Housatonic River

DEPTH (ft)	ELEVATION (ft)	SAMPLE DEPTH INTERVAL (ft)	RECOVERY (ft)	SCREENING DEPTH INTERVAL (ft)	PID HEADSPACE (ppm)	SHAKE TEST	STRATIGRAPHIC DESCRIPTION
30	950.22	28-32	3.6				Gray-brown fine-coarse SAND.
31	949.22						
32	948.22	32-36	4.0				
33	947.22						
34	946.22						34.0' (946.22')
							Light gray CLAY, some Silt, little Sand and coarse Gravel.
35	945.22						
36	944.22	36-40	3.6				36.0' (944.22')
							Gray fine-coarse SAND.
37	943.22						
38	942.22						
39	941.22						
40	940.22	40-41	1.0				40.0' (940.22')
							Light gray CLAY, some fine Sand and Gravel (Till).
41	939.22						Boring terminated at 41 feet (939.22 feet)

REMARKS:
No analytical samples collected.

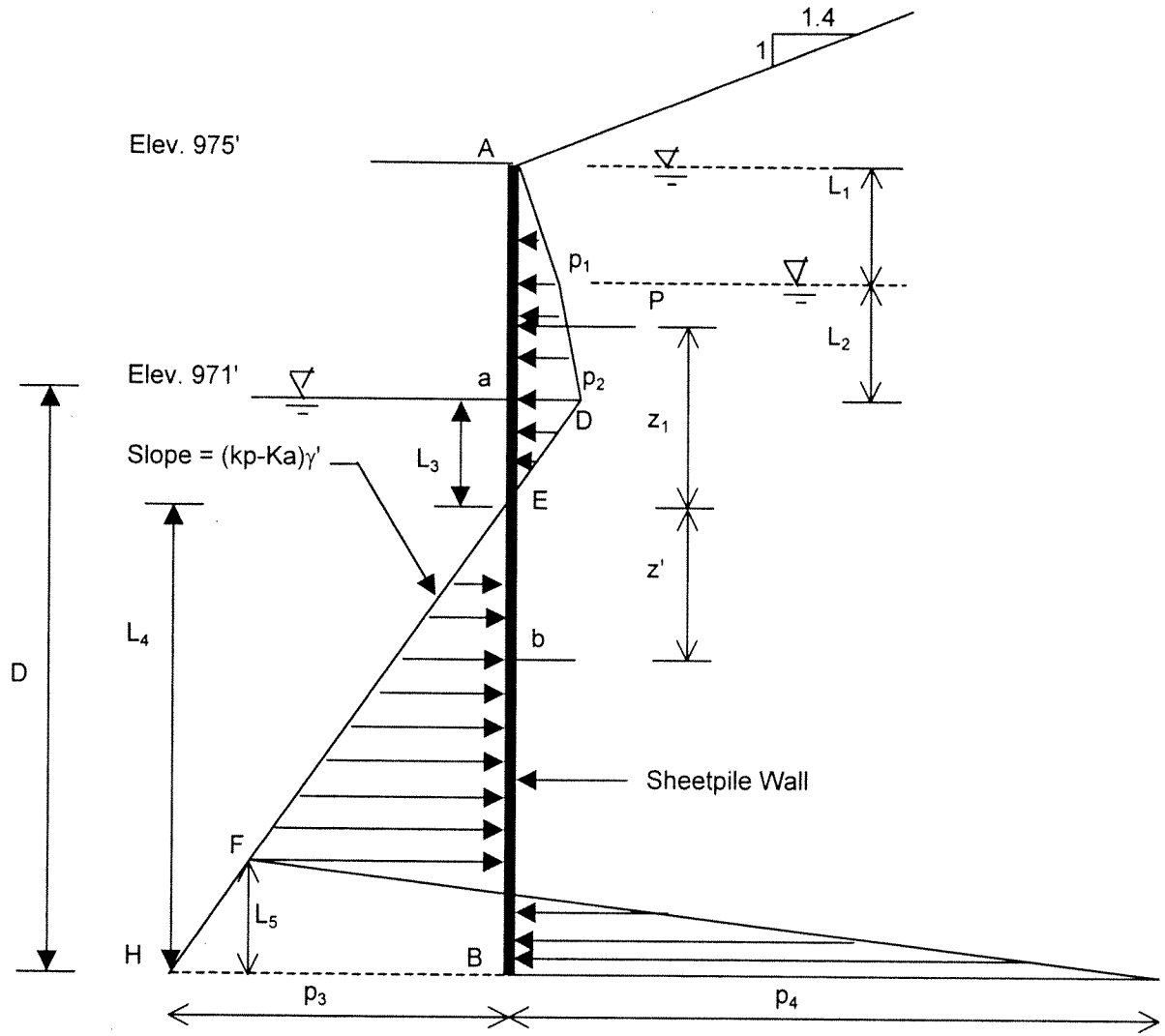


FIGURE 1 - NET PRESSURE DIAGRAM - PERMANENT CASE
(NOT TO SCALE)

Attachment C

BLASLAND, BOUCK & LEE, INC.
engineers & scientists

Summary of Groundwater Modeling

GENERAL ELECTRIC COMPANY
PITTSFIELD, MASSACHUSETTS
CELL G2 AREA SOURCE CONTROL

SUMMARY OF GROUNDWATER MODELING

Introduction

Groundwater flow modeling was utilized to evaluate the potential of water table mounding associated with a proposed sheet pile containment wall adjacent to the East Branch of the Housatonic River just southwest of Building 64W (in the Cell G2 area of the ½-mile Reach Removal Action). The same groundwater model utilized for the Building 64W Area source control sheet pile containment assessment was used for this effort with some minor modifications, which are described below.

The publicly available and well-documented Visual MODFLOW™ program was used for the groundwater modeling effort (Waterloo Hydrogeologic, Inc., 1996). Visual MODFLOW™ is a proprietary pre- and post-processing program formulated to allow quick and efficient model setup and graphical presentation of model results for the MODFLOW, MODPATH, and MT3D groundwater programs. MODFLOW is a three-dimensional groundwater flow model developed by the USGS to simulate groundwater movement (McDonald, M. G. and A.W. Harbaugh, 1988). MODPATH is a three-dimensional advective particle tracking program designed for use with MODFLOW steady-state flow simulations. MODPATH was also developed by the USGS (Pollack, D. W., 1989). MT3D is a three-dimensional solute transport program developed by S. S. Papadopolus & Associates, Inc. (Zheng, C., 1992) for use with programs such as MODFLOW that accounts for advection, dispersion, and chemical reactions. For this model application, only MODFLOW and MODPATH were applied.

Model Setup

Just as in the Building 64 Area source control modeling, the area subject to modeling extends in a north-south direction from East Street to the Housatonic River. In the east-west direction, the model extends from, and includes, the East Street Area 2 - South recharge pond westward to just east of the Buildings 63/65. Portions of the model grid (Figure 1) that extend beyond these model boundaries (i.e., south of the Housatonic River) are set as inactive and are not incorporated in the model calculations. The model grid is designed with 188 rows and 268 columns. Where the Building 64W model was comprised of 3 layers, this Cell G2 area model was comprised of 5 layers. The two additional layers were added to the model to facilitate simulating a hanging sheet pile wall to a depth of 950 feet and to account for the greater depth to till in the vicinity of the Cell G2 area.

Horizontally, the grid spacing is a uniform 5 feet in the X and Y directions. Vertically (Z direction) Model Layer 1 is 13 feet thick, Model Layer 2 is 10 feet thick, Model Layers 3 and 4 are each 5 feet thick, and Model Layer 5 is 7 feet thick (Figure 2). There is no differentiation between the different geologic deposits encountered above the till. Since the till has a substantially lower hydraulic conductivity than the overlying fill and alluvium, the top of till surface has been modeled as the impermeable base of the model. For much of the model domain, this impermeable surface is the base of Model Layer 4, which was set at an elevation of 955 feet. Because the till is deeper in the vicinity of the Cell G2 area, the base of the model is the bottom of Model Layer 5, and is set at an elevation of 948 feet. In the northern and central portion of the model domain

(where the top of till is observed at higher elevations), this impermeable till surface is the base of Model Layer 2, which was set at an elevation of 965 feet.

The input data required for the model includes stratigraphic, groundwater elevations, and hydraulic properties for each layer, estimates regarding the amount of water entering and leaving the hydrogeologic system, and the description of the model boundary conditions. Except for the model layering, the input data remained identical to that used in the Building 64W source control model. Much of this input was duplicated from the East Street Area 2 - South model and the Lyman Street model, and supplemented with data from borings and monitoring wells within the modeled area.

Based on the East Street Area 2 - South model, and site geologic logs, the top of till is a sloping surface (from north to south), with till elevations range from 940.0 feet amsl along the Housatonic River to 970 feet amsl closer to East Street. A sloping till surface was not used in this model partly due to time constraints and the lack of sensitivity to a sloping till surface that was demonstrated in the East Street Area 2 - South model. However, and as indicated above, a portion of Model Layer 3, 4, and 5 were inactivated (made impermeable) in those areas where the observed till elevation was greater than the elevation of the top of the applicable model layer.

The horizontal hydraulic conductivity for all the saturated overburden materials above the till was set to 2 x 10^{-2} cm/sec (56.7 feet/day) and the vertical hydraulic conductivity was set 10 times less. This approach and hydraulic conductivity values were the same as used in the East Street Area 2 - South model. The model boundary conditions include recharge, the Housatonic River, the recharge pond, the till, and regional groundwater flow lines.

Recharge due to precipitation was set to 10 inches per year based on the previous modeling efforts. The eastern and western model boundaries were impermeable or 'no flow' boundaries presumed to correspond with groundwater flow lines. The till also was modeled as a no flow boundary on the bottom and northern side wall of model. Constant heads were used to represent the Housatonic River with the river stage held constant at 971.6 feet amsl all along the southern edge of the model, which was the high stage value used in the Lyman Street model prepared by HSI GeoTrans (1999). Constant heads were also set along the northern model boundary in Layer 1 to allow upgradient inflow of groundwater. This line of constant heads was set at 979.5 feet amsl, generally parallel to the 980.0 foot contour shown on the April 1998 groundwater elevation contour map. The recharge pond was simulated with a lower permeability pond bottom. The elevation of the recharge pond was set to 983.0 feet amsl and the bottom of recharge pond (set as 3 feet thick) was assigned conductance values ranging from 225 feet^2/day. This conductance value is reflective of a vertical hydraulic conductivity of approximately 28.35 feet/day (1 x 10^{-2} cm/sec) applied across the area of each grid block.

Additional boundary features incorporated into the model include the existing recovery wells and the proposed sheetpile wall. The wall was set at the location shown on the site map. The wells included in the model and the pumping rates used for each well are as follows:

Well ID	Pumping Rate
64S	25 gpm
RW-1(S)	20 gpm
RW-1(X), RW-2(X), 64X(W) combined	20 gpm

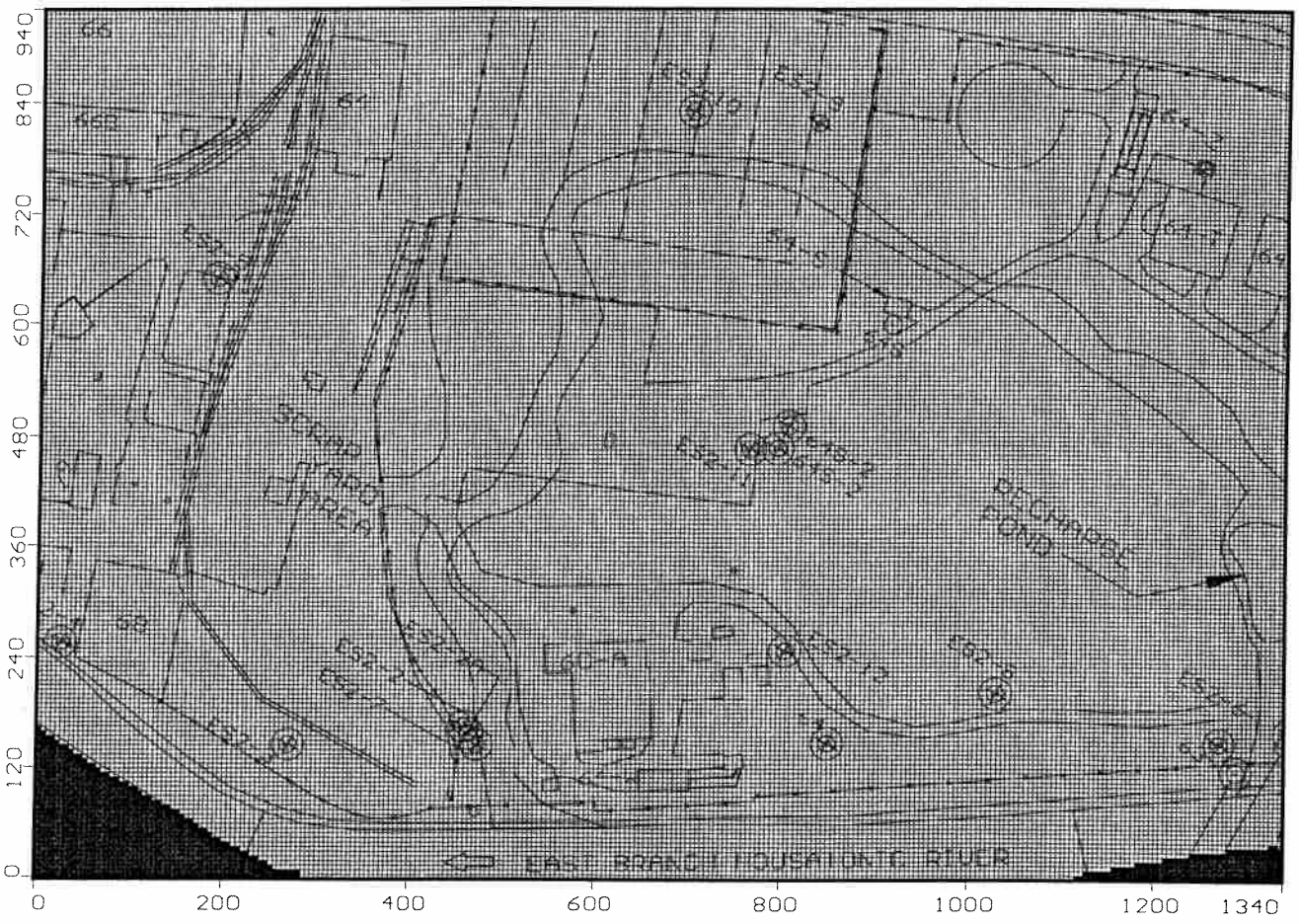
The actual pumping rates for RW-1(X), RW-2(X), 64X(W) were combined and then half that amount was input into the model (assuming symmetry) as a single well since these recovery wells are all along the models eastern boundary. Standard vertical tubular well designs were used for all the pumping wells.

The proposed sheetpile wall was incorporated with the MODFLOW wall option. The sheetpile wall was placed across Model Layers 2, 3, and 4 (Figure 2), and wing walls were incorporated (Figure 3). The width of the sheetpile wall was 0.021 feet (0.25 inches) and the hydraulic conductivity was set at 1×10^{-9} cm/sec (0.00000284 feet/day).

Calibration of the model was previously performed in association with the Building 64W modeling effort. Additional calibration was not considered necessary for this application due to the previous calibration efforts, and the similar model results.

Analysis of the mounding potential following sheetpile placement indicates that the groundwater mounding north of the sheet pile wall would be minor (mounding by approximately 0.3 feet within 20 feet of the wall) (Figure 4). As a result, groundwater recovery behind the wall does not appear to be necessary. If data collected during monitoring indicates otherwise, mounding could be controlled by pumping groundwater immediately north of the wall at a rate of approximately 10 gpm. The pre-sheetpile wall groundwater ("calibrated") contour elevations are shown on Figure 5. The post-sheet pile wall groundwater elevation contours are shown on Figure 6. The increase in the groundwater elevation (mounding) due to emplacement of the sheetpile wall is shown on Figures 4 and 7.

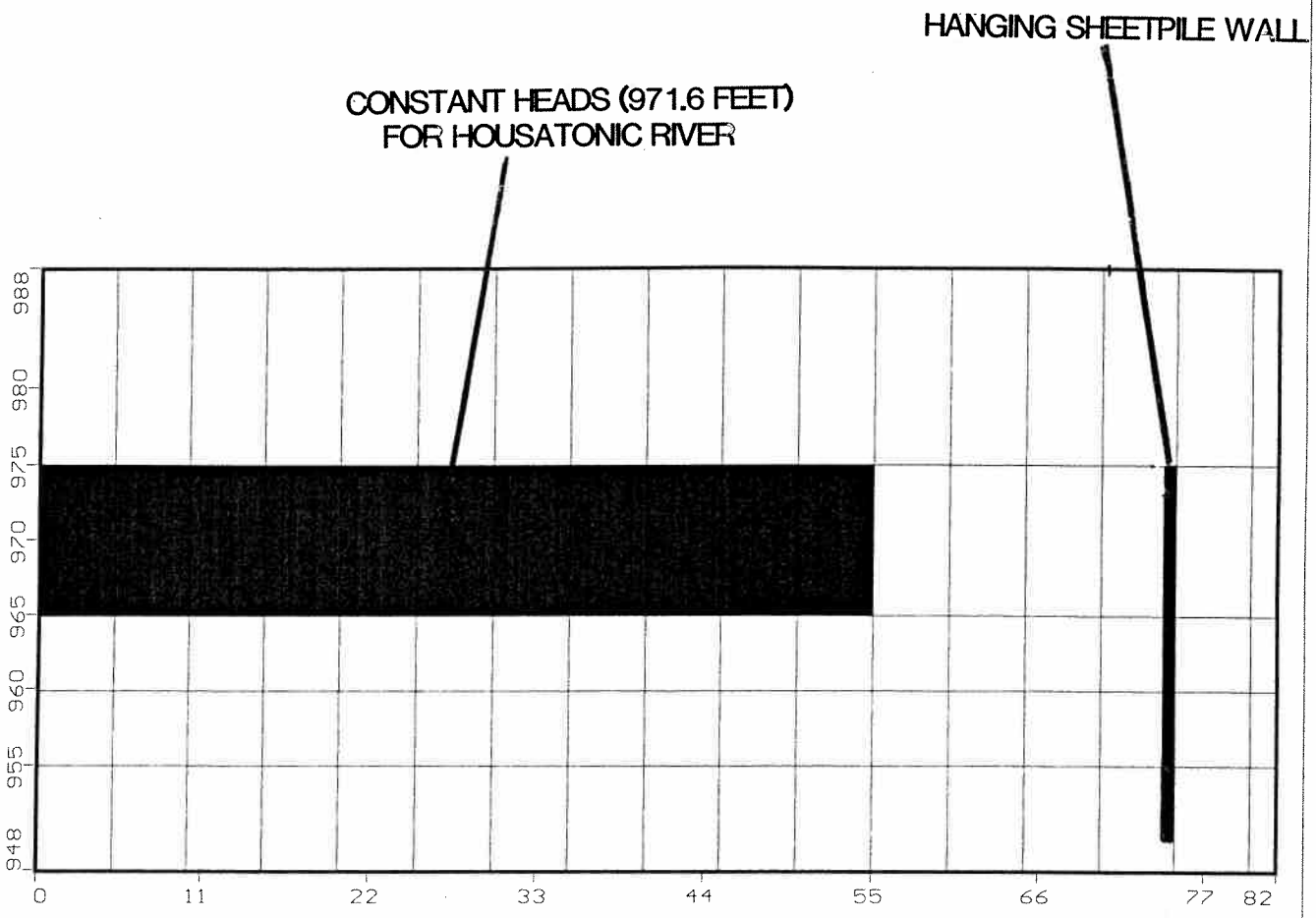
FIGURE 1 – MODEL GRID AND LATEAL EXTENTS



Blasland, Bouck & Lee, Inc.
Project: GE 1/2–Mile – Oxbow Wall
Description: Model Grid
14 Nov 00

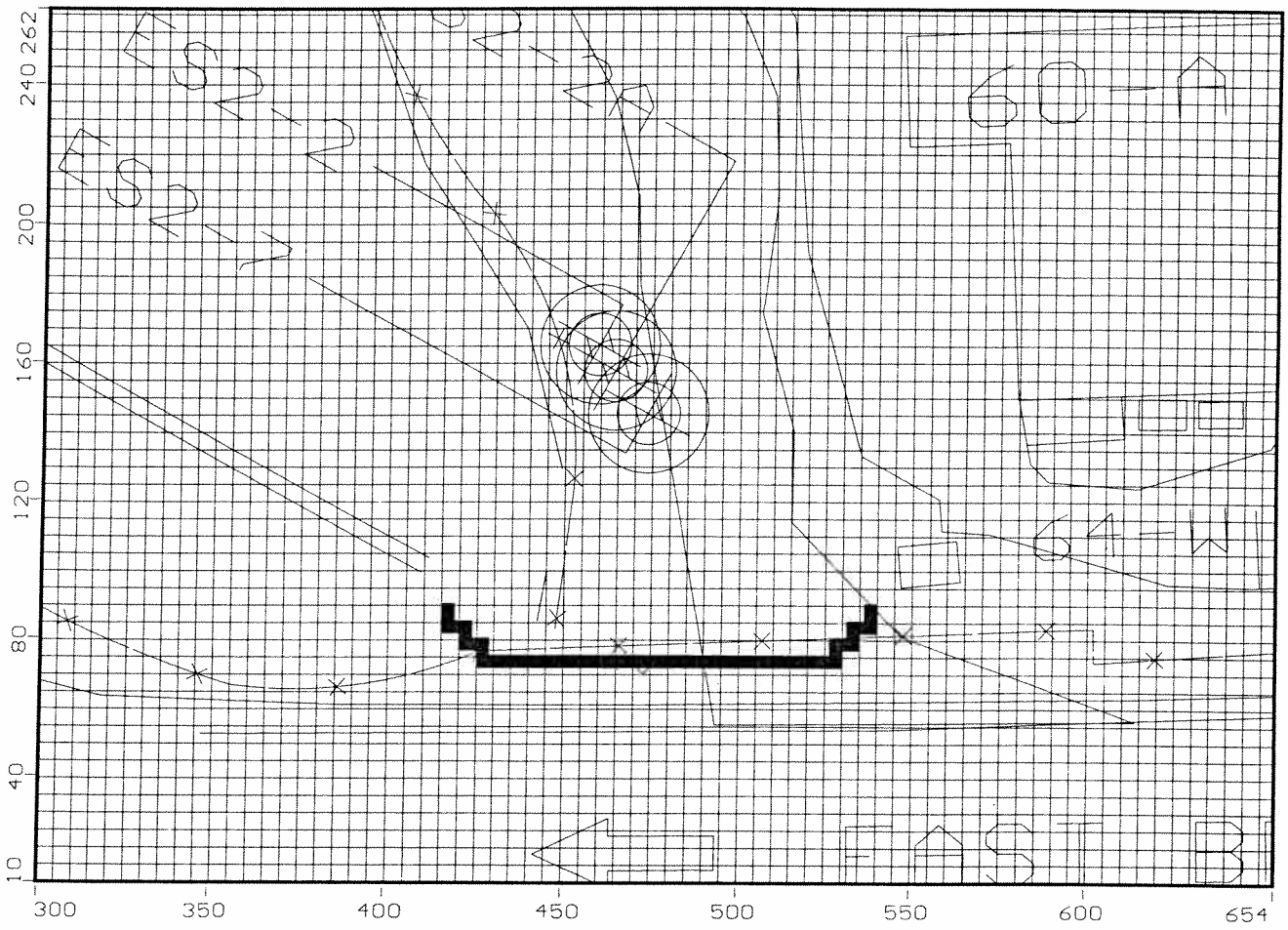
Visual MODFLOW v.2.8.2, (C) 1995–1999
Waterloo Hydrogeologic, Inc.
NC: 268 NR: 188 NL: 5
Current Layer: 1

FIGURE 2 – MODEL LAYERS AND SHEETPILE WALL



Blasland, Bouck & Lee, Inc. Project: GE 1/2–Mile – Oxbow Wall Description: Sheet Pile & River 14 Nov 00	Visual MODFLOW v.2.8.2, (C) 1995–1999 Waterloo Hydrogeologic, Inc. NC: 268 NR: 188 NL: 5 Current Column: 95

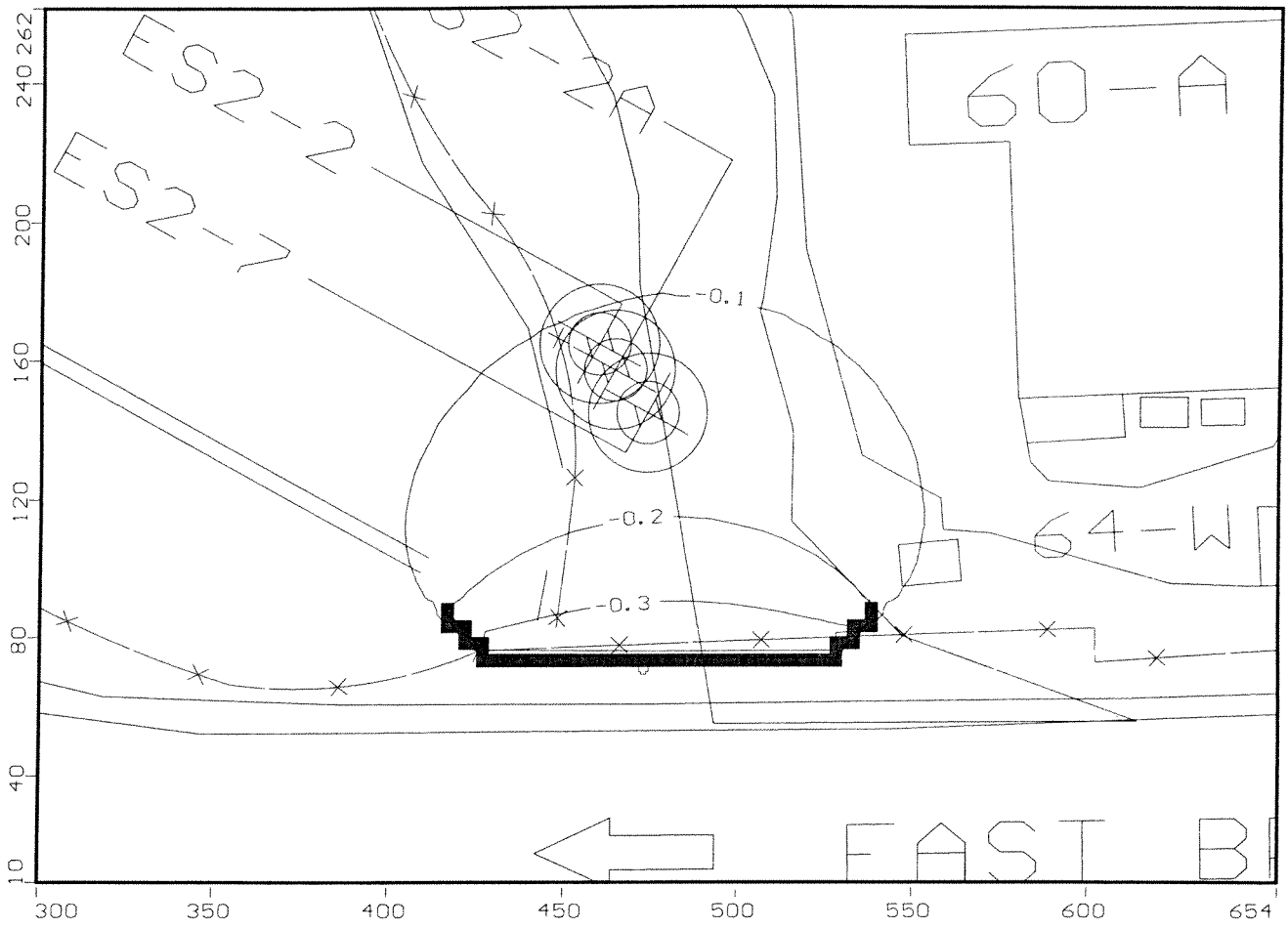
FIGURE 3 – LOCATION OF SIMULATED SHEETPILE WALL



Blasland, Bouck & Lee, Inc.
Project: GE 1/2–Mile – Oxbow Wall
Description: Simulated Sheet Pile
14 Nov 00

Visual MODFLOW v.2.8.2, (C) 1995–1999
Waterloo Hydrogeologic, Inc.
NC: 268 NR: 188 NL: 5
Current Layer: 3

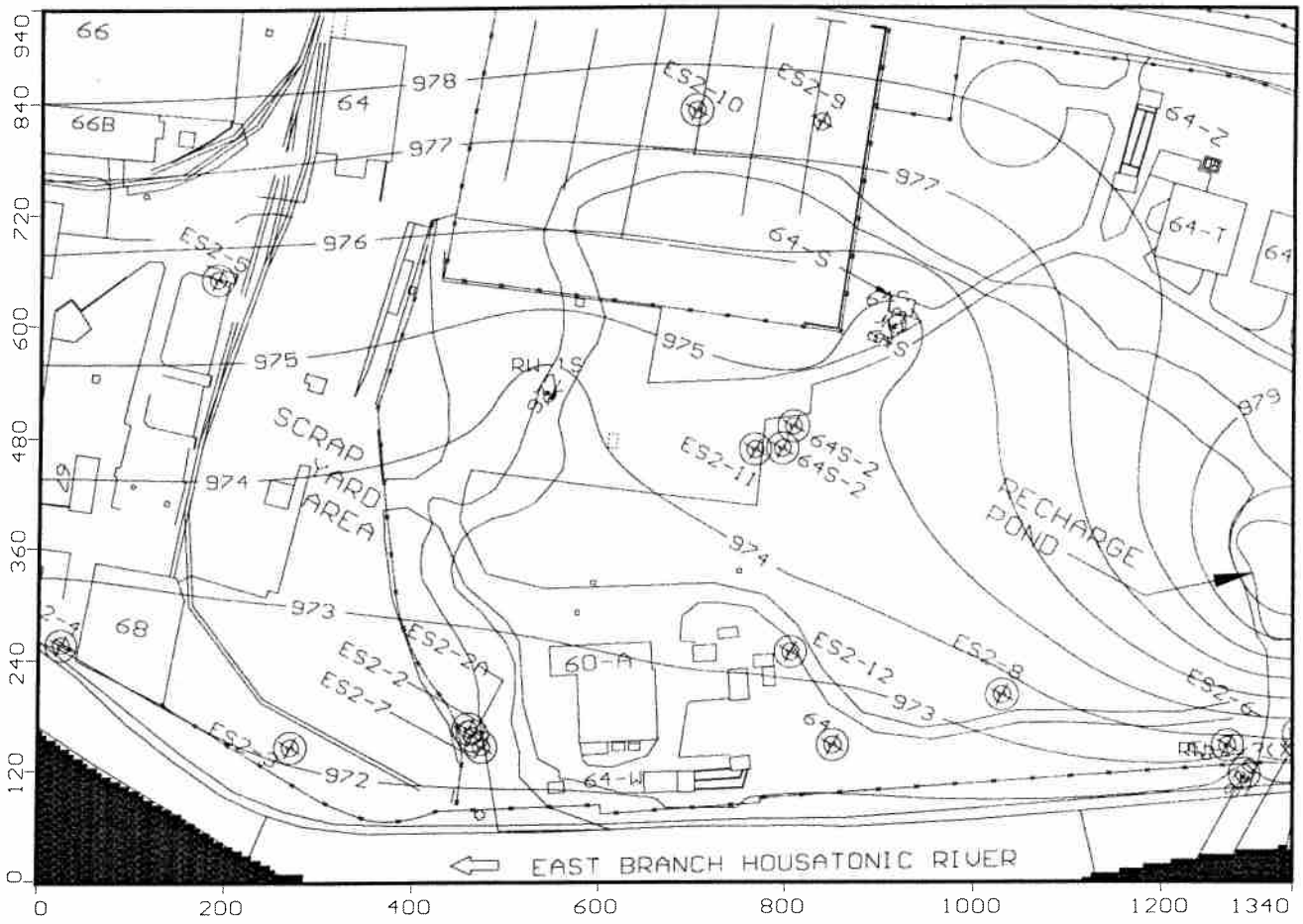
FIGURE 4 – SIMULATED GROUNDWATER MOUNDING UPGRADIENT OF SHEETPILE WALL



Blasland, Bouck & Lee, Inc.
Project: GE 1/2–Mile – Oxbow Wall
Description: Simulated GW Mounding
14 Nov 00

Visual MODFLOW v.2.8.2, (C) 1995–1999
Waterloo Hydrogeologic, Inc.
NC: 268 NR: 188 NL: 5
Current Layer: 2

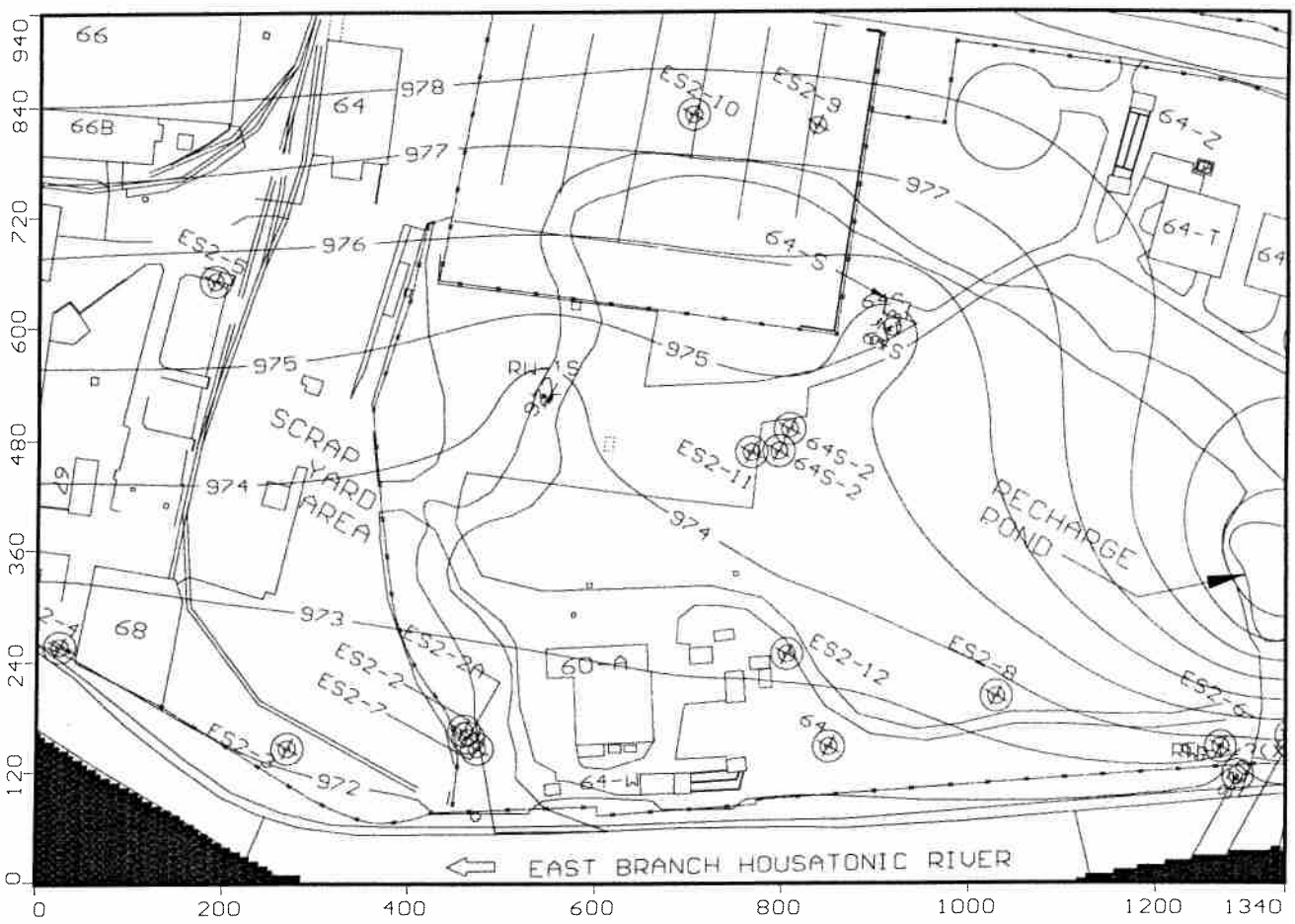
FIGURE 5 – PRE-SHEETPILE WALL GROUNDWATER ELEVATION CONTOURS (SIMULATED)



Blasland, Bouck & Lee, Inc.
Project: 1/2–Mile – Pre–Oxbow Wall
Description: Pre–Wall GW Elevations
14 Nov 00

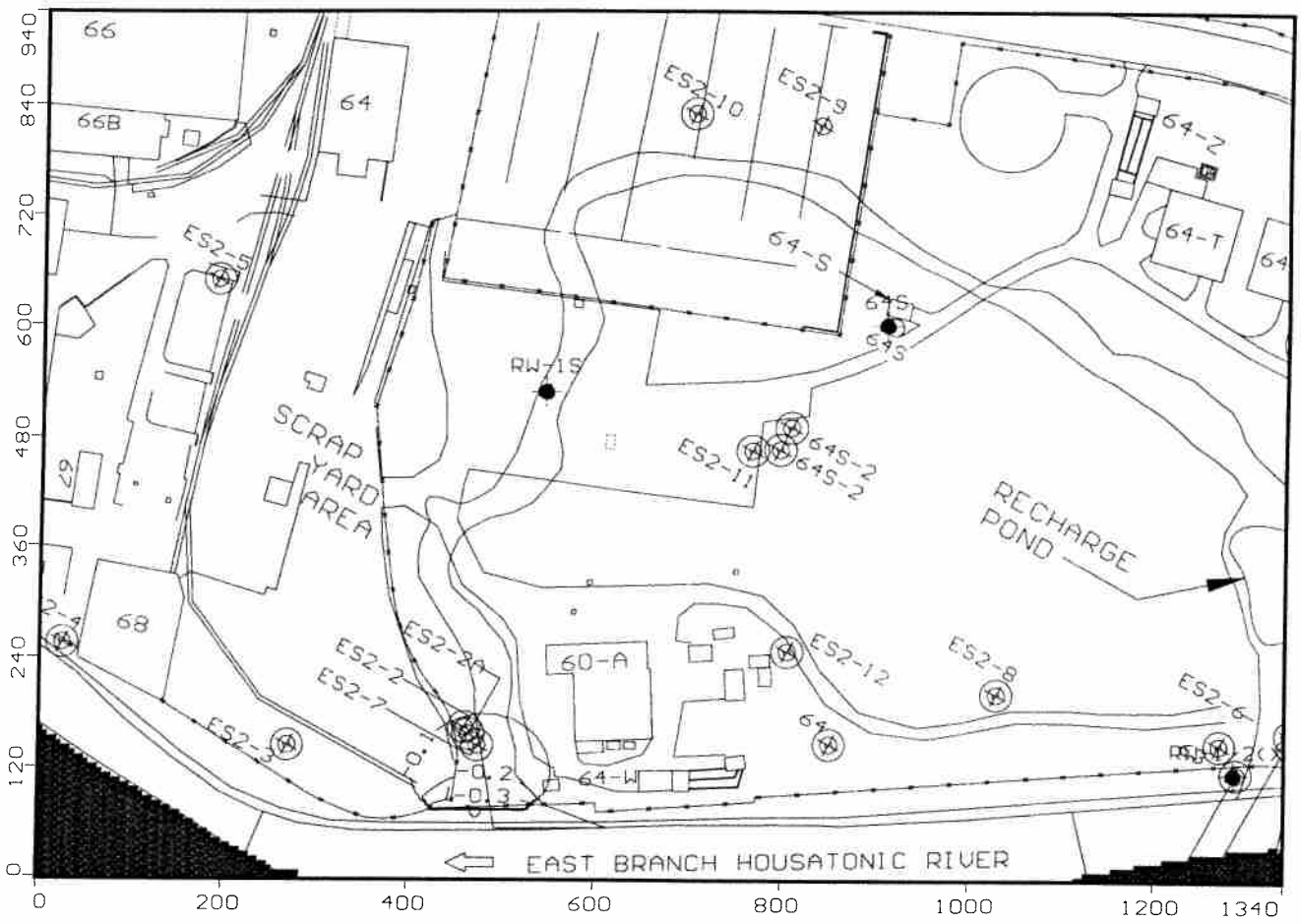
Visual MODFLOW v.2.8.2, (C) 1995–1999
Waterloo Hydrogeologic, Inc.
NC: 268 NR: 188 NL: 5
Current Layer: 2

FIGURE 6 – POST-SHEETPILE WALL GROUNDWATER ELEVATION CONTOURS (SIMULATED)



Blasland, Bouck & Lee, Inc. Project: GE 1/2-Mile – Oxbow Wall Description: Simulated GW Elevations 14 Nov 00	Visual MODFLOW v.2.8.2, (C) 1995-1999 Waterloo Hydrogeologic, Inc. NC: 268 NR: 188 NL: 5 Current Layer: 2

FIGURE 7 – SIMULATED GROUNDWATER MOUNDING UPGRADIENT OF SHEETPILE WALL



Blasland, Bouck & Lee, Inc. Project: GE 1/2–Mile – Oxbow Wall Description: Simulated GW Mounding 14 Nov 00	Visual MODFLOW v.2.8.2, (C) 1995–1999 Waterloo Hydrogeologic, Inc. NC: 268 NR: 188 NL: 5 Current Layer: 2