Table of Contents

1.0 INTRODUCTION

In February 1999, the New York State Department of Environmental Conservation (NYSDEC) contacted representatives of the former Lubricant Packaging and Supply Company, Inc., (LPS) to begin negotiations for the implementation of a Remedial Investigation and Feasibility Study (RI/FS) for the LPS property in Middletown, NY. These negotiations ended in an agreement between NYSDEC and George Saines, Inc. (GSI), owner of the LPS Site. The terms of the agreement are found in Consent Order #W3-0142-99-05, entered into on March 31, 2000 by NYSDEC and GSI. This RI Report is being submitted in accordance with the requirements of the March, 2000 Consent Order.

Consistent with past agreements between NYSDEC and LPS (Consent Order # W3-0142-86-09, dated February 20, 1991), a Phase II Investigation was conducted from 1992 to 1993 to identify the nature and extent of volatile organic compounds (VOC) in soil and ground water beneath the site. Since 1987, NYSDEC classified the LPS parcel as an inactive hazardous waste site requiring additional study to determine its level of contamination (classification: "2a"). The Phase II Investigation Report, submitted to NYSDEC in November, 1994, documented the presence of 1,1,1 trichloroethane (TCA) in site soils and ground water above NYSDEC's permissible standards. Based on the Phase II Report information, NYSDEC re-classified the Lubricant Packaging Site in June of 1995 from a "2a" classification to a "2", defined as an inactive hazardous waste site requiring remedial action (due to the presence of significant threats to public health or the environment). In a December 29, 1995 letter to NYSDEC, LPS questioned the conclusions leading to the re-classification of the site, as well as noting minor factual errors in the Department's Inactive Hazardous Waste Disposal Report. NYSDEC responded in a February 6, 1996 letter stating that despite minor errors in its records, re-classification of the LPS property to a category 2 site was justified.

Although the Phase II report, submitted to NYSDEC in November, 1994, describes the nature and extent of VOC contamination at the LPS Site, NYSDEC personnel, in accordance with New York's superfund regulations, required additional work to be performed which could *more fully* define the nature and extent of contamination at the LPS Site. The additional information required by NYSDEC is supplied in this Remedial Investigation (RI) Report. United States Environmental Protection Agency (USEPA) and NYSDEC protocols (with respect to sample collection, handling and chemical analysis) were observed throughout the RI. A Health and Safety Plan, under which work was performed for this investigation, was provided to NYSDEC prior to the submission of an RI Work Plan in April, 2002.

The RI/FS Order calls for: 1) The preparation of an RI/FS Work Plan; 2) The implementation and reporting of the Remedial Investigation; 3) The completion of a Feasibility Study; 4) If required, the implementation of Interim Remedial Measures; 5) Periodic Progress Reports; and 6) Departmental reviews of submittals by the Respondent (GSI). The Order also specifies penalties, site entrance requirements, payment of state costs, NYSDEC reservation of rights and indemnification, public notice, communication instructions and miscellaneous

NYSDEC rights and Respondent responsibilities and requirements. GSI has thus far complied with the provisions of the Order as specified in items 1, 2 and 5 above. An RI Work Plan was last revised and approved by NYSDEC in April, 2001; field work commenced shortly thereafter for the Remedial Investigation. Monthly Progress Reports have been submitted to NYSDEC documenting ongoing RI work. This document reports the findings of the Remedial Investigation and prepares the ground work for the Feasibility Study for the LPS Site.

The goal of the Remedial Investigation was to more fully define the nature and extent of contamination at the LPS Site. This general goal was refined to specific tasks enumerated in the scope of work presented in the April, 2001 RI Work Plan. These specific RI tasks are discussed in more detail in the following chapters. In summary, the RI Scope of Work required the following tasks to be performed:

1. Investigate and screen remedial technologies which may be applied to the site following the implementation of the RI and FS.

2. Conduct interviews with past employees of LPS to help narrow the search for the source/sources of contamination at the site.

3. Contact adjacent property owners to attempt to obtain access to their property, data and/or coordinate data sharing. At a minimum, the Risdon Corporation (formerly Guild Molders) & the General Switch Corporation (Zenith Auto Parts Corp.) would be contacted.

4. Perform an exposure assessment to determine the possible contaminant pathways of 1,1,1 trichloroethane (TCA) to human and animal receptors in the area surrounding the LPS Site.

5. Install one additional monitoring well, screened in an horizon 10 to 20 feet beneath the underlying bedrock surface.

6. Design and implement an RI sampling plan. The plan would have the capability of further defining the horizontal and vertical extent of 1,1,1 TCA contamination in the subsurface as well as determine if TCA contamination is detectable in the stream nearest to the LPS property. The sampling plan would include soil, soil gas, stream and sediment sampling.

7. Collect ground water samples from the existing four monitoring wells and the newly installed bedrock monitoring well.

8. Conduct aquifer characterization tests on the new and existing monitoring wells at LPS.

9. Digitize the site map and past analytical data in order to facilitate the illustration of analytical results in the RI report.

10. Evaluate field and laboratory data.

11. Prepare and submit the RI Report .

This RI Report incorporates the work enumerated above on behalf of GSI, owner of the LPS property. Therefore, this RI Report partially satisfies the March 31, 2000 RI/FS Consent Order agreement with NYSDEC. Supporting documents and information may be found in the LPS Phase II Investigation Report or in the Appendices of this report.

2.0 BACKGROUND

2.1 SITE LOCATION AND DESCRIPTION

The Lubricant Packaging Site is located in an industrial park just off of Highland Avenue Extension, on a northern border between the City of Middletown and the Town of Wallkill. The industrial park is easily accessible to commercial traffic from State Route 17M/302 which crosses Highland Avenue Extension approximately ½ mile from the park, (see Figure 1, LPS Site Location Map, Appendix A). Figure 2, an LPS Site Survey Map (Appendix A), illustrates the location of the LPS property along Industrial Place, the only road which services the industrial park. Other companies using facilities within the industrial park are/were General Switch (now occupied by Zenith Auto Parts Corp.), Orange and Rockland Electric Utility (Electrical Substation), Guild Molders, Inc. (now called Risdon AMS, A Crown Cork & Seal Company), a former U.S. Army Storage Depot, Wallace Oil Company and Orange County Corrugated (now called the National Packaging Company - NPC).

The LPS Site is approximately 1 acre in size. The original building, which was used for LPS business until 1987, is a one-story cinder block warehouse and office building. In 1978, a two-story metal fabrication warehouse building was added to the southwest side of the original facility. It is distinguished from the original building by the greater width dimension it displays on site maps. The total building occupies approximately 7000 square feet of the total property.

The LPS property generally decreases in elevation from north to south (see Figure 2 & 3 for surface elevation information). The southern portion of the property is nearly flat; all adjacent areas to the west, south and east of this level ground also share the same topography. This flat area was once part of a large railroad marshaling, repair and coal depot facility in Middletown. The operation has currently shrunk to one infrequently used track (see Figure 1). The surface soils in the southern portion the of property and adjacent areas reflect past railroad activity by its black, cinder-rich appearance. Additional site description information is presented in the 1994 Phase II Site Investigation Report, which includes regional, local and site specific maps.

2.2 SITE HISTORY

Prior to the establishment of an industrial park and a lubrication business at 17 Industrial Place, a significant portion of the Lubricant Packaging property was utilized as a railroad repair and supply yard as well as a coal depot. Proof of these past activities is supported by three lines of evidence: 1) The cinder composition of topsoil on the southern portion of the site and adjoining properties along with the proximity of the property to an active railroad line; 2) Accounts of railroad activity by Middletown residents familiar with the area; 3) Photographs and maps available at the Middletown Historical Society. Additional evidence was discovered on The Bedrock Geology of the Goshen-Greenwood Lake Area, NY Map (Offield, 1967). This map also contains topographic and cultural features and is based on aerial photography from 1942, with cultural revisions by the Geologic Survey in 1954. A copy of a portion of this map can be found in the 1994 Phase II Site Investigation Report, Figure 6.

From an examination of photographs, maps, and topsoil conditions on the northeastern portion of the property, it appears that this portion of the LPS parcel was not utilized in any significant fashion by railroad activities. The sharp topographic rise and presence of a bedrock ledge at ground surface near this portion of the property supports this conclusion. Industrial activity at this site prior to the railroad era was unlikely based on data at the Historical Society. The date of abandonment of the railroad yard and coal stockpile areas (located to the southwest of the site) is not exactly known, although it is estimated to have taken place between 1954 and 1962.

Discussion with various offices of the City of Middletown did not yield a date for the construction and development of a road into this portion of the Northern Middletown Industrial Park (i.e. Industrial Place). However, the establishment of manufacturing facilities along Industrial Place suggests modern industrial development of this land began in the late 1950's. The General Switch facility, built in 1958, was one of the first businesses established along Industrial Place. The Lubricant Packaging Site was developed in 1962 when Thomas Freeborn and his business partner (name unknown) established F&W Bearing Service.

The primary business activity of F&W Bearing, at that time, was the de-greasing and re-lubrication of metal ball bearings sent to the facility by a variety of industrial concerns. Most of the de-greasing was accomplished by tumbling bearings in a bath of mineral spirits. However, some limited use of the solvent 1,1,1 Trichloroethane (TCA) was necessary for specific greases. Fresh de-greasing solvents were received either by drum or off-loaded from tanker trucks into bulk storage tanks behind the LPS building. Spent solvents were stored in drums and shipped to solvent recycling companies by truck. Solvent recycling companies also picked-up spent solvent with their own tanker trucks.

A secondary activity of the company was the packaging of lubricants for a variety of uses and clientele. With time, the packaging of lubricants grew in importance for the F&W Bearing Service. In 1972, the F&W Bearing Service was sold by Thomas Freeborn, who was then sole proprietor of the firm, and its name was changed to Lubricant Packaging and Supply Company, Inc., shortly after the purchase. The new name reflected the dominance of lubricant sales and packaging by the firm with respect to servicing bearings. Following the new ownership, the volume of business at Lubricant Packaging expanded to the point where additional warehouse space was added to the existing building in order to store lubricant products. From the late 1970's until early 1987, outdoor storage of drummed products became a common practice at the site. To accommodate a growing inventory, Lubricant Packaging bought a larger warehouse and storage facility on Wisner Avenue in Middletown in 1986.

In December of 1986, the sale of Lubricant Packaging and Supply Company, Inc., was completed to SOS Fuels, Inc., with its bearing, packaging, and lubricant supply business. At the time of the sale, Lubricant Packaging and Supply Company, Inc., was moving its principal place of operation from 17 Industrial Place to a facility at 75 Wisner Avenue in Middletown. Both properties served as warehousing facilities for Lubricant Packaging and Supply Company, Inc., before and after the ownership transfer of the company to SOS Fuels, Inc., in December, 1986. SOS Fuels bought the Wisner Avenue LPS Property, but did not purchase the LPS property at 17 Industrial Place.

In February of 1987, while organizing sold and unsold inventory at the 17 Industrial Place property, a NYSDEC inspection of the Lubricant Packaging Site alleged that "several hundred drums of hazardous waste and some storage tanks of listed hazardous wastes were identified as being stored on-site without proper TSD permits..." The waste oil drums, among which contained spent de-greasing solvents, were removed from the site shortly after the inspection. This action met all the terms of a consent agreement between NYSDEC and Lubricant Packaging, dated February 20, 1991. The issue of oil and solvent spillage during the use and storage of these materials at the Lubricant Packaging Site was the topic of a Phase II Site Investigation between 1992 and 1993. In November, 1994, a Phase II Site Investigation Report was submitted to NYSDEC.

Since 1987, the LPS Industrial Place building has been leased to several businesses, most of which have manufactured medical supplies and devices. No outside storage of supplies or chemicals has occurred since 1987. Currently, the building is being leased by TRI/BOR Medical, Inc., a manufacturer of medical supplies.

2.3 LOCAL GEOLOGY / HYYDROGEOLOGY

According to regional bedrock maps and field work done at and adjacent to the LPS Site, the LPS property is underlain by the Austin Glen Grit and Shale member of the Normanskill Shale. The LPS Site is located in the middle/upper section of this unit, composed of massive dirty sandstones, siltstones or graywackes and thinly bedded shales. A bedrock outcrop approximately 200 feet northeast of the LPS property was studied to compare local lithology and structure with published reports: measurement and observation of the bedrock outcrop match these reports well. See Figures 3 through 18 in the November, 1994 Phase II Site Investigation Report for reference.

Rock cores recovered from drilling activities on the General Switch Site, across the road from the LPS property on Industrial Place Extension, indicate that near surface bedrock consists of alternating thin layers of shale and siltstone. A top of bedrock contour map for the Lubricant Packaging and General Switch Sites was included in the Phase II Site Investigation Report. The orientation of bedrock fracturing in the vicinity of the LPS and General Switch Sites is consistent with local bedrock structure. Primary fracturing roughly parallel to strike was observed at the sandstone outcrop just northeast of the LPS property. However, a secondary set of fractures trending roughly southeast to northwest, perpendicular to strike, were also noted, again consistent with the structural history of the area. Bedrock fracture zones may influence, to a high degree, ground water flow characteristics in the vicinity of the General Switch and LPS Sites.

Above local bedrock at the LPS Site rests an assortment of surficial materials with a variety of sources. As noted in more detailed discussions of geology in the Phase II Site Investigation Report, the LPS Site at one time was covered with glacially re-worked materials derived from regional bedrock. All of the surficial materials on the LPS property, with the possible exception of its extreme northeastern corner, have been disturbed due to building construction and/or past railroad activities. Up to 8' of fill has been noted in borings and test pits on the southern and eastern portion of the site and shallow to nonexistent soil profiles exist on the northern portion of the property, closest to the bedrock outcrop. In general, once the fill has been penetrated or uncovered, the soil material or rock generally match the description of regional till and/or bedrock. Fill material on the site generally consists of crushed shale, re-worked glacial till, coal cinders and demolition/construction debris (i.e. broken brick, ceramic tile and concrete). The southern and eastern portions of the site appear to have been topographically lower (by several feet) in the recent past. Railroad activities may have required the systematic filling of low-lying or wet areas with cinders and construction debris. The LPS Site and surrounding industrial park may have once resembled the wetland area now present on the General Switch property or the seasonal wetland east of the railroad tracks and just north of the LPS parcel.

Surface water, in the form of natural perennial streams or ponds, is not present on or directly adjacent to the Lubricant Packaging Site. However, two minor hydrogeologic features do exist in relatively close proximity to the LPS Site: (1) A small, seasonal wetland area across Industrial Place Extension from the LPS building on General Switch Property and; (2) A modified, intermittent wetland and unnamed stream channel located east of the existing railroad track line, A fold-up Northern Middletown Industrial Park Map is included with this report and illustrates this latter feature in yellow ink. All surface and ground water flow from the Northern Middletown Industrial Park eventually empties into this unnamed tributary to Monhagen Brook, which then empties into the Wallkill River, the region's major river. Former City of Middletown employees indicated the unnamed stream identified above is locally called Draper Run; where necessary in the text of this report or on associated maps, the Draper Run name will be used to describe this surface water feature.

The headwaters of Draper Run start a few hundred feet to the north and east of the LPS Site. Along the eastern side of the Norfolk Southern Railroad line, a modified seasonal wetland area exists. Although dry most of the year, when the wetland contains sufficient standing water during the rainy season of the year, surface water flow has been observed to take place through a modified channel paralleling the railroad track. The channel extends to a subsurface culvert system behind the Risdon Corporation property. From that point to Wisner Avenue, approximately one half mile southwest of the culvert, the subsurface course of Draper Run is hidden from view and is unmapped. City of Middletown employees indicated that Draper Run was channelized and buried as a result of railroad activities in the distant past. They state that several subsurface branches are likely to exist beneath the industrial park area. Draper Run briefly "daylights" as it passes under Wisner Avenue, where year round flow is normally observed. Up gradient sediment and down gradient stream water samples were obtained from Draper Run during the RI. Sample locations and results are reported and discussed in chapter 4 of this report.

Rapid infiltration of local runoff and rain water in the industrial park is commonly observed since the railroad yard soils, at least near the surface, are composed largely of highly porous coal slag, cinders and construction materials. The sloped terrain around the perimeter of the old railroad yard, which contributes surface runoff to the industrial park basin, is draped in low permeability soils derived from glacial till. Therefore, the central portion of the industrial park area is suspected to be an area of significant recharge to shallow ground water. Discharge of shallow ground water to Draper Run and its subsurface collection channels is thought to be the preferred flow route for local ground water. Since Draper Run appears to be a local discharge zone for ground water, deeper recharge to the underlying till and bedrock is less likely to take place.

Ground water and surface water flows from the *northwest of the industrial park area to the south and east,* roughly parallel to the existing railroad track line. Ground water flow direction was established during the Phase II Site Investigation. Static ground water level contour maps for the General Switch Site also exhibit a flow direction which is consistently to the south. Careful analysis of topography down gradient, or south, of the General Switch and LPS Sites suggests that ground water elevations will continue to drop slowly in a south/southwesterly direction. Ground-water flow direction should roughly parallel the south trending Norfolk Southern Railroad track across Wisner Avenue, across State Route 211 to the vicinity of Houston Avenue in Middletown. This projected analysis of ground water flow was illustrated in Figure 18 of the Phase II Site Investigation Report. A more detailed discussion of regional and local geology, surface and ground water flow, and the hydraulic properties of local geologic materials are contained in chapters 3 and 4 of the 1994 Phase II Site Investigation Report.

3.0 SCOPE OF WORK

A listing of remedial investigation tasks to be performed during the RI were developed in the April, 2001 RI Work Plan and are listed below:

1. Investigate and screen remedial technologies which may be applied to the site following the implementation of the RI and FS.

2. Conduct interviews with past employees of LPS to help narrow the search for the source/sources of contamination at the site.

3. Contact adjacent property owners to attempt to obtain access to their property, data and/or coordinate data sharing. At a minimum, the Risdon Corporation (formerly Guild Molders) & the General Switch Corporation (Zenith Auto Parts Corp.) would be contacted.

4. Perform an exposure assessment to determine the possible contaminant pathways of 1,1,1 trichloroethane (TCA) to human and animal receptors in the area surrounding the LPS Site.

5. Install one additional monitoring well, screened in an horizon 10 to 20 feet beneath the underlying bedrock surface.

6. Design and implement an RI sampling plan. The plan would have the capability of further defining the horizontal and vertical extent of 1,1,1 TCA contamination in the subsurface as well as determine if TCA contamination is detectable in the stream nearest to the LPS property. The sampling plan would include soil, soil gas, stream and sediment sampling.

7. Collect ground water samples from the existing four monitoring wells and the newly installed bedrock monitoring well.

8. Conduct aquifer characterization tests on the new and existing monitoring wells at LPS.

9. Digitize the site map and past analytical data in order to facilitate the illustration of analytical results in the RI report.

10. Evaluate field and laboratory data.

11. Prepare and submit the RI Report .

The above tasks were completed from April, 2001 to June, 2002 as per the Schedule of Completion of RI Tasks contained in Appendix J of the RI Work Plan. The following subsections of this chapter summarize the results obtained from the completion of these tasks.

3.1 REMEDIAL TECHNOLOGY PRIORITIZATION

A preliminary list of remedial technologies was prepared, summarized and submitted to NYSDEC for review prior to the implementation of the RI program. This Remedial Technology Prioritization Report was submitted to NYSDEC as part of the Monthly RI Progress Reports. The technology review guided the RI by highlighting data collection needs during field work for this report. For example, dissolved oxygen (DO) and redox values were collected during ground water sample collection to determine the oxidation state of contaminated ground water beneath the LPS Site. This information will help determine the suitability of remedial technologies selected for LPS clean-up in the future. The Remedial Technology Prioritization Report is included in Appendix C of this report.

3.2 EMPLOYEE INTERVIEW

One insufficiently documented aspect of LPS Site history during the Phase II Investigation was the collection of personal knowledge of day to day business activities from past LPS employees. While this author was an intermittent, part-time employee at LPS from 1973 to 1981, other employees had a more comprehensive and objective experience of daily business activities at this site. A questionnaire was mailed to six past employees of LPS whose work experience would have allowed them to be familiar with product and waste handling practices used at the LPS Site. It was surmised that any unknown historical practices or events relating to the mishandling or spillage of hazardous substances to the soils or subsurface of LPS could be discovered in this way. Specific information discovered would have been used to help narrow the focus of subsurface investigation activities. A copy of the questionnaire was submitted to NYSDEC with a Monthly RI Progress Report. The responses from three past employees to the Questionnaire are contained in Appendix D of this report. No new details of any spills or waste handling practices were discovered from Questionnaire responses.

3.3 ADJACENT PROPERTY OWNER CONTACT

In the past, LPS representatives informed the former General Switch Corporation and the current Risdon Corporation of the environmental investigation activities occurring on the LPS parcel. Plentiful public information (via NYSDEC files) on soil and ground water contamination and clean-up efforts at the General Switch Site were reviewed and discussed in the 1994 Phase II Site Investigation Report. During the RI, it was hoped that any past geotechnical investigations on these properties which were not contained in NYSDEC files could become available to LPS. Access to these adjacent properties was also sought in order to collect additional information concerning the concentration and extent of TCA contamination migrating from the LPS property. Other industrial park properties and nearby property owners were also contacted during the RI to inform them of the environmental work proceeding at the LPS property and the possibility of ground water contamination resulting from past practices at the site.

During the RI, LPS was granted access to specific General Switch monitoring wells (GMW-6 and GMW-9, see Figure 2) in order to ascertain ground water conditions up gradient from the LPS property. Contact with Risdon was also successful, but no property access or environmental information sharing agreements were achieved. Norfolk Southern Railroad also responded to LPS requests for property access (trespass). Letters and phone calls did not yield responses from owners/realtors selling parcels in or adjacent to the Northern Middletown Industrial Park. The owners of parcels containing the Draper Run stream channel were also contacted (including the Industrial Development Commission for the City of Middletown), but no responses were ever received. Sediment and surface water samples were collected along Draper Run without formal permission granted from the landowners. Typical letters sent to area property owners are included in Appendix E of this report.

3.4 EXPOSURE ASSESSMENT

A qualitative exposure assessment report discussing possible contaminant pathways of trichloroethane (TCA) to human and animal receptors was submitted to NYSDEC with a Monthly RI Progress Report. It is included in Appendix F of this report for reference purposes. This report includes information on the occurrence of public and private water wells within the vicinity of the LPS building, the industrial park's potable water, the location and likelihood of soil and ground water contamination exposure to human and environmental receptors on the LPS Site, and the location of property fencing. *Following the submission of this RI report in June, 2002, a map of private water supplies within a one mile radius of the LPS property was submitted to NYSDEC in July, 2002. This map identified private water supply wells to the north of the Northern Middletown Industrial Park. All other areas within the one mile radius are believed to be serviced by water from the city of Middletown or the town of Wallkill. The map also notes that private water supply wells still "exist" in the Washington Heights section of Middletown which pre-date public water supply service work completed by General Switch during its environmental investigations two decades ago. However, according to several residents in the area, if the wells still exist or are in use, they are not operated for potable uses.*

3.5 ADDITIONAL BEDROCK MONITORING WELL INSTALLATION

During the RI, one additional monitoring well was installed to evaluate the presence of TCA in bedrock beneath the LPS property. Kendrick Drilling of Chester, NY drilled the bedrock well on August 31, 2001. The well was screened in a competent bedrock horizon 10 feet beneath the top of competent bedrock at a location adjacent to the current LPS monitoring well *LMW-1*. Appendix G contains a copy of the well log and construction details for the new bedrock monitoring well, identified as LMW-5. The location of the new bedrock monitoring well is illustrated on site maps included with this RI.

3.6 SAMPLING PROGRAM

The major thrust of this RI program was the implementation of a detailed sampling plan which would have the capability of defining the horizontal and vertical extent of 1,1,1 TCA soil contamination at the LPS Site. The soil sampling program achieved this objective using Miller Environmental Group of Newburgh, NY on July 3, 2001. Miller's Geoprobe equipment obtained 18 subsurface soil samples at discrete depths beneath the LPS Site. The samples were collected and screened, using a Photoionization detector sensitive to TCA and other common VOC contaminants. Following the initial VOC screening, representative soil samples were collected using the techniques and protocols outlined in the Soil Sampling Plan included in the April, 2001 RI Work Plan. The soil samples were then sent to ChemTech Laboratories in Mountainside, NJ for VOC analysis (using USEPA method 8260B). Eighteen subsurface soil samples were collected from fourteen sampling locations during the RI using Geoprobe sampling technology. In addition, one surface water and two sediment samples were also obtained from the nearby intermittent stream (Draper Run) to determine whether contamination is detectable off site. The sampling program allowed a more detailed analysis of the vertical and areal extent of contamination in subsurface unconsolidated materials. Fourteen Geoprobe Logs, six soil test pit logs and five monitoring well logs were used to construct numerous cross sections illustrating subsurface soil conditions at the LPS Site. Appendix H contains Geoprobe, monitoring well and test pit logs; Appendix I contains the cross sectional analysis of the subsurface data on and adjacent to the site. The data collected is sufficiently detailed to allow future quantification of soil volumes to be remediated, if necessary, as well as display subsurface soil profile elevations.

The omission of one RI Work Plan task is recognized here - the collection and analysis of soil gas samples around the perimeter of the LPS building. According to the RI Work Plan, "Up to 10 soil gas samples will be obtained for submission to NYSDOH (using USEPA method TO-14)." This task was omitted due to the significantly increased costs of completing this task compared to the original cost projections supplied to GSI. It should be noted that soil gas sampling and analysis was not included in the RI Work Plan outline attached to the RI/FS Consent Order. Soil gas sampling was added to the RI Work Plan following a NYSDOH review of the Work Plan. A smaller number of soil gas samples and/or analysis of the LPS building's ambient air was proposed by GSI once cost estimates were obtained for the NYSDOH amendment to the Work Plan. However, no compromise with NYSDOH was achieved prior to the commencement of RI field work.

3.7 GROUND WATER SAMPLING EVENT

The RI program also collected ground water samples from the new bedrock monitoring well (LMW-5), the four existing monitoring wells at the LPS Site, and one shallow bedrock monitoring well on the General Switch Site. Ground water samples were submitted to ChemTech Laboratories of Mountainside, NJ for VOC analysis using USEPA method 8260. Ground water elevation data as well as in-situ measurements of pH, dissolved oxygen, conductivity, oxidation/reduction potential and temperature were also collected during the sampling event. Ground water samples were collected according to the protocols outlined in the Ground Water Sampling and Analysis Plan, included in the April, 2001 RI Work Plan.

3.8 HYDROGEOLOGIC CHARACTERIZATION

Aquifer characterization (slug) tests were performed on the four existing monitoring wells at the LPS Site. The tests consisted of introducing a "slug" of water to each monitoring well and observing it's water level response until the pre-test water level was again restored. City of Middletown potable water was used for each monitoring well "slug". The purpose of the tests was to determine the hydraulic properties of subsurface LPS soils and rock. These properties will aid in the screening and design of clean-up remedies for the site. Appendix J contains the data output files and results from the slug tests performed on each monitoring well. Because the new bedrock well, LMW-5, exhibited extremely low recharge rates following well development activities, a slug test was not performed on this well. Static water level data for this well is included in Appendix J for reference.

3.9 MAP PREPARATION

In order to facilitate the illustration of analytical results in the RI report, a new industrial park site map was prepared to allow for easier presentation of environmental data. This map is included in this report as the Northern Middletown Industrial Park Map. Three versions of the map were created at scales of 1" = 200', 1" = 400', and 1" = 800', respectively. The new map is used to display ground water, sediment and surface water data collected in the industrial park for this RI report.

3.10 EVALUATION OF FIELD AND LABORATORY DATA

Field and laboratory data have been systematically submitted to NYSDEC during the RI via Monthly Progress Reports. Soil, surface water and ground water data is compiled and tabulated in this RI report in order to describe the lateral and vertical extent of LPS generated contamination. Laboratory analytical data have also been validated using NYSDEC guidelines for data validation. A three volume set of LPS Data Usability Reports was submitted separately to NYSDEC in April, 2002.

3.11 RI REPORT PREPARATION AND SUBMISSION

Compilation and interpretation of the referenced data was completed in stages and submitted separately to NYSDEC prior to submission of this RI Report. This RI Report represents a complete accounting and summary of RI activities and data collected.

4.0 SAMPLING RESULTS

Through the completion of the eleven RI tasks previously discussed in chapter 3, GSI has attempted to delineate the full nature and extent of TCA contamination at the LPS Site. An adequate delineation requires sufficient information on the location and concentration of the sources of contamination to plan remedial activities in a future Feasibility Study (FS). An adequate delineation also requires a knowledge of the extent of TCA contamination with respect to off site transport and other viable exposure pathways which could negatively impact human and ecological receptors. GSI believes these goals have largely been met through the completion of the Phase II Investigation in the early 1990s and the RI over the past year. A discussion of the results of the RI follows. Through this discussion and review of environmental data, GSI seeks NYSDEC approval to proceed with a Feasibility Study of several remedial technologies capable of cleaning up the sources of TCA contamination still remaining on the LPS Site.

Table 1 in Appendix B displays the results of ground water elevation and monitoring well construction measurements at the LPS Site. As noted and illustrated in the November 1994 Phase II Investigation Report, ground water elevation measurements continue to illustrate decreasing head from the northwest of the LPS Site towards the southeast. Figure 3 illustrates water table elevations on the LPS property; Figure 2 expands the Figure 3 view to include ground water measurements taken on the former General Switch Site and properties adjacent to the LPS Site. Both figures indicate local ground water flow takes place to the southeast.

The ground water flow directions illustrated in Figures 2 and 3 are consistent with the property's surface topography, as illustrated in Figure 4, and the top of weathered bedrock surface, as portrayed in Figure 5. Both of these illustrations were created using the data collected during the RI, supplemented by existing data from the Phase II Investigation conducted during the early 1990s. Figure 6, a map portraying the thickness of unconsolidated material on top of weathered bedrock beneath the LPS property, was derived from similar RI / Phase II drilling and Geoprobe data. Significant overburden thicknesses of 15 - 20 feet are predicted along the eastern edge of the property. Thin surficial cover is expected along the northern and western edges of the site. For an in depth analysis of overburden and bedrock profiles, please review the cross section lines illustrated in Figure 7. Each line between Geoprobe points, test pits and monitoring wells is shown in cross section in Appendix I. Cross sectional analysis of the unconsolidated portion of the LPS subsurface will be of value during the analysis of different remedial clean up technologies in the FS.

Table 2 displays in-situ ground water measurements of temperature, specific conductivity, pH, dissolved oxygen and the ground water's oxidation/reduction potential. A noteworthy result of the measurements is the consistently positive oxidation state of the ground water and the presence of significant concentrations of dissolved oxygen. This is not surprising given the unconfined nature of the till aquifer and the shallow depth to ground water beneath most of the site. Only LMW-4 showed low dissolved oxygen levels among the seven wells tested.

Geoprobe soil sampling results are summarized in Table 3 of Appendix B. Not all the volatile organic compounds (VOC's) tested in method 8260B are listed in Table 3. Only those detected in at least one of the twenty soil or sediment samples collected are displayed. One additional TCA hot spot was discovered through the Geoprobe soil sampling program in the vicinity of GP-7, located between monitoring well LMW-4 and test. pit 4. This area was suspected to be contaminated based on Phase II Investigation data. Relatively modest concentrations of TCE (26 ppb) and PCE (7.7 ppb) were also discovered at GP-4 in the heart of oil stained soil near the back door exit of the LPS building. According to George Saines, TCE and PCE were never used at the LPS Site since his purchase of the business in 1973. It is possible that the use of these compound may have occurred prior to the Saines purchase of F&W Bearing. However, minor PCE contamination at GP-6 (3.8 ppb) and GP-14 (4 ppb) is also problematic for the same reasons noted above. Therefore, soil and ground water contamination from the General Switch plume is still the most likely explanation of PCE and TCE contamination of ground water and soil at the LPS Site. It is not certain if contaminant transport via soil gas from the General Switch plume is responsible for the trace amounts of PCE and TCE in LPS soils above the seasonal high zone of saturation.

Few other soil samples warrant discussion. Some acetone and methylene chloride hits appear to be laboratory contaminants and not reflective of LPS subsurface conditions. Although some acetone was used by LPS during its business history, drum or tank storage of this compound outside the building was not likely. When used by LPS, acetone was commonly stored in 5 gallon containers inside the LPS warehouse. The lack of sediment contamination in Draper Run suggests the main agent of contaminant transport of TCA from LPS to adjacent properties is via advection in the shallow ground water system.

Table 4 summarizes the RI water sampling results. All the monitoring wells at the LPS Site (LMW-1,2,3,4 and 5) detected TCA and/or its associated daughter compounds. Up gradient General Switch well (GSW-6) did not contain TCA, but did test positive for PCE (50 ppb), TCE (11 ppb) and cis 1,2 DCE (5.8 ppb). The shallow LPS monitoring wells exhibited TCA concentrations ranging from a high of 420 ppb at LMW-3 to a low of 46 ppb at LMW-2. These concentration levels are substantially lower than the levels detected in LPS ground water during the Phase II Investigation in 1993 (2600 ppb in LMW-3 to 1300 ppb in LMW-4).

Although it is unclear if all TCA degradation is taking place via reductive dechlorination, it appears most TCA is degrading via this route. Therefore, the presence of PCE and its associated daughter compounds in all the shallow LPS monitoring wells is difficult to explain given the minuscule levels of these compounds in LPS soils. Although the source of these compounds in ground water could be the result of LPS activities prior to 1973, it is still much more likely that ground water contamination from the General Switch Site is responsible for the presence of the these compounds in LPS soils and ground water. TCA contamination in bedrock well LMW-5 (21 ppb) indicates vertical migration of TCA has taken place beneath the LPS Site. However, the level of TCA contamination is an order of magnitude lower that the TCA level in shallow (adjacent) well LMW-1 (200 ppb).

The down gradient stream sample on Draper Run illustrates, perhaps, the most dramatic finding of the RI (TCA = 1.6 ppb). Caution must be exercised in interpreting the significance of the Draper-Down result because the TCA concentration level is below the MDL and other sources of TCA may exist within the Draper Run drainage basin. However, up until this time, it was uncertain how far TCA ground water contamination extends down gradient of the LPS Site. The Draper-Down sample suggests the possibility of a detectable TCA plume 3200 feet (down gradient) southeast of the LPS property. It is also noteworthy that no PCE or TCE was detected from the General Switch plume, which presumably would parallel any TCA plume extending down gradient from the LPS Site.

5.0 CONCLUSIONS

The following conclusions can be drawn from the LPS Remedial Investigation results:

1. One additional TCA hot spot (TCA > 100 ppb) in LPS soils was discovered during the RI at GP-7. Four other TCA hot spots were discovered during the Phase II Investigation. These results are summarized below:

Location	TCA Concentration (ppb)	Soil Depth	Date
TP-1	4,200	4'	August, 1993
TP-2	14,000	8'	August, 1993
LMW-3	2,000	10'	August, 1993
LMW-4	770	4'	August, 1993
GP-7	160	8'	September, 2001

2. All monitoring wells on the LPS Site indicate TCA ground water contamination persists. TCA concentrations in ground water range from 46 ppb to 420 ppb in the shallow till / weathered bedrock wells. In the new (competent) bedrock well (LMW-5), the TCA concentration level was measured to be 21 ppb.

3. Up gradient monitoring well GMW-6 indicates PCE (50 ppb) and TCE (11 ppb) ground water contamination from the General Switch Site persists. PCE and TCE levels in LPS monitoring wells range from non detect to 85 ppb for TCE and 53 ppb for PCE.

4. Chlorinated solvent decomposition (daughter) products also exist in ground water and soil samples collected beneath the LPS Site. Those compounds most commonly linked to TCA decomposition in this type of subsurface environment are dichloroethane (DCA), 1,1 dichloroethene (1,1 DCE) and chloroethane (CA). The presence of the cis1,2 dichloroethene isomer is likely associated with the decomposition of PCE and TCE. The presence of PCE and its associated decomposition daughter products in LPS soils and ground water are believed to be the result of subsurface trespass from the up gradient General Switch Site. The presence of TCA and its decomposition daughter products are believed to be the result of soil contamination due to the spillage of TCA products during the routine course of business at the LPS Site from 1962 to 1986.

5. No off-site sediment contamination was discovered. However, low level (1.6 ppb TCA) off-site surface water contamination in Draper Run may have been discovered at the Draper-Down sampling point. *It is probable that off-site ground water contamination has occurred due to expected ground water flux from the site. A water sample result from a former cooling water well (from the Risdon site) was reported to have 12 ppb TCA in August, 1989, according to a General Switch environmental investigation report.*

6. Ground water flow continues to be measured in a southerly direction, consistent with the Phase II Investigation Report. No human or ecological receptors have been identified down gradient (south) of the LPS Site, assuming ground water transport to Draper Run within the Northern Middletown Industrial Park.

7. The information collected and presented in this RI Report addresses the Remedial Investigation requirements of the RI/FS Consent Order signed by NYSDEC and GSI. Following NYSDEC review of this report, GSI is prepared to proceed with work on the Feasibility Study for the LPS Site.

6.0 REPORT LIMITATIONS AND OMISSIONS

The data and conclusions presented in this RI Report are based on the level of effort and investigative techniques defined under the scope of work in the RI Work Plan. The omission of one subset of an RI Work Plan task is recognized here - the collection and analysis of approximately one dozen soil gas samples around the perimeter of the LPS building. This task was omitted due to the significant increase in cost of completing soil gas work on the original projections supplied to GSI. It should be noted that soil gas sampling and analysis was not included in the RI Work Plan outline attached to the RI/FS Consent Order. Soil gas sampling was added to the RI Work Plan following a NYSDOH review. A smaller number of soil gas samples and/or analysis of the LPS building ambient air was proposed by GSI as a compromise to NYSDOH comments. However, no compromise was achieved.

This author has conducted the RI investigation in a manner consistent with sound geologic and engineering practices and with professional judgement. No other warranty or guarantee, expressed or implied, is made. This report does not attempt to evaluate past or present compliance with federal, state and local environmental or land use laws and regulations. Furthermore, this author makes no guarantees regarding the completeness or accuracy of any information obtained from public or private files or previous investigations conducted near the LPS Site.

7.0 APPENDICES

A. RI Figures
B. RI Tables
C. Remedial Technology Prioritization Report
D. Employee Questionnaire
E. Property Owner Letters
F. Exposure Assessment Report
G. Monitoring Well Construction Details
H. Geoprobe, Test Pit and Monitoring Well logs
I. Cross Sections
J. Hydraulic Property Testing - Slug Test Analysis and Results
K. LPS Fact Sheet
L. Data Package Results Summary - ChemTech Laboratory
M. Private Water Supply Location Map

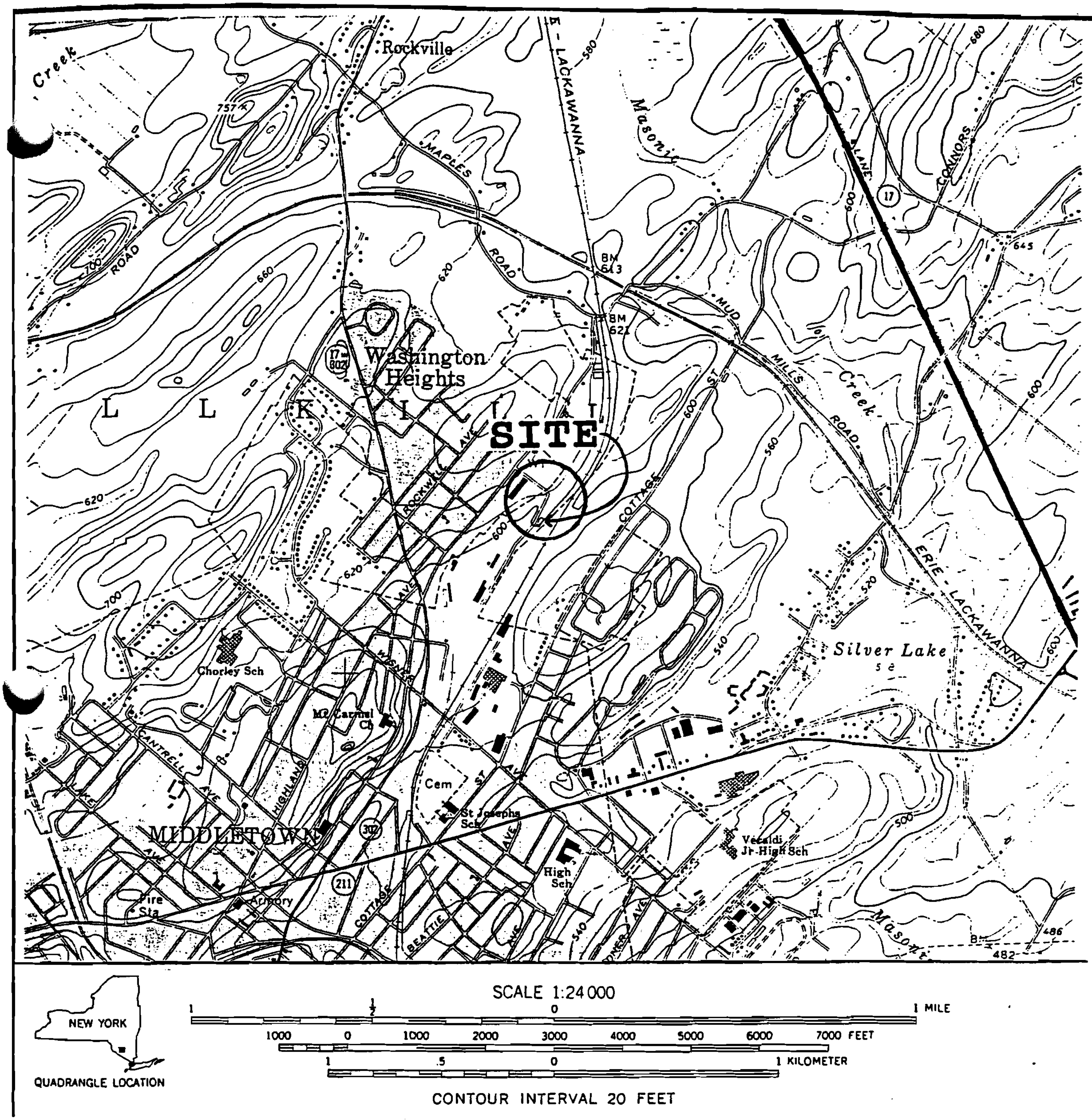
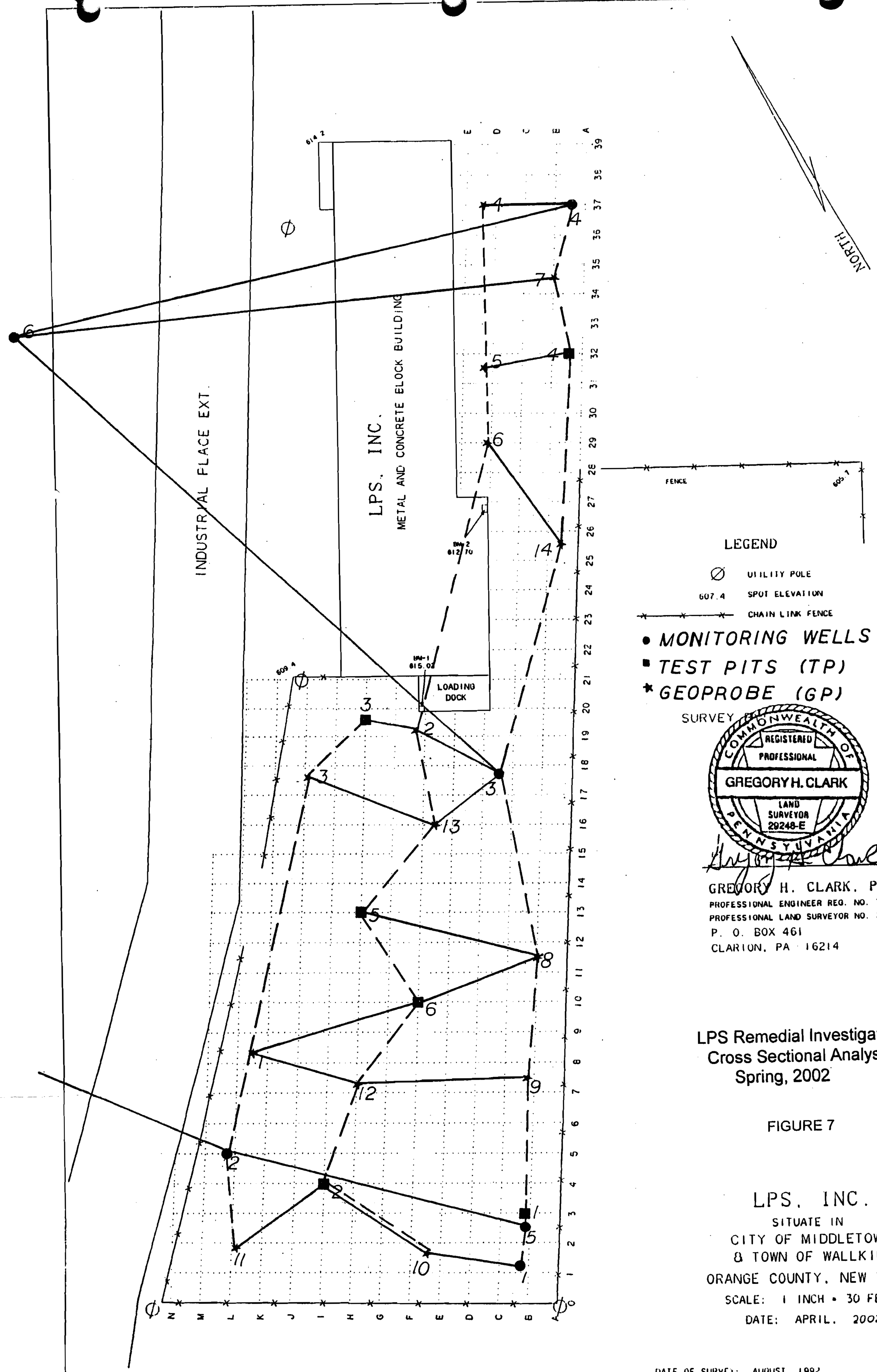


Figure 1
LPS Site Location Map
From Middletown, NY USGS Quad

SAINES ENVIRONMENTAL SERVICES

620 Seventh Street
Marietta, OH 45750

SES



LEGEND

∅ UTILITY POLE

607.4 SPOT ELEVATION

—×—×— CHAIN LINK FENCE

● *MONITORING WELLS (LMW*

■ *TEST PITS (TP)*

* *GEOPROBE (GP)*

SURVEY

GREGORY H. CLARK
LAND SURVEYOR
29248-E

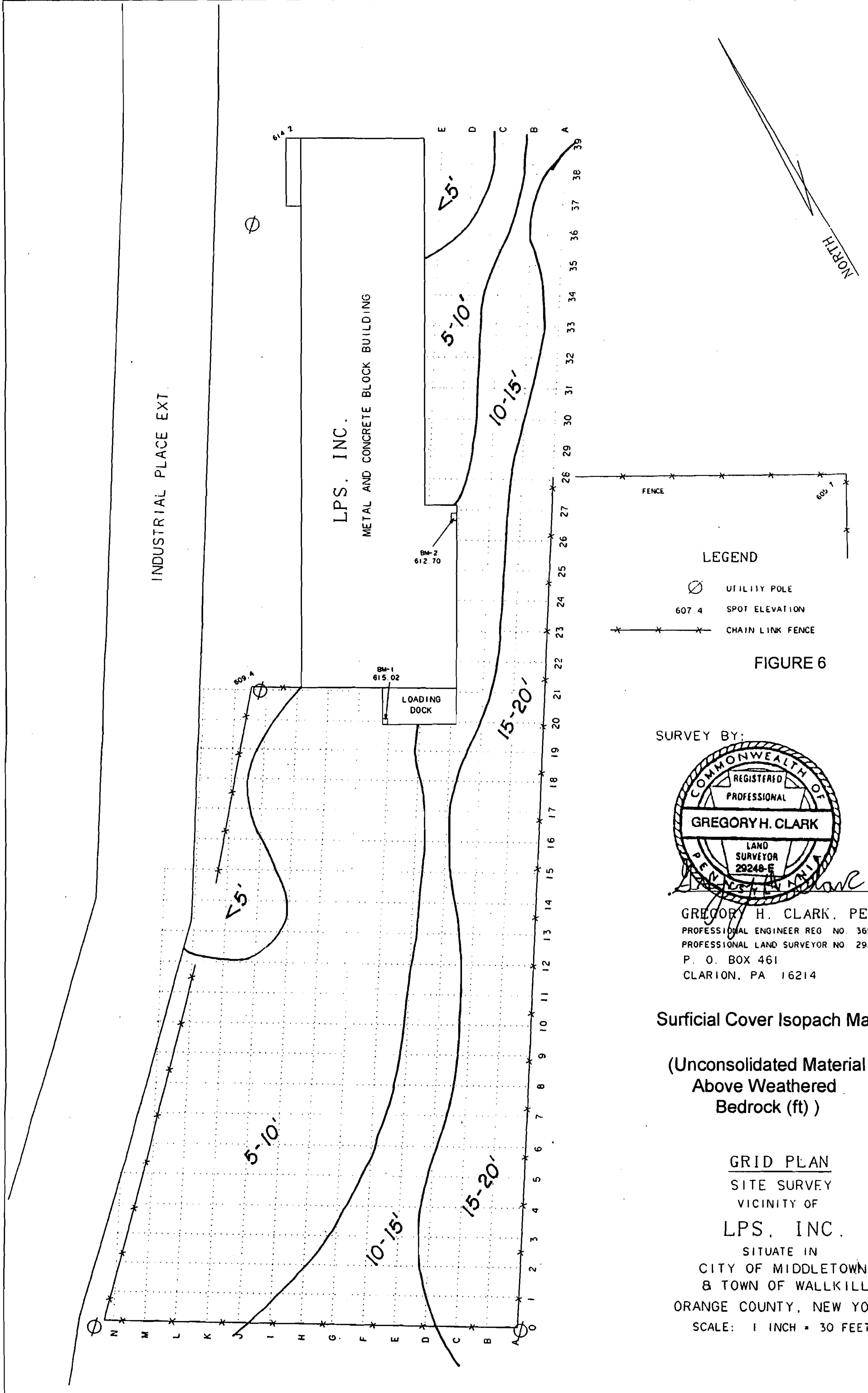
GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG. NO. 36544-E
PROFESSIONAL LAND SURVEYOR NO. 29248-E
P. O. BOX 461
CLARION, PA 16214

LPS Remedial Investigation
Cross Sectional Analysis
Spring, 2002

FIGURE 7

LPS, INC.
SITUATE IN
CITY OF MIDDLETOWN
& TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK
SCALE: 1 INCH = 30 FEET
DATE: APRIL, 2002

DATE OF SURVEY: AUGUST, 1992



LEGEND

∅	UTILITY POLE
607.4	SPOT ELEVATION
—×—×—×—	CHAIN LINK FENCE

FIGURE 6

SURVEY BY:

GREGORY H. CLARK
29248-E

GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG. NO. 36544-E
PROFESSIONAL LAND SURVEYOR NO. 29248-E
P. O. BOX 461
CLARION, PA 16214

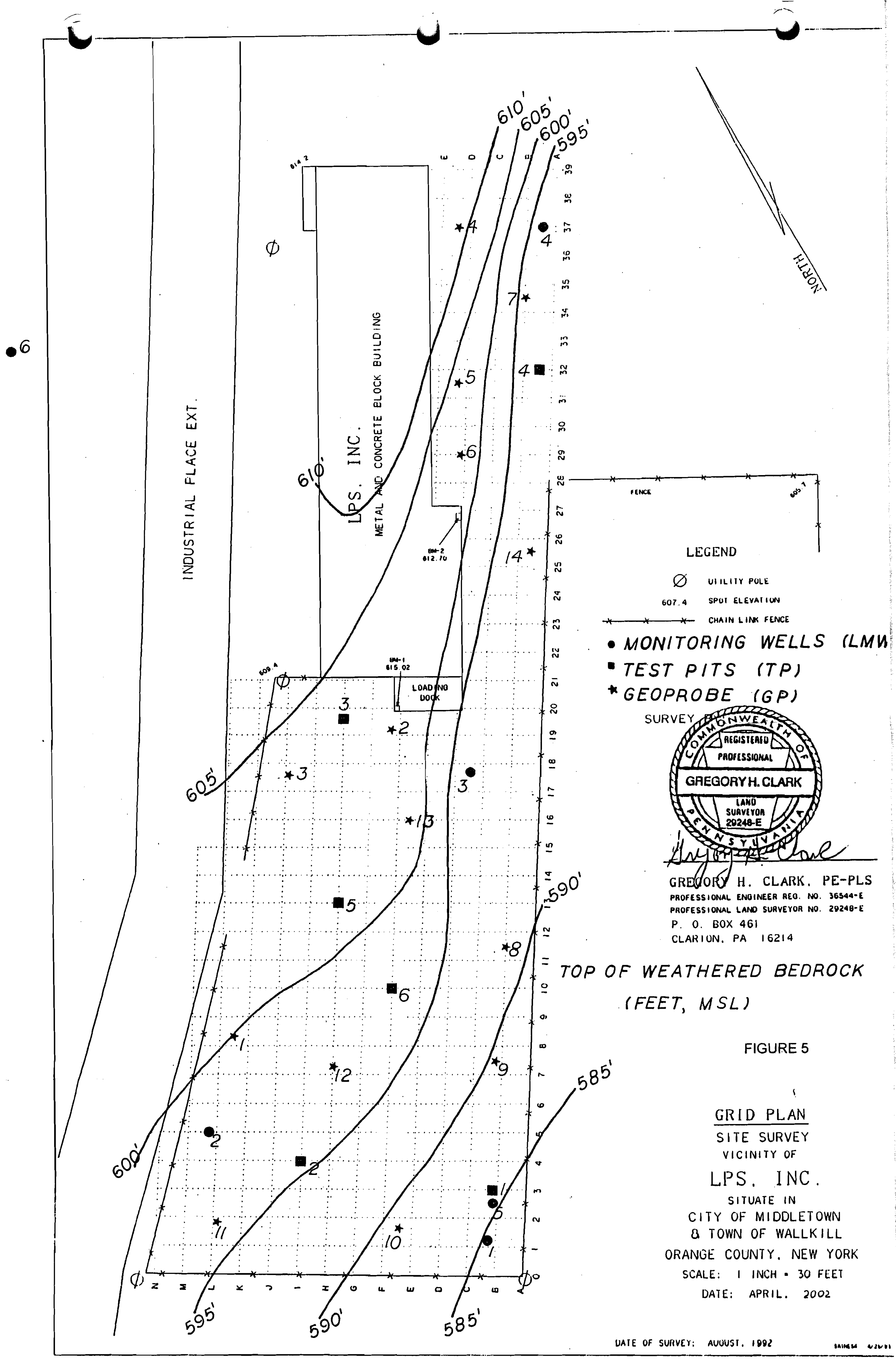
Surficial Cover Isopach Map

(Unconsolidated Material
Above Weathered
Bedrock (ft))

GRID PLAN
SITE SURVEY
VICINITY OF
LPS, INC.
SITUATE IN
CITY OF MIDDLETOWN
& TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK
SCALE: 1 INCH = 30 FEET

DATE OF SURVEY: AUGUST, 1992

SAIMES4 4/26/93



LEGEND

Ø UTILITY POLE

607.4 SPOT ELEVATION

—×—×— CHAIN LINK FENCE

- ● MONITORING WELLS (LMW
- ■ TEST PITS (TP)
- ★ GEOPROBE (GP)

SURVEY B

GREGORY H. CLARK
LAND SURVEYOR
29248-E

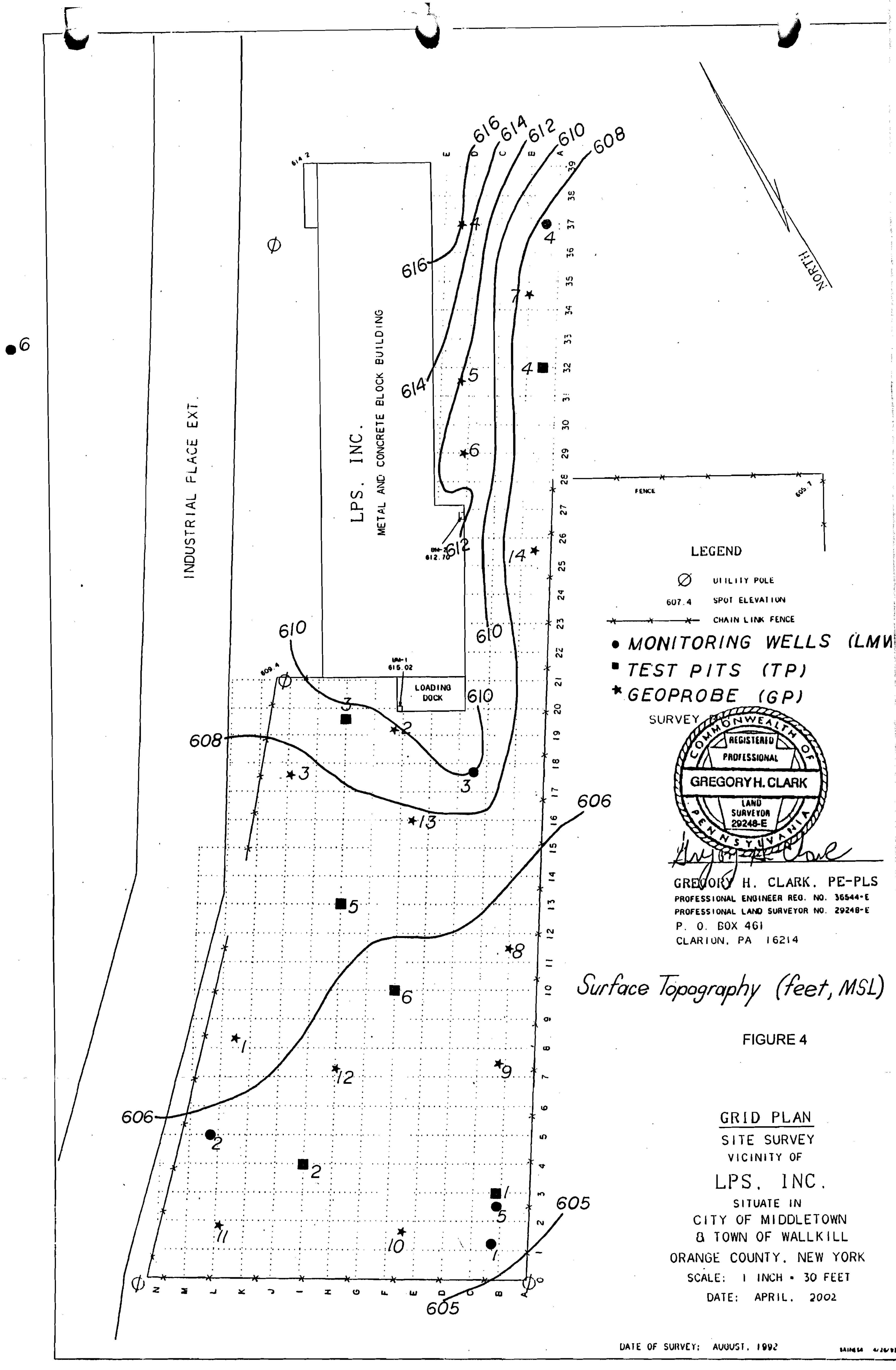
GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG. NO. 36544-E
PROFESSIONAL LAND SURVEYOR NO. 29248-E
P. O. BOX 461
CLARION, PA 16214

TOP OF WEATHERED BEDROCK
(FEET, MSL)

FIGURE 5

GRID PLAN
SITE SURVEY
VICINITY OF
LPS, INC.
SITUATE IN
CITY OF MIDDLETOWN
& TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK
SCALE: 1 INCH = 30 FEET
DATE: APRIL, 2002

DATE OF SURVEY: AUGUST, 1992



LEGEND

Ø UTILITY POLE

607.4 SPOT ELEVATION

—x—x— CHAIN LINK FENCE

- ● MONITORING WELLS (LMW
- ■ TEST PITS (TP)
- ★ GEOPROBE (GP)

SURVEY

GREGORY H. CLARK

29248-E

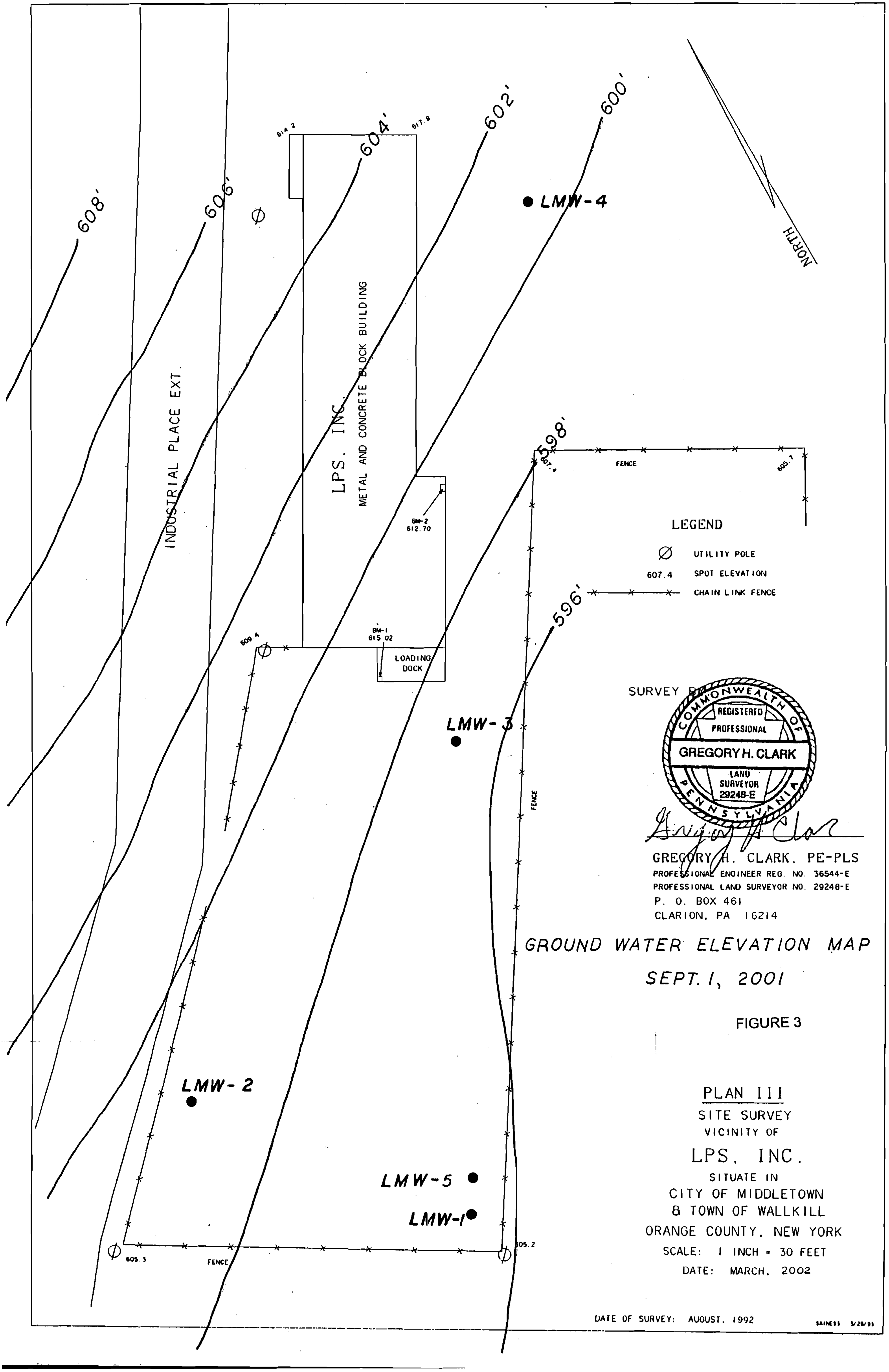
GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG. NO. 36544-E
PROFESSIONAL LAND SURVEYOR NO. 29248-E
P. O. BOX 461
CLARION, PA 16214

Surface Topography (feet, MSL)

FIGURE 4

GRID PLAN
SITE SURVEY
VICINITY OF
LPS. INC.
SITUATE IN
CITY OF MIDDLETOWN
& TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK
SCALE: 1 INCH = 30 FEET
DATE: APRIL, 2002

DATE OF SURVEY: AUGUST, 1992



SURVEY BY

GREGORY H. CLARK
29248-E

Gregory H Clark

GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG. NO. 36544-E
PROFESSIONAL LAND SURVEYOR NO. 29248-E
P. O. BOX 461
CLARION, PA 16214

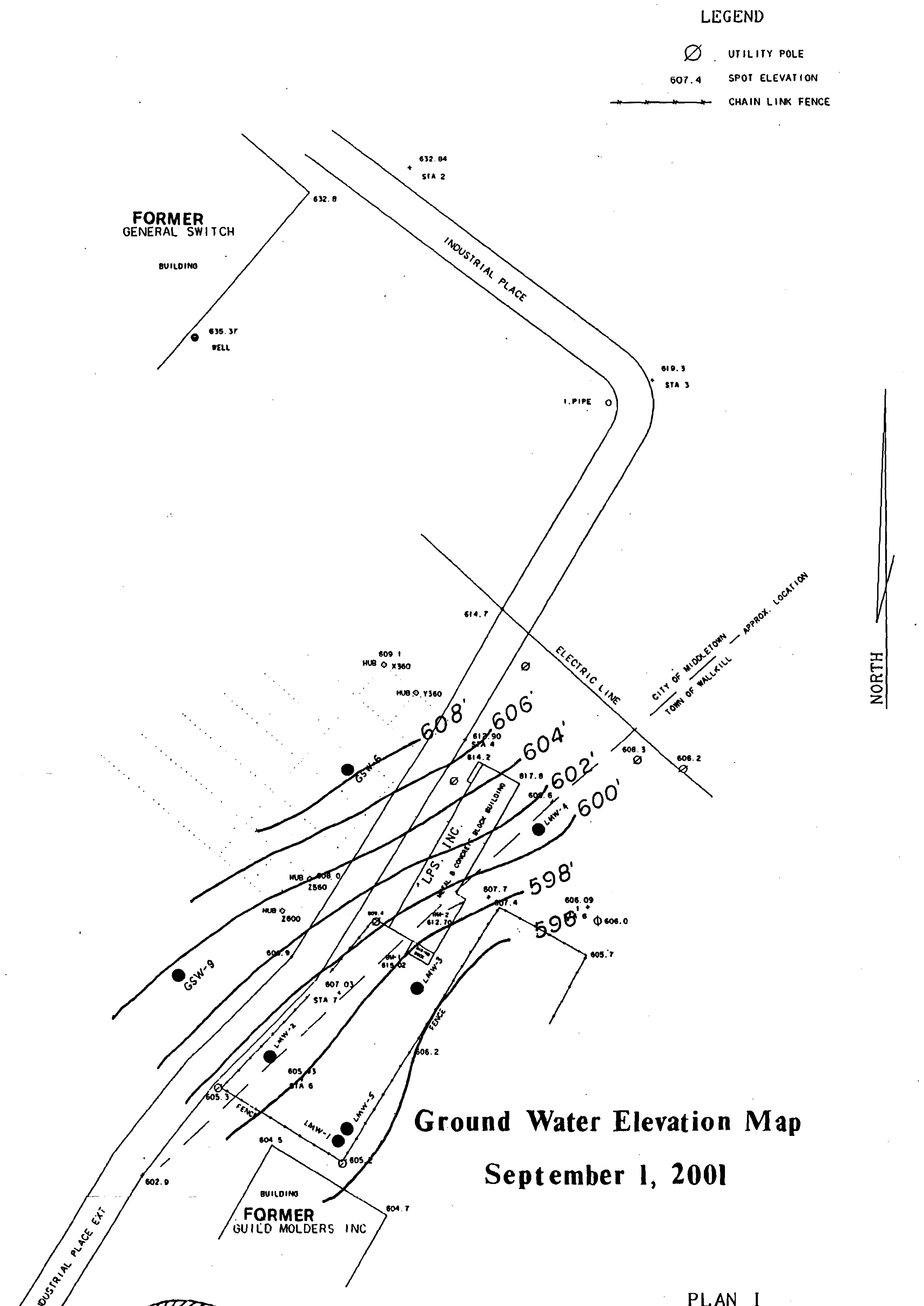
GROUND WATER ELEVATION MAP
SEPT. 1, 2001

FIGURE 3

PLAN III
SITE SURVEY
VICINITY OF
LPS. INC.
SITUATE IN
CITY OF MIDDLETOWN
& TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK
SCALE: 1 INCH = 30 FEET
DATE: MARCH, 2002

DATE OF SURVEY: AUGUST, 1992

SAINESS 3/20/93



Ground Water Elevation Map

September 1, 2001

FIGURE 2

PLAN I
SITE SURVEY
VICINITY OF
LPS. INC.
SITUATE IN
CITY OF MIDDLETOWN & TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK

SCALE: 1 INCH = 100 FEET
DATE: MARCH, 2002

GREGORY H. CLARK
29248-E

SURVEY BY:

GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG. NO 36544-E
PROFESSIONAL LAND SURVEYOR NO 29248-E
P O BOX 461
CLARION, PA 16214

DATE OF SURVEY: AUGUST, 1992

SAINESI 3/29/93

GMW-6 : TCA = ND
ground water (ppb)
PCE = 50
TCE = 11
CA = ND
1,1 DCE = ND
trans 1,2 DCE = ND
1,1 DCA = ND
cis 1,2 DCE = 5.8

LMW-4 : TCA = 170
ground water (ppb)
PCE = 23
TCE = 5.6
CA = ND
1,1 DCE = 12
trans 1,2 DCE = ND
1,1 DCA = 11
cis 1,2 DCE = 6.5

LMW-3 : TCA = 420
ground water (ppb)
PCE = 4.6
TCE = 49
CA = 200
1,1 DCE = 60
trans 1,2 DCE = ND
1,1 DCA = 150
cis 1,2 DCE = 32

LMW-2 : TCA = 46
ground water (ppb)
PCE = 53
TCE = 85
CA = 21
1,1 DCE = ND
trans 1,2 DCE = 2.3
1,1 DCA = 42
cis 1,2 DCE = 450

Draper-Up: (Dry Stream, Sediment, ppb)
TCA = ND
trans 1,2 DCE = ND
cis 1,2 DCE = ND
PCE = ND
1,1 DCA = ND
1,1 DCE = ND
TCE = ND
CA = ND

LMW-5 : TCA = 21
ground water (ppb)
PCE = ND
TCE = ND
CA = ND
1,1 DCE = ND
trans 1,2 DCE = ND
1,1 DCA = ND
cis 1,2 DCE = ND

LMW-1 : TCA = 200
ground water (ppb)
PCE = ND
TCE = 4.8
CA = 43
1,1 DCE = 13
trans 1,2 DCE = ND
1,1 DCA = 100
cis 1,2 DCE = ND

Draper-Mid: (Dry Stream, Sediment, ppb)
TCA = ND
trans 1,2 DCE = ND
cis 1,2 DCE = ND
PCE = ND
1,1 DCA = ND
1,1 DCE = ND
TCE = ND
CA = ND

Draper-Down: (Surface Water, ppb, MDL = 5)
TCA = 1.6 J
trans 1,2 DCE = ND
cis 1,2 DCE = ND
PCE = ND
1,1 DCA = ND
1,1 DCE = ND
TCE = ND
CA = ND

Legend of Major Symbols

		▨	Parcels
⌖	Monitoring Wells	(	Unpaved Roads
○	Power Line Pole	⌒	Surface Water Bodies
△	Stream Monitoring Pt.	/	Paved Streets
▭ ○	Storage Tanks	▱	Buildings

Northern Middletown Industrial Park

LOCATION: City of Middletown & Town of Wallkill
Orange County, New York State

DATA SOURCE: Orange Co. Water Authority
SCALE: 1" = 200'

Steven J. Saines
257 Midland Place
Logan, Ohio 43138–1234
740–385–7810

MAP FOR: George Saines
COMPILED BY: S. J. Saines
DATE: April, 2002
DIGITAL DATA DATE: 1995
REV. 2
SHEET: 1 of 1

Monitoring Well Measurements
LPS Site, September 1, 2001

Monitoring Well ID	Aquifer Type	Top of Casing Elevation (ft, MSL)	Static Water Level TOC (ft)	Groundwater Elevation (ft, MSL)	Total Depth of well TOC (ft)	Bottom of Well Elevation (ft, MSL)
LMW-1	Till	607.7	11.31	596.4	19.13	508.6
LMW-2	Till and weathered Bedrock	607.9	9.14	598.8	17.04	590.0
LMW-3	Till	611.7	14.78	596.9	18.75	593.0
LMW-4	Till	610.7	9.98	600.7	18.24	592.5
LMW-5	Competent Bedrock	607.4	---------*	---------*	47.40	560.0
GSW-6	Till and weathered Bedrock	612.3	3.65	608.7	6.84**	605.5
GSW-9	Till and weathered Bedrock	612.8	8.56	604.3	14.22	598.6

*Water level measurement was not valid one day after well construction.
**Total depth measurement of GSW-6 does not match well construction details obtained for this well.

Table 1.
LPS Remedial Investigation Report, June, 2002.

Ground Water Measurements and Field Parameters
LPS Site, September 1-2, 2001

Well ID	Static Water Level (ft)	Total Depth (ft) TOC PVC	Top of Casing Elevation (MSL) (ft)	Ground water Elevation (MSL) (ft)	In-Situ Temperature (C)	In-Situ Conductivity (um/sec)	In-Situ PH	In-Situ Ox./Red. Potential (mV)	In-Situ Dissolved Oxygen (ppm)
LMW-1	11.31	19.13	607.7	596.4	13.78	58	6.85	168.0	5.50
LMW-2	9.14	17.04	607.9	598.8	15.10	123	6.60	91.4	9.23
LMW-3	14.78	18.75	611.7	596.9	13.94	51	6.57	144.2	8.40
LMW-4	9.98	18.24	610.7	600.7	14.21	52	6.32	120.7	0.22
LMW-5*	-------	-------	607.4	--------	13.45	132	6.27	227.1	8.78
GSW-6	3.65	6.84	612.3	608.7	15.10	311	5.85	243.0	8.70
GSW-9	8.56	14.22	612.8	604.3	10.82	280	5.55	273.4	5.57

*Due to very low recharge rates at LMW-5, static water level readings for this well are included separately in Table 5.
**In-Situ measurements were taken follwoing monitoring well purging. For those wells purged dry, In-Situ measurements were taken the day following well purging.

Table 2.
LPS Remedial Investigation Report, June 2002.

RI Soil Sampling Results Summary[1]
LPS Site, Summer 2001 - Winter 2002

Client Sample ID[2]		GP-1@6.5'			GP 2@5'			GP-3@3.5'			GP 4@5'			GP-5@7.5'		
Lab Sample ID		N5080-01			N5080-06			N5080-11			N5080-17			N5080-02		
Sample Collection Date		07/03/2001			07/03/2001			07/03/2001			07/03/2001			07/03/2001		
		MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q
75-35-4	1,1-Dichloroethene	5.7	ND		28	ND		5.6	ND		5.6	ND		5.8	ND	
67-64-1	Acetone	5.7	11		28	76	B	5.6	11		5.6	15	B	5.8	13	
75-09-2	Methylene Chloride	5.7	1.2	J	28	5.7	J	5.6	ND		5.6	1.6	J	5.8	1.7	J
156-59-2	cis-1,2-Dichloroethene	5.7	ND		28	ND		5.6	ND		5.6	2	J	5.8	ND	
71-55-6	1,1,1-Trichloroethane	5.7	ND		28	ND		5.6	ND		5.6	1.1	J	5.8	ND	
79-01-6	Trichloroethene	5.7	ND		28	ND		5.6	ND		5.6	26		5.8	ND	
108-10-1	4-Methyl-2-Pentanone	5.7	ND		28	ND		5.6	ND		5.6	ND		5.8	ND	
108-88-3	Toluene	5.7	ND		28	ND		5.6	ND		5.6	7.7		5.8	ND	
127-18-4	Tetrachloroethene	5.7	ND		28	ND		5.6	ND		5.6	0.9	J	5.8	ND	
100-41-4	Ethyl Benzene	5.7	ND		28	ND		5.6	ND		5.6	ND		5.8	ND	
136777-61-2	m/p-Xylenes	5.7	ND		28	ND		5.6	ND		5.6	ND		5.8	ND	
95-47-6	o-Xylene	5.7	ND		28	ND		5.6	ND		5.6	ND		5.8	ND	

[1] All units in ug/Kg or parts per billion (ppb.)

[2] GP=GeoProbe Soil Sample

ND=Non-Detect; MDL=Method Detection Limit; CONC=Concentration.

Q=Data Qualifier; J= estimated value; B= analyte found in blank.

RI Soil Sampling Results Summary[1]
LPS Site, Summer 2001 - Winter 2002

Client Sample ID[2]		GP 6@10'			GP-7@8'			GP 7@13'			GP-8@8'			GP-9@8'			
Lab Sample ID		N5080-07			N5080-12			N5080-18			N5080-03			N5080-08			
Sample Collection Date		07/03/2001			07/03/2001			07/03/2001			07/03/2001			07/03/2001			
		MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	
75-35-4	1,1-Dichloroethene	29	ND		28	ND		5.4	ND		5.6	ND		5.8	ND		
67-64-1	Acetone	29	110	B	28	47		5.4	19	B	5.6	ND		5.8	ND		
75-09-2	Methylene Chloride	29	13	J	28	ND		5.4	ND		5.6	0.6	J	5.8	ND		
156-59-2	cis-1,2-Dichloroethene	29	ND		28	ND		5.4	ND		5.6	ND		5.8	ND		
71-55-6	1,1,1-Trichloroethane	29	ND		28	160		5.4	1.2	J	5.6	ND		5.8	ND		2
79-01-6	Trichloroethene	29	ND		28	7.3	J	5.4	ND		5.6	ND		5.8	ND		1
108-10-1	4-Methyl-2-Pentanone	29	ND		28	ND		5.4	ND		5.6	ND		5.8	ND		
108-88-3	Toluene	29	ND		28	ND		5.4	7.5		5.6	ND		5.8	ND		
127-18-4	Tetrachloroethene	29	3.8	J	28	46		5.4	7.2		5.6	ND		5.8	ND		3
100-41-4	Ethyl Benzene	29	ND		28	20	J	5.4	ND		5.6	ND		5.8	ND		1
136777-61-2	m/p-Xylenes	29	10	J	28	230		5.4	1.3	J	5.6	ND		5.8	ND		3
95-47-6	o-Xylene	29	ND		28	420		5.4	2.8	J	5.6	ND		5.8	ND		

[1] All units in ug/Kg or parts per billion (ppb.)

[2] GP=GeoProbe Soil Sample

ND=Non-Detect; MDL=Method Detection Limit; CONC=Concentration.

Q=Data Qualifier; J= estimated value; B= analyte found in blank.

RI Soil Sampling Results Summary[1]
LPS Site, Summer 2001 - Winter 2002

Client Sample ID[2]		GP-10@8'			GP 11@3.5'			GP-11@9'			GP-12@4'			GP-12@8'		
Lab Sample ID		N5080-15			N5080-19			N5080-04			N5080-09			N5080-16		
Sample Collection Date		07/03/2001			07/03/2001			07/03/2001			07/03/2001			07/03/2001		
		MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q
75-35-4	1,1-Dichloroethene	5.6	ND		28	ND		5.8	1.4	J	58	ND		5.6	ND	
67-64-1	Acetone	5.6	ND		28	98	B	5.8	15		58	180		5.6	7.7	
75-09-2	Methylene Chloride	5.6	ND		28	5.7	J	5.8	ND		58	ND		5.6	ND	
156-59-2	cis-1,2-Dichloroethene	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	
71-55-6	1,1,1-Trichloroethane	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	
79-01-6	Trichloroethene	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	
108-10-1	4-Methyl-2-Pentanone	5.6	ND		28	ND		5.8	ND		58	9.5		5.6	ND	
108-88-3	Toluene	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	
127-18-4	Tetrachloroethene	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	
100-41-4	Ethyl Benzene	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	
136777-61-2	m/p-Xylenes	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	
95-47-6	o-Xylene	5.6	ND		28	ND		5.8	ND		58	ND		5.6	ND	

[1] All units in ug/Kg or parts per billion (ppb.)

[2] GP=GeoProbe Soil Sample

ND=Non-Detect; MDL=Method Detection Limit; CONC=Concentration.

Q=Data Qualifier; J= estimated value; B= analyte found in blank.

RI Soil Sampling Results Summary[1]
LPS Site, Summer 2001 - Winter 2002

Client Sample ID[2]		GP-13@6.5'			GP-14@7'			GP-14@11			Draper Up			Draper Mid		
Lab Sample ID		N5080-20			N5080-05			N5080-10			P1210-001			P1210-002		
Sample Collection Date		07/03/2001			07/03/01			07/03/2001			01/19/02			01/19/02		
		MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q
75-35-4	1,1-Dichloroethene	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	
67-64-1	Acetone	5.5	ND		28	65	B	6.2	23		5.6	ND		5.6	ND	
75-09-2	Methylene Chloride	5.5	ND		28	ND		6.2	ND			1.3	JB		4.9	B
156-59-2	cis-1,2-Dichloroethene	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	
71-55-6	1,1,1-Trichloroethane	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	
79-01-6	Trichloroethene	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	
108-10-1	4-Methyl-2-Pentanone	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	
108-88-3	Toluene	5.5	ND		28	3.6	J	6.2	ND		5.6	ND		5.6	ND	
127-18-4	Tetrachloroethene	5.5	ND		28	4	J	6.2	ND		5.6	ND		5.6	ND	
100-41-4	Ethyl Benzene	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	
136777-61-2	m/p-Xylenes	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	
95-47-6	o-Xylene	5.5	ND		28	ND		6.2	ND		5.6	ND		5.6	ND	

[1] All units in ug/Kg or parts per billion (ppb.)

[2] GP=GeoProbe Soil Sample

ND=Non-Detect; MDL=Method Detection Limit; CONC=Concentration.

Q=Data Qualifier; J= estimated value; B= analyte found in blank.

RI Water Sampling Results Summary[1]
LPS Site, Summer 2001 - Winter 2002

Sample ID		LMW-1			LMW-2			LMW-2			LMW-3		
Lab Sample ID		N5790-01			N5790-02			N5790-02DL			N5790-03		
Sample Collection Date		9/02/01			9/01/01			9/01/01			9/01/01		
		MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q
75-01-4	Vinyl Chloride	5	ND		5	14		100	ND		5	ND	
75-00-3	Chloroethane	5	43		5	21		5	ND		5	200	
75-35-4	1,1-Dichloroethene	5	13		5	ND		5	ND		5	60	
156-60-5	trans-1,2-Dichloroethene	5	ND		5	2.3	J	100	ND		5	ND	
75-34-3	1,1-Dichloroethane	5	100		5	42		100	ND		5	150	
156-59-2	cis-1,2-Dichloroethene	5	ND		5	450	E	100	380	D	5	32	
71-55-6	1,1,1-Trichloroethane	5	200		5	46		100	ND		5	400	E
56-23-5	Carbon Tetrachloride	5	ND		5	46		100	ND		5	430	E
79-01-6	Trichloroethene	5	4.8	J	5	85		100	54	JD	5	49	
124-48-1	Dibromochloromethane	5	ND		5	55		100	ND		5	ND	
127-18-4	Tetrachloroethene	5	ND		5	53		100	ND		5	4.6	J
108-90-7	Chlorobenzene	5	ND		5	6.2		100	ND		5	ND	

[1] All units in ug/l or parts per billion (ppb.)

ND=Non-Detect; MDL=Method Detection Limit; CONC=Concentration.

Q=Data Qualifier; J= estimated value; E=analyte exceeded instrument calibration range; D= sample was diluted.

Table 4, Page 1 of 3.

RI Water Sampling Results Summary[1]
LPS Site, Summer 2001 - Winter 2002

Sample ID		LMW-3			LMW-4			LMW-DUP (LMW-1)			LMW-EQBL		
Lab Sample ID		N5790-03DL			N5790-04			N5790-06			N5790-08		
Sample Collection Date		09/01/01			09/01/01			09/02/01			09/01/01		
		MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q
75-01-4	Vinyl Chloride	50	ND		5	ND		5	ND		5	ND	
75-00-3	Chloroethane	50	160	D		ND		5	15		5	ND	
75-35-4	1,1-Dichloroethene	50	40	JD	5	12		5	12		5	ND	
156-60-5	trans-1,2-Dichloroethene	50	ND			ND		5	ND		5	ND	
75-34-3	1,1-Dichloroethane	50	130	D	5	11		5	100		5	ND	
156-59-2	cis-1,2-Dichloroethene	50	24	JD	5	6.5		5	3.7	J	5	ND	
71-55-6	1,1,1-Trichloroethane	5	420	E	5	170		5	210		5	ND	
56-23-5	Carbon Tetrachloride	5	430	E	5	170		5	230		5	ND	
79-01-6	Trichloroethene	5	46		5	5.6		5	5.2		5	ND	
124-48-1	Dibromochloromethane	50	ND		5	25		5	ND		5	ND	
127-18-4	Tetrachloroethene	50	ND		5	23		5	3.1	J	5	ND	
108-90-7	Chlorobenzene	50	ND		5	3.9	J	5	ND		5	ND	

[1] All units in ug/l or parts per billion (ppb.)

ND=Non-Detect; MDL=Method Detection Limit; CONC=Concentration.

Q=Data Qualifier; J= estimated value; E=analyte exceeded instrument calibration range; D= sample was diluted.

RI Water Sampling Results Summary[1]
LPS Site, Summer 2001 - Winter 2002

Sample ID[2]		MW-6			VOABLANK			LMW-5			Draper-Down			Trip Black		
Lab Sample ID		N5790-05			N5790-07			P1210-004			P1210-003			P1210-005		
Collection Date		9/02/01			9/02/01			01/19/02			01/19/02			01/19/02		
		MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q	MDL	CONC	Q
75-01-4	Vinyl Chloride	5	ND		5	ND		5	ND		5	ND		5	ND	
75-00-3	Chloroethane	5	ND		5	ND		5	ND		5	ND		5	ND	
75-35-4	1,1-DCE	5	ND		5	ND		5	ND		5	ND		5	ND	
156-60-5	trans-1,2-DCE	5	ND		5	ND		5	ND		5	ND		5	ND	
75-34-3	1,1-DCA	5	ND		5	ND		5	ND		5	ND		5	ND	
156-59-2	cis-1,2-DCE	5	5.8		5	ND		5	ND		5	ND		5	ND	
71-55-6	1,1,1-TCA	5	ND		5	ND		5	21		5	1.6	J	5	ND	
56-23-5	Carbon Tet	5	ND		5	ND		5	ND		5	ND		5	ND	
79-01-6	TCE	5	11		5	ND		5	ND		5	ND		5	ND	
124-48-1	Dibromo-chloromethane	5	52		5	ND		5	ND		5	ND		5	ND	
127-18-4	PCE	5	50		5	ND		5	ND		5	ND		5	ND	
108-90-7	Chlorobenzene	5	3.4	J	5	ND		5	ND		5	ND		5	ND	

[1]All units in ug/l or parts per billion (ppb.)
ND=Non-Detect; MDL=Method Detection Limit; CONC=Concentration.
Q=Data Qualifier; J= estimated value; E=analyte exceeded instrument calibration range; D= sample was diluted.

PRIORITIZATION OF REMEDIAL OBJECTIVES

AND

PRELIMINARY SCREENING OF REMEDIAL TECHNOLOGIES

Lubricant Packaging and Supply Co., Inc.
Middletown, NY

August, 2001

Revised, May 2002

INTRODUCTION

Data from the Phase II Investigation and preliminary results from the Remedial Investigation at the Lubricant Packaging and Supply (LPS) site indicates that the constituents of potential concern on the property are limited to chlorinated VOCs located in the soil and shallow ground water. Based on water level data, the primary direction of ground water flow is toward the south, into the southeastern portion of the industrial park (see Figure 18 from the Phase II Investigation Report). The Phase II and Remedial Investigation also determined that VOCs from the General Switch property to the northwest of the site have also contributed some soil and ground water contamination beneath portions of the LPS property.

The Remedial Investigation (RI} was undertaken to evaluate, in detail, the horizontal and vertical extent of contamination on the LPS property. This information allows for an assessment of the best methods for remediating VOC contamination on site.

An appropriate remedial objective at the LPS site is the abatement of exposure to VOCs in soil and ground water as well as the reduction of VOC releases from source soils to the ground water. The reduction in source soil releases may be accomplished either by reducing the concentrations of VOCs in the soil or by limiting their susceptibility to leaching. Because the results of the Phase II and Remedial Investigation did <u>not</u> delineate a single, well-defined source area, but rather a half dozen general areas of the LPS property where VOCs are present in the soils, discussions of soil remediation technologies will emphasize those which can be applied to in-situ soils, rather than ex-situ processes. Limited soil removal and disposal will still remain a defacto option. Emphasis on in-situ remedial technologies is consistent with current trends toward minimizing the volume of contaminated soil material requiring off-site treatment or disposal.

The following sections provide a preliminary screening of many available technologies for remediating VOCs from soil and ground water. Those technologies identified as inappropriate for use at the LPS site will be rejected at this time, and will not be revisited in the Feasibility Study (FS). Those technologies identified as appropriate will be retained for possible consideration (and more detailed evaluation) in the FS.

REMEDIAL TECHNOLOGIES SCREENING

In the following sections, remedial technologies are identified that are potentially capable of reducing concentrations of VOCs in soil and/or ground water. The candidate technologies were chosen from the author's experience in working in the environmental regulatory and consulting business for the past 15 years as well as a review of emerging clean-up technologies used, described or promoted by the USEPA, Army Corps of Engineers, and other governmental, military, academic and public interest groups. A large portion of the following discussion was based on information maintained by the Center for Public Environmental Oversight (CPEO web page). CPEO is a project of the San Francisco Urban Institute at San Francisco State University in California.

Each technology will be briefly defined and discussed with regard to its potential applicability, considering the site-specific conditions at the LPS site. Technologies that are not eliminated from consideration at this point may be retained for a more detailed analysis in the FS.

Soil and Ground Water Remedial Technology Screening

The following potential remedial response actions for soil and ground water have evolved from the information collected during the Phase II Investigation and the preliminary results of soil sampling in the RI. The response actions generally fall into one of the following technology categories: 1) In-situ Treatment; 2) Ex-situ Treatment; 3) Contaminant Removal; 4) Containment.

Once contamination has been confirmed at sites like the LPS property, an important question to be answered is whether the contaminants can be treated in place (i.e., in-situ). Treatment could include destruction, or reduction in mobility or mass. Typical in-situ methods range from phytoremediation (absorption and metabolism by plants) to permeable reactive barrier walls (walls of material that react with an agent to render it harmless).

If contaminants cannot be successfully treated or destroyed in place, they have to be removed. Once removed (ex-situ), the contaminated materials must be treated, contained or taken to a disposal facility. A typical treatment technology is the use of an incinerator. Containment is a remediation strategy often selected when treatment is impractical. It is also used in combination with in-situ treatment. The most common containment measures are capping landfills and placing barriers in the subsurface to impede migration. Disposal options most frequently involve transport of contaminated media to a permitted solid waste or hazardous waste landfill.

No action and institutional control responses are also included in the remedial technology list to establish baseline comparisons with more active remedies. Each of the technologies chosen as applicable to the LPS site were used to assess the data collection needs for the RI. Some of the technologies applicable for study at the LPS site were evaluated during the RI to determine their appropriateness for future study or use.

The following list of technologies, developed from a technology matrix tree on the CPEO web site, were screened for applicability at the LPS site:

- No Action
- Institutional Controls
- Air Sparging
- Dynamic Underground Stripping (DUS)
- Enhanced Bioremediation
- Groundwater Circulation Well
- In-situ Air Stripping
- In-situ Enhanced Soil Mixing
- In Well Stripping
- Natural Attenuation
- Permeable Barriers
- Phytoremediation
- Chemical Extraction
- Dual-Phase Extraction
- Enhanced Soil Vapor Extraction (SVE)
- Six-phase Soil Heating
- Soil Flushing
- Soil Vapor Extraction (SVE)
- Surfactant Enhanced Recovery
- Thermal Desorption
- Thermal Enhanced Vapor Extraction System (TEVES)
- Aeration
- Air Stripping
- Bio-Reactors
- Bio-Slurry
- Incineration
- Liquid Phase GAC
- Sorption
- Sprinkler Irrigation
- Ultra-violet (UV) Treatment

NO ACTION

The no-action alternative will be used as a baseline, to evaluate whether it is necessary to implement any soil or ground water remedial action beyond the status quo. "No action" is defined as no proactive steps taken to remediate the affected medium, with the exception of periodic site monitoring. Under current conditions, the leaching of contaminated soils and movement of ground water south of the LPS property carries the potential of an associated VOC plume in the surficial aquifer. Because there are few ecological or human receptors for this contaminated ground water south of the site, the "no-action" alternative for ground water in the surficial aquifer implies allowing an existing plume to migrate (and perhaps degrade) under natural ground water conditions and gradients toward the city of Middletown. Because the "no-action" alternative may abate the potential for exposure to VOCs in soil and ground water, it is considered to be theoretically applicable and is retained for further evaluation in the FS.

INSTITUTIONAL CONTROLS

Institutional controls, as a corrective measures technology for the remediation of soil and ground water, can be divided into two primary categories: access restrictions and monitoring. Access restrictions commonly involve deed restrictions which prohibit access to and use of the soil and ground water beneath specific properties. It may not be possible, however, to restrict access to ground water beneath properties controlled by other parties, such as the ground water that moves from beneath the LPS property toward the Risdon facility. Therefore, at the LPS site, the use of deed restrictions would be limited to controlling any additional future use of subsurface soils or ground water beneath the LPS property.

Monitoring is commonly associated with the use of institutional controls and typically involves scheduled, periodic sampling to assess site conditions. It is not anticipated that institutional controls will be the sole component of remedial alternatives developed for the LPS site since the LPS property is small and any ground water contamination could easily trespass to neighboring properties where its access could not easily be controlled, legally. However, institutional controls will be retained for further evaluation in the FS since other sources of ground water contamination in the industrial park may require a more regional approach to contaminant management.

SELECTED SOIL REMOVAL

Limited soil removal and disposal at a waste management facility will remain a defacto option for the LPS site. The Phase II investigation and RI soil sampling has sufficiently delineated areas where soil removal could take place. Additional sampling would be required during excavation activities to determine the exact extent of horizontal and vertical excavation. On-site GC laboratory services would likely be required for this activity. Selected soil removal actions will be retained for further consideration in the FS.

AIR SPARGING

Air sparging is the process of injecting air directly into ground water. Air sparging remediates ground water by volatilizing contaminants and enhancing biodegradation. It is akin to blowing bubbles through a straw into a bowl of water. As the bubbles rise, the contaminants are removed from the ground water by physical contact with the air (i.e., stripping) and are carried up into the unsaturated zone (i.e., soil). As the contaminants move into the soil, a soil vapor extraction system is usually used to remove vapors. The addition of oxygen to contaminated ground water and soils also enhances the biodegradation of some contaminants in and above the water table, as it acts as a nutrient for bacteria. There are several enhancements to air sparging.

The first enhancement is called cometabolic air sparging. Propane, which is injected along with air, acts as another nutrient for microorganisms. Another method is a newly patented technology, Bio-SpargeSM. It addresses a major problem of traditional pump-and-treat systems. When a pump-and-treat system is employed, it pumps contaminated water to the surface and pulls the ground water down into a "cone of depression." At the former upper extent of the ground water (called the capillary fringe), most of the sorbed contaminant remains. In many instances, this area contains the most heavily contaminated soil. When ground water pumping ceases, the ground water returns to its former level and becomes re-contaminated by the sorbed material. This is called a rebound.

Bio-SpargeSM induces desorption within the capillary fringe by injecting a heated mixture of air, water, nutrients and bacteria. A down gradient well recovers the air for reinjection. As the air mixture moves across the contaminated zone, bacteria, with the aid of the nutrients, destroy many of the contaminants. Since the system is a closed loop, no release to the environment occurs. That is, there is no need for off-gas treatment and no need for an air emission permit.

Another method is called the C-Sparge. C-Sparging periodically injects an ozone/air mixture in conjunction with a pulsing pump. This is a two-phase process. First, fine bubbles are injected into the ground water to extract dissolved volatile organic compounds out of contaminated ground water. Second, ozone contained within the bubbles reacts rapidly with the volatile compounds to decompose them into end products consisting of carbon dioxide, dilute hydrochloric acid and water.

Limitations and Concerns

Air flow through the saturated zone may not be uniform. There can also be uncontrolled movement of potentially dangerous vapors.

Air sparging depends on two processes. One helps to biodegrade the contaminants by adding nutrients or other amendments, so transformation products should be monitored. The other process removes remaining contaminants from the ground water, possibly emitting them into the air. Therefore, air injection wells must be designed for site-specific conditions. The depth of contaminants and specific site geology must be considered. Soil heterogeneity may cause some zones to be relatively unaffected.

Applicability

Air sparging has been demonstrated at numerous sites around the country, and it is a commercial technology. Enhancements to the sparging devices are not well documented. The target contaminant groups for air sparging are VOCs and fuels in ground water. VOC contaminants are the sole hazardous constituents at the LPS site. The RI has documented that VOC contaminated soils beneath the LPS site are poorly sorted (i.e. heterogenous) and of low to moderate permeability. While this does not preclude the use of air sparging as a sound remedial technology, it may limit its effectiveness.

Air sparging will be retained for further consideration in the FS. Soil and bedrock permeability characteristics will be sought during the RI in order to better evaluate this technology as a remedy for the LPS site.

DYNAMIC UNDERGROUND STRIPPING (DUS)

Dynamic Underground Stripping (DUS) combines several technologies to remediate soil and ground water contaminated with fuel and other organic compounds. It is very similar to Enhanced Soil Vapor Extraction, except that it also treats ground water contamination. DUS injection and extraction wells are installed so that their screened section is in both saturated and unsaturated zones. Steam is injected at the periphery of a contaminated area to heat permeable subsurface areas, vaporize volatile compounds bound to the soil, and drive contaminants to centrally located vacuum extraction wells. Electrical heating is used on less permeable clays to vaporize contaminants and drive them into the steam zone. DUS also uses an underground imaging system called Electrical Resistance Tomography (ERT) that delineates heated areas to ensure total cleanup and process control.

Recently, another technology called Pyrolysis was added. This technology adds oxygen in parallel with steam. When injection is halted, the steam condenses and contaminated ground water returns to the heated zone, where it mixes with oxygen-rich condensed steam. This enhances natural biodegradation of certain materials by providing nutrients to microorganisms that thrive at high temperatures (called thermopiles).

Limitations and Concerns

Microorganisms which are destroyed by the steam can foul the system. Small particles that are pumped to the surface can clog the system. High temperatures increase the amount of carbonates and silicates in the extracted liquids, which can foul the sensors and treatment units. Above ground treatment systems must be located where they will not interfere with access to the subsurface treatment zone. This is necessary to avoid situations in which additional injection, extraction, heating, or monitoring wells need to be installed. Air emissions from both above ground treatment units and equipment used to supply steam energy are of concern.

Aboveground treatment systems must also be sized to handle the peak extraction rates. The extracted vapor and liquid streams will contain different amounts of various VOCs. The systems must also be prepared to handle the way VOCs are distributed in the vapor and liquid streams. To be effective, DUS must produce boiling temperatures in the subsurface environment. Consequently, the process consumes a large amount of energy.

Steam adds significant amounts of water to the subsurface. Precautions must be taken so as not to mobilize contaminants past the capture zones. In one demonstration, downstream capture wells equipped with in-situ bio-filters were being considered.

There has also been some concern that DUS will sterilize the subsurface so that microorganisms will not attack the contaminants. At Lawrence Livermore National Laboratory (LLNL), DUS was found to be compatible with long-term efforts to bioremediate residual contamination following steam injection. After application of DUS at LLNL, viable microbial populations continued to degrade gasoline at the site at temperatures above 158 degrees F. Treated soils can remain at elevated temperatures for months and even years after cleanup. This could impact site reuse plans. Soil venting can greatly accelerate the cooling process.

Applicability

DUS has been successfully demonstrated to remediate fuel hydrocarbons bound in the saturated and unsaturated soil matrix. Laboratory tests have been successful for a variety of volatile and semi-volatile compounds, including diesel fuel, light nonaqueous phase liquids (LNAPLs), and dense nonaqueous phase liquids (DNAPLs).

A recent demonstration in California found DUS and hydrous pyrolysis to degraded wood preservatives and PCBs. The minimum depth for application of DUS is approximately 5 feet. It has been used at depths of approximately 120 feet.

DUS is being field tested at several sites. Data on long-term routine operating experience with DUS are not yet available, but are needed to better plan future applications. Future development needs include: 1) demonstrating the process for removing chlorinated solvents including DNAPLs, mixed wastes, and sites with fractured subsurface media; 2) automating the monitoring techniques; and 3) further refining the system design and operating techniques.

Based on the above analysis of DUS technology, energy requirements, current track record at sites around the US and future development research needs, DUS will not be retained for consideration in the FS. DUS has not satisfactorily demonstrated its applicability to remediating sites with chlorinated VOCs in lower permeability environments. The proximity of the LPS site to other properties which could be affected by steam injection is also a major concern which precludes further analysis.

IN-SITU CHEMICAL OXIDATION

In Situ Chemical Oxidation is a developing class of remediation technologies in which organic contaminants are degraded in place by oxidants delivered to the subsurface. Chemical oxidation involves the injection or surficial application of chemical oxidants such as potassium permanganate, ozone or Fenton's reagent to the subsurface environment. The additives react with organic chemical contaminants of concern, usually oxidizing them to water and carbon dioxide.

Chemical oxidation is a particularly viable treatment option for high concentrations of organics, such as sites where fuel hydrocarbons and/or chlorinated solvents were heavily released in specific areas. Successful implementation of this technology requires an effective means for dispersing the oxidant to subsurface contaminated regions. Often, oxidant injection via horizontal wells or horizontal and/or vertical walls is employed to provide access to subsurface VOC contaminant plumes. Chemical oxidants have also been delivered to contaminated media via deep soil mixing, hydraulic fracturing, multi-point vertical lancing, horizontal well recirculation, and vertical well recirculation.

In Situ Chemical Oxidation using potassium permanganate has advantages over pump and treat technologies because it can significantly reduce the time required for remediation. In Situ Chemical Oxidation is a more aggressive remediation technology than in situ air sparging or bioremediation. Its application at many sites should result in a faster cleanup, thus reducing life-cycle maintenance and remediation costs for the site. In Situ Chemical Oxidation can also be used at sites where reactive barriers cannot be applied because the hydrologic conditions and distribution of contaminants at the site preclude the installation of a reactive barrier.

Like other in-situ technologies, In Situ Chemical Oxidation would reduce contaminant exposure to remediation workers. It is also a well known process, easily applied and controlled, without secondary waste streams.

Limitations and Concerns

In Situ Chemical Oxidation can be designed to treat a range of organic contaminants in soil and ground water. However, some oxidants, including the permanganates, are not as effective as alternative technologies at sites containing saturated organic compounds (i.e. TCA). It is also not as effective as alternative technologies at sites containing media with a high natural or co-contaminant oxidant demand (i.e. high soil carbon content from spilled petroleum products). There is also a potential for process-induced detrimental effects such as the loss of permeability due to particulate formation from oxidant reactions. Hydraulic conductivities in soil and rock media where In Situ Chemical Oxidation is applied should be greater than 10^{-4} cm/sec.

Applicability

Chemical oxidation has been widely used for treatment of pollutants in drinking water and wastewater applications for over 50 years. In Situ Chemical Oxidation has more recently been used to remediate hazardous waste sites with soils and ground water contaminated with organics. The process utilizes various techniques for delivery of both aqueous and solid permanganate. Several military and DOE sites have used this technology successfully to remediate DNAPL and BTEX contaminated soils and ground water plumes, cleaning up aquifers to near non-detect levels.

The recent increase in popularity of In Situ Chemical Oxidation as a remediation technology suggested consideration of this technique for the LPS site. However, as noted in the Limitations and Concerns section above, oxidation of contaminated soils and ground water at the LPS site would not be effectively addressed by In Situ Chemical Oxidation. The principle contaminant of concern at the LPS site is TCA, a saturated VOC which is not efficiently oxidized by reagents such as potassium permanganate. The soils at the LPS site also contain a relatively large percentage of lubricating oils, also spilled, like the TCA, during 25 years of operating a lubricant packaging business at the LPS site. This high organic (carbon) content to the soil would have the effect of buffering a large percentage of the oxidants delivered to the subsurface. Although not yet determined, soil and bedrock permeability are also suspected to be low at the LPS site, which would also limit oxidant delivery. For these reasons, In Situ Chemical Oxidation will not be retained for consideration in the FS.

ENHANCED BIOREMEDIATION

Bioremediation is a general term used for the destruction of contaminants by biological mechanisms, including microorganisms (e.g. yeast, fungi, or bacteria), in contaminated soil and water. Microorganisms eat and digest organic substances for nutrients and energy. Certain microorganisms can digest organic substances such as fuels or solvents into harmless products such as carbon dioxide and water. Once the contaminants are degraded, the microorganism population dies off, having consumed all of their food source. Bioremediation may rely on either indigenous microorganisms (those that are native to the site) or exogenous microorganisms (those that are imported from other locations). In either case, bioremediation technologies optimize the environmental conditions so the appropriate microorganisms will flourish and destroy the maximum amount of contaminants. Bioremediation can take place under aerobic or anaerobic conditions. Under aerobic conditions, microorganisms consume atmospheric oxygen in order to function. Under anaerobic conditions, no oxygen is present. In this case, the microorganisms break down chemical compounds in the soil to release the energy they need. Sometimes, intermediate products are created as the biological processes break down the original contaminants. The intermediate products may be less, equally, or more toxic than the original contaminants. Both in-situ or ex-situ bioremediation processes have been developed. In-situ bioremediation treats the contaminated water or soil where it was found. Ex-situ bioremediation processes involve removing the contaminated soil or water to another location before treatment.

Enhanced Bioremediation involves the addition of micro-organisms (e.g., fungi, bacteria, and other microbes) or nutrients (e.g. oxygen, nitrates) to the subsurface environment to accelerate the natural biodegradation process. There are four major processes: gaseous nutrient injection, hydrogen peroxide circulation, nitrate enhancement, and bio-augmentation. These are briefly described below.

In Gaseous Nutrient Injection, nutrients are injected into contaminated ground water and soil via wells to encourage and feed naturally occurring microorganisms (see technology descriptions of Air Sparging and Bioventing). Vapor extraction is often used in conjunction with gaseous nutrient injection. The most commonly added gas is air. In the presence of sufficient oxygen, microorganisms convert many organic contaminants to carbon dioxide, water, and microbial cell mass. In the absence of oxygen, organic contaminants are metabolized to methane, limited amounts of carbon dioxide, and trace amounts of hydrogen gas. Soil vapor extraction can be combined with the injection process to strip the higher concentration, more easily removed contaminants from the subsurface.

Oxygen Enhancement with Hydrogen Peroxide, an alternative to pumping oxygen gas into ground water, involves injecting a dilute solution of hydrogen peroxide. Its chemical formula is H2O2, and it easily releases its extra oxygen atom to form water and free oxygen. This circulates through the contaminated ground water zone to enhance the rate of aerobic biodegradation of organic contaminants by naturally occurring microbes. A solid peroxide product (e.g., oxygen releasing compound (ORC)) can also be used to increase the rate of biodegradation.

In Nitrate Enhancement, a solution of nitrate is sometimes added to ground water to enhance anaerobic biodegradation.

For Bio-augmentation, acclimated microorganisms are added to soil to increase biological activity. Spray irrigation is typically used for shallow contaminated soils, and injection wells are used for deeper contaminated soils.

Limitations and Concerns

Under anaerobic conditions, contaminants may be degraded to a product that is more hazardous than the original contaminant. For example, TCE anaerobically biodegrades to the persistent and more toxic vinyl chloride. This can also occur with the LPS contaminant of concern, TCA.

Introducing cold water or gas may slow the remediation process, as lower temperatures do not support degradation. Bioremediation is also not well suited for soils with low permeability (e.g., fine clays). Permeability is required to allow the nutrients to reach the indigenous microorganisms.

It is possible that subsurface injection of gases below the water table can induce ground water flow. It may be necessary to use a pump-and-treat system in conjunction with gas injection for hydraulic control. The circulation of water-based solutions through the soil may also increase contaminant mobility and necessitate treatment of underlying ground water so contaminants do not escape from zones of active biodegradation.

Nitrate injection into ground water is of concern because nitrate is a regulated compound. Bio-augmentation using non-native microorganisms is also controversial.

Safety precautions must be used when handling hydrogen peroxide. Because gaseous injection increases pressure in the soil, vapors can build up in nearby building basements.

Applicability

Enhanced bioremediation techniques have been successfully used to remediate soils and ground water contaminated with fuel, VOCs, SVOCs, and pesticides. At the LPS site, it is likely that anaerobic conditions for the degradation of chlorinated VOCs would be required to successfully remediate soils and ground water. However, the RI has shown that ground water conditions (at least during the fall of 2001) were exclusively aerobic. Gaseous Nutrient Injection is currently being applied and certain applications are considered commercial, although development of nitrate enhancement is still at the pilot scale. Although this technology may be suited to the LPS site, aerobic, low permeability subsurface conditions currently suggest several technological drawbacks. Because this technology is widely used and research is rapidly advancing its effectiveness in differing subsurface environments, enhanced bioremediation will be retained for further evaluation in the FS.

GROUNDWATER CIRCULATION WELL (GCW)

A ground water circulation well (GCW) treats ground water and soil contaminated with hydrocarbons. In this process, ground water is pumped to the surface and aerated, removing most of the volatile vapors. The aerated groundwater is distributed over an area of contaminated soil. The aerated water carries oxygen to the subsurface soil, promoting biodegradation. The combined process of biological treatment and physical extraction reduces the time required to achieve remediation goals and lowers contaminant concentrations.

Limitations and Concerns

Contaminant mobility can be increased due to the increased water in the soil. Additional monitoring wells may also be necessary. Vapors that are stripped off should be evaluated and treated, if necessary, before being discharged to the atmosphere.

Applicability

GCW is a combined ground water and soil treatment process for fuels and VOCs. GCW treatment has been demonstrated in the laboratory and in the field and is currently considered to be in the field testing stage of development. Because this technology has not reached widespread use, its applicability to the LPS site is limited. However, some of the concepts involved in this technology may be joined with other remedial tools to create an effective remedial system. The technology will be retained for evaluation in the FS.

IN-SITU AIR STRIPPING (ISAS)

In-situ (i.e., in place) air stripping (ISAS) combines three technologies, air sparging, horizontal wells, and soil vapor extraction. ISAS uses horizontal wells to inject (sparge) air into the groundwater. The horizontal wells provide more effective access to a horizontal ground water plume. As the air comes into contact with contaminants, they volatilize and rise through the soil. The volatile organic compounds (VOCs) are then extracted from overlying soils by standard soil vapor extraction. The air sparging process eliminates the need for surface ground water treatment systems such as air strippers.

Limitations and Concerns

ISAS using horizontal wells may accelerate plume migration. If this occurs, it may be necessary to use ISAS in conjunction with a pump-and-treat system for hydraulic control.

Increasing the contaminant surface area exposed to oxygen enhances efficiency. Each application must be assessed and designed on a site-specific basis. For ISAS to be effective, the contaminants of concern must be strippable (i.e., volatilize when exposed to air). Most light hydrocarbons and chlorinated solvents meet this condition. ISAS is effective at removing light nonaqueous phase liquids (LNAPLs) because they are mainly located at the top of the water table. It is not suitable for dense nonaqueous phase liquids (DNAPLs).

Successful ISAS requires good contact between injected air, contaminated soils, and ground water. ISAS is not well suited for sites with highly stratified soils with low permeability layers, fractured rock or clay geology. ISAS does not effectively remediate large dilute plumes, but it is useful near source areas.

Applicability

ISAS has been demonstrated to remediate soils and ground water contaminated with VOCs and fuels. A full-scale demonstration was conducted by the Department of Energy at the Savannah River Integrated Demonstration. Long-term performance data from several years of operation are still required. Hence, this should be considered a technology that is still being field tested, although all of the equipment is commercially available. Since it would be difficult, if not impossible to install horizontal wells at the LPS site for geologic as well as space limitations, this technology will not be retained for further evaluation in the FS. However, air sparging and soil vapor extraction are technologies that will likely be evaluated in the FS. Therefore, components of this technology will again be reviewed for their applicability to remediate the LPS site.

IN-SITU ENHANCED SOIL MIXING

In-Situ Enhanced Soil Mixing (ISESM) is a treatment technology for remediating soils that are contaminated with volatile organic compounds (VOCs). ISESM combines a number of in-situ soil treatment technologies that can treat fine-grained soils. In processes where chemicals, air and/or steam are added, soil mixing allows good access to all soil particles and the spaces between particles. The technology is particularly suited to shallow applications (i.e., up to about 45 feet below the surface) above the water table. Four variations of ISESM technology have been evaluated. They are briefly described below.

1. Soil mixing combined with vapor extraction and ambient air injection. The mixing auger is moved up and down to assist in removal of contaminated vapors. At the same time, air is injected to volatilize contaminants. The vapors are collected in a shroud covering the treatment area and run through a treatment unit.

2. Soil mixing combined with vapor extraction and hot air injection. This process is the same as ambient air injection except that hot air or steam is injected to increase the amount of contaminants that are volatilized.

3. Soil mixing with hydrogen peroxide injection. Contaminated soil is mixed with ambient air that contains a mist of diluted hydrogen peroxide (H2O2) solution. The H2O2 solution chemically oxidizes the VOCs to carbon dioxide (CO2), free chlorine, and water.

4. Soil mixing with grout injection for solidification and stabilization. Contaminated soil is mixed as a cement grout is injected under pressure to solidify and immobilize the contaminated soil into a concrete-like form.

Limitations and Concerns

VOC emissions must be treated. Hydrogen peroxide is an oxidizing agent. Proper handling precautions must be taken to prevent spills and to protect workers because bulk quantities are used. ISESM requires surface access at all locations where soils are contaminated. This rules out its effective use if the contamination underlies buildings or parking lots.

Applicability

In-situ soil mixing for stabilization is commonly used at sites with soil contaminated with organics. It is also appropriate for soils contaminated with metals. ISESM with injection of hot air, ambient air, or hydrogen peroxide has been demonstrated to effectively remediate clay-rich soils contaminated with VOCs in the unsaturated zone.

In-situ soil mixing has been used for a number of years in the construction industry. Soil mixing with stabilization was demonstrated under the EPA SITE Program in 1990 for soils contaminated with PCBs. DOE demonstrated variations of the technology at the Portsmouth Gaseous Diffusion Plant in Ohio, and it is planning to demonstrate it at the DOE Kansas City Plant.

Because this technology is well suited to fine grained soils with low permeability and at sites with shallow application depths, this technology will be retained for further consideration at the LPS site.

IN WELL AIR STRIPPING

In-well air stripping technology injects air into a vertical well that has been screened at two depths. The lower screen is set in the groundwater saturated zone, and the upper screen is in the unsaturated zone (i.e., called the vadose zone, otherwise referred to as soil). Pressurized air is injected into the well below the water table, aerating the water. The aerated water rises in the well and flows out of the system at the upper screen. Contaminated ground water is drawn into the system at the lower screen. The volatile organic compounds (VOCs) vaporize within the well at the top of the water table, as the air bubbles out of the water. The vapors are drawn off by a soil vapor extraction (SVE) system. The partially treated ground water is never brought to the surface. After it is released to the unsaturated zone, the water percolates back down to the groundwater. Contaminant concentrations are gradually reduced as the process is repeated.

Limitations and Concerns

These systems only treat the water that passes through the stripping well. Thus the radius of influence is limited to the pumping capacity of each well and the site's hydrogeology. Effective installations require a well-defined contaminant plume and proper screen placement to prevent the spread contaminants.

Some contaminants are transferred from the ground water to the soil. Depending on site geology, these contaminants may be sorbed to soil particles and slowly desorbed after treatment is complete. In general, in-well air strippers are most effective at sites containing high concentrations of dissolved contaminants. The effectiveness of the process may be limited at sites with shallow aquifers.

To prevent smearing the contaminants in the area immediately above the ground water level, the process should not be used at sites containing NAPLs.

Applicability

This technology remediates VOCs, SVOCs, and fuels in ground water. When combined with a vacuum extraction system, it also remediates contaminated soil. In-well air stripping is a pilot-scale technology. There are several variations of this technology. The most common is called Unterdruck-Verdampfer Brunner (UVB) and has been used at numerous sites in Germany. Stanford University has developed another variation of this process called NoVOCs that is currently being evaluated as part of the Energy Department's Integrated Technology Demonstration Program and by the US Navy. Wasatch Environmental, Inc. has developed an in-well vapor stripping system that enhances bioremediation and discharges extracted vapors into the unsaturated zone for degradation by naturally-occurring microorganisms.

Although this technology may have some limitations at the LPS site, it does combine several conventional technologies which will be retained for evaluation in the FS. Therefore, this technology will also be retained for further evaluation.

NATURAL ATTENUATION

Natural attenuation is not a "technology," per se. It generally describes a range of physical and biological processes which, unaided by deliberate human intervention, reduce the concentration, toxicity, or mobility of chemical or radioactive contaminants. These processes take place whether or not other active cleanup measures are in place. However, techniques and technologies for predicting and monitoring natural attenuation are being developed. Increasingly, parties responsible for cleanup as well as environmental regulators are relying upon natural attenuation as a remediation strategy.

The mechanisms of natural attenuation can be classified as destructive and non-destructive. Destructive processes include biodegradation and hydrolysis. Biodegradation is by far the most prevalent destructive mechanism. Biodegradation, also called bioremediation, is a process in which naturally occurring microorganisms such as yeast, fungi, and bacteria, break down target substances, such as fuels and chlorinated solvents, into less toxic or non-toxic substances. Like larger living things, these microbes must eat organic substances to survive. Certain microorganisms digest fuels or chlorinated solvents found in the subsurface environment. Non-destructive attenuation mechanisms include sorption, dispersion, dilution, and volatilization. Dilution, dispersion and sorption are generally the most important non-destructive mechanisms.

Long-term monitoring is necessary to demonstrate that contaminant concentrations continue to decrease at a rate sufficient to ensure that they will not become a health threat or violate regulatory criteria. Monitoring should be designed to verify that potentially toxic transformation products are not created at levels that are a threat to human health; that the plume is not expanding; that there are not releases that could effect the remedy; and, that there are no changes in hydrogeological, geochemical, or microbiological parameters that might reduce the effectiveness of natural attenuation.

Limitations and Concerns

While there is significant debate among technical experts about the application of natural attenuation, most consider that in order for it to be chosen as a remedy, there must be a significant amount of contaminant destruction taking place. A remediation strategy that largely depends on physical mechanisms such as sorption, dilution and dispersion is not attractive to most communities.

Typically, at most sites contaminated with chlorinated solvents, PCE and TCE are the major threats. It is assumed that conventional cleanup of these chemicals through pump-and-treat systems will also remove co-contaminants. This may not be true with natural attenuation. In studying natural attenuation of chlorinated solvents, other contaminants derived from the breakdown of the original contaminant are likely to be present in ground water plumes and should also be included in the investigation and remedy selection.

It is well known that some degradation products are more harmful then the original contaminant. For chlorinated solvent plumes, this is especially true. For example, vinyl chloride is more persistent, more mobile, and more toxic than its parent products (e.g., PCE, TCE or TCA). Project proponents must demonstrate that human or environmental receptors will not be exposed to greater risks during the long natural attenuation process.

Project proponents must present a convincing technical demonstration that natural attenuation will be effective at protecting human health and the environment. A site-specific study of the potential effectiveness of natural attenuation should be conclusive. If natural attenuation is to be used in an area that relies on ground water for its drinking water, or has the potential to do so, then it must be supported by a preponderance of the technical data available.

While natural attenuation may be attractive in some locations, it should not be viewed as an exclusive remedial strategy without considering simultaneous remedies that enhance natural biological or chemical destructive mechanisms. Also, over-reliance on natural attenuation could stifle the development of new cleanup technologies.

Longer time frames may be required to achieve remediation objectives, compared to active remediation. Thus, institutional controls may be required and the site may not be available for reuse as compared to other strategies. Extended land-use restrictions should be considered in the cost of the remedy.

Natural attenuation is not appropriate where imminent site risks are present. Contaminated surface soils, because they are subject to wind and erosion, require long-range and effective containment before being considered for natural attenuation.

Source control actions should use treatment to address "principle threat" wastes wherever practicable. If treatment is not practicable, then the source could be contained with engineering controls. If natural attenuation is selected, it should be selected in conjunction with or after other remedial options have removed, treated, or contained the contaminant source.

Applicability

Contaminants potentially addressed by natural attenuation include VOCs, SVOCs including PCBs, fuel hydrocarbons, metals, and explosives. Fuels and chlorinated VOCs are so far the most commonly evaluated for natural attenuation. Natural attenuation may be appropriate for some metals, when natural attenuation processes result in a change in the valence state of the metal that results in immobilization (e.g., chromium). U.S. Army Corps of Engineers scientists have also observed that certain natural processes "attenuate" certain explosive compounds and there is a 3-year pilot project now underway.

Natural attenuation has been selected at numerous sites and is now considered a commercially available "technology." Both the US Air Force and the Department of Energy have indicated policies that encourage the use of natural attenuation as a first resort. Because natural attenuation would likely be a favorable remedial component to an overall cleanup plan at the LPS site, it will be retained for further evaluation in the FS.

PERMEABLE REACTIVE BARRIER WALL

Permeable Reactive Barrier Walls are installed in or down gradient from the flow path of a contaminant plume. The contaminants in the plume react with the media inside the barrier to either break the compound down into harmless products or immobilize contaminants by precipitation or sorption. The distinguishing feature about this technology is that it is a passive system that requires no pumping.

The most common of the permeable barrier walls is the Iron Treatment Wall. It is made up of zero-valent iron or iron-bearing minerals that reduce chlorinated contaminants such as trichloroethylene (TCE) and perchloroethylene (PCE). As the iron is oxidized, a chlorine atom is removed from the compound using electrons supplied by the oxidation of iron. The chlorinated compounds are reduced to nontoxic by-products.

Reactive walls are also used to immobilize metals such as uranium, chromium, and arsenic. A variety of materials have been used in pilot tests, including iron, peat, and bone char. Essentially, these materials either absorb the metals or precipitate them, similar to soil fixation and precipitation technologies

Limitations and Concerns

There has been concern that the wall captures the entire plume. In areas where there are preferential ground water flow paths, ensuring total capture may be difficult. In many designs, an impermeable material such as a slurry wall or sheet pile flanks the reactive zone. This is called a funnel and gate system, and provides greater capture of the plume.

Because this technology is passive (that is, it depends on the natural flow of the contaminant plume to pass through the wall), complete breakdown will only occur after the entire plume has passed through the wall. This may take many years. A ground water monitoring system should be put in place to monitor whether the technology is still working over the long-term. Wall permeability may decrease due to precipitation of metal, salts and biological activity. Passive treatment walls may also lose their reactive capacity over time, and the iron may have to be replaced periodically. Iron may also leach out of the wall and become a contaminant if concentrations are high enough.

Applicability

Target contaminant groups for passive treatment walls are VOCs. SVOCs and metals are also being tested. Several full-scale and demonstration scale walls have been installed for remediation of ground water contaminated with chlorinated hydrocarbons. There are several pilot tests of walls to precipitate metals. Because this technology could easily be applicable to known conditions at the LPS site, it will be retained for further consideration in the FS.

PHYTOREMEDIATION

Phytoremediation is a bioremediation process that uses various types of plants to remove, transfer, stabilize and destroy contaminants in the soil and ground water. There are several different types of phytoremediation mechanisms. These are:

1. Rhizosphere biodegradation. In this process, the plant releases natural substances through its roots that supply nutrients to microorganisms in the soil. The microorganisms enhance biological degradation.

2. Phyto-stabilization. In this process, chemical compounds produced by the plant immobilize contaminants, rather than degrade them.

3. Phyto-accumulation. In this process, plant roots sorb the contaminants along with other nutrients and water. The contaminant mass is not destroyed but ends up in the plant shoots and leaves. This method is used primarily for wastes containing metals.

4. Rhizofiltration. Rhizofiltration is similar to phyto-accumulation, but the plants used for cleanup are raised in greenhouses with their roots in water. As the roots become saturated with contaminants, they are harvested and disposed of.

5. Phyto-volatilization. In this process, plants take up water containing organic contaminants and release the contaminants into the air through their leaves.

6. Phyto-degradation. In this process, plants actually metabolize and destroy contaminants within plant tissues. No toxic waste products remain.

7. Hydraulic Control. In this process, trees indirectly remediate by controlling ground water movement. Trees act as natural pumps when their roots reach down towards the water table and establish a dense root mass that takes up large quantities of water. Poplar trees, for example, pull out of the ground 30 gallons of water per day, and cottonwoods can absorb up to 350 gallons per day.

The plants most used and studied are poplar trees. The U.S. Air Force used poplar trees to contain TCE in ground water. In Iowa, USEPA demonstrated that poplar trees acted as natural pumps to keep toxic herbicides, pesticides, and fertilizers out of the streams and ground water. The US Army Corps of Engineers has experimented with wetland plants to destroy explosive compounds in the soil and ground water. Submersed and floating-leafed species (coontail and pondweed, and arrowhead, respectively) decreased TNT to 5% of original concentration. Submersed plants were able to decrease RDX levels by 40%, and when microbial degradation was added, RDX decreased by 80%. Sunflowers, using rhizofiltration, were used successfully to remove radioactive contaminants from pond water in a test at Chernobyl, Ukraine.

Limitations and Concerns

The toxicity and bioavailability of biodegradation products is not always known. Degradation by-products may be mobilized in ground water or bio-accumulated in animals. More research is needed to determine the fate of various compounds in the plant metabolic cycle to ensure that plant droppings and products manufactured by plants do not contribute toxic or harmful chemicals into the food chain.

Scientists need to establish whether contaminants that collect in the leaves and wood of trees are released when the leaves fall in the autumn or when firewood or mulch from the trees is used. Disposal of harvested plants can be a problem if they contain high levels of heavy metals.

The depth of the contaminants limits treatment. The treatment zone is determined by plant root depth. In most cases, it is limited to shallow soils, streams, and ground water. Pumping the water out of the ground and using it to irrigate plantations of trees may treat contaminated ground water that is too deep to be reached by plant roots.

Generally, the use of phytoremediation is limited to sites with lower contaminant concentrations and contamination in shallow soils, streams, and ground water. However, researchers are finding that the use of trees (rather than smaller plants) allows them to treat deeper contamination because tree roots penetrate more deeply into the ground. The success of phytoremediation may be seasonal, depending on location. Other climatic factors will also influence its effectiveness. Also, if contaminant concentrations are too high, plants may die.

Some phytoremediation transfers contamination across media, (e.g., from soil to air). Phytoremediation is not effective for strongly sorbed contaminants such as PCBs. Phytoremediation may also require a large surface area of land for remediation.

Applicability

Phytoremediation is used for the remediation of metals, radionuclides, pesticides, explosives, fuels, VOCs and SVOCs. It may be used to cleanup contaminants found in soil and ground water. Because LPS site characteristics such as shallow ground water and moderate contaminant levels are favorable for the application of phytoremediation, it will be retained as a technology for further evaluation in the FS.

CHEMICAL EXTRACTION

Chemical extraction is a process that separates contaminants from soils and thereby reduces the volume of the hazardous waste that must be treated. The process differs from soil washing, which generally uses water, and varies with contaminant and soil type. Often, physical separation is used before chemical extraction on the assumption that smaller particles contain most of the contamination. The two major chemical extraction processes are described below:

Acid Extraction

Acid extraction uses hydrochloric acid to extract heavy metal contaminants from soils. In this process, hydrochloric acid is mixed with soil in a closed extraction unit. The residence time in the extraction unit generally ranges between 10 and 40 minutes. When extraction is complete, the soils are rinsed with water to remove entrained acid and metals. The extraction solution and rinse waters are regenerated using precipitation. The heavy metals are potentially suitable for recovery. The clean soils are dewatered and mixed with lime and fertilizer to neutralize any residual acid.

Solvent Extraction

Solvent extraction uses an organic solvent, to remove metals and mixtures of metal and organic compounds. It is commonly used in combination with other technologies, such as solidification and stabilization, incineration, or soil washing. Soil is removed and treated.

Limitations and Concerns

Organically bound metals can be extracted along with the target pollutants, thereby creating residuals with special handling requirements. The toxicity of the solvent is an important consideration as traces may remain in the treated soil. If solvent extraction is used for PCBs and other chlorinated compounds, concentrations of these contaminants in the solvent must be kept very low if the resulting solvent is going to be burned. Burning may cause the formation and release of dioxin and furans.

After acid extraction, any residual acid in treated soil needs to be neutralized. "Clean soil" must meet cleanup criteria. This may prove difficult and uneconomical. In solvent extraction, impermeable membrane liners and covers should be used to reduce solvent evaporation and to protect against rain. Some soil types and moisture content levels will adversely impact process performance. Higher clay content may reduce extraction efficiency and require longer contact times.

Applicability

Solvent extraction is used to treat soils containing organic contaminants such as SVOCs, VOCs, and fuels, as well as metals. Acid extraction is suitable to treat soils contaminated with heavy metals. Commercial-scale units are in operation. Because the volume of soils which may be involved in the extraction process are comparatively large, and their permeability is expected to be relatively small (i.e. high clay content), the use of this technology does not appear to be favorable. It will not be retained for evaluation in the FS.

DUAL-PHASE EXTRACTION (DPE)

Dual-phase extraction (DPE), which is also known as multi-phase extraction, is a technology that uses a high vacuum system to remove contaminated ground water and soil vapor. In DPE systems a high vacuum extraction well is installed so that its screened section is in the zone of contaminated soils and ground water. Because fluid/vapor extraction systems depress the water table and use a high vacuum, water flows faster to the extraction well. It removes contaminants from above and below the water table. As the water table around the well is lowered by pumping, unsaturated soil is exposed. This area, called the capillary fringe, is often highly contaminated, as it holds undissolved chemicals, chemicals that are lighter than water, and vapors that have escaped from the dissolved ground water below. Contaminants in the newly exposed zone can be removed by vapor extraction. Once above ground, the extracted vapors or liquid-phase organics and ground water are separated and treated. Use of dual-phase extraction with these technologies can shorten the cleanup time at a site, as the capillary fringe is often the most contaminated area.

Limitations and Concerns

Site geology and contaminant characteristics influence the effectiveness of this technology. DPE for liquid/vapor treatment is generally combined with bioremediation, air sparging, or bioventing when the contaminants include long-chained hydrocarbons (e.g., some fuels).

Dual phase extraction requires both water treatment and vapor treatment. DPE is not recommended for low permeability formations as it has the potential to leave isolated areas of undissolved contaminants in the formation.

Applicability

DPE removes VOCs and fuels from ground water and soil and is considered to be commercially available. Because DPE incorporates the use of pump and treat technologies along with soil vapor extraction, it will be evaluated in the FS in one form or another. However, it may not be evaluated separately as Dual Phase Extraction.

ENHANCED SOIL VAPOR EXTRACTION

This technology is an enhancement of soil vapor extraction (SVE), a proven technology for removing volatile organic contaminants (VOCs) from permeable soils. The effectiveness of conventional SVE is limited when contaminants cannot be easily vaporized, if the soil is too tight for air to pass, or if the contaminants are below the water table. Heating the soil while venting can extend the effectiveness of SVE. Heating effectively increases the vapor pressure of the contaminant, increasing its removal rate. Heating is done by injecting hot air or steam into the soil or by placing electrodes in the ground. This later method is called six-phase soil heating (SPSH) and is described as a separate technology.

Limitations and Concerns

The effectiveness of directly injecting hot air or steam depends largely on the characteristics of the soil. A highly permeable soil is required to ensure uniform heating, venting, and contaminant removal. Tightly bound soils are not generally suited for hot air or steam injection.

In a complex underground geological system where impermeable layers of silt or clay are interspersed with permeable layers, injection of hot air or steam may be ineffective. Injection of hot air also suffers from the low heat capacity of air compared to soil, requiring long injection times, large blowers and significant pumping costs. Condensed steam may decrease the soil's permeability to gas flow.

Steam adds significant amounts of water to the subsurface. Where the contaminated zone is close to the water table, precautions must be taken to prevent the transfer of contaminants from soil to ground water.

Electrical heating is more applicable in tighter soils. Electrical heating not only raises the vapor pressure of the contaminants, but it also provides steam from soil moisture to accelerate removal of contaminants from soils. When electrical heating is sufficient to dry the soil, electrical conduction stops because dry soil is much more resistive. Water can be added to maintain conduction.

Applicability

This technology is used to enhance the removal of VOCs and fuel from soil. It may work well for some DNAPL removal. Steam injection has long been used in the oil industry. It is being field tested at several sites outside of the oil industry for more widespread applicability. Because of the limitations of steam injection at a site where soils are expected to exhibit low permeability, this technology is not being retained for evaluation in the FS. However, the following technology dealing with electrical heating of the subsurface is a more favorable technology and will be retained for further evaluation in the future.

SIX PHASE SOIL HEATING

Six Phase Soil Heating (SPSH) enhances recovery of soils contaminated with volatile and semi-volatile organic compounds (VOCs and SVOCs). SPSH assists soil vapor extraction (SVE) by heating the contaminants in the soil. With SVE, a vacuum created in the soil pulls contaminated vapor into a well and then to the surface where the vapors are treated to remove the contaminants. However, its effectiveness is limited if the contaminants cannot be easily vaporized or if the soil is too tight for air to pass through readily. SPSH raises the vapor pressure of VOCs and SVOCs, increasing volatilization and removal via SVE. As SPSH dries the soil, it also creates a source of steam that strips contaminants from soils.

SPSH splits conventional three-phase electricity into six separate electrical phases, producing an improved subsurface heat distribution. Each phase is delivered to a single electrode, which is placed in a hexagonal pattern at up to 100 feet deep. Each electrode conducts electricity to all the others and to a central neutral electrode. At one demonstration, temperatures within the array were elevated to 100 degrees Celsius after 8 days of heating. The vapor extraction well is located in the center of the hexagon. An applied electrical field heats soils internally, and the soil itself acts as a heat source. Thus SPSH is more effective than other soil heating techniques such as using heating elements, which has a much smaller radius of influence. Because conventional SVE relies on the ability to draw vapors out of the soil, SPSH is especially suited to sites where contaminants are tightly bound to clays and are thus difficult to remove.

Limitations and Concerns

Engineered barriers to prevent worker exposure to high voltages are recommended. Also, an off-gas treatment system for contaminated vapors removed from the subsurface needs to be installed. The system should be sized to handle peak extraction rates and the mix of VOCs in extracted vapor and liquid streams.

The extraction well should be screened both above and below the target zone to ensure sufficient vacuum pressure in the subsurface. This extraction well design should also ensure total capture of contaminants released as a result of the heating.

The presence of buried metal objects presents a safety hazard. The subsurface should be mapped before the heating system is installed.

Questions remain about how quickly soil should be heated. When heating is sufficient to dry the soil, electrical conduction stops because dry soil is more resistive to electricity. Water can be added to maintain conduction.

A potential explosion hazard exists from concentrated fumes released from the vacuum unit.

Applicability

SPSH has been demonstrated to enhance removal of VOCs and SVOCs in unsaturated clay-rich soils. Bench-scale tests demonstrated that SPSH is effective on lower volatility compounds. SPSH is considered to be in the field test stage of development. Although there are many variables which would have to be taken into account to determine the applicability of this technology at the LPS site, the technology has potential. It will be retained for further evaluation in the FS.

SOIL FLUSHING

Soil flushing is a technology used for extracting contaminants from the soil. It works by applying water to the soil. The water has an additive that enhances contaminant solubility. Contaminants that are dissolved in the flushing solution are leached into the ground water, which is then extracted and treated. In some cases, the flushing solution is injected directly into the ground water. This raises the water table into the capillary fringe just above the surface of the water table, where high concentrations of contaminants are found. In many instances, surfactants (i.e., detergent-like substances) or solvents are used as the additive. The effectiveness of this process is dependant on hydrogeologic variables (e.g., type of soil, soil moisture) and type of contaminant.

Limitations and Concerns

Flushing additives may leave small residuals in the soil or ground water, and should be evaluated on a site-specific basis. There is the potential of washing the contaminant beyond the capture zone and the introduction of surfactants to the subsurface. The technology should be used only where flushed contaminants and soil-flushing fluid can be contained and recaptured. Additives must also be recovered from the underlying aquifer and, when possible, should be recycled.

Treatment of the recovered fluids forms residual sludges that must be treated or disposed of. Recovered ground water may need treatment to meet appropriate discharge standards. If used to extract volatile organic compounds (VOCs), air emissions should also be treated.

Low permeability soils, such as clays, are difficult to treat with this method. Surfactants may reduce soil porosity, and therefore should only be used on a case by case basis.

Applicability

Soil flushing technology removes metals, including radioactive contaminants, and VOCs, SVOCs, fuels, and pesticides from soil. It is usually less cost-effective for organic materials. Soil flushing is a developing technology that has had limited use. Typically, laboratory and field treatability studies must be performed under site-specific conditions before soil flushing is selected as the remedy. Although this technology may have promise at some sites, because it has been shown to be less cost-effective for organic contaminants, and LPS soils are expected to be low in permeability, this technology will not be retained for further consideration in the FS.

SOIL VAPOR EXTRACTION (SVE)

Soil vapor extraction (SVE) uses vacuum pressure to remove volatile and some semi-volatile contaminants (VOCs and SVOCs) from the soil. The gas leaving the soil may be treated or destroyed, depending on local and state air discharge regulations. Extraction wells are typically used at depths of 5 feet or greater, and have been successfully applied as deep as 91 meters (300 feet). Ground water pumps may be used in conjunction with SVE to keep ground water from rising into the unsaturated zone as a result of vacuum pressure, or to increase the depth of the unsaturated zone. This area, called the capillary fringe, is often highly contaminated, as it holds undissolved chemicals, chemicals that are lighter than water, and vapors that have escaped from the dissolved ground water below. In soils where the contamination is deep or when there is low permeability, injecting air into the soil helps extraction. During full-scale operation, SVE can be run intermittently (pulsed operation) once the extracted mass removal rate has reached a steady state level. Because the process involves the continuous flow of air through the soil, it often promotes biodegradation of low-volatility organic compounds that may be present.

SVE can also be used on piles of excavated soil. A vacuum is applied to a network of above ground piping to encourage volatilization of organics from the excavated media. The process includes a system for handling off-gases.

Limitations and Concerns

Soil with high moisture requires higher vacuums, hindering the operation of the SVE system. Soils with high organic content or soils that are extremely dry have a high sorption capacity of VOCs. These conditions limit the effectiveness of SVE. Soils with low permeability also limit the effectiveness of SVE.

Because SVE applies vacuum pressure to subsurface soils, it can raise ground water levels. As soil becomes saturated, some contaminants may dissolve into the water. As a result, ground water could show increases in contamination levels, especially when this process begins.

SVE will not remove heavy oils, metals, PCBs, or dioxins. Exhaust air from in-situ SVE system may require treatment. Off-gas treatment usually involves vapor-phase Granular Activated Carbon (GAC). SVE is not effective in the saturated zone.

A field pilot study is necessary to establish the feasibility of the method as well as to obtain information necessary to design and configure the system.

Applicability

The technology is typically applicable for soil with VOC and/or fuels contamination. SVE works only on compounds which readily vaporize (i.e., with a high Henry's law constant). SVE is commercially available and widely used. LPS soils are expected to be low in permeability, and high seasonal ground water levels may preclude its effective use. However, because SVE is widely used and its capabilities are well known in the industry, it will be retained for further consideration in the FS.

SURFACTANT ENHANCED RECOVERY

Surfactant enhanced recovery increases the mobility and solubility of the contaminants sorbed to the saturated soil matrix. Surfactants (i.e., surface-active agents) are the primary ingredient of many soaps and detergents. Surfactant-enhanced recovery injects surfactants into contaminated ground water. A typical system uses an extraction pump to remove ground water downstream from the injection point. The extracted ground water is treated above ground to separate the injected surfactants from the contaminants and ground water. Once the surfactants have separated from the ground water they are re-used. Contaminants must be separated from the ground water using one of many treatment methods. The surfactants used are non-toxic and biodegradable.

Surfactant enhanced recovery is used most often when the ground water is contaminated by dense nonaqueous phase liquids (DNAPLs). These dense compounds, such as trichloroethylene (TCE), sink in ground water because they are heavier than water. They then act as a continuous source for contaminant plumes that can stretch for miles within an aquifer. These compounds may biodegrade very slowly. They are commonly found in the vicinity of the original spill or leak where capillary forces have trapped them.

Limitations and Concerns

Hydraulic control of the surfactant and contaminants must be maintained to prevent the spread of contamination. Air emissions should be controlled at above ground treatment.

Surfactant enhanced recovery is often used to complement conventional pump-and-treat systems for removing dissolved-phase DNAPL contamination.

Applicability

A typical system removes and treats VOC-contaminated ground water. Surfactant enhanced recovery has been used in the oil industry for years. It is commercially available, although each surfactant should be matched with the contaminant. Because it is principally used to treat DNAPL pockets in soil or ground water, and separate phase contamination was not discovered at LPS during the Phase II and Remedial Investigations, this technology will not be retained for consideration in the FS.

THERMAL DESORPTION

Thermal desorption separates contaminants from soil. Soil is heated in a chamber where water, organic contaminants and certain metals are vaporized. A gas or vacuum system transports vaporized water and contaminants to an off-gas (i.e., air emission) treatment system. The design of a system aims to volatilize contaminants, while attempting not to oxidize them. (Otherwise, thermal desorption would be another way of saying incinerator.) Based on the operating temperature of the desorber, thermal desorption processes can be categorized into two groups: high temperature thermal desorption (HTTD) and low temperature thermal desorption (LTTD). It is important to note that thermal desorption does not to destroy organics.

In HTTD, wastes are heated to 320 to 560 °C (600 to 1,000 °F). HTTD is frequently used in combination with incineration, solidification/stabilization, or dechlorination, depending upon site-specific conditions.

In LTTD, wastes are heated to between 90 and 320 °C (200 to 600°F). LTTD is most often used for remediating fuels in soil. Unless being heated to the higher end of the LTTD temperature range, organic components in the soil are not damaged, which enables treated soil to retain the ability to support future biological activity.

Treatment of the off-gas must remove particulates and contaminants. Particulates are removed by conventional particulate removal equipment, such as fabric filters. Contaminants are removed through condensation followed by carbon adsorption, or they are destroyed in a secondary combustion chamber or a catalytic oxidizer.

Limitations and Concerns

Treatment and control of air emissions from thermal desorption operations is an extremely important consideration. It is important that there are not emissions problems concerning metals, certain PAHs and dioxins/furans. Dewatering may also be necessary to achieve acceptable soil moisture content levels.

Soil storage piles need to be covered to protect from rain (to minimize soil moisture and infiltration) and from wind. Clay and soils with high humic content need longer reaction time.

Treated soil may no longer be able to support microbiological activity that breaks down contaminants. If the soil is returned to a previously or partially contaminated site, this may be of concern.

Applicability

Thermal desorption systems are somewhat effective in removing VOCs, SVOCs, fuels, pesticides and some metals from soil. High temperature units are more effective removing volatile metals and SVOCs. The technology is commercially available. Because this potential remedy requires the removal (and eventual replacement) of contaminated soils, it is less favored than other remedies. It would be likely that soils treated in this fashion would also have to be treated off-site, increasing logistical work and concern over the increased risk of spreading VOC contamination elsewhere. For these reasons, this technology will not be retained for consideration in the FS.

THERMAL ENHANCED VAPOR EXTRACTION SYSTEM (TEVES)

Thermal Enhanced Vapor Extraction System (TEVES) uses a combination of soil heating processes (i.e., electrical resistance, electromagnetic heating, fiber optic/radio frequency heating or hot-air/steam injection) to enhance soil vapor extraction (SVE). It enhances vapor extraction by increasing the vapor pressure of semi-volatile organic compounds and volatile organic compounds (SVOCs and VOCs, respectively). It is similar to Enhanced Soil Vapor Extraction, and Six-Phase Soil Heating, except it uses electromagnetic and radio-frequency heating (RFH) in combination with electrical resistance heating.

The first step of the system is placing three rows of electrodes to a depth of approximately 25 feet. As the electrodes begin to heat the soil and drive off the soil moisture, electrical conductivity can be maintained by adding water to the electrodes. However, electrical heating is self limiting; for as the soil heats and dries, current between electrodes stops flowing. At this point, RFH is used. RFH uses electromagnetic energy to heat soil to over 300 °C. RFH enhances vapor extraction by raising contaminant vapor pressure and increasing soil permeability (i.e., dryer soils have more pore space between particles). Extracted vapor can be treated by a variety of technologies, such as granular activated carbon (GAC).

Limitations and Concerns

Engineered barriers to prevent worker exposure to high voltages are recommended. An off-gas treatment system for contaminated vapors removed from the subsurface also needs to be installed. The system should be sized to handle peak extraction rates and the mix of VOCs in extracted vapor and liquid streams.

The extraction well should be screened both above and below the target zone to ensure sufficient vacuum pressure in the subsurface. This extraction well design should also ensure total capture of contaminants released as a result of the heating. The presence of buried metal objects presents a safety hazard. The subsurface should be mapped before the heating system is installed. Lastly, a potential explosion hazard exists from concentrated fumes released from the vacuum unit.

Soil that is tight or has high moisture content has a reduced permeability to air and requires more energy to increase vacuum and temperature. Soil with highly variable permeability may result in uneven delivery of airflow to the contaminated regions. Soil that has a high organic content results in reduced removal rates because of sorbed VOCs. As with SVE, remediation projects using TEVES are highly dependent upon the specific soil and chemical properties of the contaminated media.

Applicability

The system is designed to treat and remove SVOCs and VOCs from soil. After application of this process, subsurface conditions are excellent for biodegradation of residual contaminants. This technology is still considered to be in the field demonstration stage. Because the FS will consider SVE technologies based on the soil properties obtained during the RI, this SVE variant will also be considered in the FS.

AERATION

Aeration is a well-developed technology in the cleanup and wastewater treatment industries. It is a process that promotes volatilization and biological degradation by bringing contaminated media into contact with the air. Aeration technologies include activated sludge, rotating biological contacters, trickling filters, air stripping, air sparging and bioventing. (These latter three technologies are described separately.) In air strippers, for example, water is allowed to cascade down through a series of slats or baffles in a tower, while the air rises in a countercurrent flow. Other methods include blowing air through jets into the water in a tank and the use of mechanical aeration devices that propel water droplets through the air. Many other configurations are possible, including baffled tanks through which the water is forced to flow.

Limitations and Concerns

When the contaminated water is high in volatile organic compounds (VOCs), contaminants removed through aeration - that is, off-gases - must still be treated. When spray irrigation is selected as the aeration technology, off-gas treatment is not feasible. There is a major concern that this treatment merely transfers contaminants from the water to the air. Consequently, it's important to evaluate risks related to increases in contaminant loading of air and to monitor air quality continuously.

Aeration promotes biodegradation only in systems where the oxygen-rich air has time to nourish bacteria. Consequently, open systems, such as air stripping, do not take advantage of this attribute.

Oxygen is not the only food source for bacteria that reduce VOCs, and it is used relatively quickly. Depending on the contaminant, contaminant concentration, and geochemical factors, oxygen is only one factor in sustaining biodegradation. As in other biodegradation technologies, byproducts and rates of degradation must be carefully monitored.

Applicability

The target contaminant groups for aeration are semi-volatile organic compounds (SVOCs), pesticides, and fuels. VOCs can be stripped followed by off-gas treatments. These technologies are commercial and will be evaluated, as appropriate (i.e. if stripping to remediate ground water is applied), during the FS.

AIR STRIPPING

Air stripping is a technology in which volatile organic compounds (VOCs) are transferred from extracted water to air. Typically, air stripping takes place in a packed tower (known as an air stripper) or an aeration tank. The "air stripper" includes a spray nozzle at the top of the tower. It sprays ground water that has been pumped to the surface over the packing in the column. As the water descends, air is forced up through the column, stripping off the volatile compounds. Packing or baffles within the tower increase the surface area of the contaminated water that is exposed to air, thus maximizing the amount of volatilization. A sump at the bottom of the tower collects decontaminated water. Auxiliary equipment may include an air heater to improve removal efficiency and air emission "scrubbers."

Traditional air strippers vary in height, and the height is correlated to the chemical concentration of the contaminated water. A recent innovation in air strippers is the low-profile air stripper. These units have a number of trays that are set almost horizontally. Water is cascaded over the trays to maximize air-water contact while minimizing vertical space. Because they are not so visible, they are increasingly being used for ground water treatment.

Limitations and Concerns

Air strippers transfer contaminants from one medium to another. There is no destruction of the contaminant. Consequently, the risks of emitting pollutants into the air must be carefully evaluated. Often, the air stream is treated with vapor-phase granular activated charcoal, which adsorbs most of the contaminants. Algae, fungi, bacteria, and fine particles may foul the equipment, requiring pretreatment or periodic column cleaning.

Air stripping is effective only for water contaminated with VOC or semi-volatile concentrations with a Henry's constant greater than 0.01. (Henry's Law is a measure of the extent that a chemical separates between water and air. The higher the Henry's Law constant, the more likely substances will volatilize rather than remain in water.) The LPS primary contaminant of concern, TCA, is effectively stripped using this technology.

Applicability

Air stripping is used to separate VOCs from contaminated ground water. Air strippers are commercially available and widely used. This technology will be retained for further consideration in the FS, as noted above for the Aeration technology.

BIO-REACTORS

A bio-reactor is a generic term for a system that degrades contaminants in ground water and soil with microorganisms. The reactors can be open systems, such as a constructed wetland (described as a separate technology), or an enclosed chamber. This description only describes the latter. Unlike natural attenuation and in-situ bioremediation, bio-reactors can avoid and control the frequent problem of ineffective indigenous microorganisms and/or low indigenous microbial populations. There are several types of bio-reactors.

The most common bio-reactor is used in wastewater treatment. Contaminated ground water is circulated in an aeration basin where microbes degrade organic matter, forming a sludge that is disposed of or recycled. A second type uses a rotating biological matrix. Microorganism populations grow on the matrix, which is rotated in the reactor. Another method uses a packed bed. A tank is filled with a support medium, which provides a large surface area for microbial growth. Another system uses soil slurry bio-reactor technology to degrade soil having TNT and RDX concentrations.

Bio-reactors can be installed in-situ (i.e., in place). Vertically oriented bio-reactors are called bio-plugs. Horizontal bio-reactors are called bio-conduits. These techniques enhance degradation as contaminated ground water passes through the reactor. This technology has been successfully implemented to remediate organic compounds at leaking underground storage tank and industrial sites.

Limitations and Concerns

Contaminated ground water is often too dilute to support an adequate microbial population. At the other extreme, very high concentrations may be toxic to microorganisms. If contaminants tend to volatilize, air pollution controls may be necessary.

With explosive materials or chlorinated solvents, some intermediary degradation products are more toxic than the original contaminant. Residuals may also require treatment or disposal.

Applicability

Bio-reactors are used primarily to treat VOCs and fuel hydrocarbons. The in-situ immobilized bio-reactors can also be used to provide a cometabolite for degradation of hazardous by-products produced during the degradation process of some of the chlorinated solvents. This type of bio-reactor contains adapted microbes that mineralize the organic compounds of interest. The microbes are trapped onto a biological support medium. An in-situ immobilized bio-reactor system can be used in conjunction with a vapor extraction system.

Basic bio-reactors are a well-developed technology that has been used in the treatment of municipal and industrial wastewater. Adaptations have only recently been evaluated for treating ground water and soil containing large concentrations of chemical contaminants. Several successful pilot projects have been completed for chlorinated compounds. Laboratory experiments have been done for explosive compounds. Bio-reactors are commercially available for treating fuels.

In the case of the LPS property, the Phase II Investigation results indicate soil and ground water contamination do not exist in sufficiently high concentrations for bioreactors to be used efficiently. In-situ remedial technologies offer similar advantages without the degree of engineering and construction inputs. Therefore, this technology will not be retained for evaluation in the FS.

BIO-SLURRY

Bio-Slurry is the controlled treatment of excavated soil in an enclosed vessel. The bio-slurry process is used primarily for remediation of soil contaminated with explosives such as TNT, RDX, and HMX. It is a form of bio-reactor. After removal of stones and rubble, excavated soil is mixed with water and placed in a tank. Typically, slurry contains from 10 to 30% solids. Nutrients are added to enhance the ability of soil microbes to destroy contaminants. The vessels are designed with various process controls so that temperature, mixing, and nutrient additions can be manipulated to achieve maximum efficiency. After treatment, the soil is dried and tested to ensure that the explosive compounds have been degraded. Then, the soil may be disposed of or put back in its original location. Mobile treatment units that are quickly moved into and out of the site are available.

Limitations and Concerns

Excavation of contaminated media is required, and therefore dust and particulates must be controlled. Any free-phase contaminants must be removed prior to mixing soils into the slurry.

Drying the soil after treatment may be expensive. Disposing of wastewater may also present a problem, and the wastewater should be carefully monitored for residual contaminants.

Biodegradation of specific contaminants in any specific soil/site condition is dependent on many factors, including soil type, soil chemistry, the mix of contaminants, and temperature. To determine whether biodegradation is an appropriate remedy, it is necessary to characterize the contamination, soil, and site, and to evaluate the biodegradation potential of the contaminants. A preliminary treatability study should be conducted.

Applicability

Bioremediation techniques have been successfully used to remediate soils contaminated by explosives, petroleum hydrocarbons, solvents, pesticides, and wood preservatives. Slurry bio-reactors are used primarily to treat nonhalogenated (i.e., halogens are a class of chemicals including bromine, fluorine, iodine, and chlorine) SVOCs, VOCs, and explosive compounds in soil. Bio-reactors are favored over in-situ (i.e., in-place) biological techniques in situations where underlying ground water may be difficult to capture, or when faster treatment times are required. Slurry-phase bio-reactors containing cometabolites and specially adapted microorganisms are both used to treat halogenated VOCs and SVOCs, pesticides, and PCBs in excavated soils and dredged sediments.

This technology is field-tested. Demonstrations of three different bio-slurry processes are underway. An aerobic (with oxygen) bio-slurry was used to reduce TNT, HMX, and RDX concentrations at Joliet Army Ammunition Plant, IL by 99%. An anoxic (without oxygen)/aerobic process and an anaerobic process are also being tested. Because this technology has been most effective for nonhalogenated VOCs, it will not be retained for further consideration in the LPS FS.

INCINERATION

High temperatures, 870 to 1,200 °C (1,400 to 2,200 °F), are used to volatilize and combust halogenated and other organics in hazardous wastes. Auxiliary fuels are used to initiate and sustain combustion. Incinerator designs are geared towards different waste streams and different end products, and operating temperatures vary with the different designs. The destruction and removal efficiency for properly operated incinerators is 99.99% for most waste. Off-gases and combustion residuals generally require treatment. Air pollution-control systems are employed to remove particulates, and to neutralize and remove acids.

Incineration is different from other thermal technologies in that it oxidizes bulk quantities of waste that may be in liquid and solid phase. Pyrolysis, which is described separately, uses heat in the absence of oxygen to destroy contaminants. Thermal and Catalytic Oxidation treats only the vapor phase of contaminants.

Limitations and Concerns

Incinerators may release carcinogenic and toxic chemicals from their stacks, including heavy metals, partially-burned organic material such as polyvinyl chloride (PVC), herbicide residues, and other organic chemicals, including polycyclic aromatic hydrocarbons (PAHs), and dioxins and furans.

When chlorinated hydrocarbons are incinerated, products of incomplete combustion are formed. These may include dioxins and furans. Several PAHs and dioxins and furans are known or suspected human carcinogens. Dioxins may be toxic in the parts per trillion range. Even with the best practices, these products may form as gases leave the stack.

Only one off-site incinerator is permitted in the United States to burn wastes that contain PCBs and dioxins. It reportedly achieves 99.9999% destruction efficiency.

Wastes with heavy metals can produce a bottom ash with high concentrations. The ashes may require disposal and/or stabilization. Some heavy metals, including lead, cadmium, mercury, and arsenic may partially vaporize and leave the combustion unit with the flue gases. This may require gas-cleaning systems for removal.

Metals can react with other elements in the feed stream, such as chlorine or sulfur, forming compounds that are more volatile and toxic than the original species. Most of these compounds are short-lived reaction intermediates that can be destroyed. If an off-site incinerator is used, the potential risk of transporting the hazardous waste through the community must be considered.

Applicability

Incineration is used to remediate soils contaminated with explosives and hazardous wastes, particularly chlorinated hydrocarbons. One incinerator in the U.S. treats soils contaminated with PCBs and dioxins. Incineration is a commercial technology, used as a remedial action at more than 150 Superfund sites. It will be retained for further consideration in the LPS FS.

LIQUID-PHASE GRANULAR ACTIVATED CARBON ADSORPTION

Liquid-phase Granular Activated Charcoal Adsorption (GAC) is a treatment technology to remove contaminants from the ground water. Ground water is pumped through one or more vessels containing GAC. Thermal processing of carbon, often derived from ground coconut shells, creates small porous particles with a large internal surface area. This attribute makes it activated. The activated carbon attracts and adsorbs organic molecules as well as certain metal and inorganic molecules. Dissolved contaminants sorb onto the surfaces of the activated carbon. Water is passed through the vessels relatively quickly. When the concentration of contaminants in the water exiting the vessels exceeds a certain level, the carbon must be replaced. Spent carbon can be regenerated in place, removed and regenerated at an off-site facility or most commonly, removed and disposed.

Limitations and Concerns

Ground water with suspended solids and oil and grease may cause fouling of the carbon. Pretreatment for removal of suspended solids from ground water is an important design consideration. Costs are high if used as the primary treatment for ground water with high concentrations of contaminants. Often, GAC is phased in after a different technology is used.

Some degradation products such as vinyl chloride and smaller molecules are not sorbed well, and consequently must be monitored carefully. Also, all spent carbon eventually needs to be disposed in landfills or regenerated. There are few regeneration facilities. Carbon used for some contaminants (e.g., explosives or metals) may not be regenerated.

Applicability

This technology is used to treat ground water contaminated with hydrocarbons, SVOCs, metals and explosives. Limited effectiveness is achieved on certain VOCs and pesticides. The technology is well proven, and is frequently part of remedial designs. It will be retained for consideration in the FS.

SORPTION

Sorption is the common term used for both absorption and adsorption. These terms are often confused. Absorption is the incorporation of a substance in one state into another of a different state (e.g., liquids being absorbed by a solid or gases being absorbed by water). Adsorption is the physical adherence or bonding of ions and molecules onto the surface of another molecule. It is the most common form of sorption used in cleanup. Unless it is clear which process is operative, sorption is the preferred term.

Most sorption technologies act like a sponge or a filter, soaking up contaminants until they run out of surface area. In liquid adsorption technologies, contaminants that are in solution (i.e., solutes) adsorb to the surface of a sorbent. The most common adsorbent is granulated activated carbon (GAC), discussed above. Other natural and synthetic adsorbents include activated alumina, forager sponge, lignin adsorption, sorption clays, and synthetic resins. Activated alumina is a filter media that is porous and highly adsorptive. Activated alumina filters a variety of contaminants, including fluoride, arsenic, and selenium. The alumina can be regenerated. The forager sponge is a cellulose sponge that incorporates a polymer that selectively sorbs dissolved heavy metals. Lignin adsorption/sorptive clays are used to treat aqueous waste streams with organic, inorganic and heavy metals contamination. Synthetic resins are more expensive than GAC, but they can be designed to achieve higher degrees of selectivity and adsorption capacity for certain compounds than activated carbon. Resins are typically regenerated.

Limitations and Concerns

Small molecules are not adsorbed well. Therefore, when GAC is used for liquid or off-gas treatment, it may have difficulty adsorbing some organic by-products, such as vinyl chloride. Sorption is not applicable for waste streams that have high levels of oily substances combined with other wastes, as the oily wastes rapidly adsorb onto the medium.

Most sorption technology merely transfers the contaminant from one medium to another. For example, there are only one or two commercial regeneration facilities for GAC. These regeneration units heat the GAC so that it desorbs the adsorbed chemicals. Extracted chemicals are either recycled or disposed. The GAC can then be used again. Consequently, GAC sorption is not preferred when the concentration of the hazardous substance is so high that frequent replacement of the absorbent unit is necessary.

Applicability

The target contaminants for adsorption/absorption processes are most organic contaminants and selected inorganic contaminants from liquid and gas streams. GAC is used most often for liquid and off-gas capture of organic materials. Activated alumina can remove fluoride and heavy metals. Sorption technologies are well developed and commercial. Because GAC will be considered as a possible remedy during the FS, sorption in general will be considered. One significant drawback or limitation to use of the technology at the LPS site may be the presence of lubricating oils in the VOC contaminated soils. LPS was primarily a lubricating oil business, and as such, was subject to spills of this type of product as well as the more rarely used TCA. Oils have been documented as claiming sorption sites in lieu of hazardous contaminants, such as TCA, thereby rendering the technology inefficient.

SPRINKLER IRRIGATION

Sprinkler irrigation is a relatively simple treatment technology used to volatilize volatile organic compounds (VOCs) from contaminated wastewater. The process uses pressure to force water contaminated with VOCs through a sprinkler irrigation system. As the water is sprayed in the air, VOCs vaporize and are released directly to the atmosphere.

Limitations and Concerns

The system causes the direct release of contaminants to the atmosphere. Emission control is not feasible. Sprinkler irrigation systems transfer contaminants from one medium to another. There is no destruction of the contaminant. Therefore, the risks of emitting pollutants into the air must be carefully evaluated. Also, sprinkler irrigation is not appropriate for contaminated water containing heavy compounds such as metals, some fuels, and semi-volatile organic compounds. It should only be used for water containing low levels of contamination and the contaminants readily transfer from the dissolved phase to the vapor phase. Lower temperatures may effect performance.

Applicability

Sprinkler irrigation is used to treat VOCs in ground water. It is only applicable for ground water containing very low concentration of contaminants. Little detailed performance information is available in the literature. Because this technology is designed for ground water containing very low VOC levels, it will only be considered as a remedy in conjunction with other remedial technologies in the FS.

ULTRAVIOLET(UV) OXIDATION

Ultraviolet (UV) oxidation is a destruction process that oxidizes organic contaminants in water. It works by adding oxidizing agents such as ozone (O3) or hydrogen peroxide (H2O2) to the contaminated ground water. The contaminated solution is passed through a chamber where it is exposed to intense UV radiation. UV radiation is provided by UV light bulbs. Oxidation of target contaminants is caused by direct reaction with the oxidizers and through the action of UV light in combination with ozone and/or hydrogen peroxide.

Limitations and Concerns

A major success factor is how well UV light is transmitted to dissolved contaminants. High turbidity (e.g., cloudiness) of the water would cause interference. The water should be relatively free of heavy metal ions and insoluble oil or grease to minimize the potential for fouling of the lights.

This system does not destroy some volatile organics such as trichloroethane (TCA). Instead, the contaminants may be vaporized and would need to be treated in an off-gas system. Energy requirements are very high, and this is a large drawback to this technology. Handling and storage of hydrogen peroxide requires special safety precautions.

Applicability

UV treatment is used to destroy VOCs and UXO (explosive compounds such as TNT) in ground water. Typically, easily oxidized organic compounds, such as those with double bonds (e.g., TCE, PCE, and vinyl chloride), as well as simple aromatic compounds (e.g., toluene, benzene, xylene, and phenol) are rapidly destroyed in UV/oxidation processes.

The UV/oxidation technology is a commercially available ground water treatment technology that has been used for more than 10 years. A majority of these applications are for ground water contaminated with petroleum products or with a variety of industrial solvent-related organics such as TCE, DCE, and vinyl chloride. Its use for destroying explosive compounds has been more limited. The US Army Environmental Center (AEC) evaluations have shown it to be 99.9% effective in destroying common explosives in ground water. Because the technology does not effectively oxidize TCA, the primary contaminant of concern at the LPS site, this technology will not be evaluated further in the FS.

Summary of Remedial Technologies Applicable to the LPS Site:

The technologies discussed above were selected from a large database of waste cleanup technologies which have been capable of removing, containing or treating TCA in soil and ground water at other sites in the U.S. This report considered each of the technologies with respect their applicability of cleaning up TCA contaminated soil and ground water at the LPS site in Middletown, NY. Specific hydrogeologic, geographic, climatic and contaminant distribution information was used to screen/remove those technologies with little chance of technical success or economic viability at the LPS site. A large number of technologies were considered to be potentially applicable, at least in terms of their technical capability of addressing LPS contamination. The following technologies will be retained for future consideration in the FS:

- *No Action*
- *Institutional Controls*
- *Selected Soil Removal*
- *Air Sparging*
- *Enhanced Bioremediation*
- *Groundwater Circulation Well*
- *In-situ Enhanced Soil Mixing*
- *In Well Air Stripping*
- *Natural Attenuation*
- *Permeable Reactive Barriers*
- *Phytoremediation*
- *Six-phase Soil Heating*
- *Soil Vapor Extraction (SVE)*
- *Thermal Enhanced Vapor Extraction System (TEVES)*
- *Aeration*
- *Air Stripping*
- *Incineration*
- *Liquid Phase GAC*
- *Solar Detoxification*
- *Sorption*
- *Sprinkler Irrigation*

Former Employee Questionnaire
Lubricant Packaging & Supply Co. Inc.
17 Industrial Place
Middletown, NY 10940

Darrel Ware
63 Grand Avenue, Apt #2
Middletown, NY 10940

1. Were you aware of any liquid disposal areas, floor drains or other devices in the building or on the property which received liquid solvent wastes? If so, please briefly describe the area or object and mark the corresponding location on the map. The attached map shows the location of the current LPS building, former storage tanks and property line fence. NO

2. Were you aware of any particular area that received repeated or numerous spills of solvent (particularly 1,1,1 trichloroethane) due to routine business activities? If so, please briefly describe the activities which caused the spillage, the approximate volume(s) lost and mark the approximate location where these activities occurred on the map. NO

3. Do you recall any areas on the map where spillage of solvent products (particularly 1,1,1 trichloroethane) occurred? If so, please briefly describe the incident(s) you recall, then mark the location of the incident on the map.

   NO

4. If you were aware of any other information which might help me locate a specific area where the solvent 1,1,1 trichloroethane may have been spilled or dumped, please give this information below or on the back of this page. NO

Thank you very much for completing this questionnaire. Even if you cannot answer any of the questions above with details, your completion of this form will help me plan the areas where I will sample soil and ground water in my upcoming remedial investigation. Thanks again.
Steve Saines

Darrel Ware

Former Employee Questionnaire
Lubricant Packaging & Supply Co. Inc.
17 Industrial Place
Middletown, NY 10940

Julie Meade
75 Wallkill Avenue
Middletown, NY 10940
845-343-8115

1. Were you aware of any liquid disposal areas, floor drains or other devices in the building or on the property which received liquid solvent wastes? If so, please briefly describe the area or object and mark the corresponding location on the map. The attached map shows the location of the current LPS building, former storage tanks and property line fence. NO

2. Were you aware of any particular area that received repeated or numerous spills of solvent (particularly 1,1,1 trichloroethane) due to routine business activities? If so, please briefly describe the activities which caused the spillage, the approximate volume(s) lost and mark the approximate location where these activities occurred on the map. NO

3. Do you recall any areas on the map where spillage of solvent products (particularly 1,1,1 trichloroethane) occurred? If so, please briefly describe the incident(s) you recall, then mark the location of the incident on the map. NO

4. If you were aware of any other information which might help me locate a specific area where the solvent 1,1,1 trichloroethane may have been spilled or dumped, please give this information below or on the back of this page. NO

J Meade

Thank you very much for completing this questionnaire. Even if you cannot answer any of the questions above with details, your completion of this form will help me plan the areas where I will sample soil and ground water in my upcoming remedial investigation. Thanks again.
Steve Saines

Former Employee Questionnaire
Lubricant Packaging & Supply Co. Inc.
17 Industrial Place
Middletown, NY 10940

Steven Renwick
Tamms Road, RD#2, Box 449
Middletown, NY 10940
845-343-8115

1. Were you aware of any liquid disposal areas, floor drains or other devices in the building or on the property which received liquid solvent wastes? If so, please briefly describe the area or object and mark the corresponding location on the map. The attached map shows the location of the current LPS building, former storage tanks and property line fence.

   No

2. Were you aware of any particular area that received repeated or numerous spills of solvent (particularly 1,1,1 trichloroethane) due to routine business activities? If so, please briefly describe the activities which caused the spillage, the approximate volume(s) lost and mark the approximate location where these activities occurred on the map.

   No

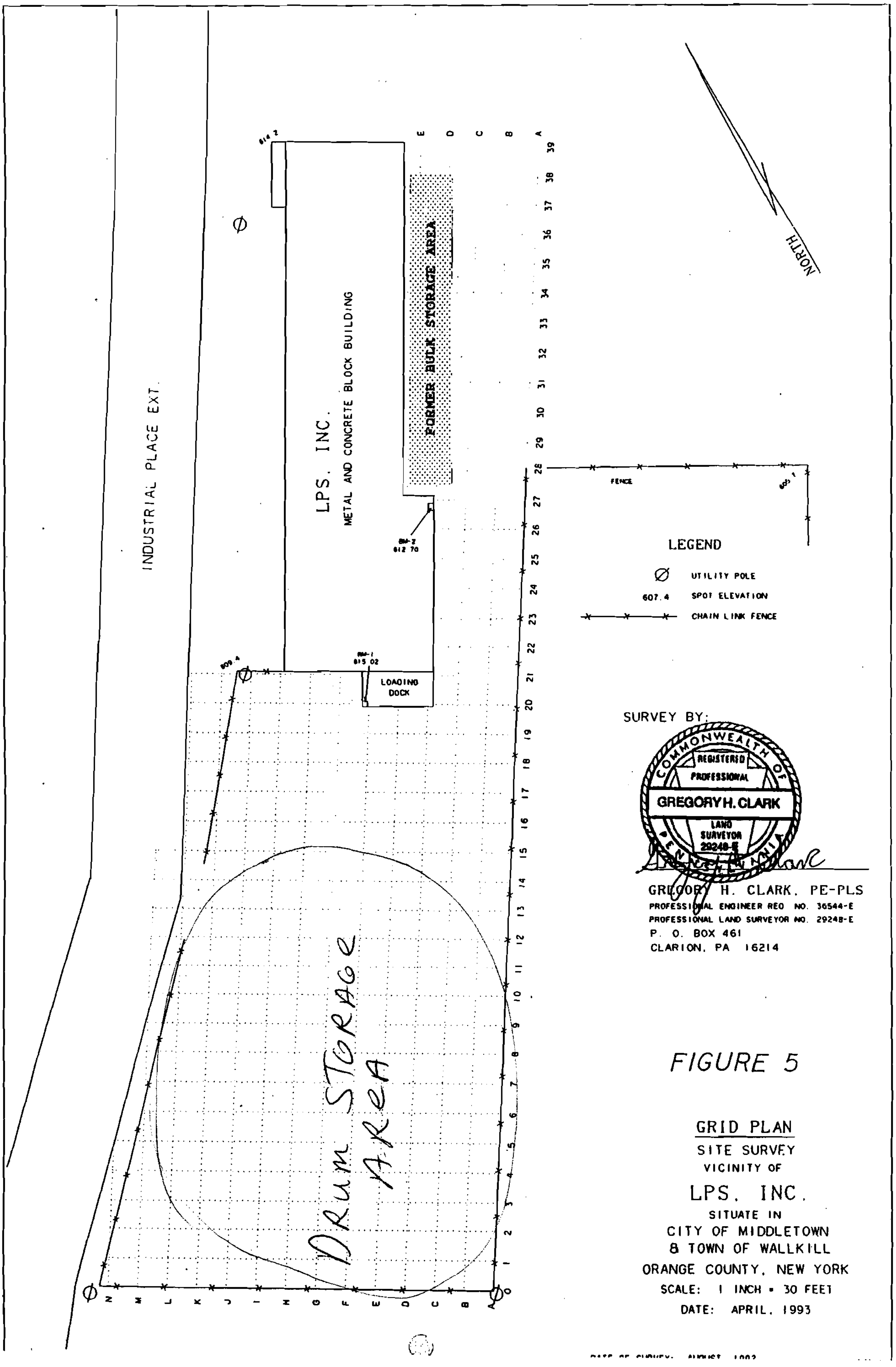
3. Do you recall any areas on the map where spillage of solvent products (particularly 1,1,1 trichloroethane) occurred? If so, please briefly describe the incident(s) you recall, then mark the location of the incident on the map.

   No

4. If you were aware of any other information which might help me locate a specific area where the solvent 1,1,1 trichloroethane may have been spilled or dumped, please give this information below or on the back of this page.

   DRUM STORAGE AREA

Thank you very much for completing this questionnaire. Even if you cannot answer any of the questions above with details, your completion of this form will help me plan the areas where I will sample soil and ground water in my upcoming remedial investigation. Thanks again.
Steve Saines



SURVEY BY:

GREGORY H. CLARK
29248-E

GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG NO. 36544-E
PROFESSIONAL LAND SURVEYOR NO. 29248-E
P. O. BOX 461
CLARION, PA 16214

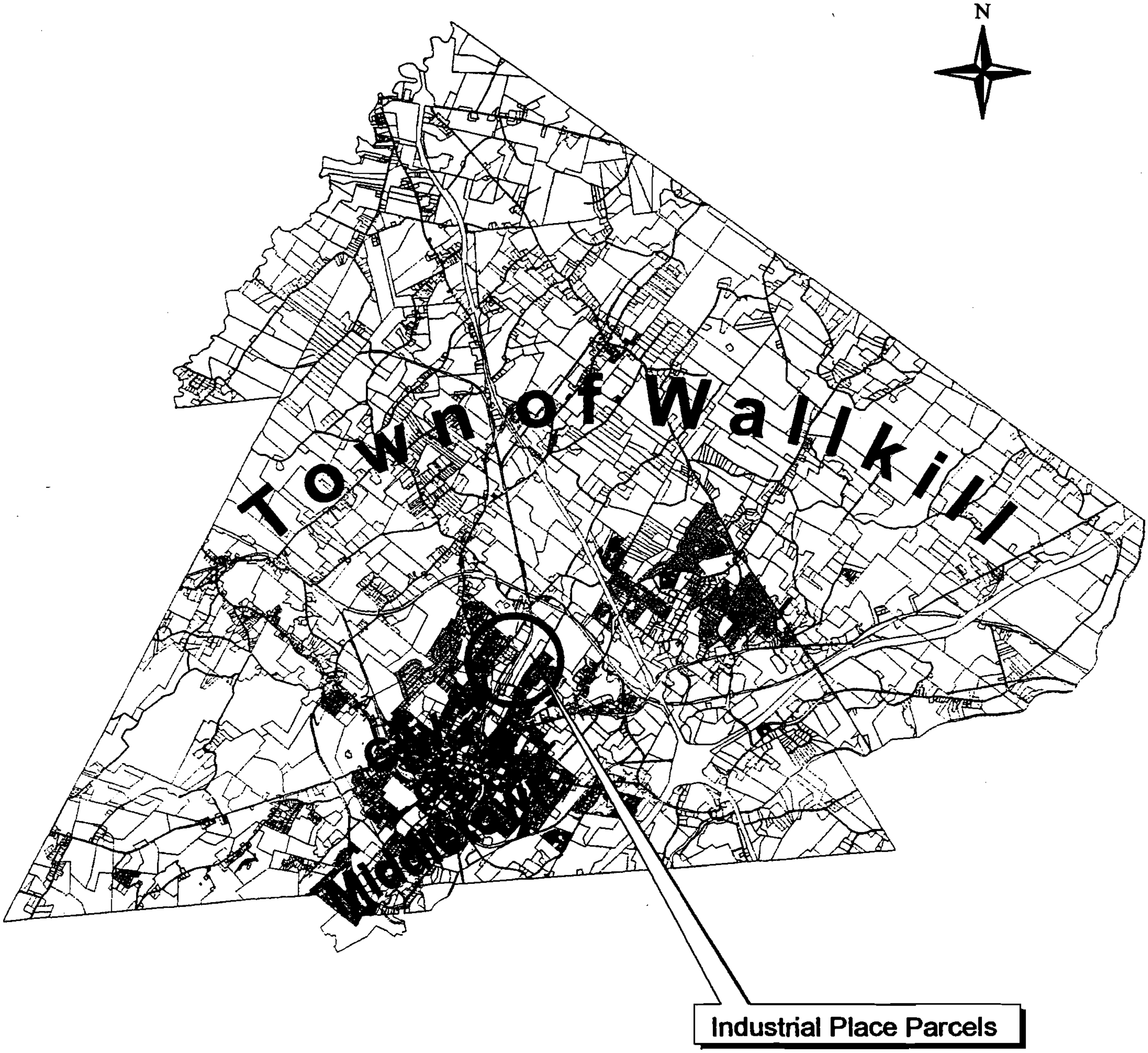
FIGURE 5

GRID PLAN
SITE SURVEY
VICINITY OF
LPS. INC.
SITUATE IN
CITY OF MIDDLETOWN
& TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK
SCALE: 1 INCH = 30 FEET
DATE: APRIL, 1993

DATE OF SURVEY: AUGUST 1992

Location Map

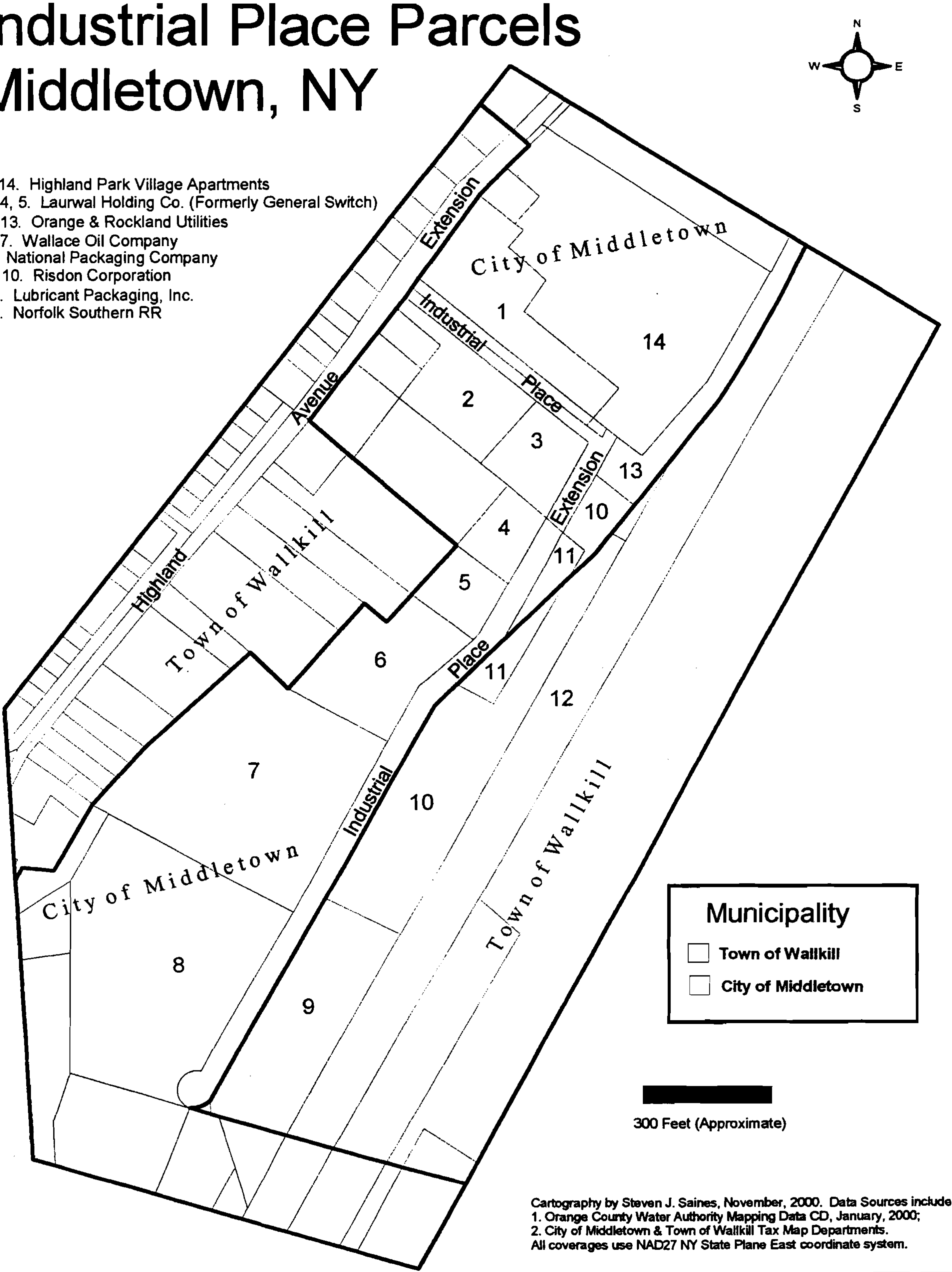
Industrial Place Parcels
City of Middletown, Town of Wallkill
Orange County, New York



Cartograpy by Steven J. Saines, November, 2000.
Data Source: Orange County Water Authority Mapping Data CD, January, 2000.

Industrial Place Parcels
Middletown, NY

1, 14. Highland Park Village Apartments
2, 4, 5. Laurwal Holding Co. (Formerly General Switch)
3, 13. Orange & Rockland Utilities
6, 7. Wallace Oil Company
8. National Packaging Company
9, 10. Risdon Corporation
11. Lubricant Packaging, Inc.
12. Norfolk Southern RR



Cartography by Steven J. Saines, November, 2000. Data Sources include:
1. Orange County Water Authority Mapping Data CD, January, 2000;
2. City of Middletown & Town of Wallkill Tax Map Departments.
All coverages use NAD27 NY State Plane East coordinate system.

257 Midland Place
Logan, OH 43138-1234
(740) 385-7810 (H)
May 7, 2001

Environmental Manager
Norfolk Southern Railway Co.
110 Franklin Road, SE
Roanoke, VA 24042

RE: Lubricant Packaging & Supply Co., Inc., Site No. 3-36-034, Orange Co., NY.

Dear Neighbor:

I am writing to call your attention to the Remedial Investigation I will be managing at the former Lubricant Packaging and Supply (LPS) site, adjacent to a segment of your rail line in the Town of Wallkill, Orange County, NY. Last month, the New York State Department of Environmental Conservation (NYSDEC) mailed your office a Fact Sheet describing the nature of the contamination which exists at the LPS site. In the next few months, I will be drilling an additional monitoring well on the property and will follow that work up with subsurface soil and ground water sampling. I am researching property ownership across your railroad tracks from Risdon Corporation, a property neighbor to the south of LPS site, to determine if I can sample surface water and sediment in the intermittent stream to the east of your rail line. If you are aware of the property ownership there, or your company owns the property on which the intermittent stream flows, please contact me.

I do not anticipate any need to trespass on your property, except, perhaps to walk across your lines to reach the stream area on the east side of the railroad tracks. If you have any specific questions about our planned activities, I would be happy to speak with you by phone, or correspond by email or US mail. Or, you can visit one of the three document repositories listed on the enclosed Fact Sheet to obtain additional information about the site and the upcoming Remedial Investigation. Thank you for your time in reviewing this information, and please contact me if you have any questions.

Sincerely,

Steven J. Saines

email address = stevesaines@yahoo.com
(W) 740-380-5445

257 Midland Place
Logan, OH 43138-1234
(740) 385-7810 (H)
May 7, 2001

Plant, Environmental and/or Maintenance Manager
Risdon AMS Corp.
21 Industrial Place
Middletown, NY 10940

RE: Lubricant Packaging & Supply Co., Inc., Site No. 3-36-034, Orange Co., NY.

Dear Neighbor:

I am writing to call your attention to the Remedial Investigation I will be managing at the former Lubricant Packaging and Supply (LPS) site, adjacent to your property on Industrial Place Extension in Middletown, NY. Last month, the New York State Department of Environmental Conservation (NYSDEC) mailed your facility a Fact Sheet describing the nature of the contamination which exists at the LPS site. In the next few months, I will be drilling an additional monitoring well on the property and will follow that work up with subsurface soil and ground water sampling. I am researching property ownership across the railroad tracks from Risdon to determine if I can sample surface water and sediment in the intermittent stream to the east of your property.

I do not anticipate any need to tresspass on your property, except, perhaps to walk across it to reach the stream area on the east side of the railroad tracks. Please let me know if you wish for me to take any special care or precautions along your property boundary. If you have any specific questions about our planned activities, I would be happy to speak with you by phone, or correspond by email or US mail. Or, you can visit one of the three document repositories listed on the enclosed Fact Sheet to obtrain additional information about the site and the upcoming Remedial Investigation. Thank you for your time in reviewing this information, and please contact me if you require any additional information.

Sincerely,

Steven J. Saines

email address = stevesaines@yahoo.com
(W) 740-380-5445

257 Midland Place
Logan, OH 43138-1234
(740) 385-7810
May 7, 2001

Paul Ciminello
Jonathan Kaplan
Ecosystems Strategies, Inc.
60 Worrall Avenue
Poughkeepsie, NY 12603-2332

RE: Lubricant Packaging & Supply Co., Inc., Site No. 3-36-034, Orange Co., NY, adjacent to the Laurwal General Switch Site.

Dear Paul and Jonathan:

Thank you for your assistance two months ago. I received your well location and site property maps shortly after our telephone discussions. Yes, I did have maps very similar to the copies you sent me. The updated maps will help me, but NYSDOH is requiring me to produce a one mile radius map depicting all water supplies in the area. Your map is just a tiny part of that effort. If you have or receive any additional water line or well supply information within 1 mile of the Laurwal site, I would appreciate a note or phone call.

Jonathan included some copies of field notes taken during well sampling events with the maps. Thanks again. I would like to request the use of one of the wells near the LPS site during the upcoming field work. It can act as an up gradient well and supply me with off site ground water elevation data. It appears that MW-11 or MW-6 could serve in this capacity, although I noted that MW-11 was dry last year. Is that common for MW-11?

I am enclosing the DEC Fact Sheet on the LPS site which was just mailed out last month to interested parties. Laurwal was on that list, but I do not think Ecosystem Strategies was a part of that list. Please let me know if I can be of any assistance to your investigation during my RI field work. I plan to be out at the site sometime this summer drilling a bedrock monitoring well and sampling soil and ground water. I also plan to collect a surface water and stream sediment sample in the intermittent stream down gradient from LPS and the old GS site.

Sincerely,

Steven J. Saines

email address = stevesaines@yahoo.com

257 Midland Place
Logan, OH 43138-1234
May 28, 2001

MKA Realty Corporation
c/o Comstack & Theakston
466 Kinderkamack Road
Oradell, NJ 07649

RE: Lubricant Packaging & Supply Co., Inc., Site No. 3-36-034, Orange Co., NY.

Dear MKA Staff:

I am writing to call your attention to the Remedial Investigation I will be managing at the former Lubricant Packaging and Supply (LPS) site, which is situated close to a parcel of land (lot 36) which your firm owns in the Town of Wallkill, Orange County, NY. Last month, the New York State Department of Environmental Conservation (NYSDEC) mailed out a Fact Sheet to interested parties and close neighbors of the LPS site describing the nature of the contamination which exists at the LPS site. I am including a copy of the fact sheet for you in the event that you did not receive this notification. In the next few months, I will be drilling an additional monitoring well on the property and will follow that work up with subsurface soil and ground water sampling. I am currently researching property ownership on the east side of the Norfolk Southern railroad tracks, where lot 36 is located, to seek permission to sample surface water and sediment in the intermittent stream on this property. If your firm is the owner of this property, I seek this permission from you.

I do not anticipate the need to trespass on your property for more than a few minutes this summer to collect a water and sediment sample from the stream on your property. If you have any specific questions about my planned activities, I would be happy to speak with you by phone, or correspond by email or US mail. Or, you can visit one of the three document repositories listed on the enclosed Fact Sheet to obtain additional information about the site and the upcoming Remedial Investigation. Thank you for your time in reviewing this information, and please contact me if you are capable of granting me permission to your property.

Sincerely,

Steve J. Saines

Steven J. Saines

email address = stevesaines@yahoo.com
(W) 740-380-5445
(H) 740-385-7810

257 Midland Place
Logan, OH 43138-1234
May 28, 2001

City of Middletown Industrial Development Agency
16 James Street
Middletown, NY 10940

RE: Lubricant Packaging & Supply Co., Inc., Site No. 3-36-034, Orange Co., NY.

Dear Industrial Development Agency Staff:

I am writing to call your attention to the Remedial Investigation I will be managing at the former Lubricant Packaging and Supply (LPS) site, which is situated close to a parcel of land (lot 35) which your agency owns in the Town of Wallkill, Orange County, NY. Last month, the New York State Department of Environmental Conservation (NYSDEC) mailed out a Fact Sheet to interested parties and close neighbors of the LPS site describing the nature of the contamination which exists at the LPS site. I am including a copy of the fact sheet for you in the event that your agency did not receive this notification. In the next few months, I will be drilling an additional monitoring well on the property and will follow that work up with subsurface soil and ground water sampling. I am currently researching property ownership on the east side of the Norfolk Southern railroad tracks, where lot 35 is located, to seek permission to sample surface water and sediment in the intermittent stream on this property. If your agency is the owner of this property, I seek this permission from you.

I do not anticipate the need to trespass on your property for more than a few minutes this summer to collect a water and sediment sample from the stream. If you have any specific questions about my planned activities, I would be happy to speak with you by phone, or correspond by email or US mail. Or, you can visit one of the three document repositories listed on the enclosed Fact Sheet to obtain additional information about the site and the upcoming Remedial Investigation. Thank you for your time in reviewing this information, and please contact me if you are capable of granting me permission to your property.

Sincerely,

Steven J. Saines

Steven J. Saines

email address = stevesaines@yahoo.com
(W) 740-380-5445
(H) 740- 385-7810

Exposure Assessment Report

LPS Site, Middletown, Orange County, New York

The principle contaminant of concern at the Lubricant Packaging & Supply Site (LPS) is 1,1,1-trichloroethane (TCA), a synthetic chemical also known as methlychloroform, methyl trichloromethane and trichloromethylmethane. It is a colorless liquid with a sweet, sharp ordor. Most people begin to smell TCA in the air when levels reach 120 to 500 parts per million (ppm). Until recently, TCA was widely used in many commercial products, mostly as a solvent to dissolve glues and paints or to remove oil and grease from metal parts. In the home, it has been used in spot cleaners, glues and aerosol sprays. Because TCA, along with other chlorinated solvents, plays a role in the destruction of the ozone layer in our upper atmoshphere, its manufacture in the United States was scheduled to be eliminated by 1996. However, many products used in the U.S. still contain TCA and it's elimination from the environment is still considered to me a distant goal.

With the continued use of TCA in consumer products in the U.S. and abroad, and a history of past industrial use and spillage of this solvent, TCA persists in the natural environment worldwide. Once released into the environment, TCA can volatilize and remain in the atmosphere for as long as 6 years. In U.S. cities, TCA is typically detected at levels from 0.1 to 1.0 parts per billion (ppb). If products containing TCA are used inside buildings, levels are significantly higher. If TCA is released into the outdoor environment in its liquid phase, it can adhere to soils and/or mix with surface or ground water. Although TCA is not highly soluble in water, it does dissolve (solubility = 0.4%) and has been found in rivers, lakes, soils and ground water. Human exposure to TCA was once common in the industrial work place where it was handled as nonhazardous product. Industrial work place exposure occurred via skin contact or through inhalation of vapors. Work place exposure to TCA in the U.S. is more limited today. Human and animal exposure to TCA still commonly occurs from inhalation, but it can also occur due to physical contact with contaminated media, like soils or water, or through the ingestion of contaminated foods. Regardless of how TCA enters a person or animal, nearly all of it quickly leaves the body through exhaled air. If any amount remains, it will exit the body through urine or breath within a few days.

Studies of animals exposed to high levels of TCA in the air (>2000 ppm), indicate that respiratory damage may occur, as well as mild effects in the liver and nervous system. It is not known if TCA inhalation affects reproduction or development in people. When rats were exposed to high levels of TCA in the air, their offspring developed more slowly than normal. There are no human studies that tell us whether eating food or drinking water contaminated with TCA could cause harmful health effects. However, exposure to people who work with TCA seldom causes harmful effects. Available information to date does not indicate that TCA causes cancer.

TCA is found on the Lubricant Packaging & Supply property attached to subsurface soils and dissolved in ground water. It is probable that small amounts of this TCA escape to the atmosphere from both media on a regular basis. However, the level of TCA lost to the atmosphere is believed to be too low to be detected by the field instruments normally used during environmental investigations. Exposure to atmospheric TCA leaving soils and ground water at the LPS property are potentially the greatest within the LPS building itself. If the floors or foundations of the building are cracked or contain subsurface drains, passage of TCA contaminated soil gas is possible into the building. TCA residues in the building itself may also contribute to exposure within the building. However, based on past atmospheric surveys of the LPS property and building, no VOC levels in the building were recorded above background (> 1 ppm). TCA migration from the subsurface into the LPS building is also unlikely due to the absence of any drains or major foundation cracks.

If atmospheric TCA travels with the predominant direction of weather, it is most likely carried to northeastward, away from the LPS property, as weather is predominantly from the southwest in this area of the country. Property to the northeast, east and southeast of the site is either wooded, occupied by rail road tracks or undeveloped industrial property. These areas do not represent significant atmospheric environmental receptors. The nearest housing in these directions is more than 1000 feet away from the LPS site. However, due north of the LPS property, within 1000 feet of contaminated soil and ground water, is a residential development called Highland Park Village Apartments, located off of Highland Avenue Extension and Industrial Place. The apartments were built along this edge of the industrial park after LPS ceased its business operations at 17 Industrial Place. The Highland Park Village Apartments are not downwind of the LPS property during normal weather patterns, but may be downwind of the LPS property when weather occasionally comes from the southeast. While exposure to TCA volatilizing from LPS soil and ground water is a hypothetical possibility to any property located down wind of the site, it is unlikely that levels above background ever, based on studies conducted at facilities elsewhere in the U.S.

Exposure to TCA through direct contact with contaminated soil and/or ground water is also a possibility at the LPS site. However, this type of exposure would have to be much more deliberate or invasive by the persons or animals potentially exposed. The portions of the LPS property most heavily contaminated by TCA is partially restricted to public access by fence, building and/or terrain barriers. However, all of these site specific restrictions are incapable of keeping a person or animal from tresspassing on the contaminated portions of the site if they so desired, or digging into contaminated soils on the property. Ground hog activity near the rear of the building has been observed in the past, and other burrowing animals may be exposed, depending on the location and depth of their burrowing. Human activity resulting in contaminated soil exposure has not been observed at the site except through environmental investigations conducted under a Health and Safety Plan and with the full knowledge of NYSDEC. No known critical resource or protected habitat exists near the LPS site.

The concentration of TCA in ground water on the LPS property has been measured as high as 2600 ppb (in monitoring well LMW-3). This level is above the maximum contaminant level allowed for drinking water by both NYSDEC (5 ppb) and the USEPA (200 ppb). However, exposure to ground water or ingestion of ground water from the LPS property is even less likely than exposure to soil contamination. No known drinking water wells exist within 1000 feet of the LPS property, and it is unlikely any future ground water use will be considered in the area. In the industrial park and its environs, public water is universally available and preferable to local ground water. In the past, homes along Highland Avenue Extension, and further west, utilized ground water for their domestic needs. However, releases of the chlorinated solvent, PCE (perchloroethylene, discovered in the early 1980s) from the nearby General Switch Site, contaminated some of these domestic wells. As a result of PCE contamination, the homes to the west of the LPS property abandoned their use of ground water for domestic use and now obtain public water. General Switch, just 500 feet from the LPS site, conducted a well survey of the area around its property. Its survey identifies those properties which once used ground water as a domestic source of water, and those properties that continue to use ground water for some type of domestic or business use. *A current private water supply location map was submitted to NYSDEC in July, 2002. The map identifies residences/businesses capable of using well water for potable uses within a one mile radius of the LPS property. All of the well water users are located north (up gradient) of the Northern Middletown Industrial Park. However, the map "Survey Notes" indicate that some wells still (physically) exist in the Washington Heights section of the Town of Wallkill. These residences once used local well water for potable uses, but were all converted to public water use after General Switch discovered it was responsible for ground water contamination in the area. Some of the wells may still be used for non-potable uses, and it is possible that General Switch may use some of these wells for monitoring purposes.*

Exposure to TCA in ground water can only reasonably be contemplated to the south and east of the LPS property. This is the measured direction of ground water flow based on ground water elevation measurements collected on the LPS property and the adjacent General Switch property. Almost all soluble man-made and natural contaminants are transported in the direction of ground water flow and are seldom transported in other way from a contaminated site. No other significant method of TCA transport exists in this area, since ground water is not withdrawn from any local wells (except monitoring wells for testing purposes). TCA contamination of ground water south and east of the LPS property is assumed to have occured, although off site contamination has been documented by only one ground water analysis from a former well on the Risdon property, a parcel adjacent to LPS along its southeastern border. A General Switch Report indicated that a ground water well formerly used to supply cooling water to Risdon (formerly Guild Molders) contained 12 ppb of TCA in August of 1989. This former well was situated hydraulically down gradient from LPS, and the source of TCA is presumed to have been the LPS site.

Natural ground water flow to the south and east of the LPS property is believed to eventually discharge to an intermittent, unnamed tributary to Monhagen Brook, which flows through the center of Middletown. By the time TCA contaminated ground water reaches this surface water body, it is questionable whether it would be meaureable at current laboratory detection limits. However, during the RI at the LPS site, a surface water and sediment sample will be collected from this unnamed tributary (contingent upon property owner permission) to investigate this avenue of TCA exposure. Once TCA reaches the stream, some of it will be released to the atmosphere and the rest will be carried downstream with surface water flow. With turbulence and continued exposure to the atmosphere, most of the TCA will eventually reach the atmosphere where it will slowly degrade.

In summary, TCA exposure to human and animal populations on and near the LPS site exist through the inhalation of TCA contaminated air. Although TCA contaminated air has not been measured at levels above the detection limit of a PhotoVac photoionization detector, TCA is a likely atmospheric contaminant at very low levels. TCA exposure is also possible through contact with contaminated ground water and soil. Human contact would likely be deliberate, as a result of property trespass and/or excavation activities. However, in the case of animal contact, burrowing species would be vulnerable. It is not known if TCA, or its degradation products, is measurable once it appears reaches the unnamed stream hydraulically down gradient of the site. If it is detectable, it will likely be found at very low levels. Because few high dosage receptor pathways exist for the delivery of TCA to human and animal populations, no major impact to human health or the environment is predicted from TCA contamination at the LPS site.

United States
Environmental Protection
Agency

Integrated Risk Information System

1,1,1-Trichloroethane

CASRN 71-55-6

Contents

0197
1,1,1-Trichloroethane; CASRN 71-55-6

Health assessment information on a chemical substance is included in IRIS only after a comprehensive review of chronic toxicity data by U.S. EPA health scientists from several Program Offices and the Office of Research and Development. The summaries presented in Sections I and II represent a consensus reached in the review process. Background information and explanations of the methods used to derive the values given in IRIS are provided in the Background Documents.

STATUS OF DATA FOR 1,1,1-Trichloroethane

File On-Line 03/31/1987

Category (section)	Status	Last Revised
Oral RfD Assessment (I.A.)	withdrawn	02/01/1996
Inhalation RfC Assessment (I.B.)	no data	

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Carcinogenicity Assessment (II.)            on-line       09/01/1990
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_I. CHRONIC HEALTH HAZARD ASSESSMENTS FOR NONCARCINOGENIC EFFECTS

__I.A. REFERENCE DOSE FOR CHRONIC ORAL EXPOSURE (RfD)

Substance Name -- 1,1,1-Trichloroethane
CASRN -- 71-55-6

The oral RfD for 1,1,1-trichloroethane has been withdrawn on 08/01/1991 pending further review by the RfD/RfC Work Group.

EPA Contacts:

Please contact the Risk Information Hotline for all questions concerning this assessment or IRIS, in general, at (513)569-7254 (phone), (513)569-7159 (FAX) or RIH.IRIS@EPAMAIL.EPA.GOV (internet address).

__I.B. REFERENCE CONCENTRATION FOR CHRONIC INHALATION EXPOSURE (RfC)

Substance Name -- 1,1,1-Trichloroethane
CASRN -- 71-55-6

Not available at this time.

_II. CARCINOGENICITY ASSESSMENT FOR LIFETIME EXPOSURE

Substance Name -- 1,1,1-Trichloroethane
CASRN -- 71-55-6

Last Revised -- 09/01/1990

Section II provides information on three aspects of the carcinogenic assessment for the substance in question; the weight-of-evidence judgment of the likelihood that the substance is a human carcinogen, and quantitative estimates of risk from oral exposure and from inhalation exposure. The quantitative risk estimates are presented in three ways. The slope factor is the result of application of a low-dose extrapolation procedure and is presented as the risk per (mg/kg)/day. The unit risk is the quantitative estimate in terms of either risk per ug/L drinking water or risk per ug/cu.m air breathed. The third form in which risk is presented is a drinking water or air concentration providing cancer risks of 1 in 10,000, 1 in 100,000 or 1 in 1,000,000. The rationale and methods used to develop the carcinogenicity information in IRIS are described in The Risk Assessment Guidelines of 1986 (EPA/600/8-87/045) and in the IRIS Background Document. IRIS summaries developed since the publication of EPA's more recent Proposed Guidelines for Carcinogen Risk Assessment also utilize those Guidelines where indicated (Federal Register 61(79):17960-18011, April 23, 1996). Users are referred to Section I of this IRIS file for information on long-term toxic effects other than carcinogenicity.

__II.A. EVIDENCE FOR CLASSIFICATION AS TO HUMAN CARCINOGENICITY

___II.A.1. WEIGHT-OF-EVIDENCE CLASSIFICATION

Classification -- D; not classifiable as to human carcinogenicity.

Basis -- There are no reported human data and animal studies (one lifetime gavage, one intermediate-term inhalation) have not demonstrated carcinogenicity. Technical grade 1,1,1-trichloroethane has been shown to be weakly mutagenic, although the contaminant, 1,4-dioxane, a known animal carcinogen, may be responsible for this response.

___II.A.2. HUMAN CARCINOGENICITY DATA

None.

___II.A.3. ANIMAL CARCINOGENICITY DATA

Inadequate. The NCI (1977) treated Osborne-Mendel rats (50/sex/dose) with 750 or 1500 mg/kg technical-grade 1,1,1-trichloroethane 5 times/week for 78 weeks by gavage. The rats were observed for an additional 32 weeks. Twenty rats of each sex served as untreated controls. Low survival of both male and female treated rats (3%) may have precluded detection of a significant number of tumors late in life. Although a variety of neoplasms was observed in both treated and matched control rats, they were common to aged rats and were not dose-related. Similar results were obtained when the NCI (1977) treated B6C3F1 hybrid mice with the time-weighted average doses of 2807 or 5615 mg/kg 1,1,1-trichloroethane by gavage 5 days/week for 78 weeks. The mice were observed for an additional 12 weeks. The control and treated groups had 20 and 50 animals of each sex, respectively. Only 25 to 45% of those treated survived until the time of terminal sacrifice. A variety of neoplasms were observed in treated groups, but the incidence not statistically different from matched controls.

Quast et al. (1978) exposed 96 Sprague-Dawley rats of both sexes to 875 or 1750 ppm 1,1,1-trichloroethane vapor for 6 hours/day, 5 days/week for 12 months, followed by an additional 19-month observation period. The only significant sign of toxicity was an increased incidence of focal hepatocellular alterations in female rats at the highest dosage. It was not evident that a maximum tolerated dose (MTD) was used nor was a range-finding study conducted. No significant dose-related neoplasms were reported, but these dose levels were below those used in the NCI study.

__II.A.4. SUPPORTING DATA FOR CARCINOGENICITY

Mutagenicity testing of 1,1,1-trichloroethane has produced positive results in S. typhimurium strain TA100 (Simmon et al., 1977; Fishbein, 1979; Snow et al., 1979) as well as some negative results (Henschler et al., 1977; Taylor, 1978).

It was mutagenic for S. typhimurium strain TA1535 both with exogenous metabolic activation (Farber, 1977) and without activation (Nestmann et al., 1980). 1,1,1-Trichloroethane did not result in gene conversion or mitotic recombination in Saccharomyces cerevisiae (Farber, 1977; Simmon et al., 1977) nor was it positive in a host-mediated forward mutation assay using Schizosaccharomyces pombe in mice. The chemical also failed to produce chromosomal aberrations in the bone marrow of cats (Rampy et al., 1977), but responded positively in a cell transformation test with rat embryo cells (Price et al., 1978).

An isomer, 1,1,2-trichloroethane, is carcinogenic in mice, inducing liver cancer and pheochromocytomas in both sexes. Dichloroethanes, tetrachloroethanes and hexachloroethanes also produced liver cancer in mice and other types of neoplasms in rats.

It should be noted that 1,4-dioxane, a known animal carcinogen that causes liver and nasal tumors in more than one strain of rats and hepatocellular carcinomas in mice, is a contaminant of technical-grade 1,1,1-trichlorethane.

__II.B. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM ORAL EXPOSURE

Not available.

__II.C. QUANTITATIVE ESTIMATE OF CARCINOGENIC RISK FROM INHALATION EX

Not available.

__II.D. EPA DOCUMENTATION, REVIEW, AND CONTACTS (CARCINOGENICITY ASSE

___II.D.1. EPA DOCUMENTATION

Source Document -- U.S. EPA, 1984a,b

The 1984 Health Effects Assessment for 1,1,1-Trichloroethane has received limited Agency review. The values in the 1984 Health Assessment Document for 1,1,1-Trichloroethane have received both Agency and public review.

___II.D.2. REVIEW (CARCINOGENICITY ASSESSMENT)

Agency Work Group Review -- 08/05/1987

Verification Date -- 08/05/1987

___II.D.3. U.S. EPA CONTACTS (CARCINOGENICITY ASSESSMENT)

Please contact the Risk Information Hotline for all questions concerning this assessment or IRIS, in general, at (513)569-7254 (phone), (513)569-7159 (FAX) or RIH.IRIS@EPAMAIL.EPA.GOV (internet address).

_VI. BIBLIOGRAPHY

Substance Name -- 1,1,1-Trichloroethane
CASRN -- 71-55-6
Last Revised -- 08/01/1991

__VI.A. ORAL RfD REFERENCES

Not available at this time

__VI.B. INHALATION RfD REFERENCES

None

__VI.C. CARCINOGENICITY ASSESSMENT REFERENCES

Farber, H. 1977. Manager of Environmental Affairs, Dow Chemical letter to James Price, Chief of Air Quality Data Analysis, Texas Air Control Board, Austin, TX. (Cited in: NCI, 1977)

Fishbein, L. 1979. Potential halogenated industrial carcinogenic and mutagenic chemicals. II. Halogenated saturated hydrocarbons. Sci. Total Environ. 11: 163.

Henschler, D., E. Eder, T. Neudecker and M. Metzler. 1977. Carcinogenicity of trichloroethylene: Fact or artifact? Arch. Toxicol. 37: 233-236.

NCI (National Cancer Institute). 1977. Bioassay of 1,1,1-trichloroethane for possible carcinogenicity. Carcinog. Tech. Rep. Ser. No. 3, NCI-CG-TR-3.

Nestmann, E.R., E.G.H. Lee, T.I. Matula, G.R. Douglas and J.C. Mueller. 1980. Mutagenicity of constituents identified in pulp and paper mill effluents using the Salmonella/mammalian-microsome assay. Mutat. Res. 79: 203-212.

Price, P.J., C.M. Hassett and J.I. Mansfield. 1978. Transforming activities of trichloroethylene and proposed industrial alternatives. In vitro. 14: 290-293.

Quast, J.F., B.K.J. Leong, L.W. Rampy and P.J. Gehring. 1978. Toxicologic and carcinogenic evaluation of a methylchloroform (1,1,1-trichloroethane) formulation by chronic inhalation in rats - interim report after 24 months. Dow Chemical Co., Midland, MI.

Rampy, L.W., J.F. Quast, B.K.J. Leong and P.J. Gehring. 1977. Results of long-term inhalation toxicity studies on rats of 1,1,1-trichloroethane and perchloroethylene formulations. In: Proc. Int. Cong. Toxicol. Toronto.

Simmon, V.F., K. Kauhanen and R.G. Tardiff. 1977. Mutagenic activity of chemicals identified in drinking water. In: Progress in Genetic Toxicology, D. Scott et al., Ed. Elsevier/North Holland Biomedical Press, Amsterdam.

Snow, L.P., B.C. Nair and B.C. Castro. 1979. Mutagenesis testing of methylene chloride and 1,1,1-trichloroethane in Salmonella strains TA100 and TA98. Northrop Services, Inc., Research Triangle Park, NC.

Taylor, G. 1978. Personal communication. NIOSH, Morgantown, WV. (Cited in: U.S. EPA, 1984a)

U.S. EPA. 1984a. Health Effects Assessment for 1,1,1-Trichloroethane. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Emergency and Remedial Response, Washington, DC.

U.S. EPA. 1984b. Health Assessment Document for 1,1,1-Trichloroethane. Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, NC. EPA-600/8-82-003F.

_VII. REVISION HISTORY

Substance Name -- 1,1,1-Trichloroethane
CASRN -- 71-55-6

Date	Section	Description
09/30/1987	IV.	Regulatory Action section on-line
03/01/1988	I.A.4.	Text clarified
06/30/1988	IV.B.2.	Units corrected for MCL
06/30/1988	I.A.7.	Contacts switched
09/07/1988	II.	Carcinogen summary on-line
06/01/1989	II.D.3.	Secondary contact deleted
03/01/1990	VI.	Bibliography on-line
05/01/1990	I.A.	Oral RfD summary noted as pending change
05/01/1990	I.B.	Inhalation RfC now under review
09/01/1990	I.A.	Text edited
09/01/1990	II.	Text edited
09/01/1990	III.A.	Health Advisory on-line
09/01/1990	IV.F.1.	EPA contact changed
09/01/1990	VI.C.	Snow et al. 1979 citation clarified

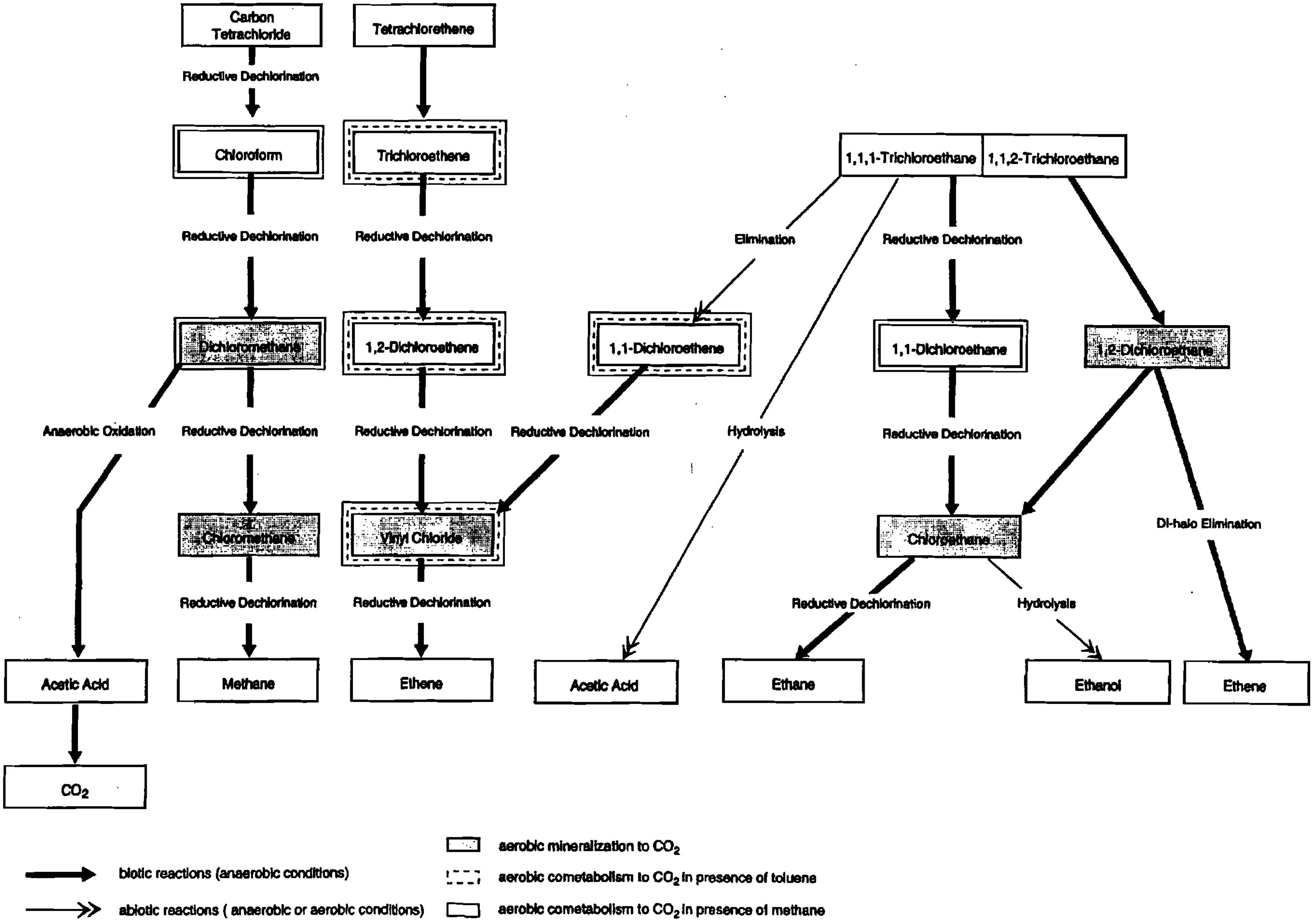
09/01/1990	VI.D.	Health Advisory references added
08/01/1991	I.A.	Withdrawn pending further review
08/01/1991	VI.A.	Oral RfD references withdrawn
08/01/1991	VI.C.	Citations clarified
01/01/1992	IV.	Regulatory actions updated
10/01/1992	IV.B.1.	MCLG value corrected
10/01/1992	IV.B.2.	MCL value corrected
04/01/1993	IV.C.1.	Withdrawn; mandated by National Toxics Rule
08/01/1995	I.A.,I.B., VI.A.	EPA's RfD/RfC and CRAVE workgroups were discontinued in May 1995. Chemical substance reviews that were not completed by September 1995 were taken out of IRIS review. The IRIS Pilo Program replaced the workgroup functions beginning in September, 1995.
02/01/1996	I.A.	Contact changed
09/01/1996	III.A.5.	DWEL withdrawn
04/01/1997	III.,IV., V.	Drinking Water Health Advisories, EPA Regulatory Actions, a Supplementary Data were removed from IRIS on or before Apri 1997. IRIS users were directed to the appropriate EPA Progr Offices for this information.

VIII. SYNONYMS

Substance Name -- 1,1,1-Trichloroethane
CASRN -- 71-55-6
Last Revised -- 03/31/1987

71-55-6
AEROTHENE TT
CHLOROETENE
CHLOROETHENE
CHLOROETHENE NU
CHLOROFORM, METHYL-
CHLOROTHANE NU
CHLOROTHENE
CHLOROTHENE NU
CHLOROTHENE VG
CHLORTEN
ETHANE, 1,1,1-TRICHLORO-
INHIBISOL
METHYLCHLOROFORM
METHYLTRICHLOROMETHANE
NCI-C04626
RCRA WASTE NUMBER U226
STROBANE
alpha-T
1,1,1-TCE
1,1,1-TRICHLOORETHAAN
1,1,1-TRICHLORAETHAN
Trichloroethane, 1,1,1-
alpha-TRICHLOROETHANE
1,1,1-TRICLOROETANO

Common Degradation Pathways



Sajeed Jamal, Beak International Inc., 1997

Well No. LMW-1
Boring No. X-Ref: LPS Site

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: B1
Refer to Grid Plan
Elevation Ground Level 605.4
Top of Casing 607.7

Drilling Summary:

Total Depth 18'
Borehole Diameter 8"
Casing Stick-up Height: 2.3' (above pad)
Driller Kendrick Drilling, Inc
John Stevenson
Rig Mobile B61 Auger Rig
Bit(s) 8" auger bit
Drilling Fluid none
Protective Casing 5' Length of 6" OD Steel
+ 2.4 stick up

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling Auger Drill	8/16/93	9:30	8/16/93	14:16
Geophys. Logging:	NA			
Casing:	8/16/93	14:25	8/16/93	14:35
Filter Placement:	8/16/93	14:35	8/16/93	15:16
Cementing:	8/17/93	7:20	8/17/93	8:00
Development:	8/17/93	[illegible]		
	8/18/93	[illegible]		
	8/19/93	[illegible]		

Well Design & Specifications

Basis: Geologic Log ✓ Geophysical Log ___
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
17 - 7	S	-
7 - +2.3	C	-

Casing: C1 4" ID Schedule 40 Solid PVC, flush threaded
C2
Screen: S1 4" ID sch 40 PVC screen .020 Slot
S2
Filter Pack: #2 Morie (4-100 lb sack) 18.0' - 5.5'
Grout Seal: 5 sx Premix gravel cement 3.0' - +0.1'
Bentonite Seal: 1-5 gal bucket of Bentonite pellets 5.5' - 3.0'

Well Development:

Following well completion LMW-1 was hand bailed using dedicated polyethylene bailer allowing removal of 44½ gal prior to purging and sample program on 8/20/93

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)
11:23	6.40	430	15.5 8/19
16:52	6.11	330	9.7° 8/19
7:30	6.56	meter malfunction	14.3 8/20
14:29	6.38	370	14.0° 8/20

Recovery Data:

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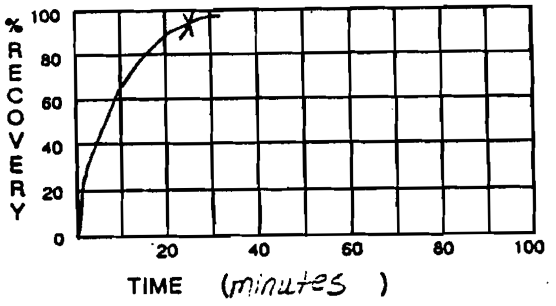
S_o=



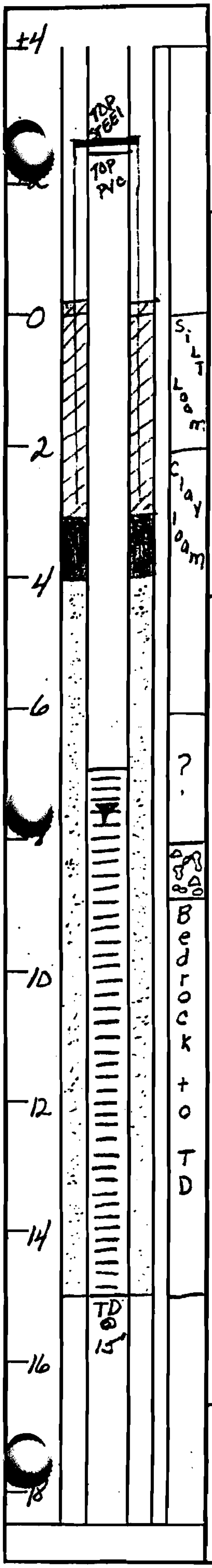
Comments: Only well fully completed by [illegible] rig. Difficulty constructing monitoring well due to sand lock within the auger flights during filter pack placement. Lock eventually freed by numerous physical manipulations of auger flight string.

SITE NAME LPS Site

SUPERVISED BY Steven J. Saines

Well No. LMW-2
Boring No. X-Ref: LPS Site

MONITOR WELL CONSTRUCTION SUMMARY



Survey Coords: L5
Refer to Grid Plan

Elevation Ground Level 606.2
Top of Casing 607.9

Drilling Summary:

Total Depth 15'
Borehole Diameter 8 3/4"
Casing Stick-up Height: 1.7' (above pad)
Driller Kendrick Drilling, Inc,
Kerry Kendrick
Rig Ingersol Rand TH60 Air Rig
Bit(s) 7 3/4" roller bit
Drilling Fluid Air
Protective Casing 5' length of 6" OD Steel

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/18/93	8:15	8/18/93	9:33
Geophys. Logging:	NA			
Casing:	8/18/93	9:40	8/18/93	9:50
Filter Placement:	8/18/93	9:50	8/18/93	10:00
Cementing:	8/18/93	10:00	8/18/93	10:30
Development:	8/18/93	20 gal		
	8/19/93	10 gal		

Well Design & Specifications

Basis: Geologic Log ✓ Geophysical Log ____
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
15 - 5'	S	-
5 - +2.2'	C	-
-		-
-		-
-		-

Casing: C1 4" ID Schedule 40 Solid PVC, flush threaded
C2
Screen: S1 4" ID Sch 40 pvc screen 020 slot
S2
Filter Pack: Morie #2 Sand
2 1/2 sacks (100 lb sacks)
15.0' - 4.0'
Grout Seal: 5 sacks of pre-mix gravel cement
2.9' - +0.4'
Bentonite Seal: 3/4 sack of Benseal
4.0' - 2.9'

Well Development:

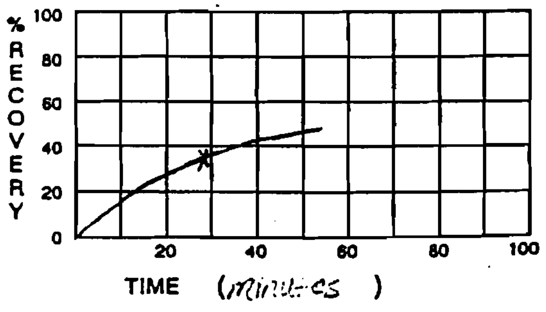
Following well construction LMW-2 was hand bailed using dedicated 2" polyethylene bailer allowing removal of 39 gal prior to purge and sample program on 8/20/93

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)	
11:27	6.44	1160	16.5°	8/19
15:30	6.51	1150	17.3°	8/19
8:00	6.72	meter malfunct	16.5°	8/20
14:01	6.67	1120	17.1°	8/20

Recovery Data:

Q= S_o=

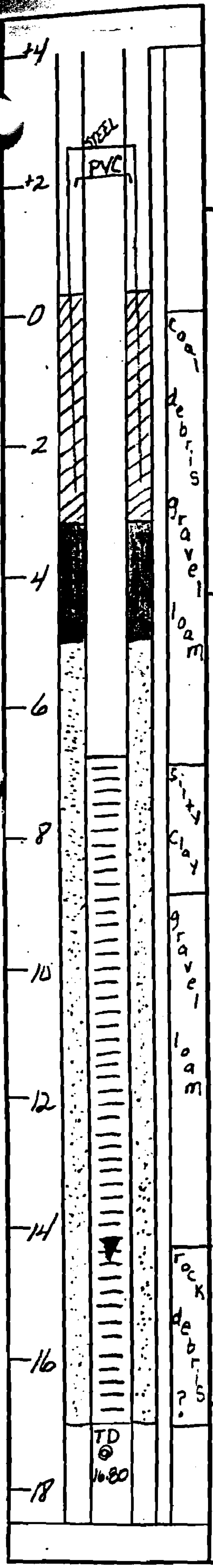


Comments: Well was initially started by auger rig but was abandoned due to shallow bedrock. New hole drilled adjacent to auger rig bore hole with air rotary rig.

SITE NAME LPS
LO[illegible]ON [illegible] NY
SUPERVISED BY SJS
[illegible]8/18/93

Well No. LMW-3
Boring No. X-Ref: LPS Site

MONITOR WELL CONSTRUCTION SUMMARY



Survey Coords: C18
Refer to Grid Plan

Elevation Ground Level 610.0
Top of Casing 611.7

Drilling Summary:

Total Depth 16.85'
Borehole Diameter 8 3/4"
Casing Stick-up Height: 1.7' (above pad)
Driller Kendrick Drilling, Inc, Kerry Kendrick
Rig Ingersol Rand TH60 Air Rig
Bit(s) 8 3/4" Roller bit
Drilling Fluid Air
Protective Casing 5' length of 6" ID Steel

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/18/93	11:25	8/18/93	12:05
Geophys. Logging:	NA			
Casing:	8/18/93	12:05	8/18/93	12:15
Filter Placement:	8/18/93	12:15	8/18/93	13:00
Cementing:	8/18/93	13:00	8/18/93	13:25
Development:	8/18/93	2200		
	8/19/93	1900		

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
16.7 - 6.7'	S	-
6.7 - 2.1'	C	-
-		-
-		-
-		-

Casing: C1 4" ID Schedule 40 solid PVC, flush threaded
C2
Screen: S1 4" ID Sch 40 PVC Screen .020 slot
S2
Filter Pack: Morie #2 sand 4½ sacks 16.8'-5.0'
Grout Seal: 5 sacks of pre-mix gravel cement, 3.0'-+0.4'
Bentonite Seal: ½ sack of benseal 5.0'-3.0'

Well Development:

Following well construction, LMW-3 was hand bailed using a dedicated 2" polyethylene bailer allowing removal of 41 gallons prior to purge and sample program on 8/20/93

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)
10:37	6.49	480	15.1° 8/19
16:57	6.41	420	15.3° 8/19
7:42	6.53	meter malfunction	12.3° 8/20
14:49	6.60	490	14.7° 8/20

Recovery Data:

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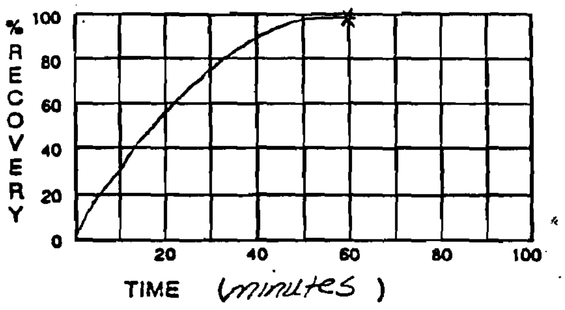
S_o=



Comments: Split spoon sampled this location but did not auger it. Pulled air rig over sample hole and drilled using roller bit. Wet gravel encountered at 14'±. Just prior to completion of hole, water was seen produced from the hole.

SITE NAME LPS

LTC

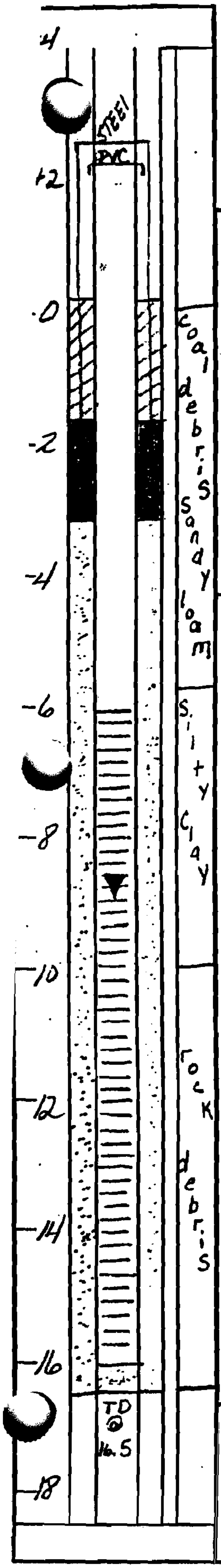
Well No. LMW-4

Boring No. X-Ref: LPS Site

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: A37
Refer to grid plan

Elevation Ground Level 608.5
Top of Casing 610.7



Drilling Summary:

Total Depth 16.5'
Borehole Diameter 8 3/4"
Casing Stick-up Height: 2.1 (above pad)
Driller Kendrick Drilling, Inc.
Kerry Kendrick
Rig Ingersol Rand TH60 Air Rig
Bit(s) 8 3/4" roller bit
Drilling Fluid Air
Protective Casing 5' length of 6" OD steel

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/17/93	7:50	8/17/93	14:14
Geophys. Logging:	NA			
Casing:	8/17/93	14:30	8/17/93	14:38
Filter Placement:				
Cementing:				
Development:	8/18/93 8/19/93	25 gal 38 gal		

Well Design & Specifications

Basis: Geologic Log ____ Geophysical Log ____
Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
16.1 - 6.1	S	-
6.1 - +2.4	C	-

Casing: C1 4" ID schedule 40, solid PVC, flush threaded
C2
Screen: S1 4" ID Sch 40, PVC screen 020 slot
S2
Filter Pack: Morie #2 sand 4 sacks, 16.5' - 3.1'
Grout Seal: 4 sacks of pre mix gravel cement 1.5' - +0.3'
Bentonite Seal: ½ sack benseal 3.1' - 1.5'

Well Development:

Following well construction LMW-4 was bailed using a dedicated 2" polyethylene bailer allowing removal of 67 gallons prior to purge and sample program on 8/20/93

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)	
10:33	6.48	620	16.0°	8/19
16:27	6.65	600	14.5°	8/19
7:16	6.56	meter malfunction	14.3°	8/20
15:15	6.61	630	15.1°	8/20

Recovery Data:

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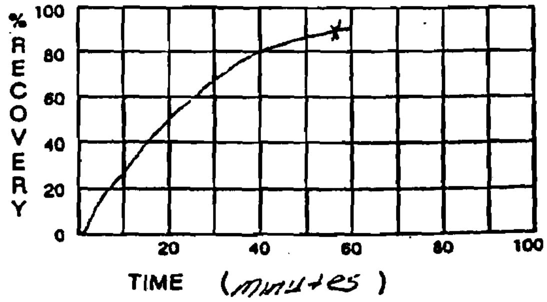
S_0=



Comments: Well initially started with auger rig but abandoned after encountering loose rock at 9'. A second auger hole was attempted ~5' behind initial hole. Hit loose rock at 8.5'. Air rotary rig completed the hole 5' in front of initial auger hole.

SITE NAME LPS
LO[illegible]N Middleton N''
SUPERVISED BY SJS
D[illegible] 8/93

Well No. LMW-5

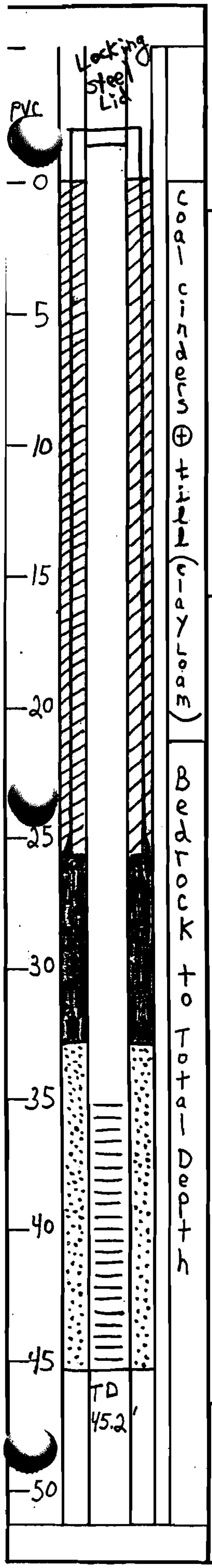
Boring No. X-Ref: LPS Site

MONITOR WELL CONSTRUCTION SUMMARY

Survey Coords: B 2.5 Refer to Grid Plan

Elevation Ground Level 605.2'

Top of Casing 607.4'



Drilling Summary:

Total Depth 45.2'

Borehole Diameter 10" hole → 5 7/8"

Casing Stick-up Height: ~ 2.2'

Driller Kendrick Drilling, Inc Chester, NY
Tom Kendrick, Terry Kendrick, Pete Albert

Rig Ingersol Rand Air Rotary Rig

Bit(s) 10" roller and 5 7/8" percussion bit

Drilling Fluid Air, formation water

Protective Casing 28 1/2' 6" Steel Casing

Construction Time Log:

Task	Start Date	Start Time	Finish Date	Finish Time
Drilling	8/31/01	8:45	8/31/01	3:00
Geophys. Logging:	NA			
Casing: Drive Steel Casing	8/31/01	12:45		1:00
Filter Placement:	8/31/01	1:30		2:30
Cementing:	8/31/01	2:30		3:00
Development: Remove 6 gallons well Dry	9/01/01	11:45		12:00

Well Design & Specifications

Basis: Geologic Log X Geophysical Log ____

Casing String (s): C = Casing S = Screen.

Depth	String(s)	Elevation
45 - 35	S	-
35 - +2.2	C	-
-		-
25.7 - +2.2	Steel outer Casing	-
-		-

Casing: C1 2" ID Schedule 40 solid flush threaded PVC

C2

Screen: S1 2" ID Schedule 40 PVC Screen, .020 slot

S2

Filter Pack: #1 Sand, 4 bags 45 - 33'

Grout Seal: 25' - Ground surface 10 bags cement, 1 bag benseal

Bentonite Seal: 2 bag benseal 33-25'

Well Development:

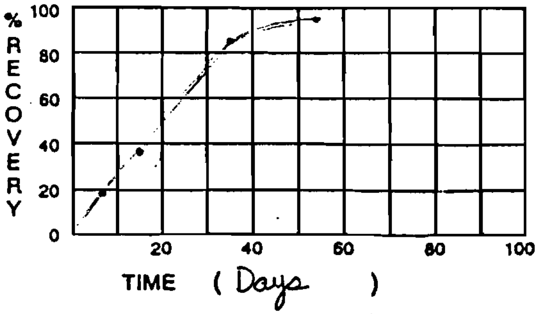
Extremely slow recharge. well could not be developed conventionally. outer Steel Casing guarantee ground water is from bedrock aquifer only

Stabilization Test Data:

Time	pH	Spec. Cond.	Temp (C)
9/02/01	6.27	132	13.45°
	DO	ORP	
	8.7	227.1	

Recovery Data:

Q= S₀=



Comments: Proposed well location moved slightly to the north to increase distance from electric line. Air rotary cuttings collected confirm log from LMW-1 sampling. Top of weathered bedrock @ 21.6. Driller estimates top of solid / competent bedrock @ 27.5'. Well construction designed to collect ground water from bedrock aquifer.

SITE NAME LPS

LOCATION Middletown NY

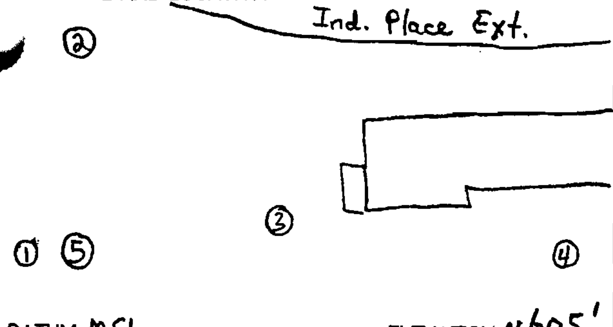
SUPERVISED BY SJS

DATE 8/31/01

⊙ monitoring well

FIELD LOG – ROCK BOREHOLE

SITE NAME AND LOCATION Ind. Place Ext.



DATUM MSL
ELEVATION ~605'

DRILLING METHOD: Rotary + Percussion
Air

SAMPLING METHOD:
Cuttings observed

WATER LEVEL	NA			
TIME				
DATE				
CASING DEPTH	25'			

BORING NO. LMW-5
SHEET 1 OF 1

DRILLING	
START	FINISH
TIME	TIME
DATE	DATE

DRILL RIG Ingersol Rand TH60
SURFACE CONDITIONS Firm, gravel and cinder fill over firm till
ANGLE Vertical
BEARING
SAMPLE HAMMER TORQUE NA FT.-LBS

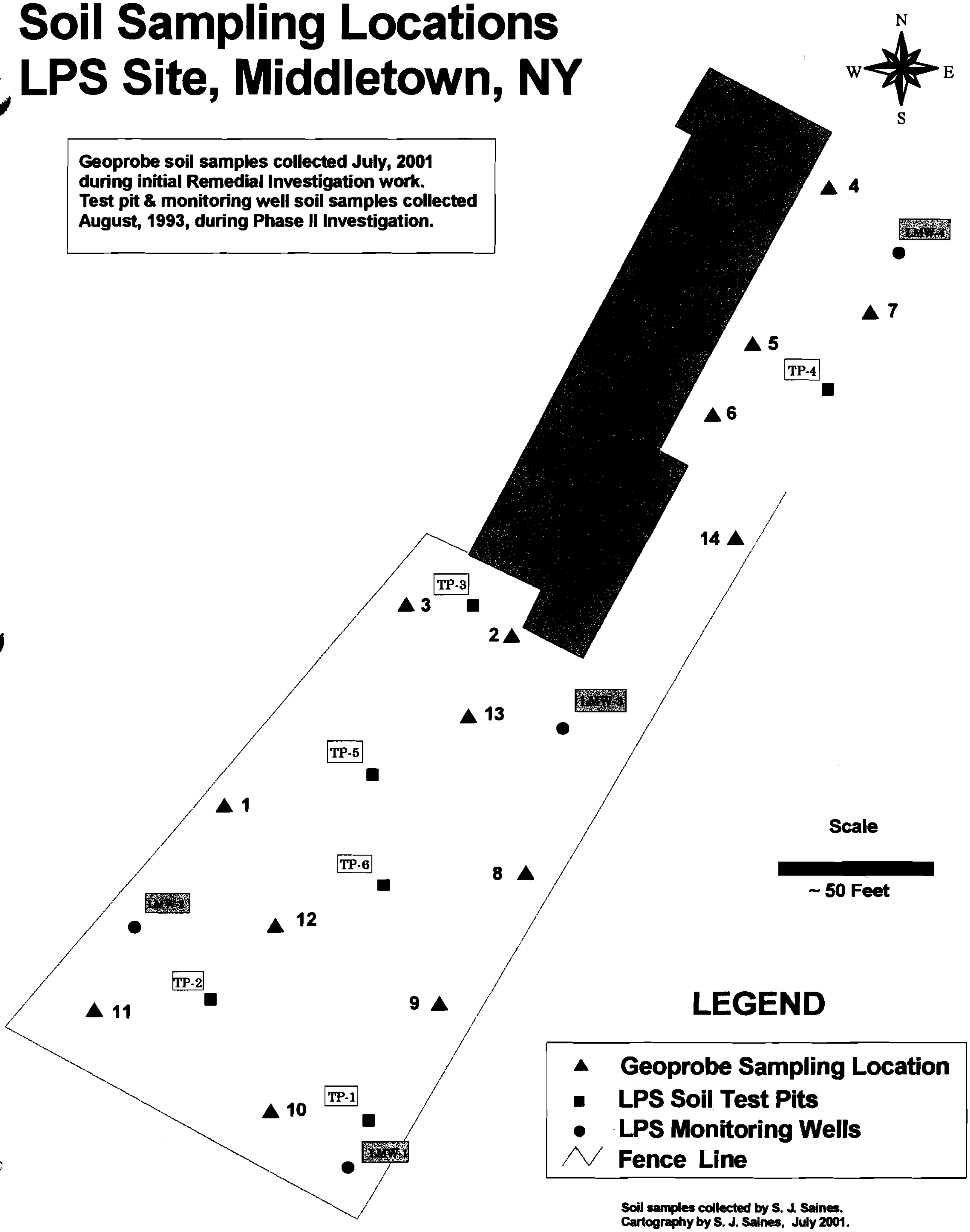
DEPTH IN FEET (ELEVATION)	BLOWS/ 6 IN. ON SAMPLER (RECOVERY)	CORES RUN NO.	NO. AND SIZE OF CORE PIECES	% RECOVERY	RQD	ROCK LITHOLOGY AND STRUCTURE	SAMPLER AND BIT	CASING TYPE	BLOWS/FOOT ON CASING	PRESSURE TEST INTERVAL AND NO	DESCRIPTION OF OPERATION AND REMARKS
3						See LMW-1 log for detailed description of overburden above bedrock.					Start drilling @ 8:45 using 10" roller bit.
6											PID = 0 @ top of borehole
9						Gray/black gravel-clay loam.					Encountered saturated conditions @ ~10'. Hole cave-in @ ~14'. Lose air return. Some air return through LMW-1, which bubbles out of well casing. PID = 0.
12											
15											
18						Some angular shale/siltstone chips in return.					
21						Gray sandy siltstone ↓					Encounter top of bedrock @ 21.6' @ 9:20. Then, blow leak in hydraulic line. Shut down for repairs.
24											
27											
30											Resume drilling @ 12:45. At 25.75', place 4 bags of cement in hole, then hammer solid 6" ID steel casing to ~25'. Driller notes "solid" bedrock 27'. Possible fractured or weathered bedrock from 21-26'. Drilling proceeds to 45', ceases @ 2:00
33											
36											
39											
42											
45						BoH = 45'.					

DRILLING CONTR Kendrick Drilling Chester, NY

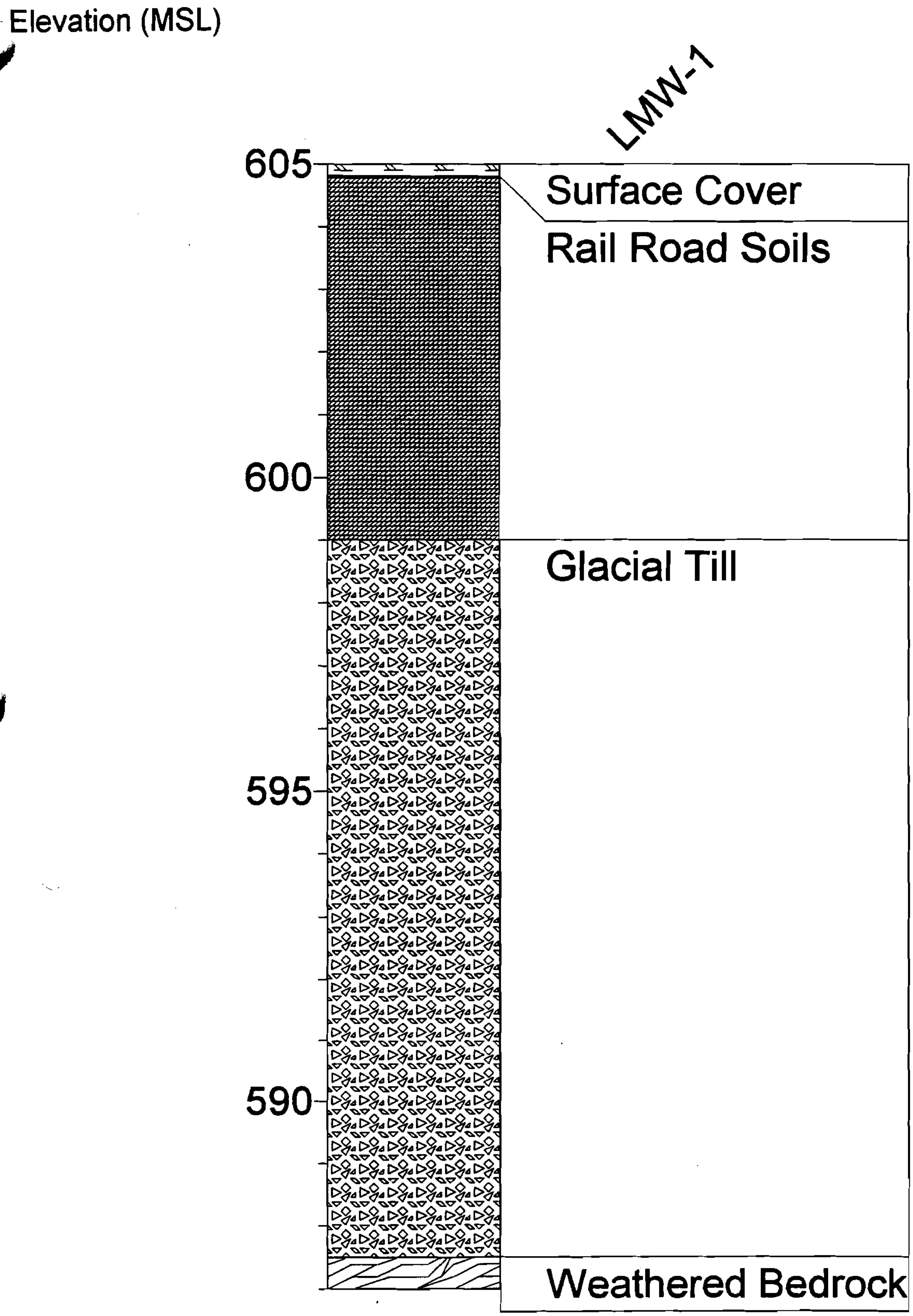
LOGGED BY Steven J. Saines
CHK'D BY
DATE 8/31/01

Soil Sampling Locations
LPS Site, Middletown, NY

Geoprobe soil samples collected July, 2001 during initial Remedial Investigation work.
Test pit & monitoring well soil samples collected August, 1993, during Phase II Investigation.



Soil samples collected by S. J. Saines.
Cartography by S. J. Saines, July 2001.



LPS Remedial Investigation
Cross Sectional Analysis
Spring, 2002

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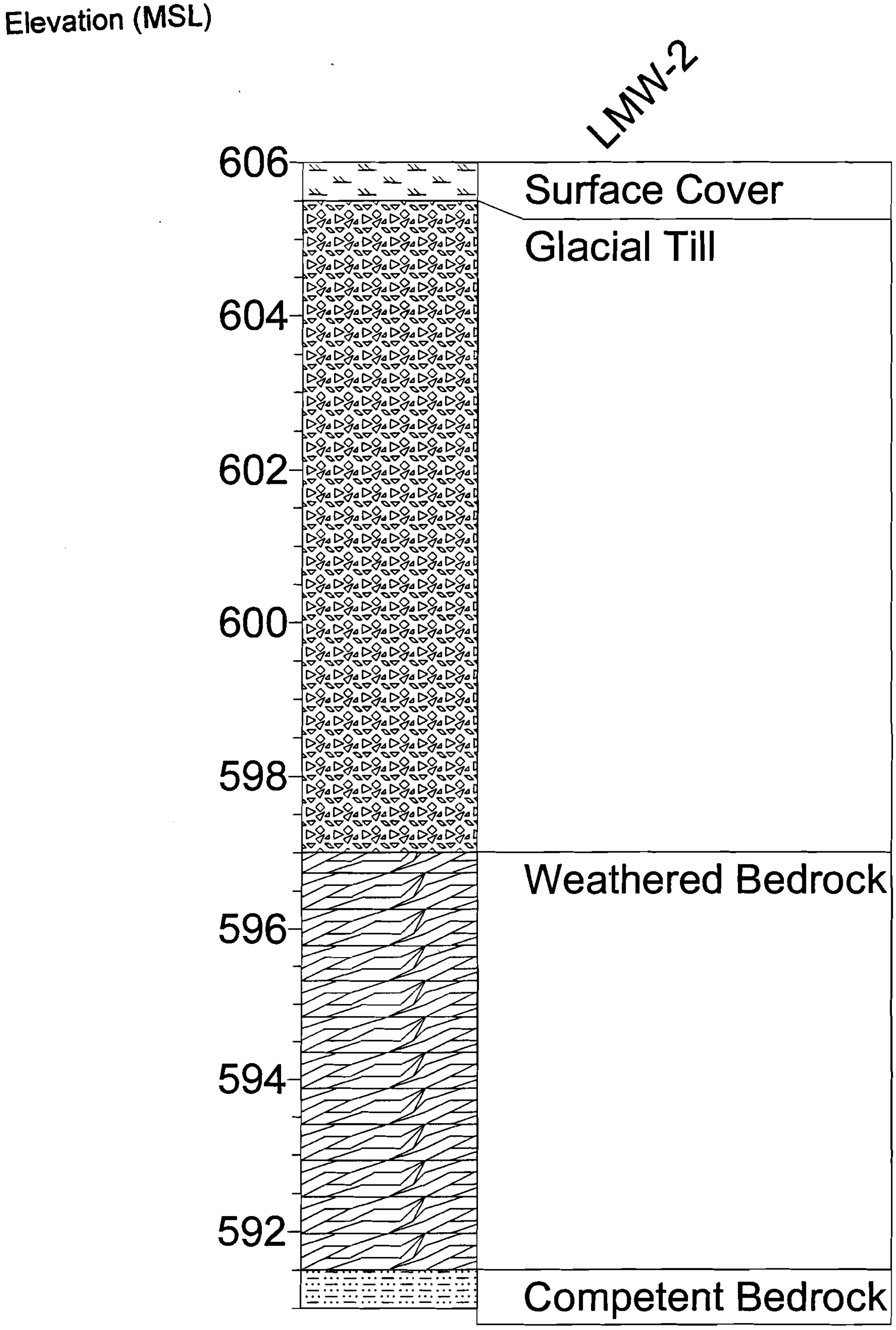
Logan, OH 43138
740-385-7810



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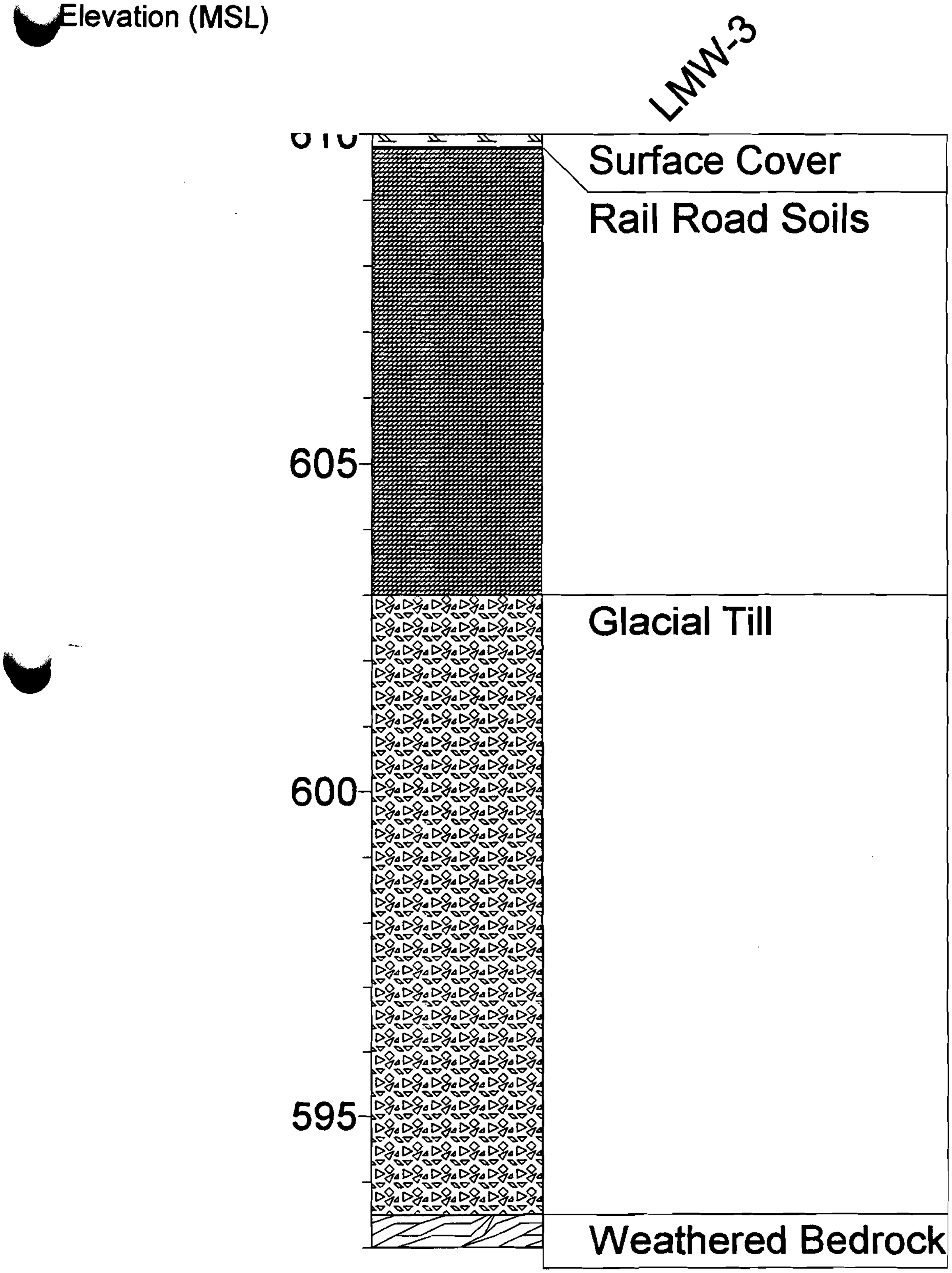

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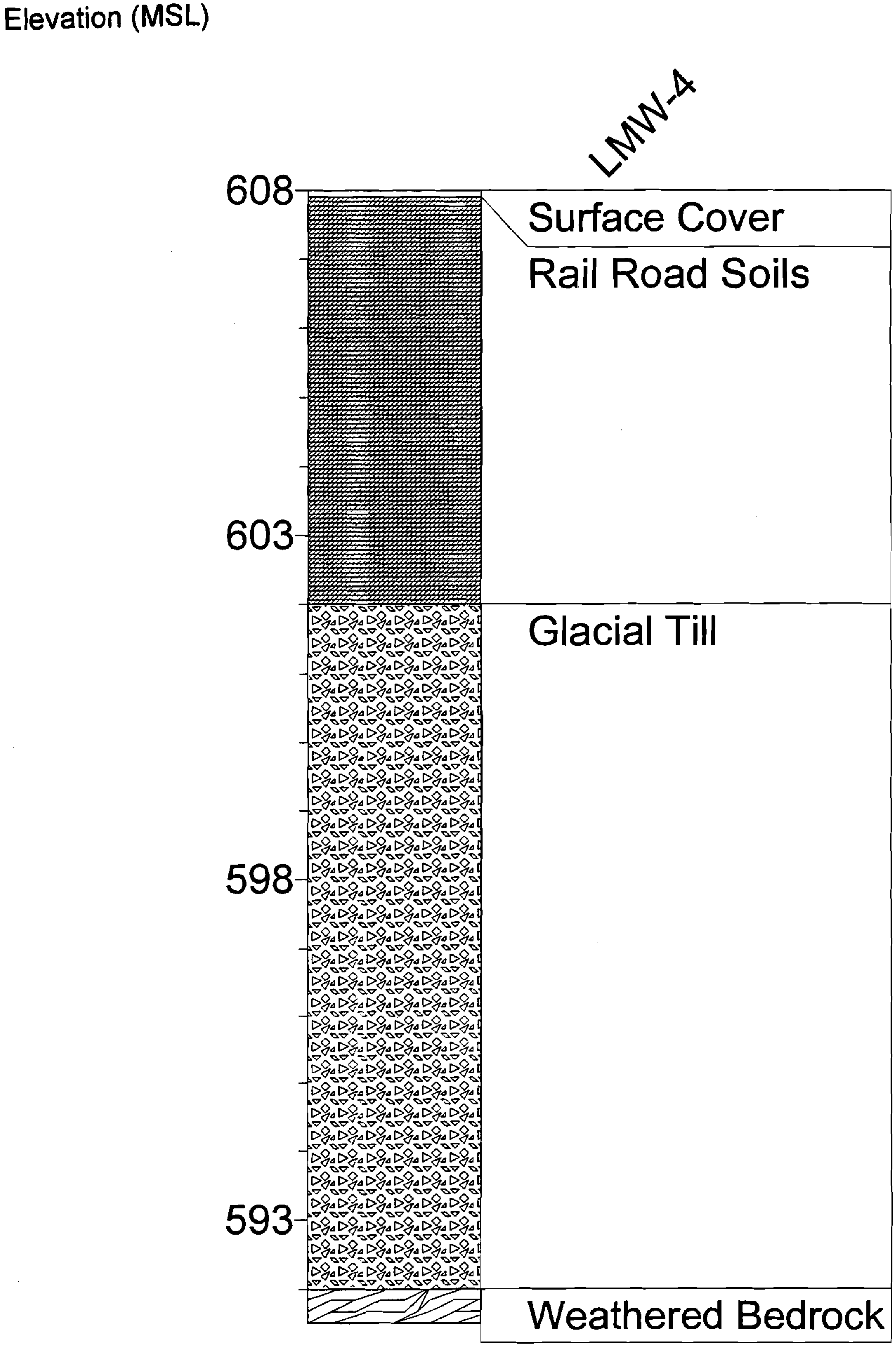

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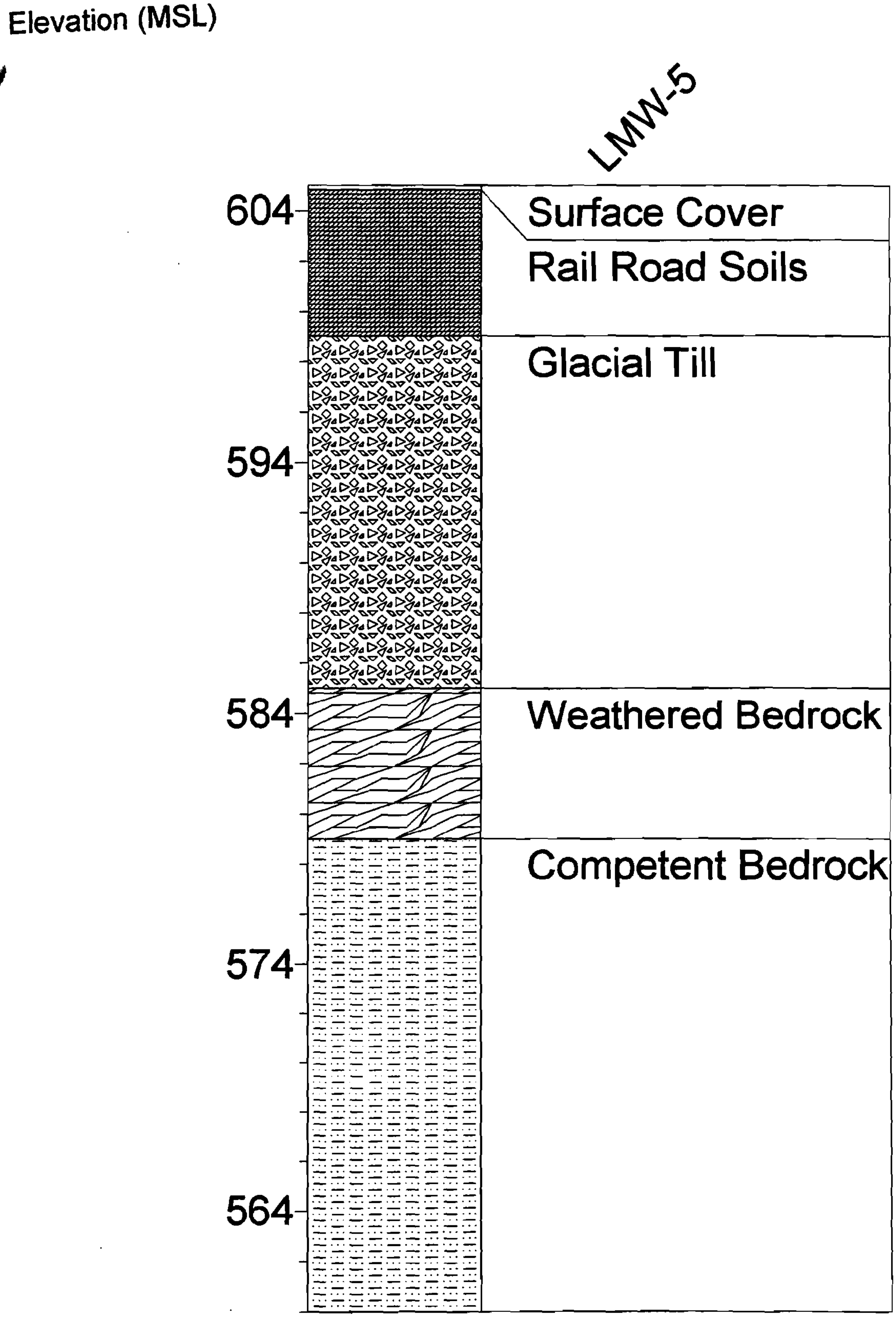

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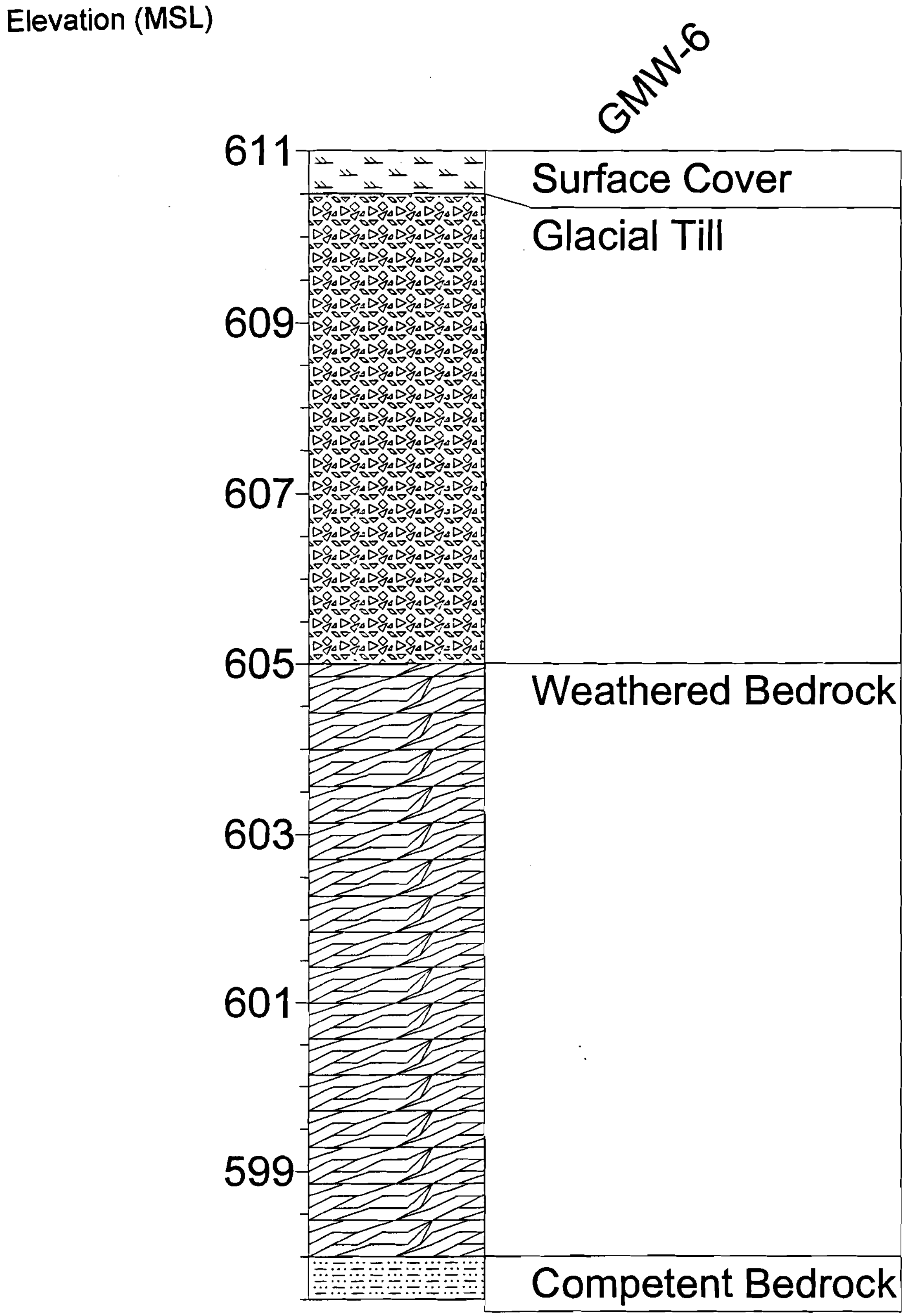

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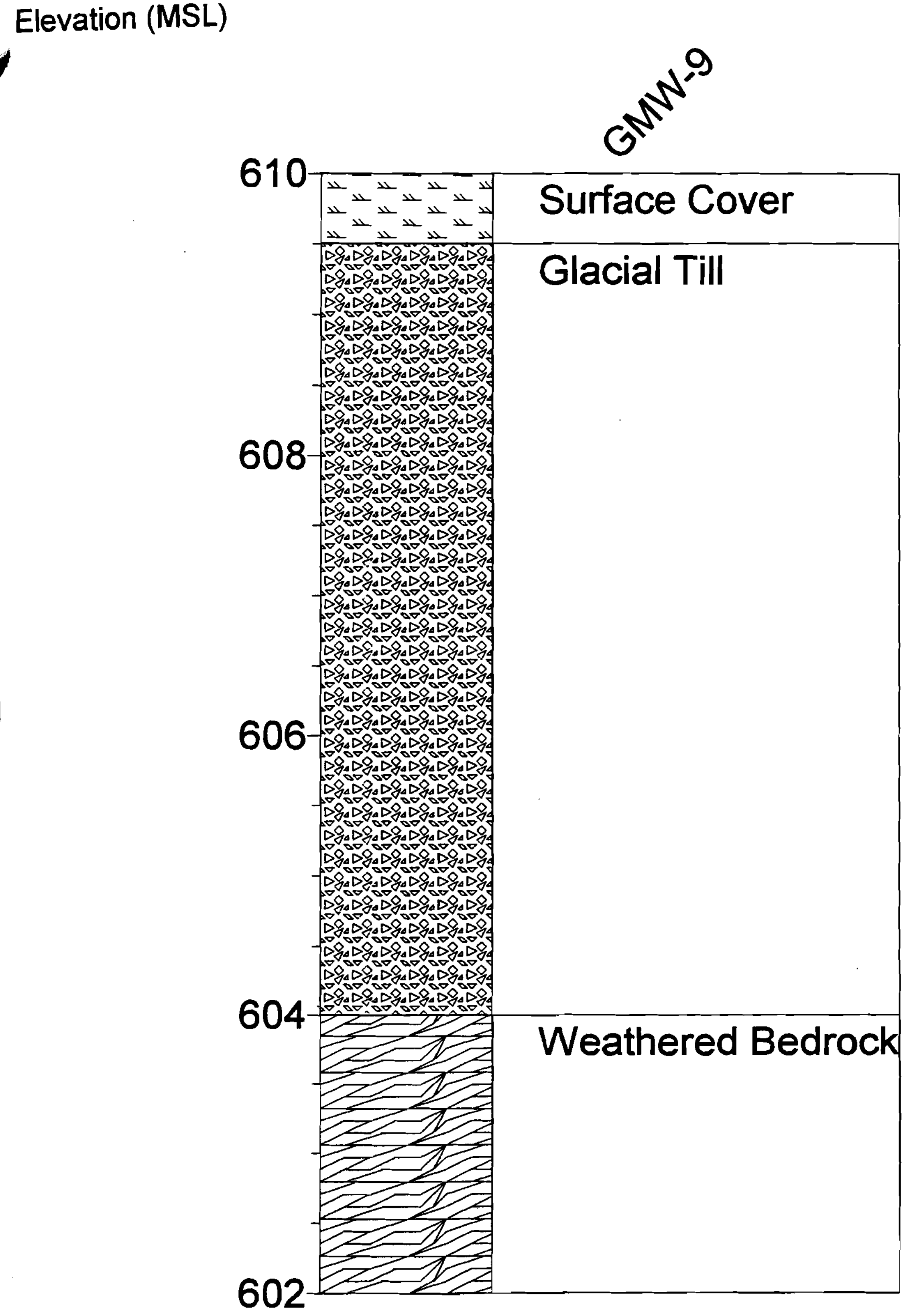

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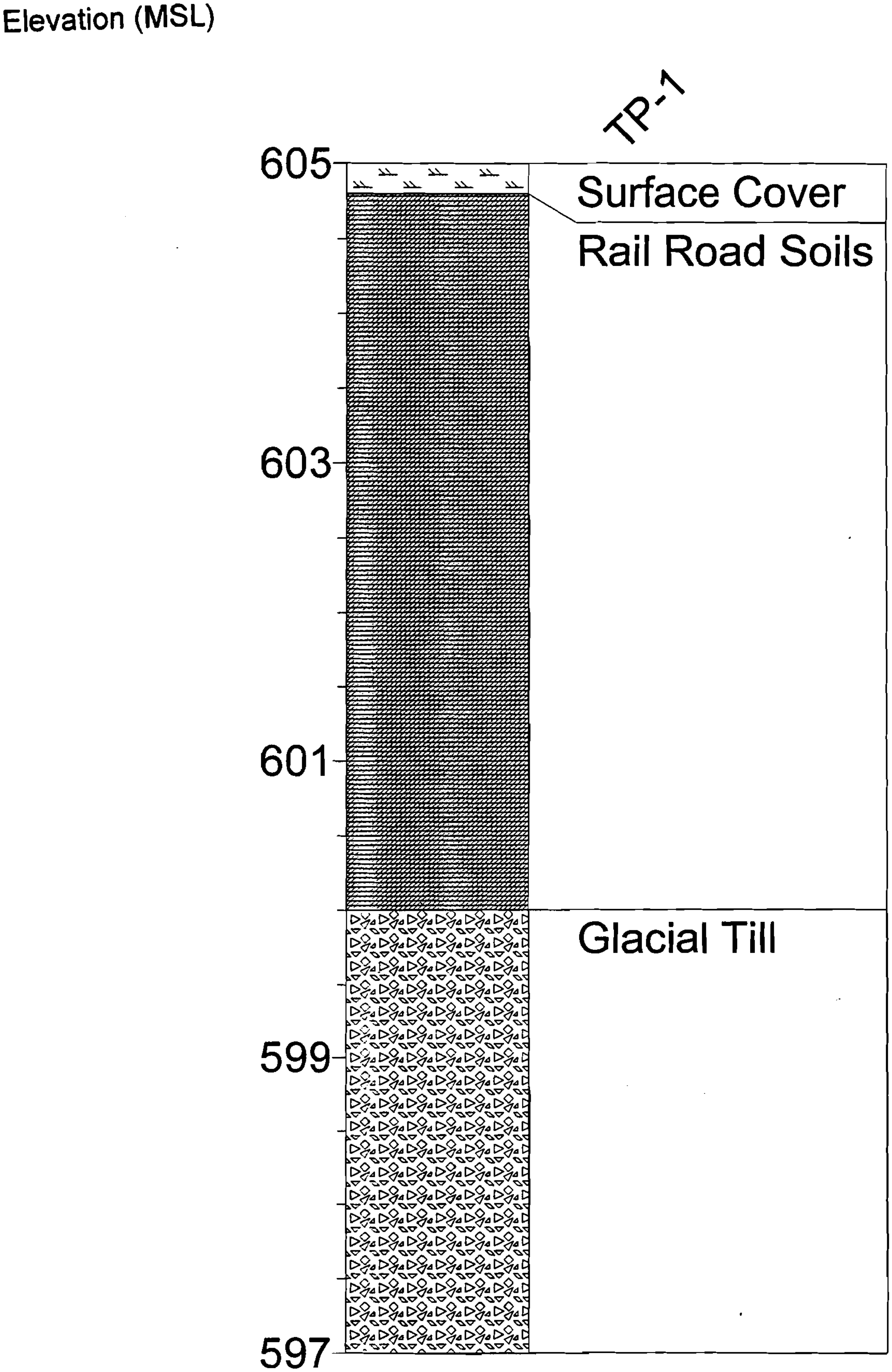

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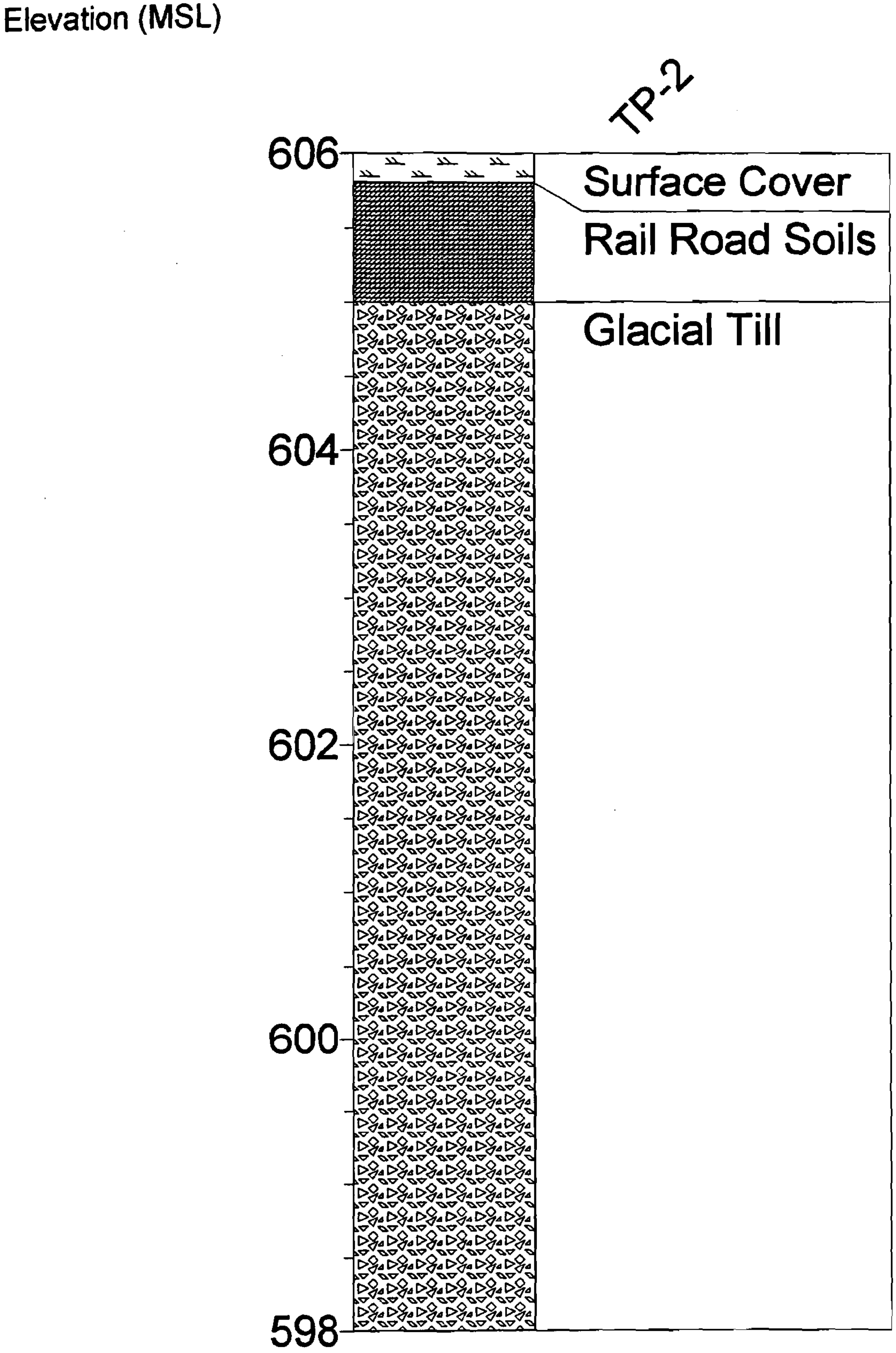

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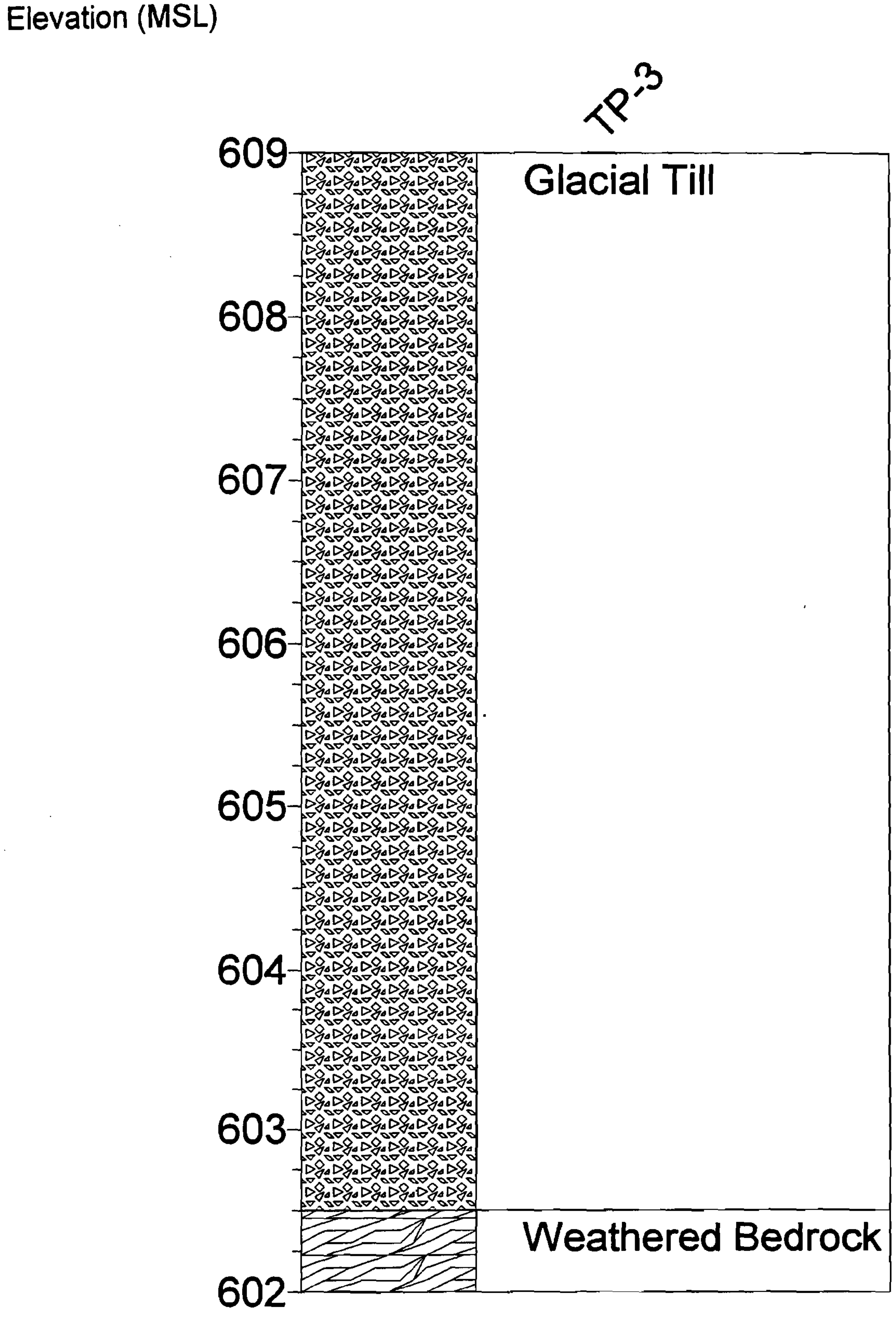

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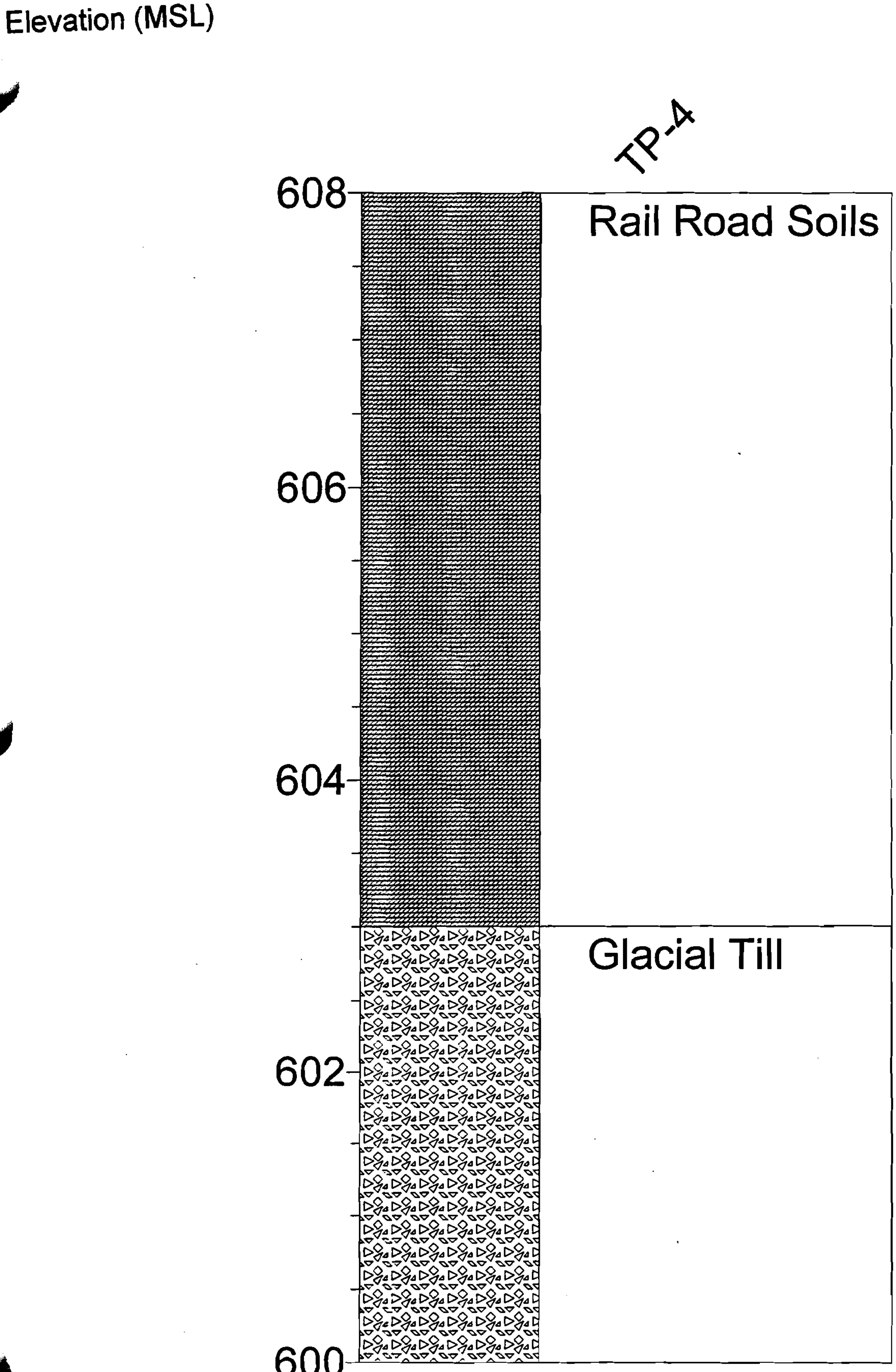

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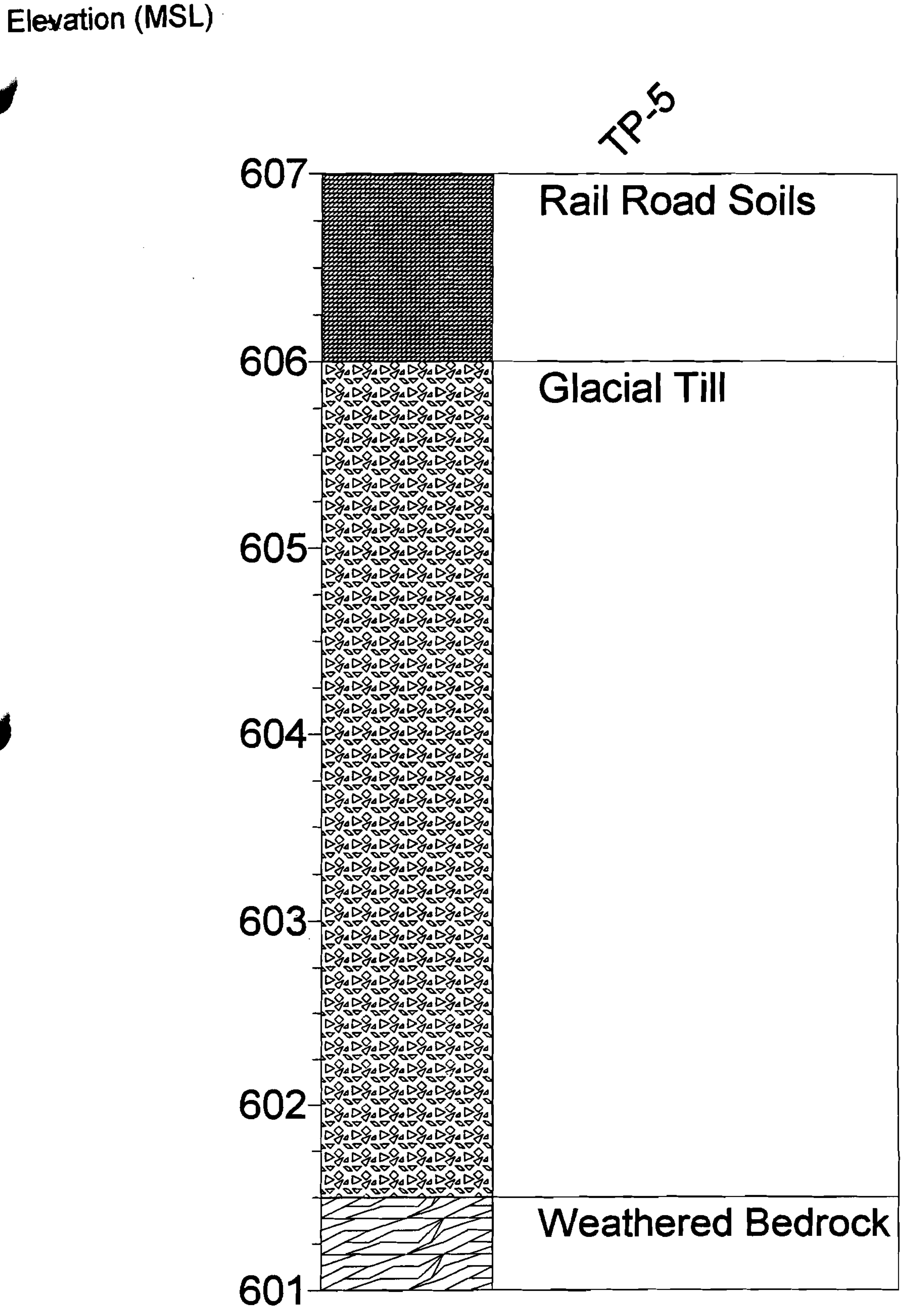

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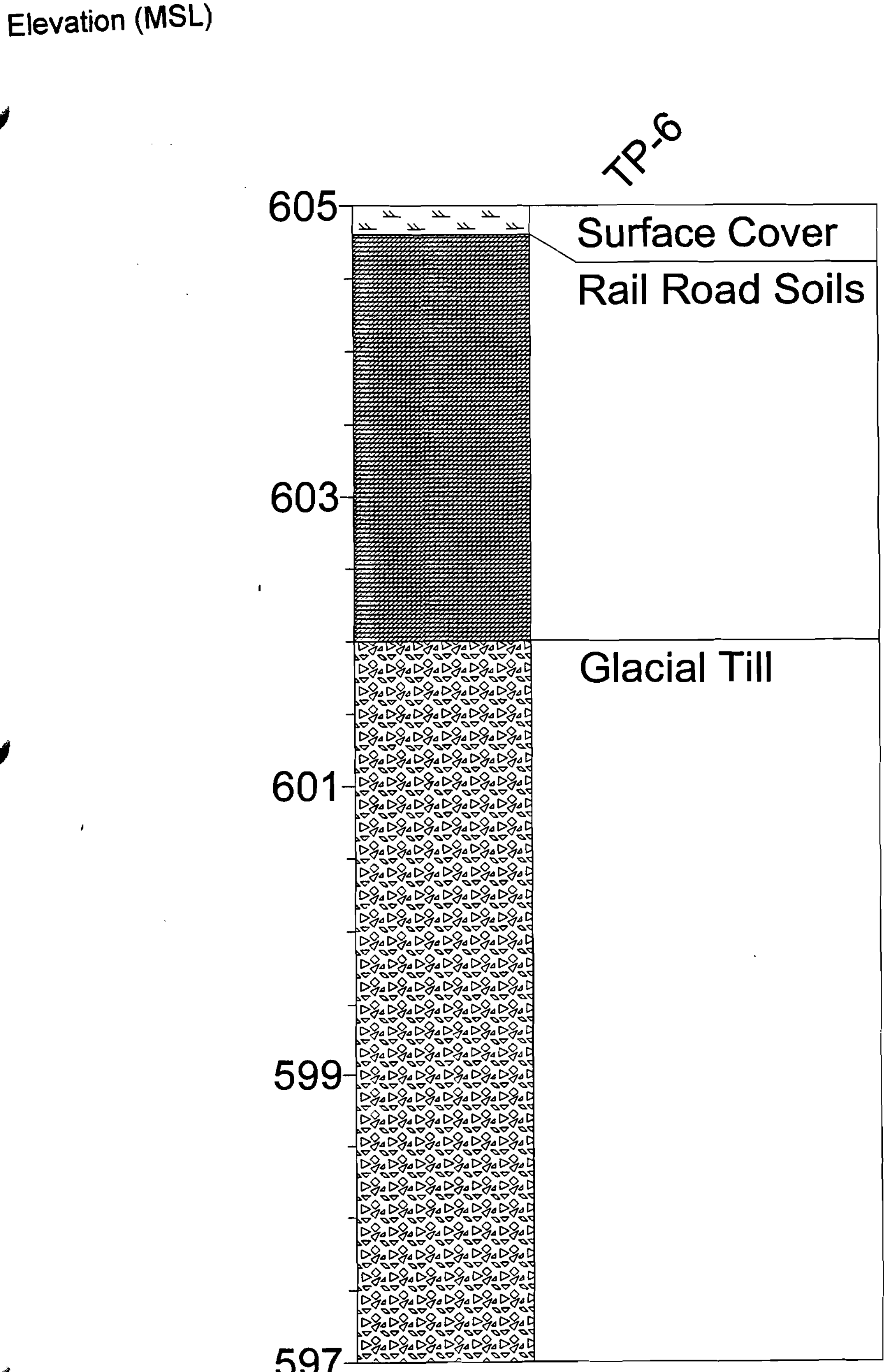

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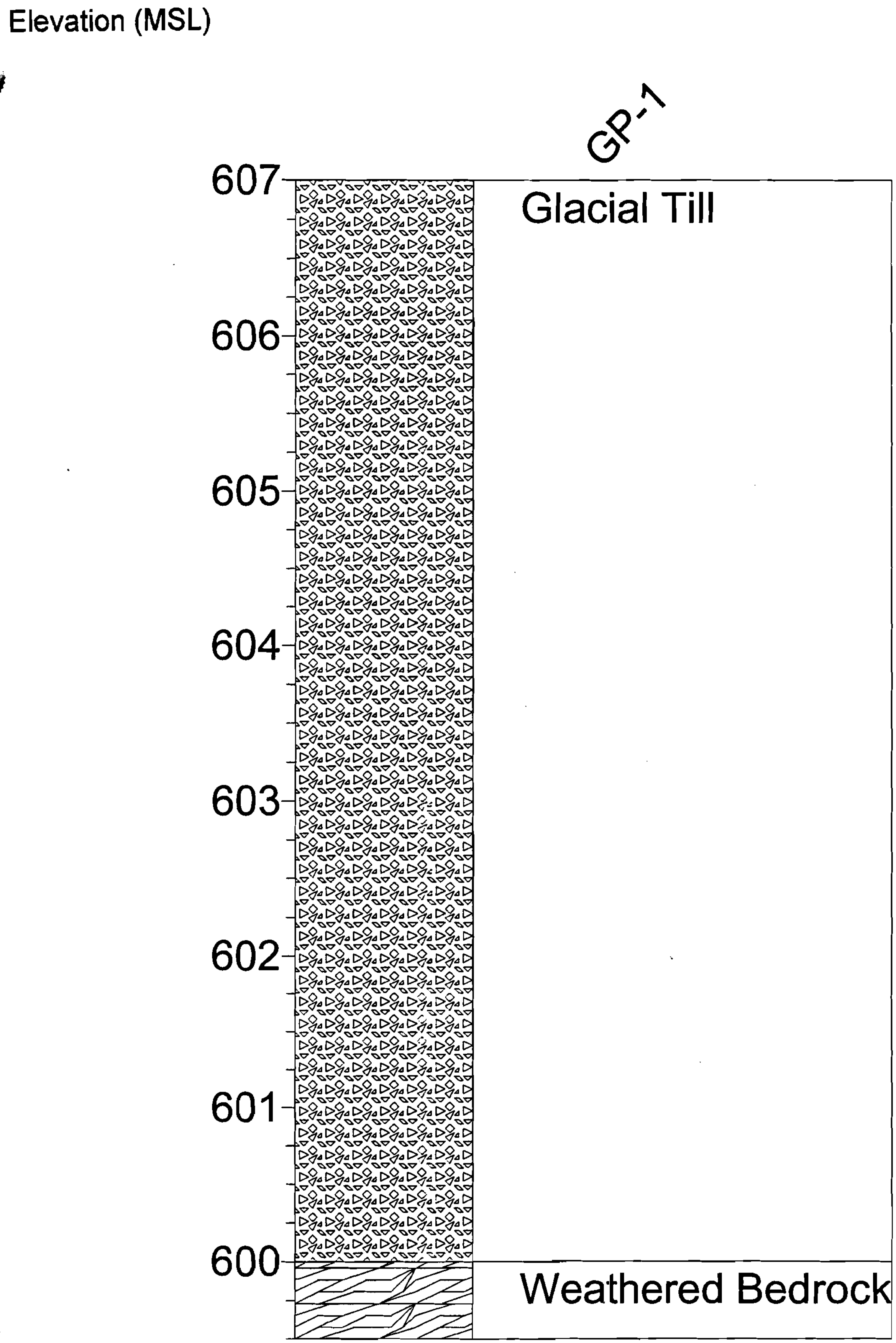

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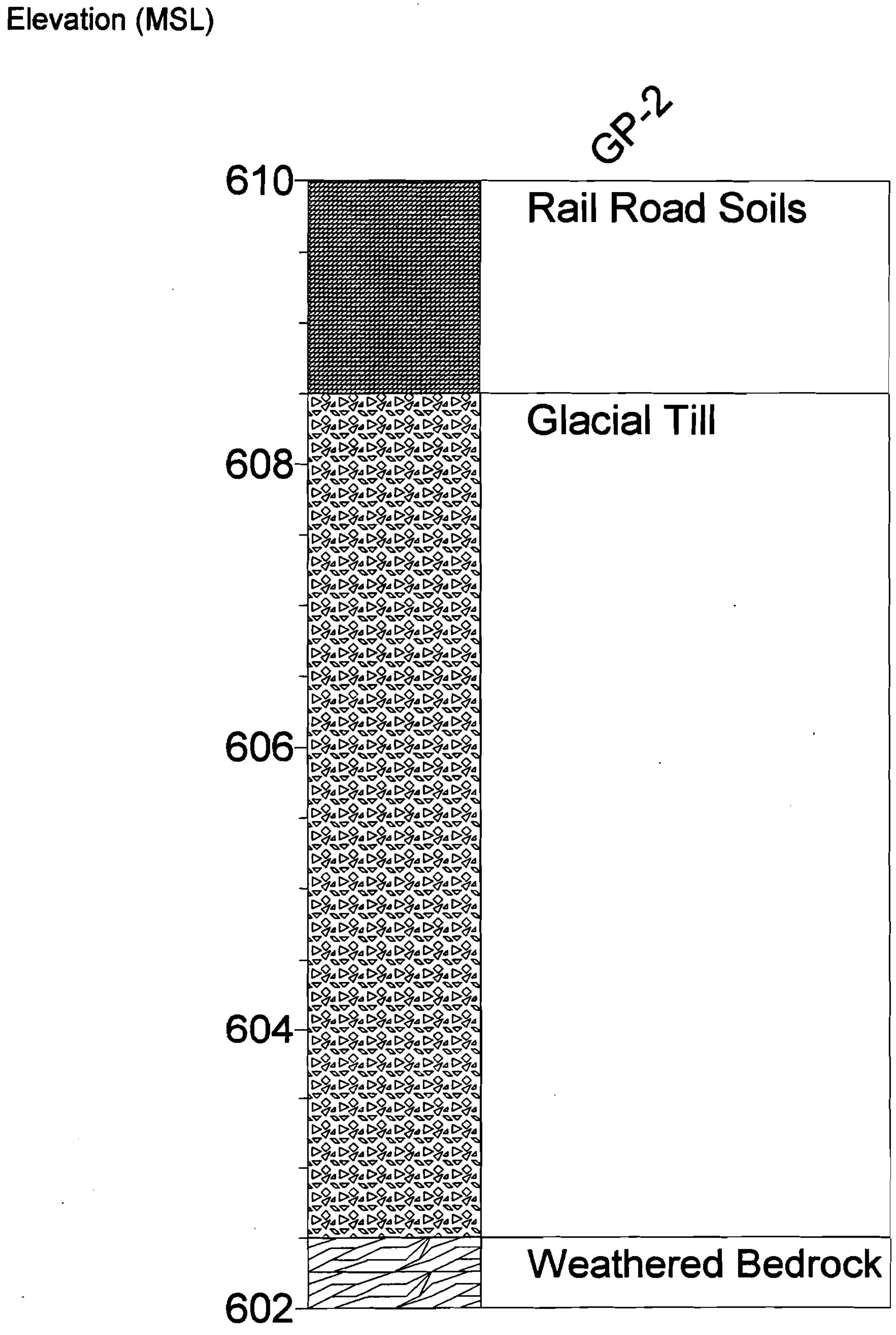

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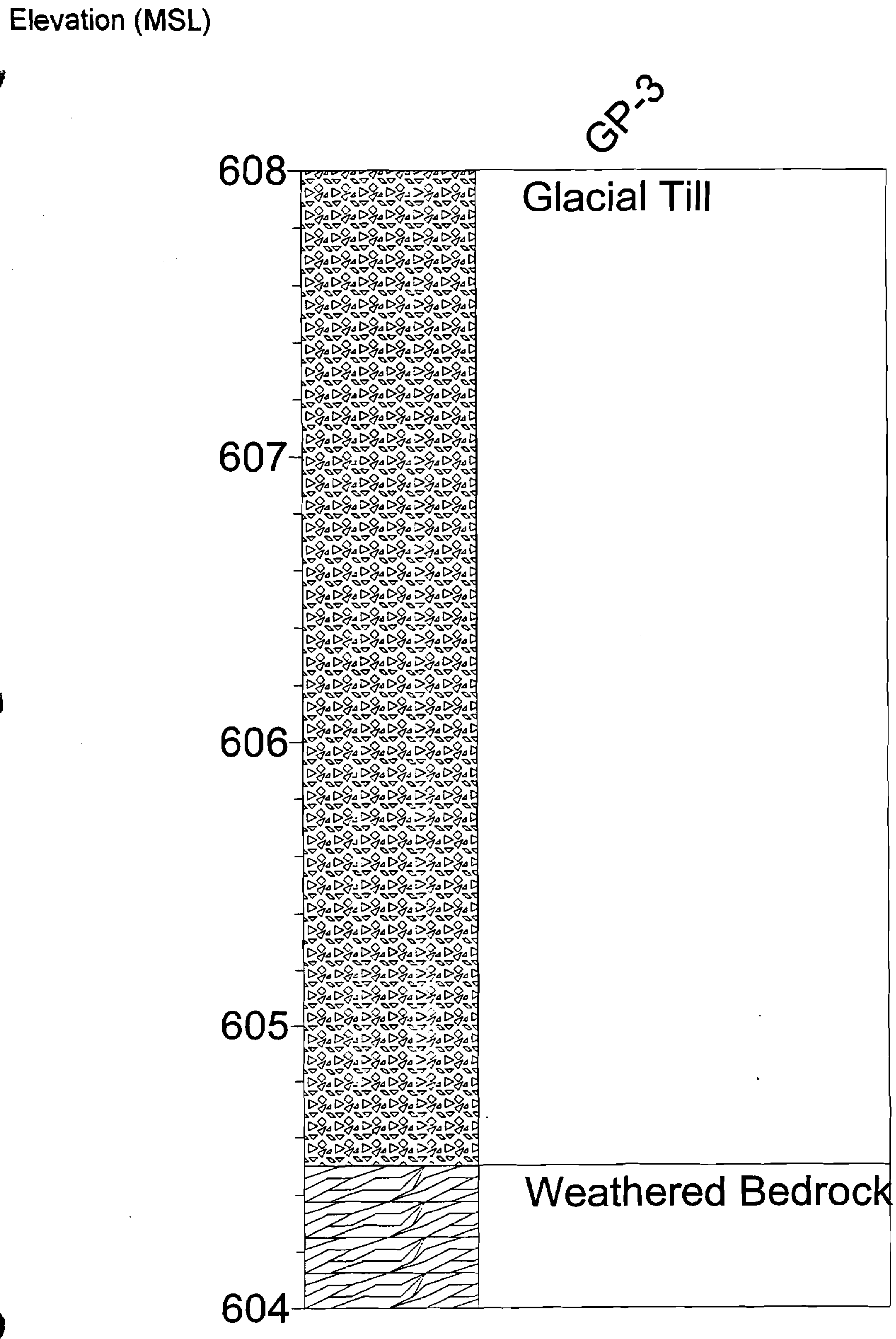

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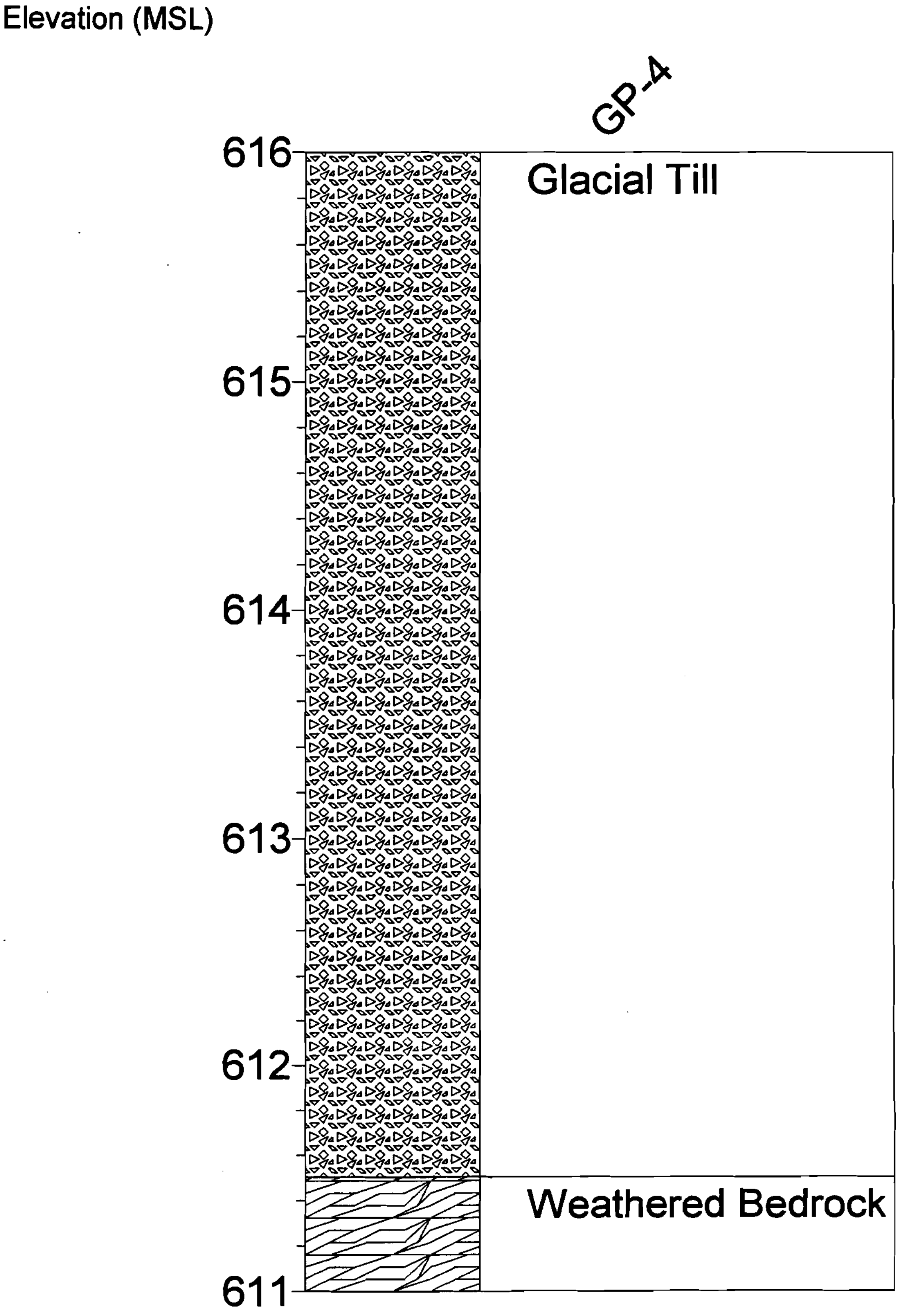

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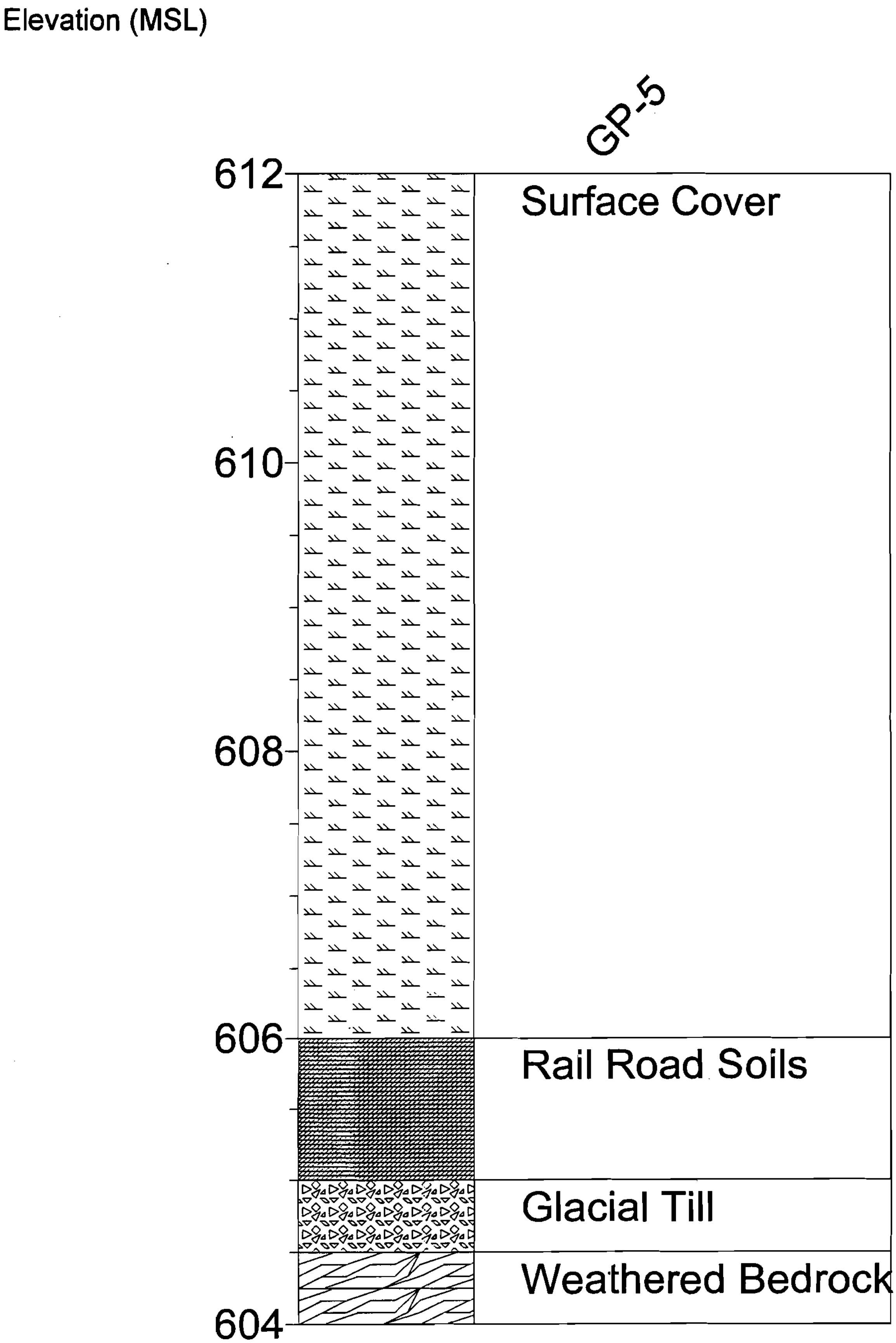

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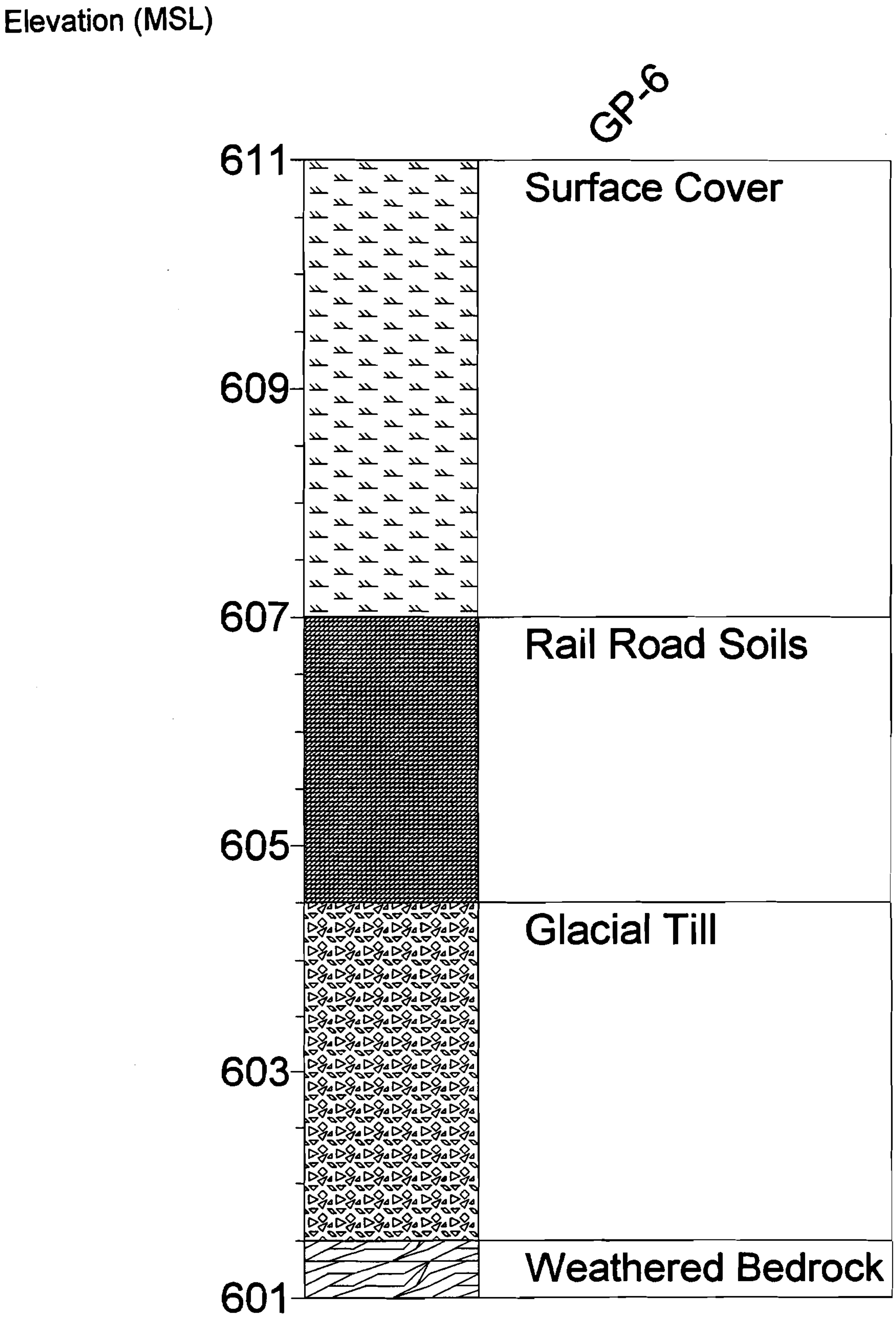

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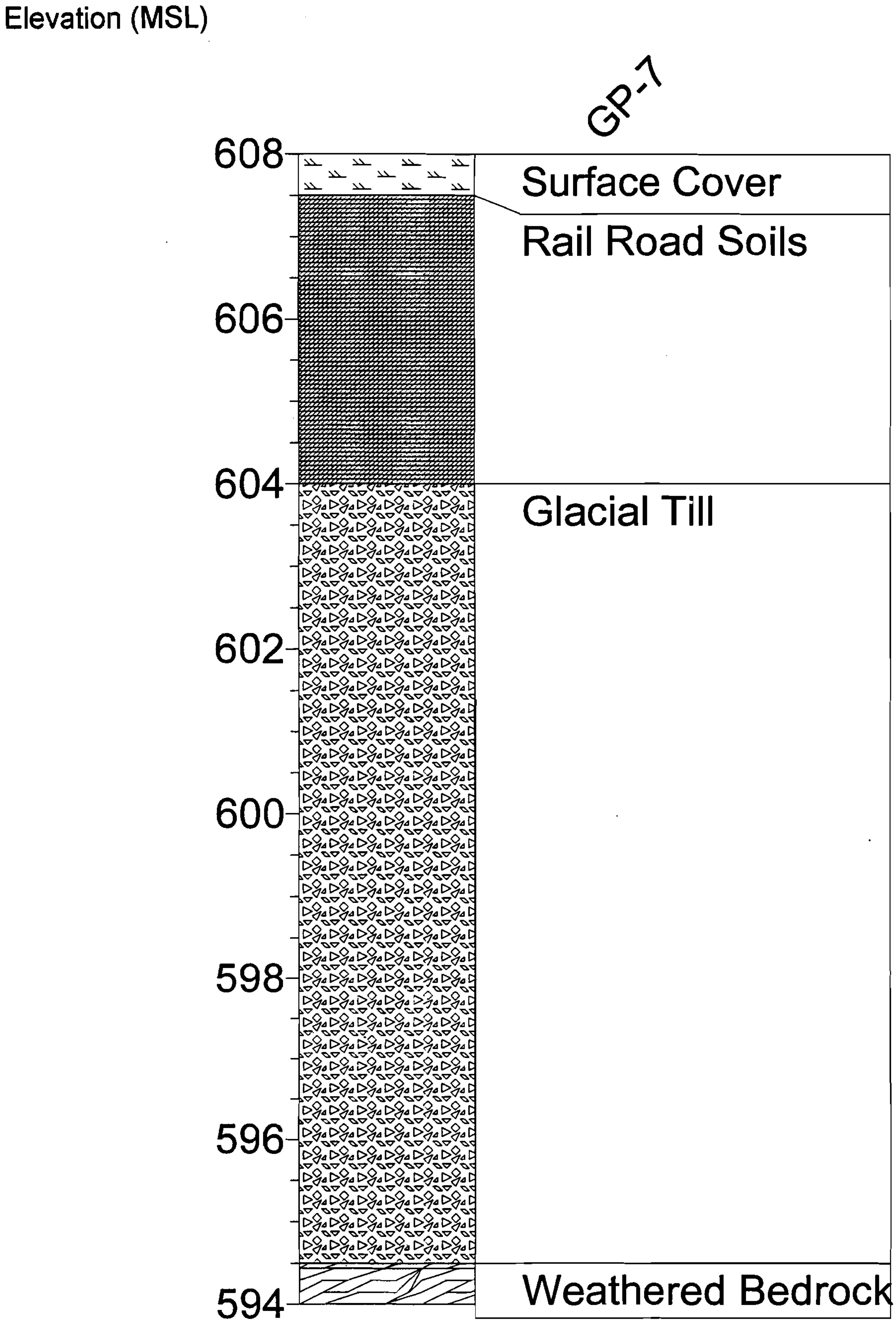

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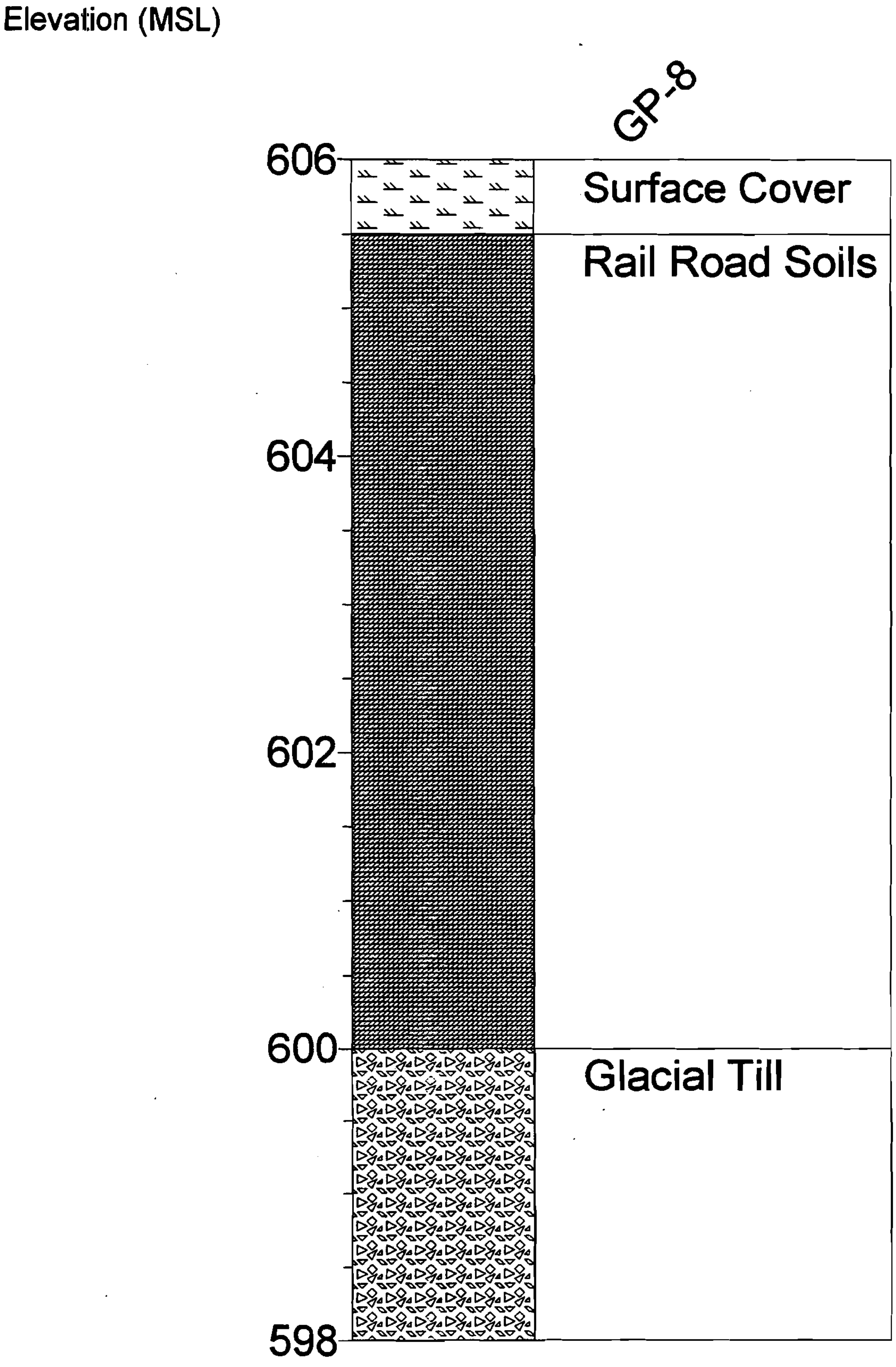

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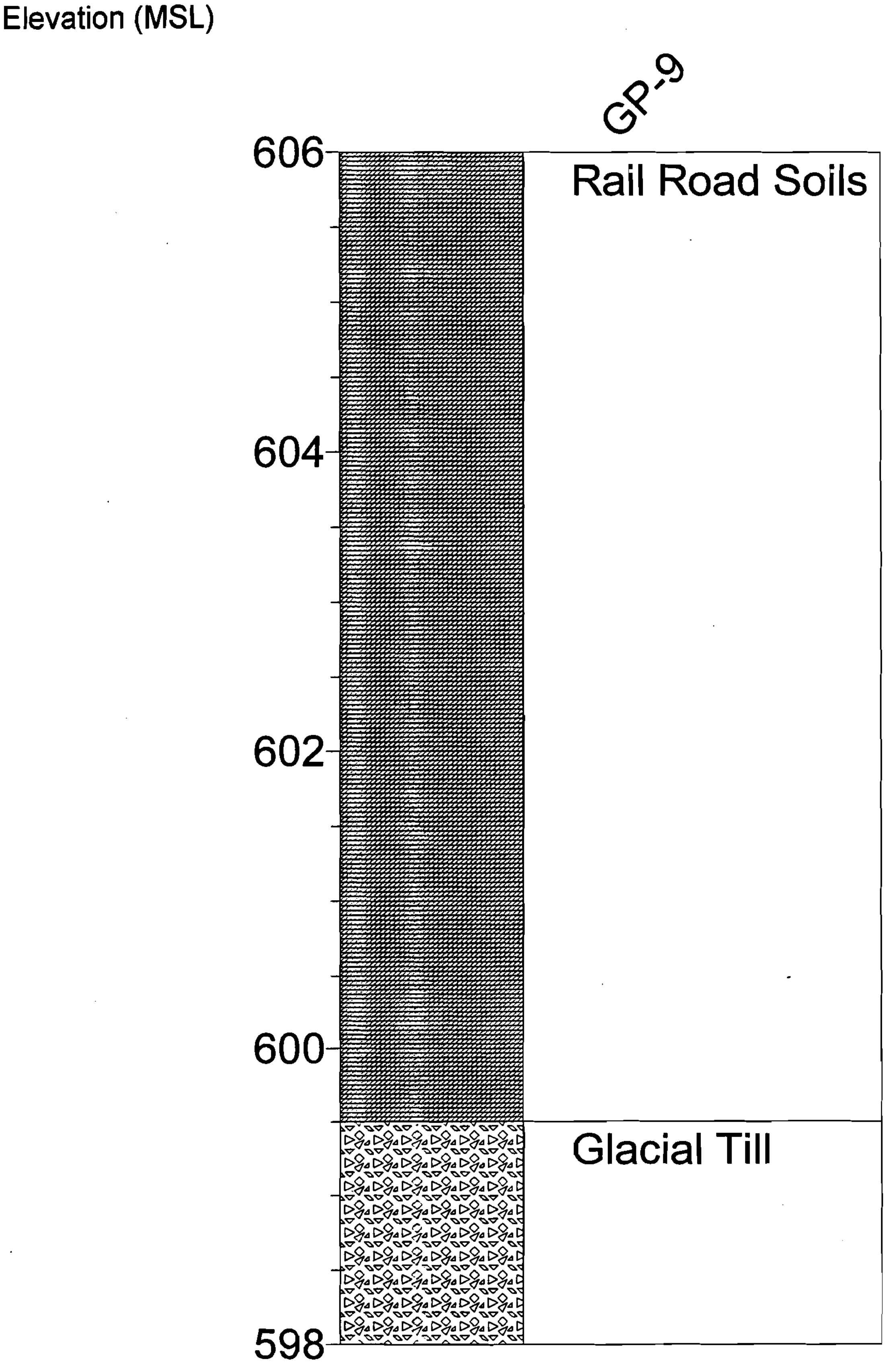

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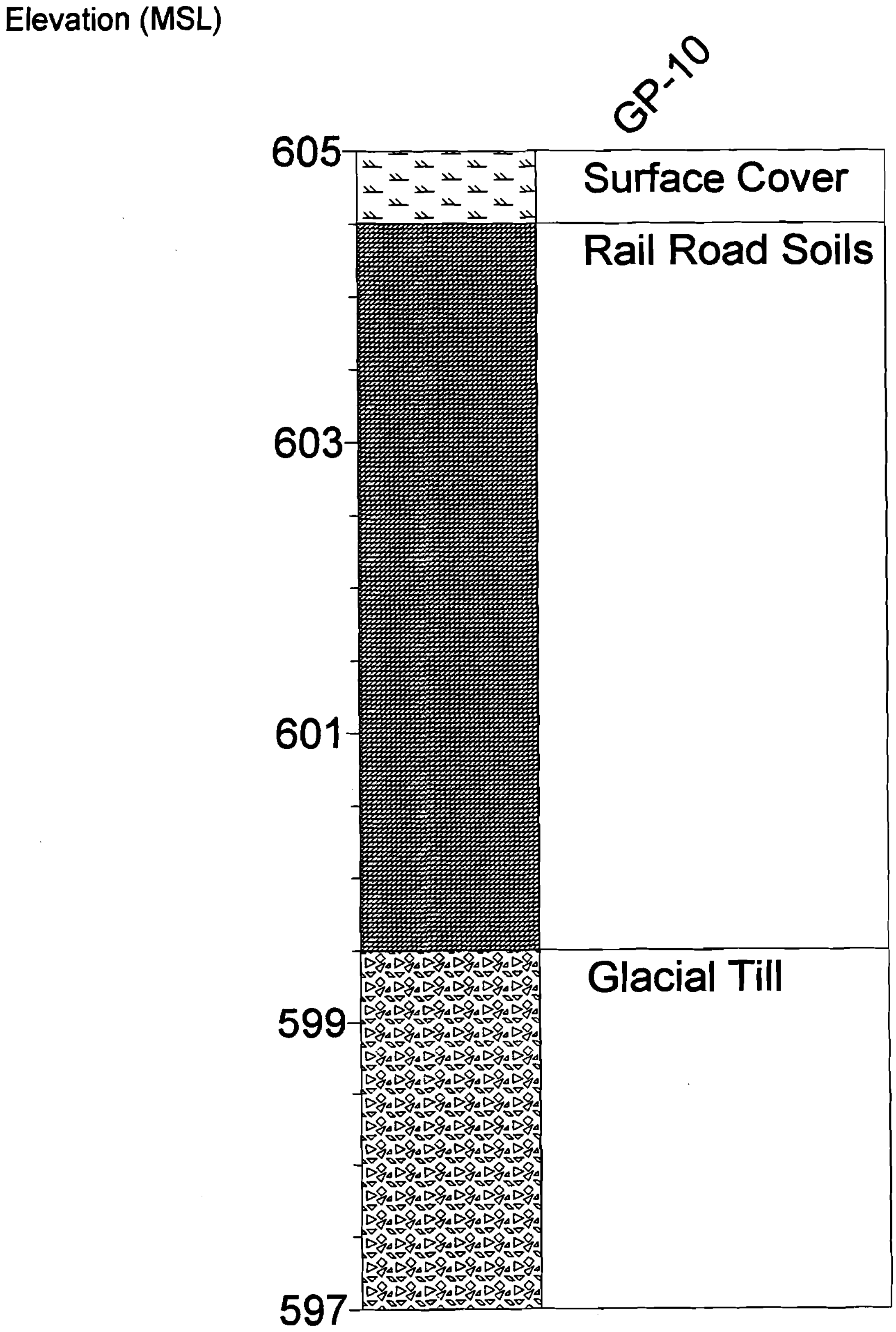

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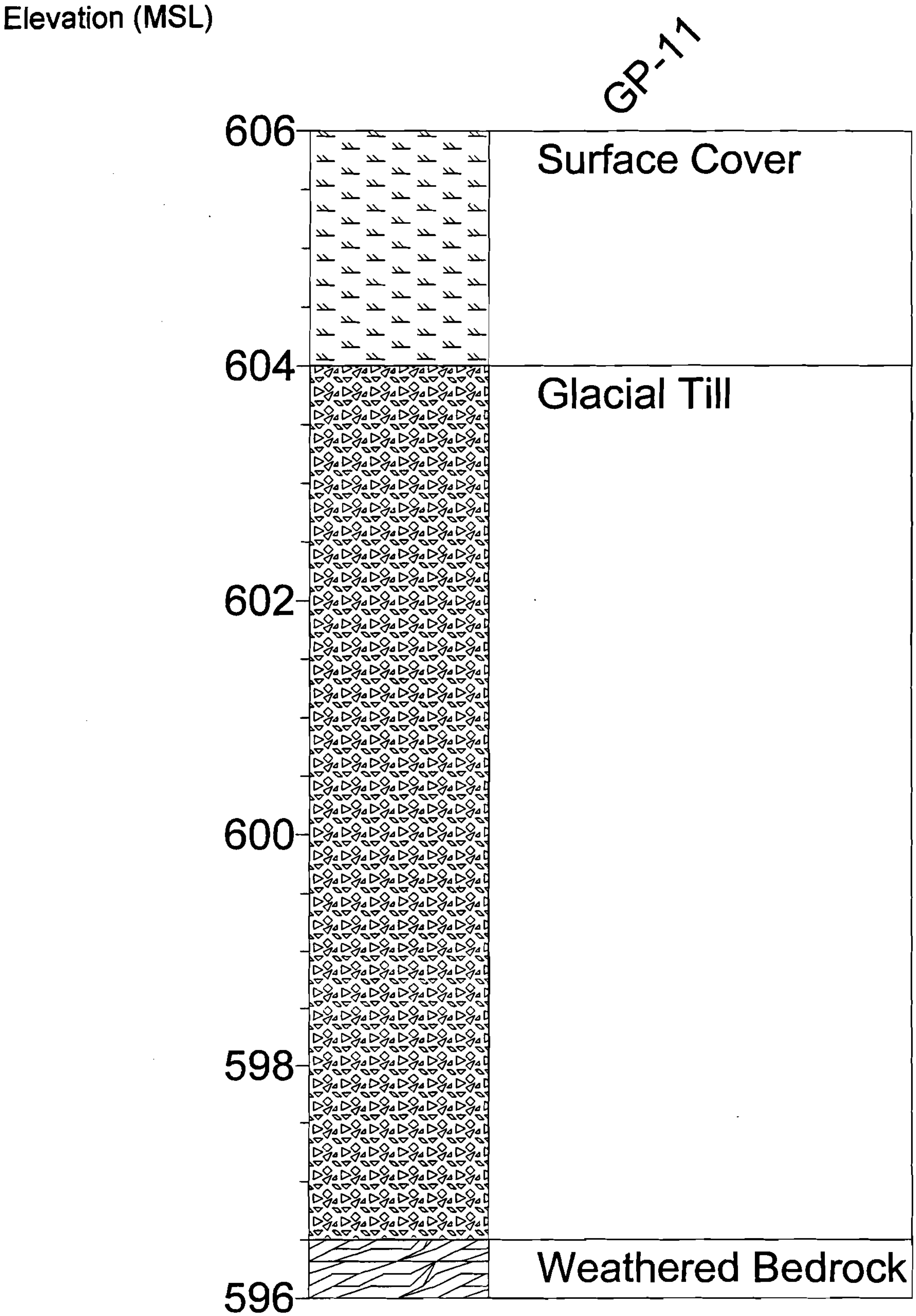

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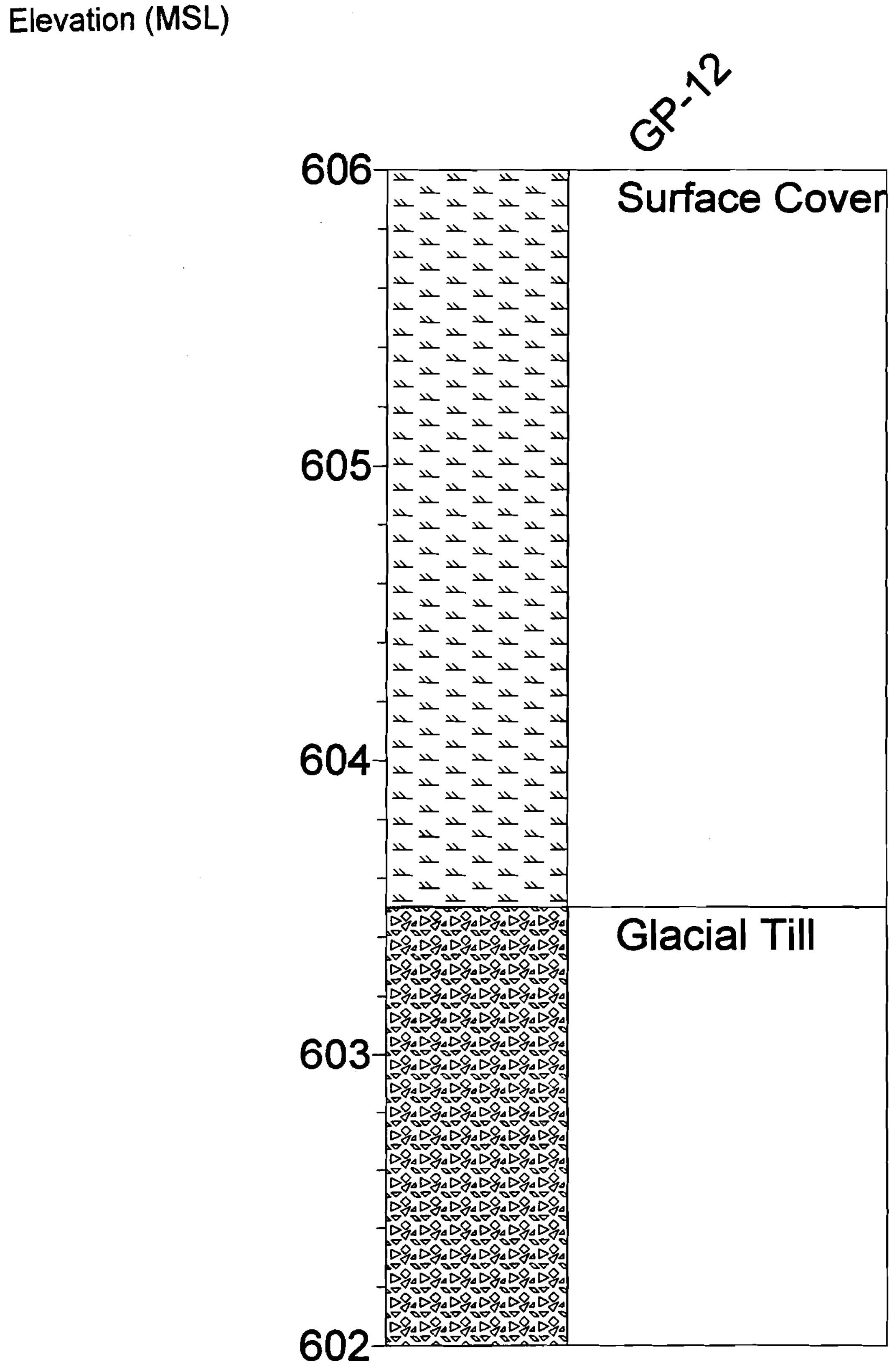

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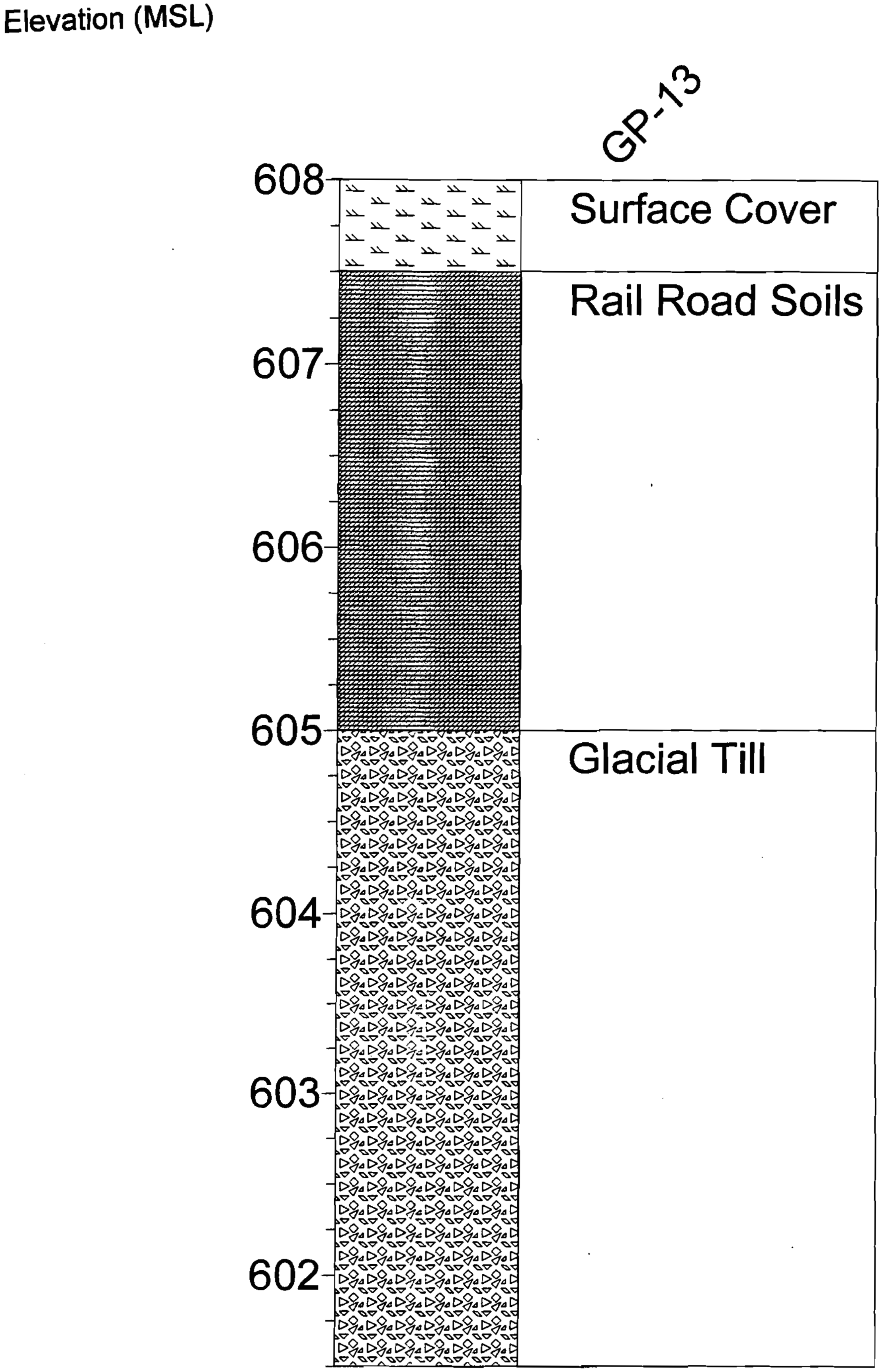

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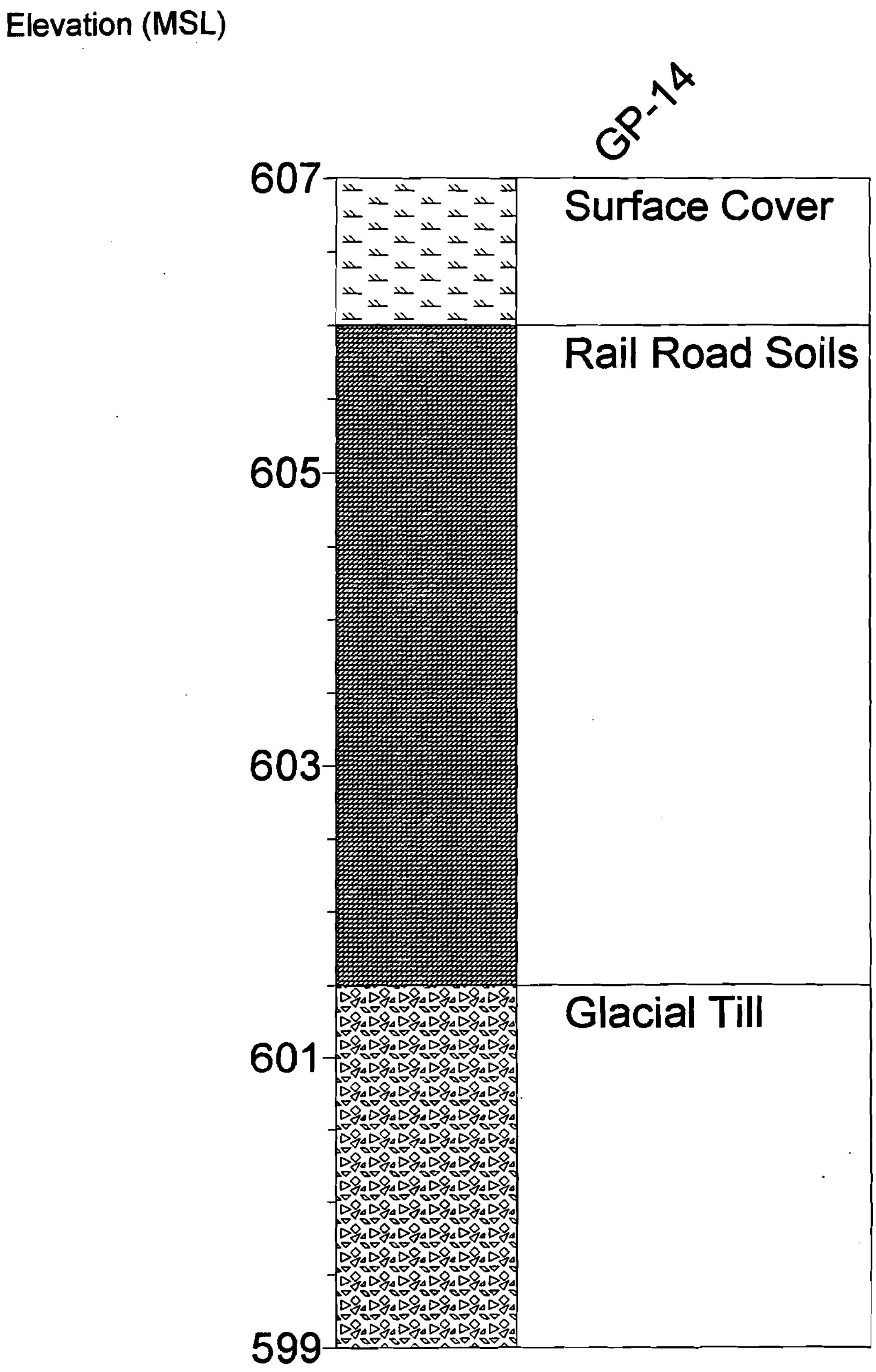

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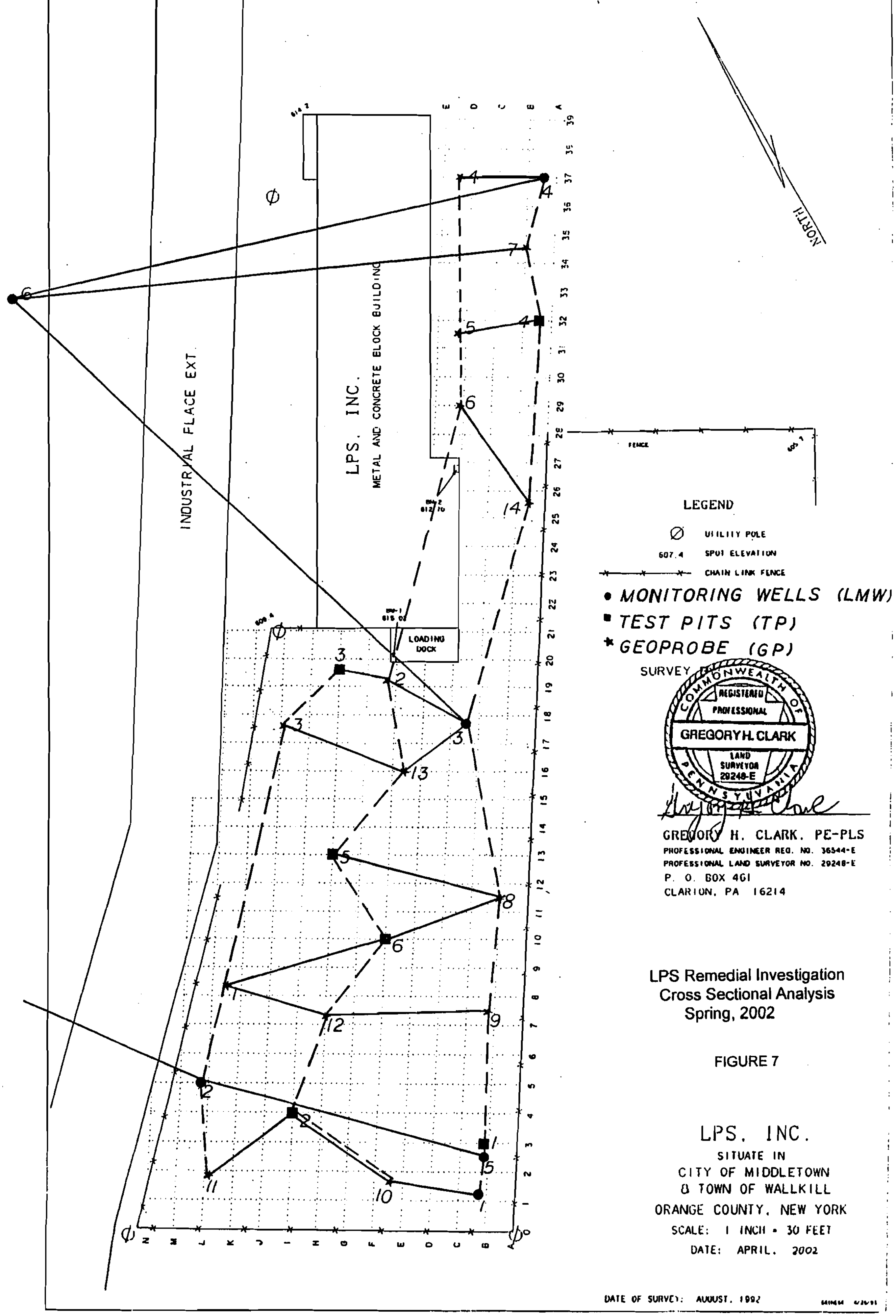


SURVEY

GREGORY H. CLARK
29248-E

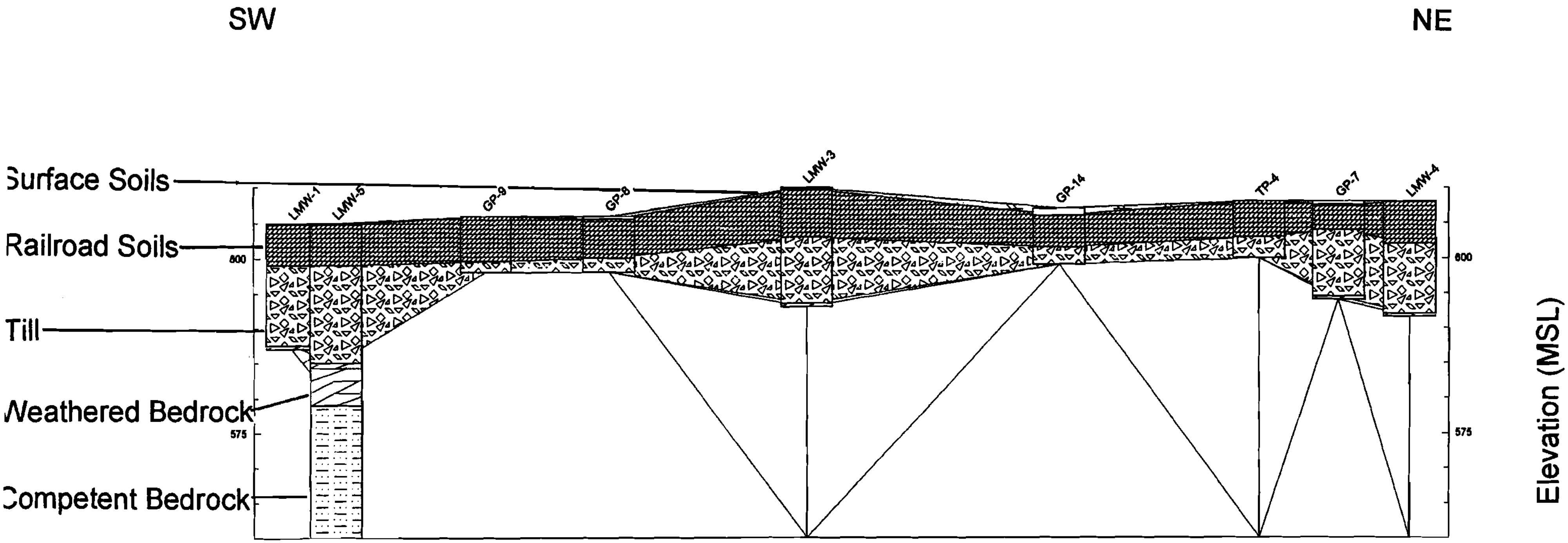
GREGORY H. CLARK, PE-PLS
PROFESSIONAL ENGINEER REG. NO. 36544-E
PROFESSIONAL LAND SURVEYOR NO. 29248-E
P. O. BOX 461
CLARION, PA 16214

LPS Remedial Investigation
Cross Sectional Analysis
Spring, 2002

FIGURE 7

LPS. INC.
SITUATE IN
CITY OF MIDDLETOWN
& TOWN OF WALLKILL
ORANGE COUNTY, NEW YORK
SCALE: 1 INCH = 30 FEET
DATE: APRIL, 2002

DATE OF SURVEY: AUGUST, 1992



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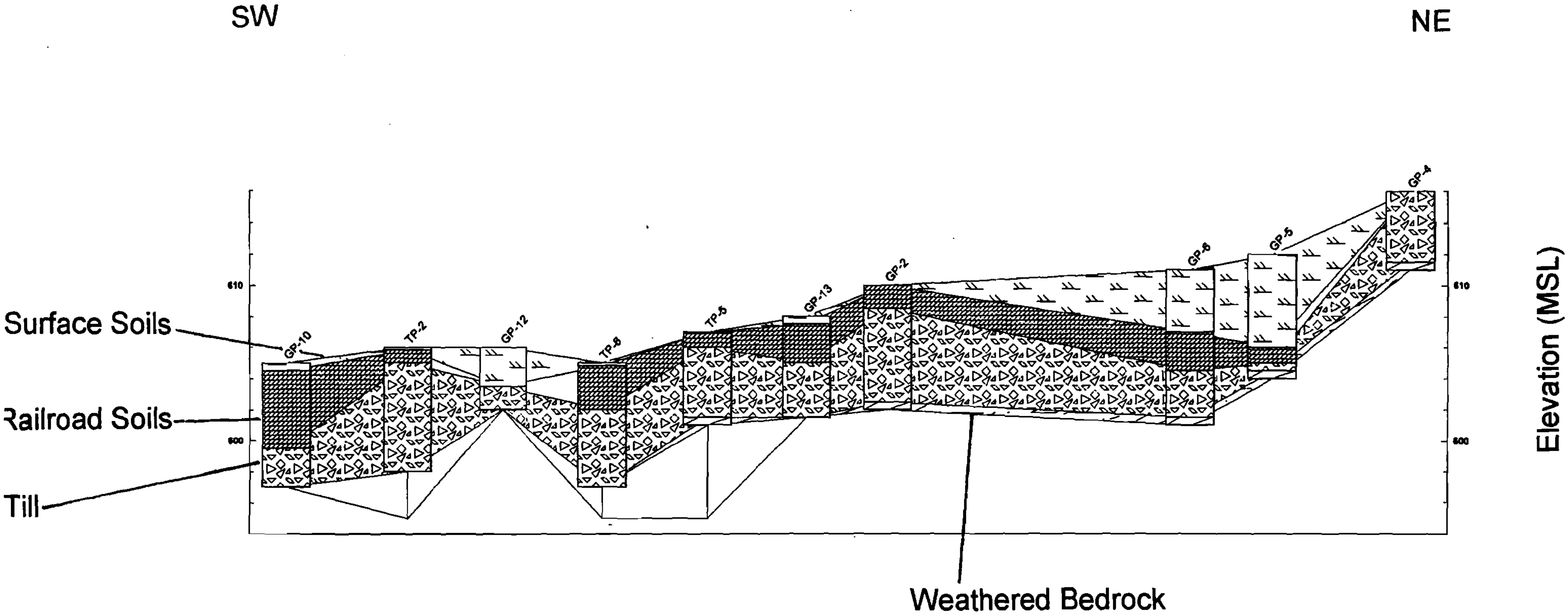

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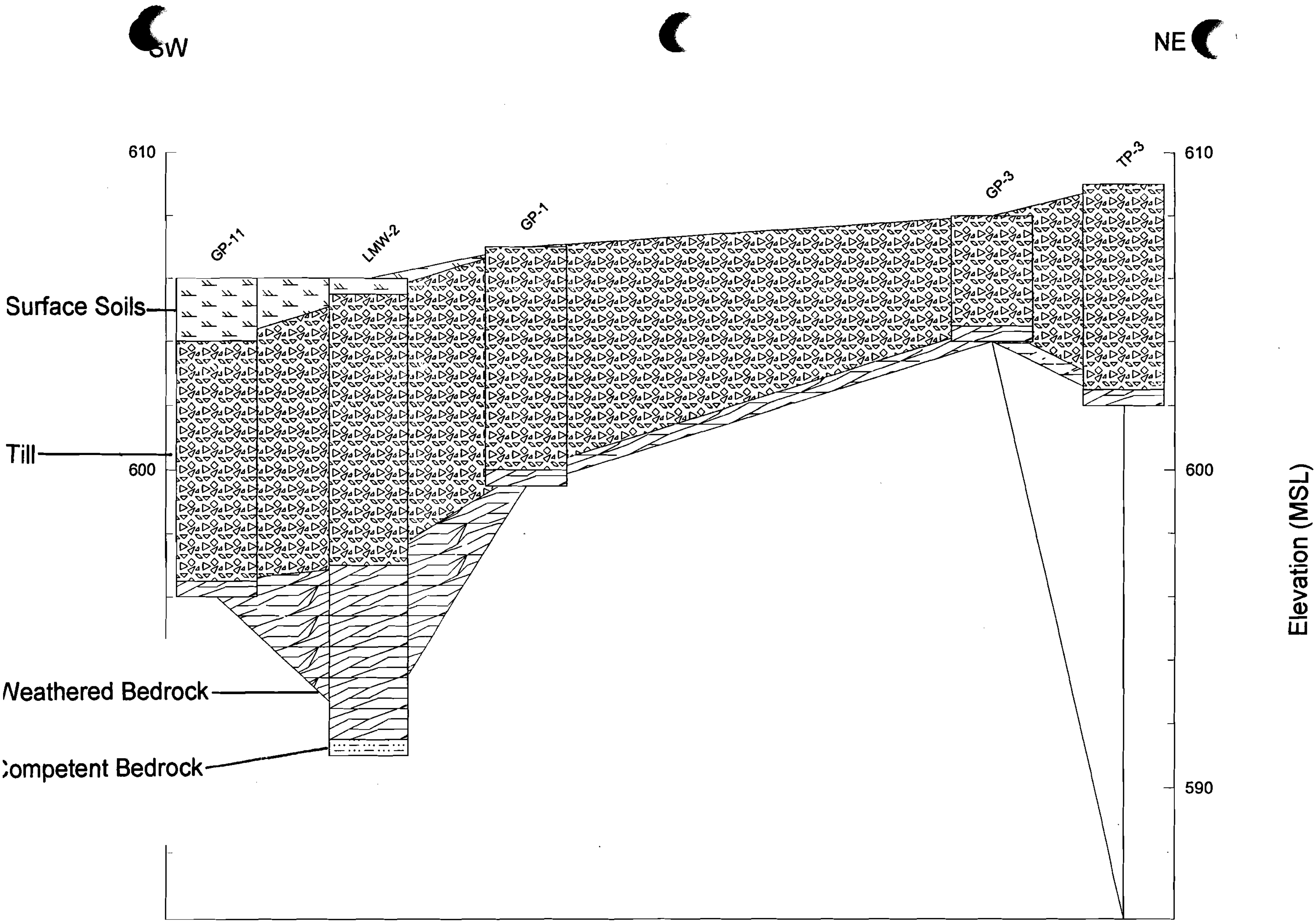

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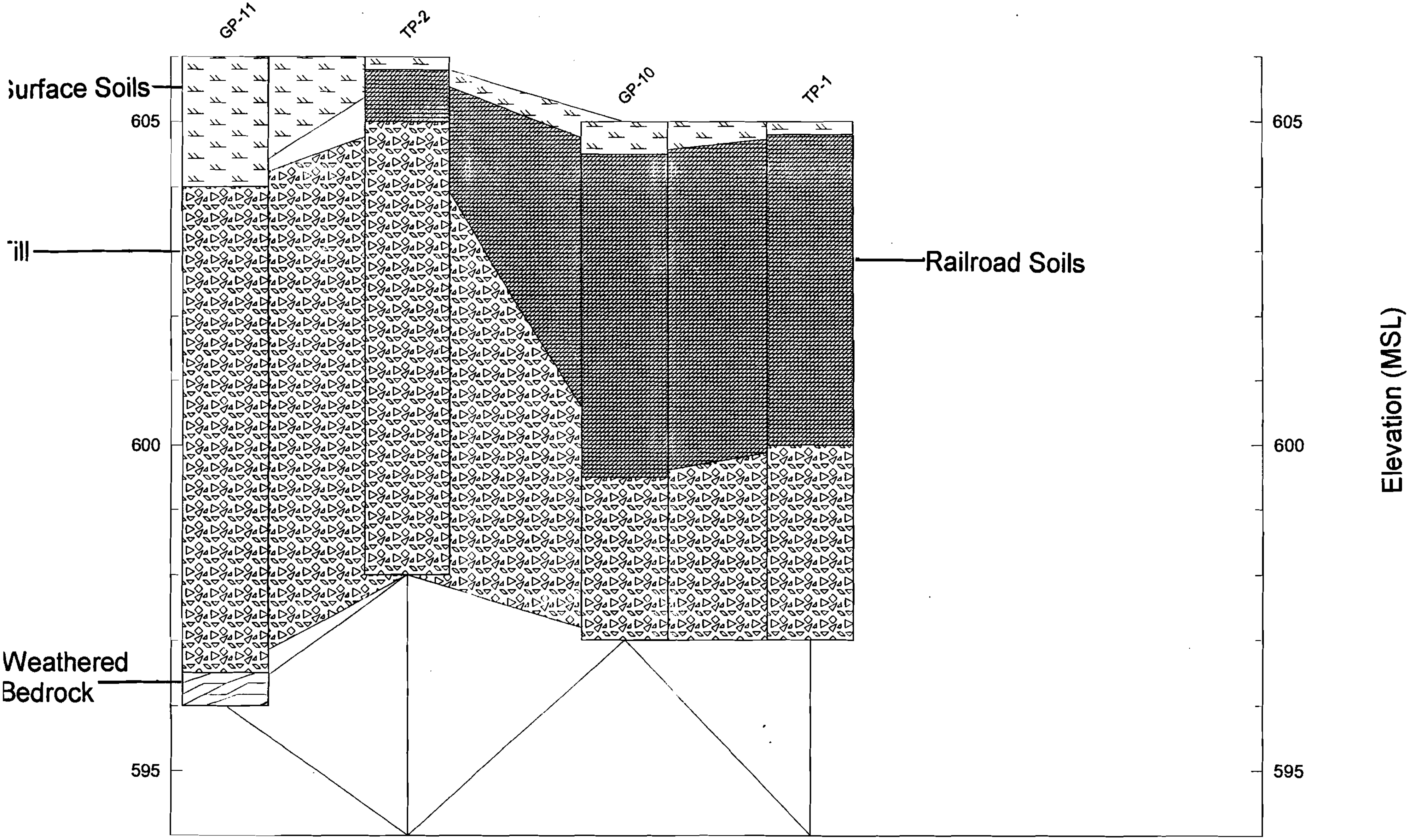

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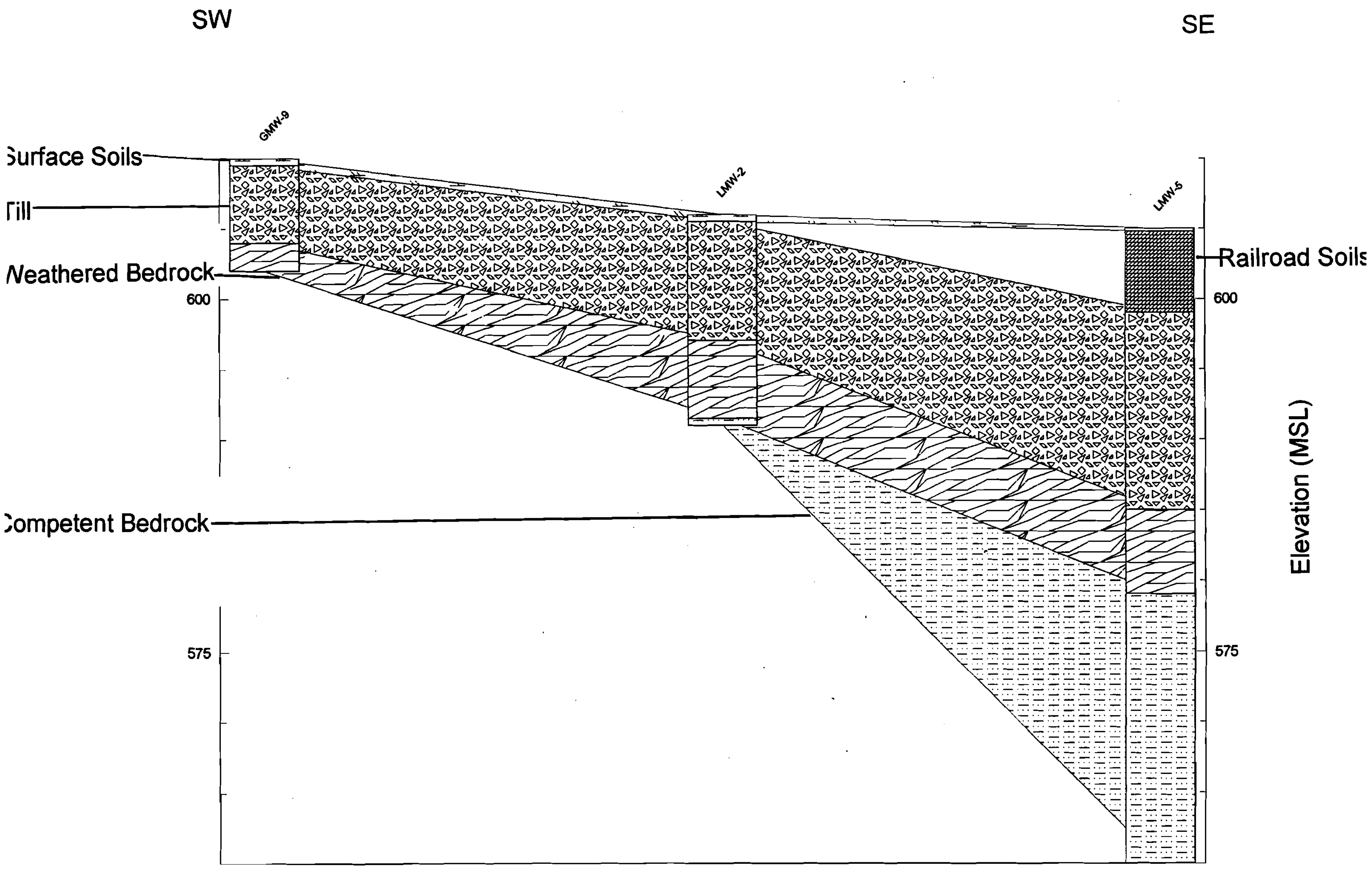

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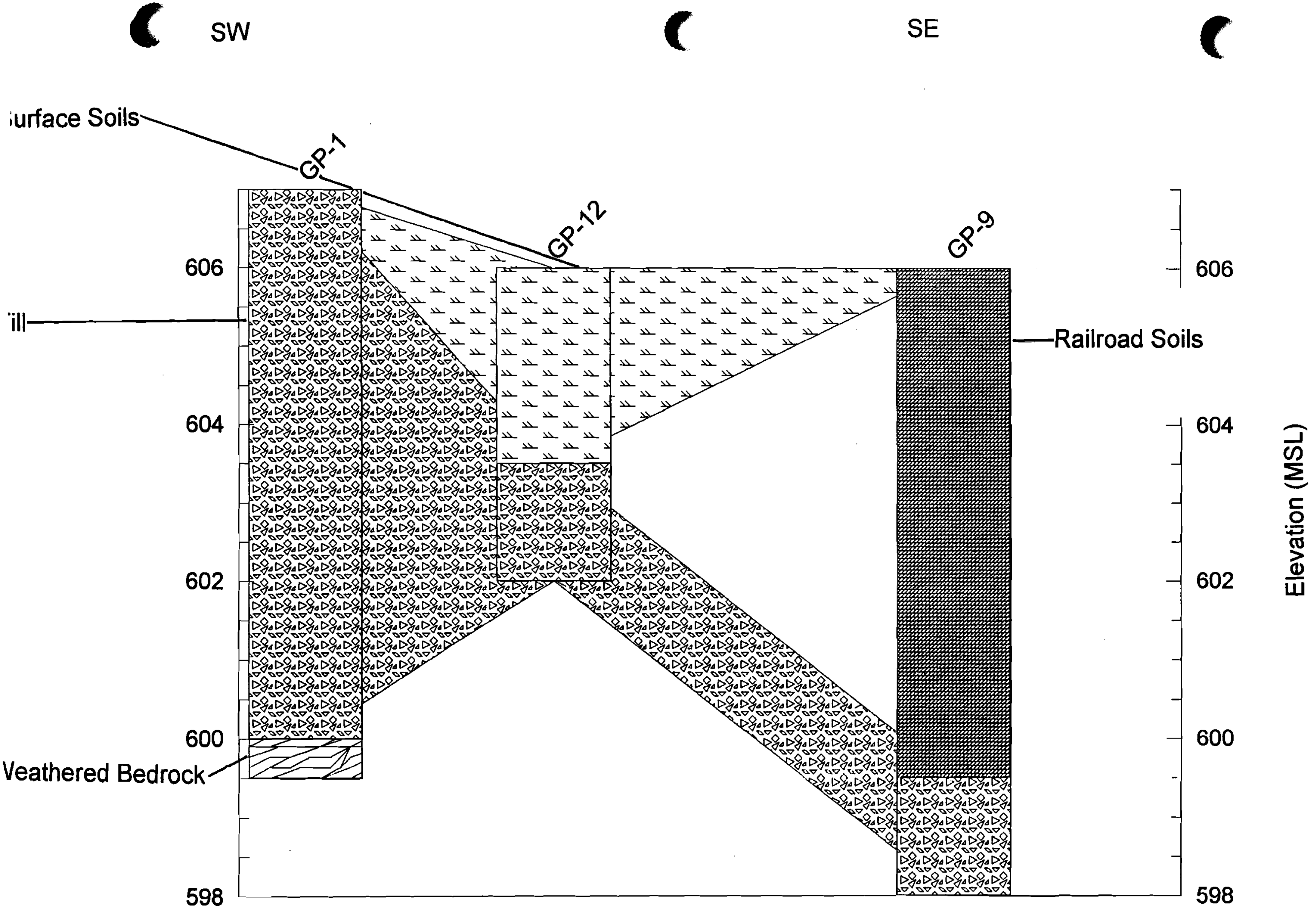

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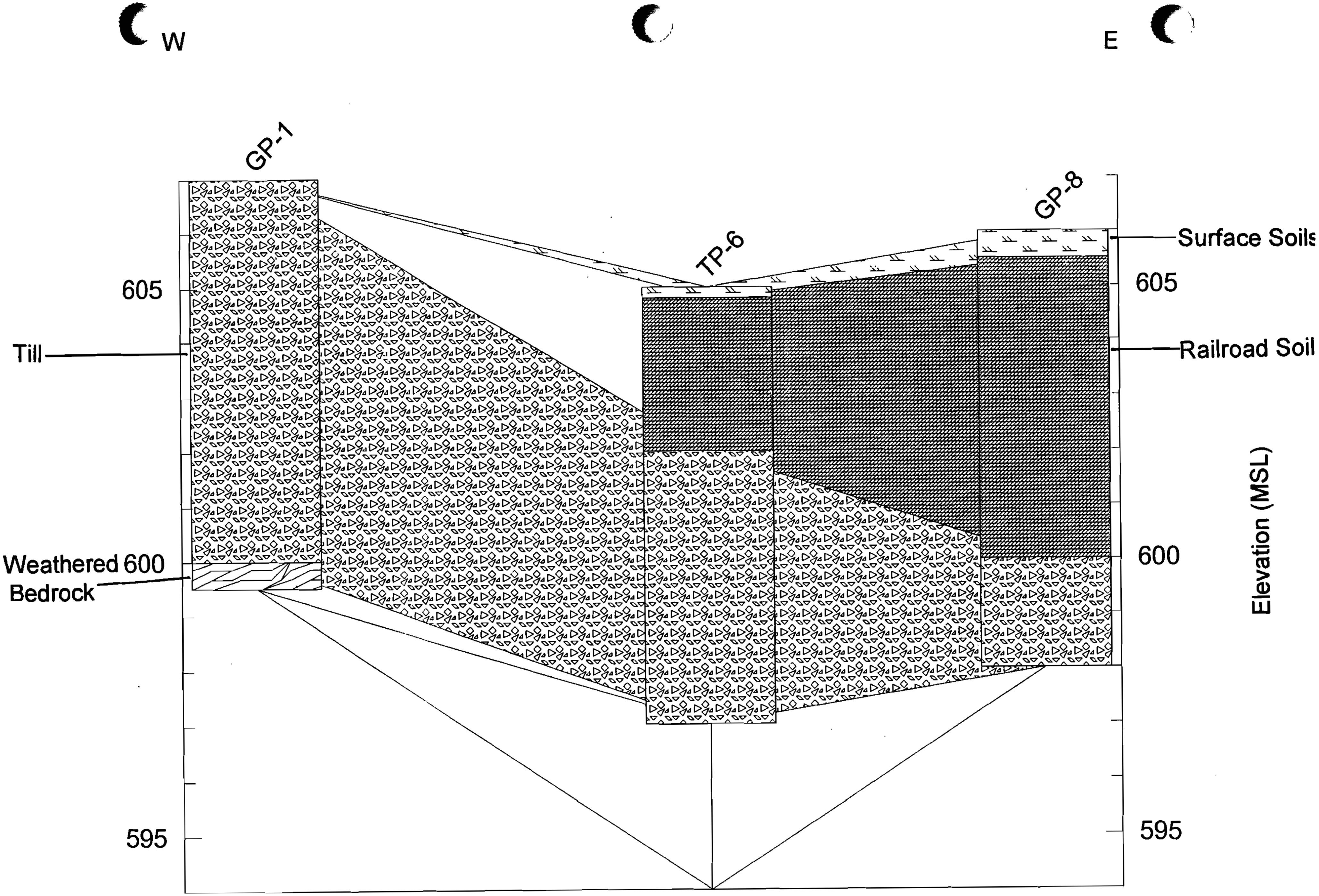

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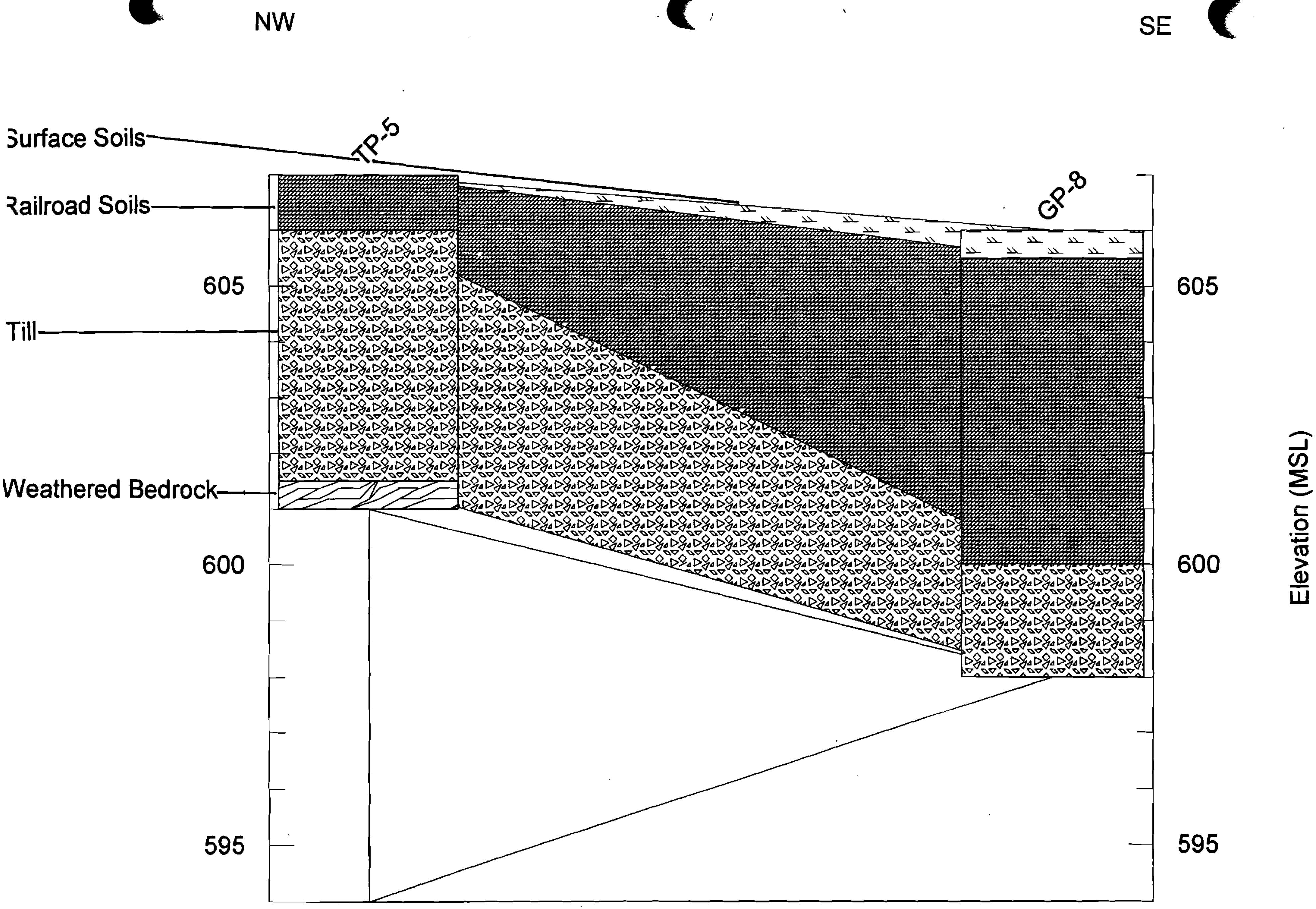

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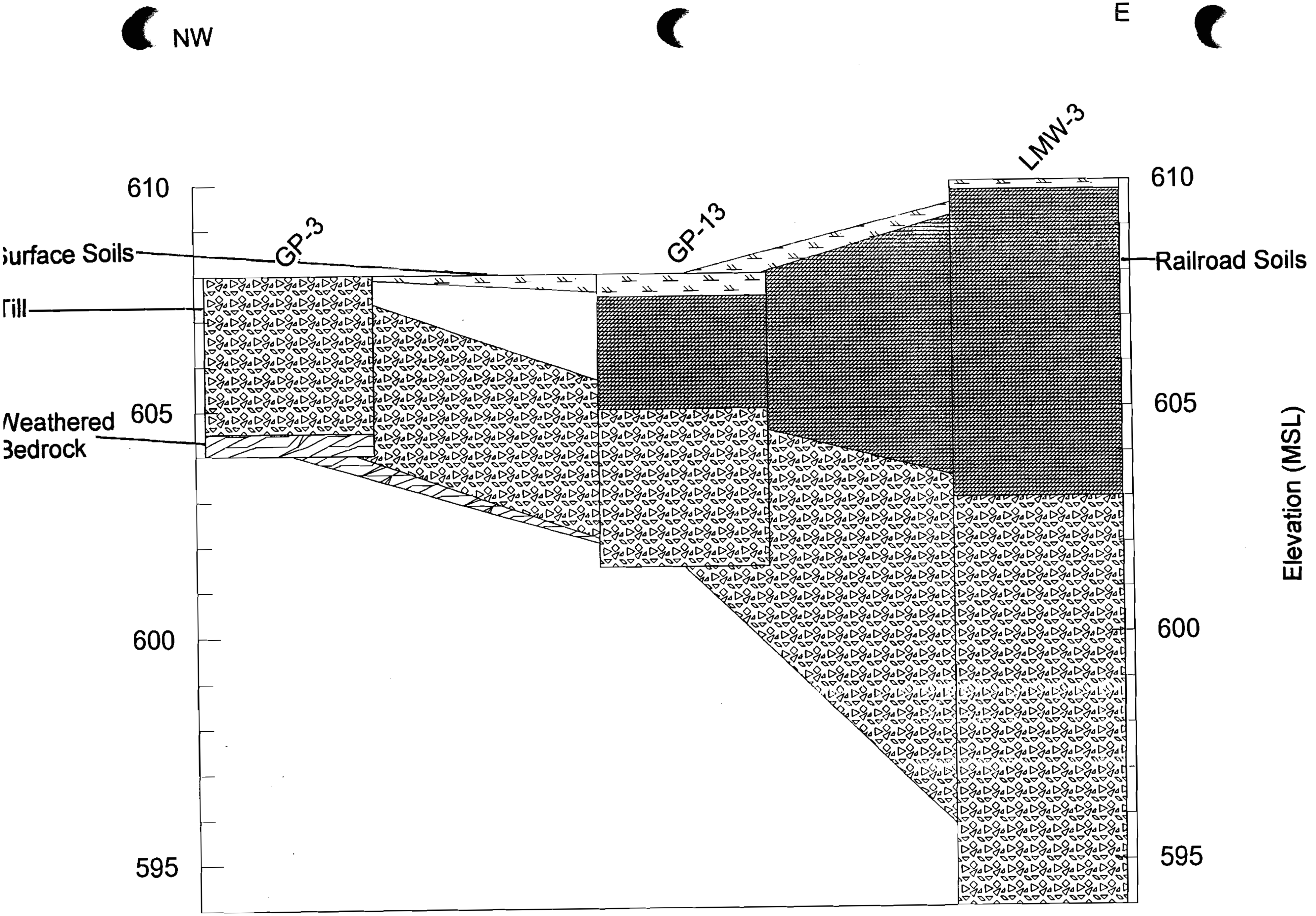

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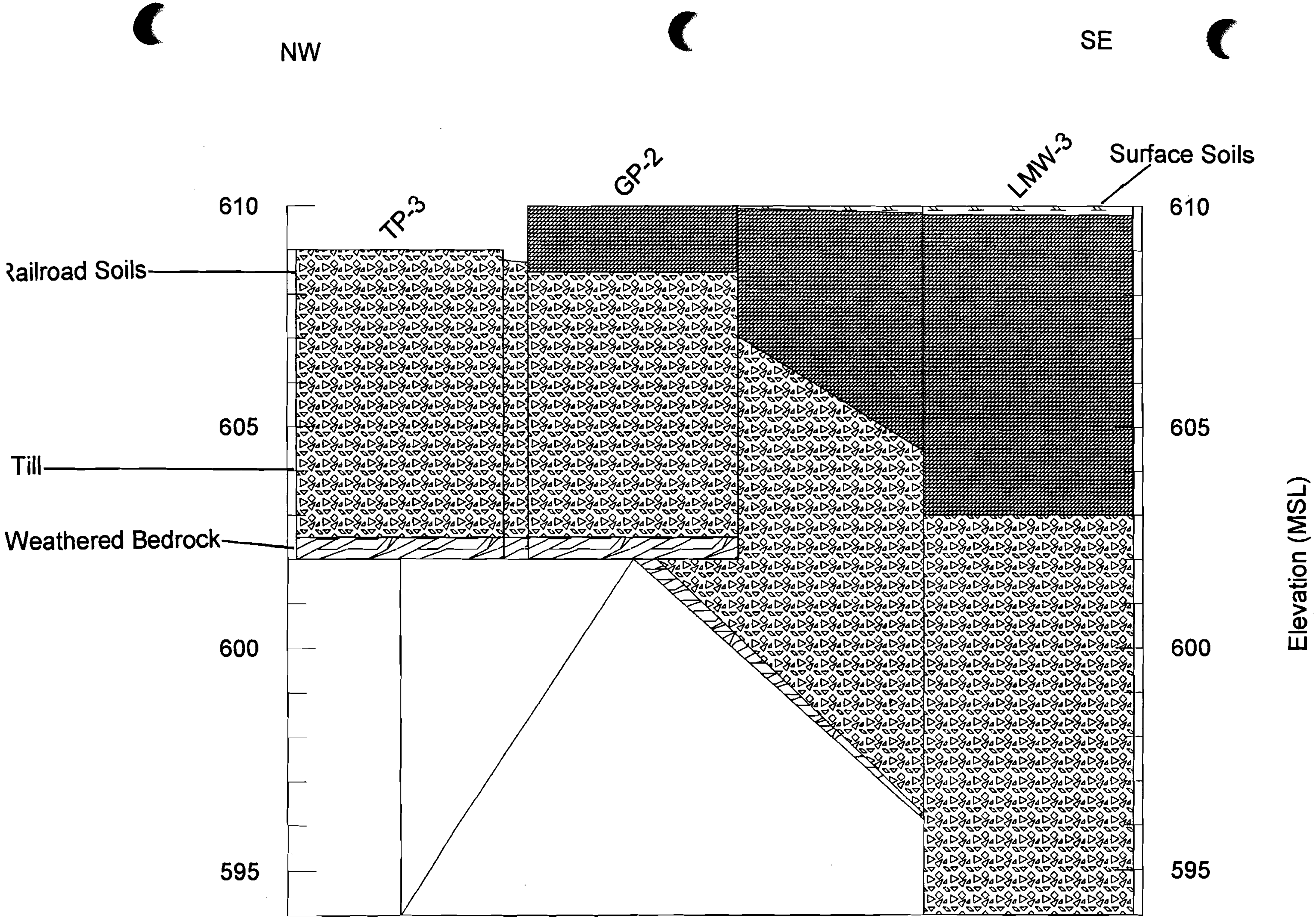

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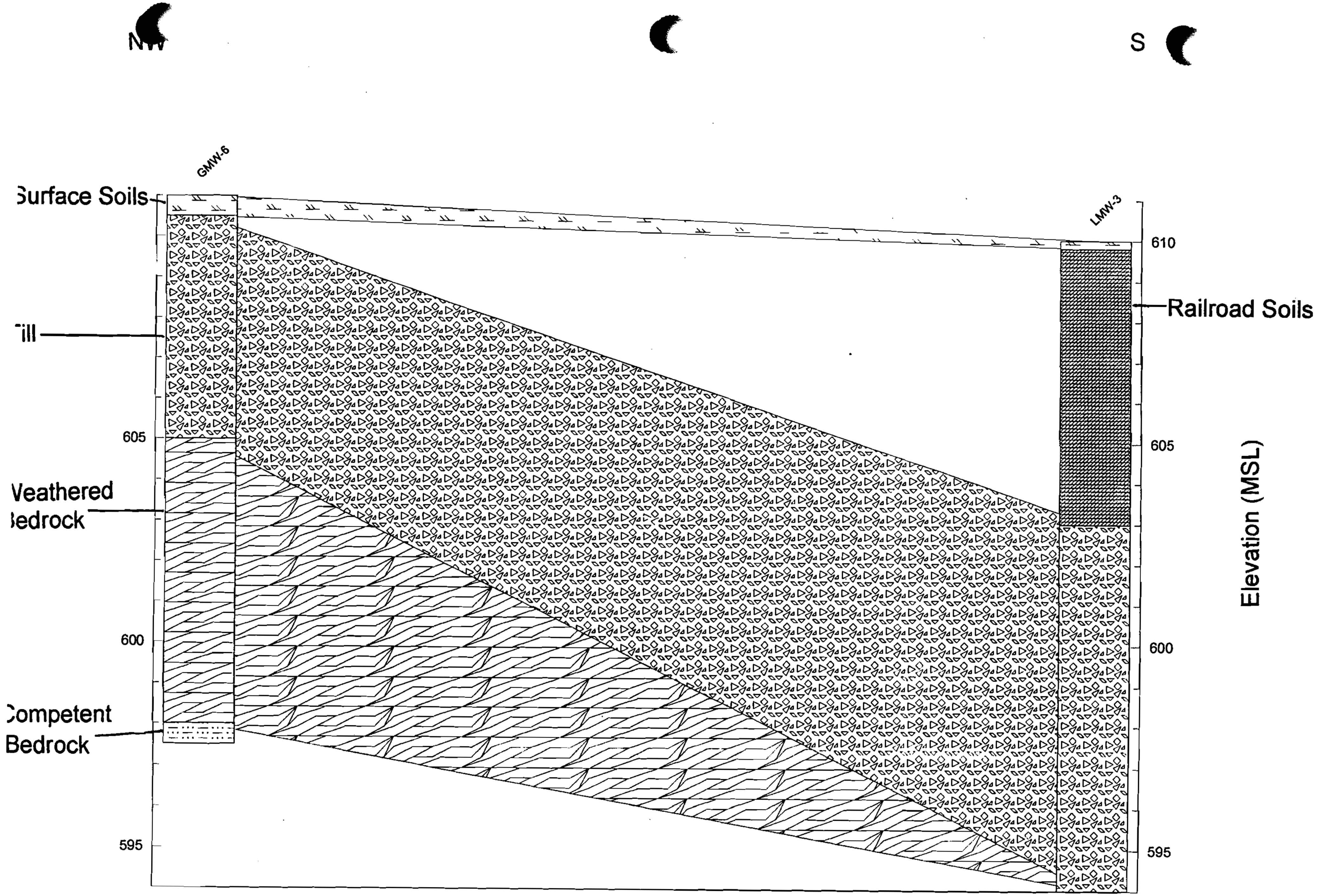

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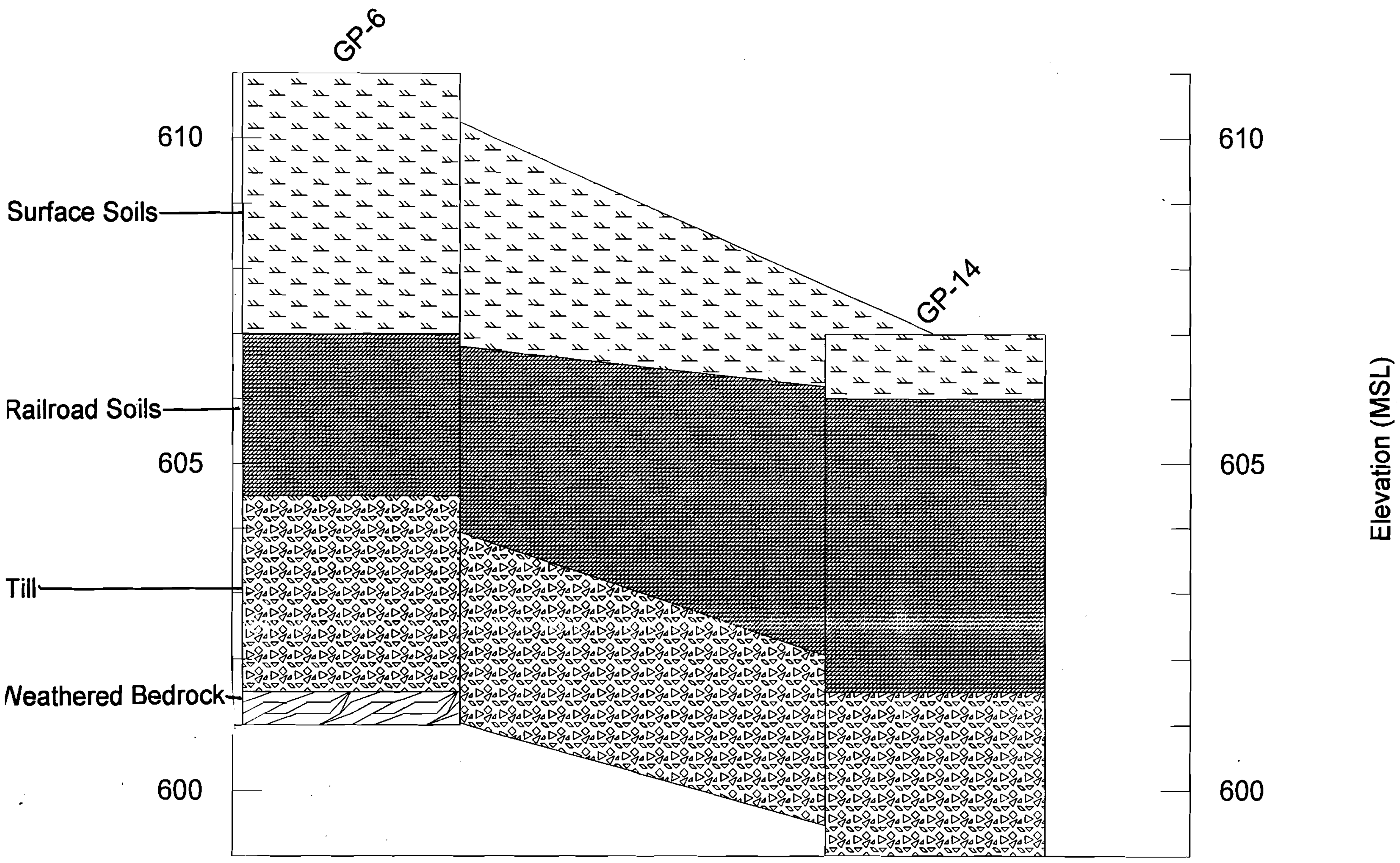

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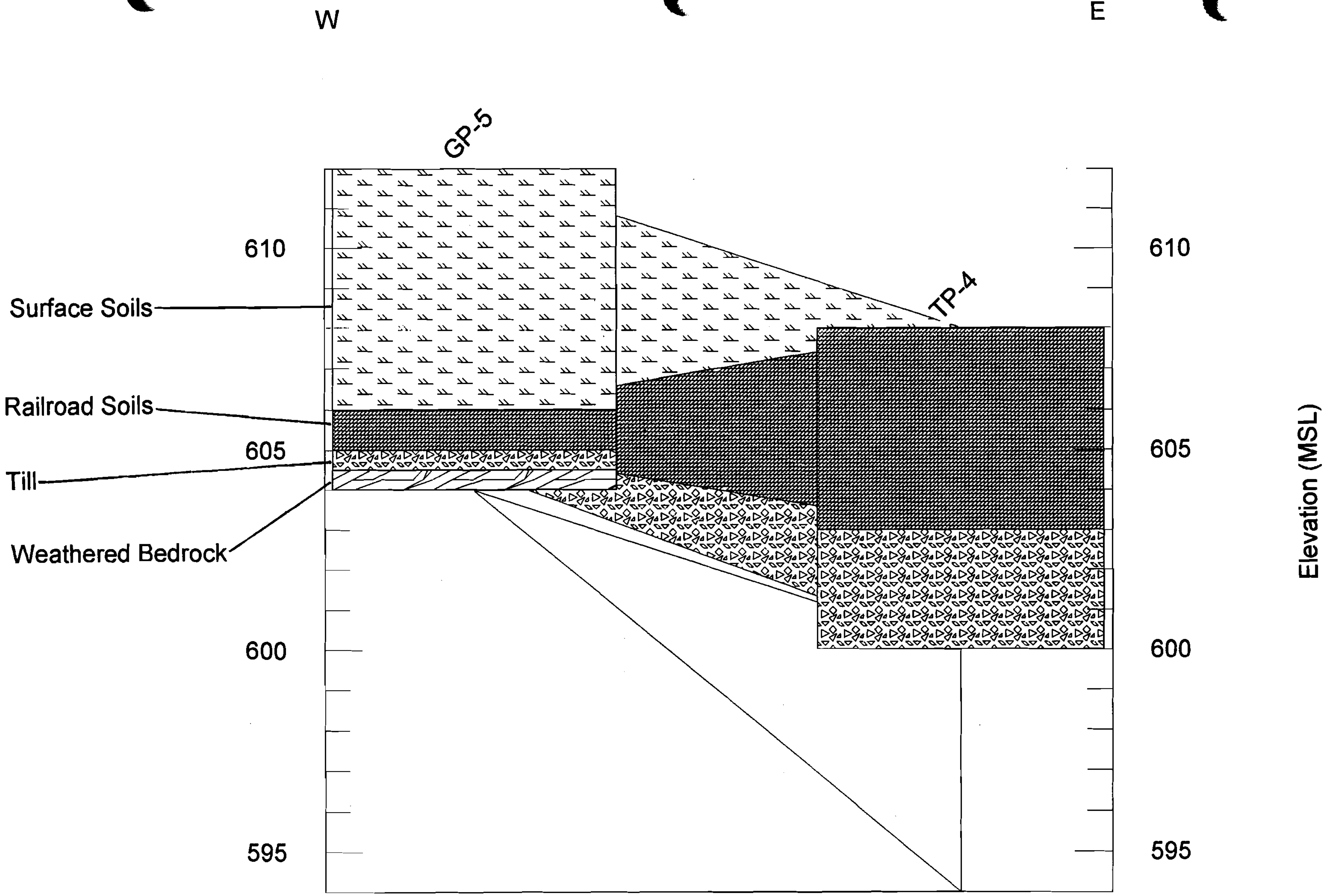

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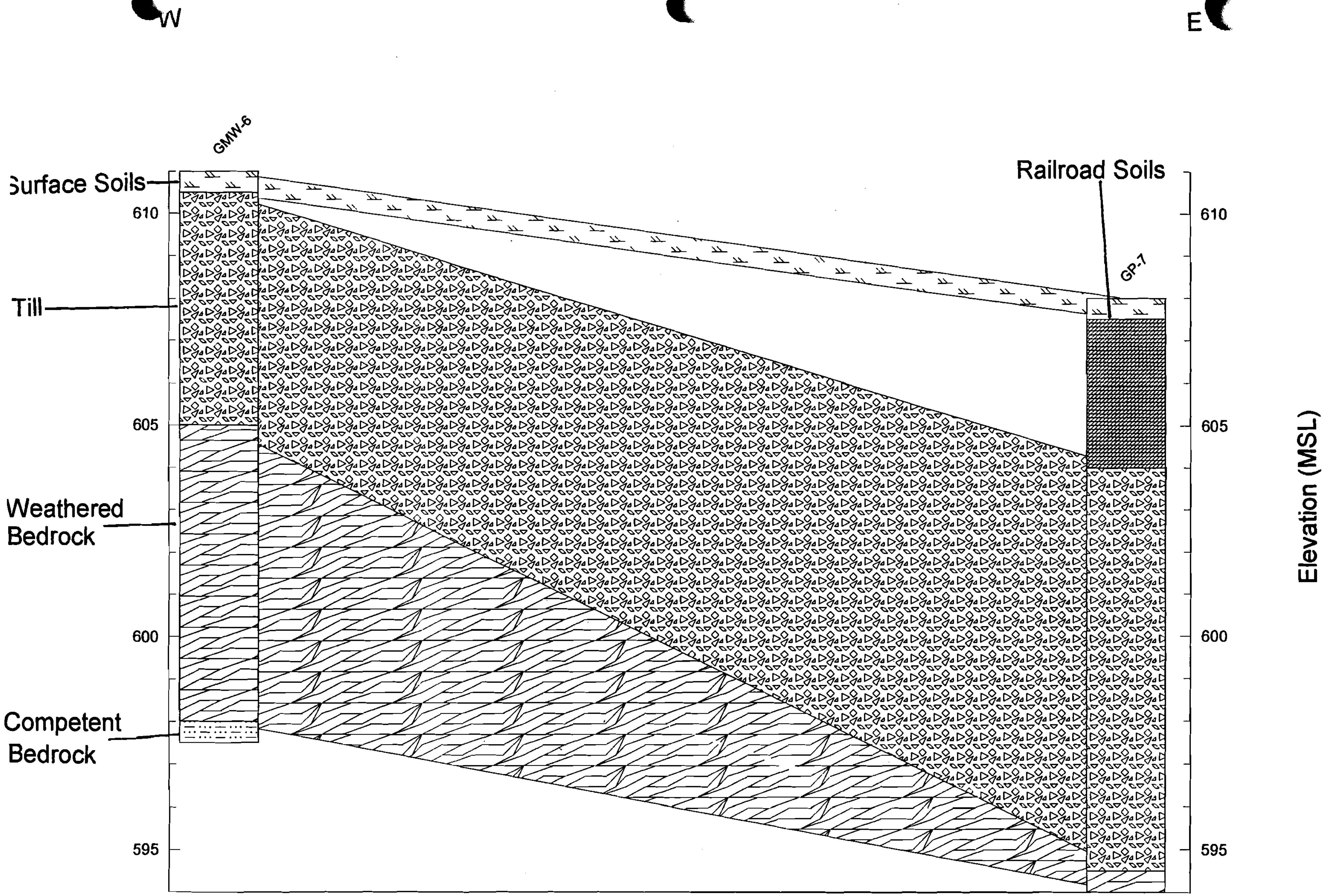

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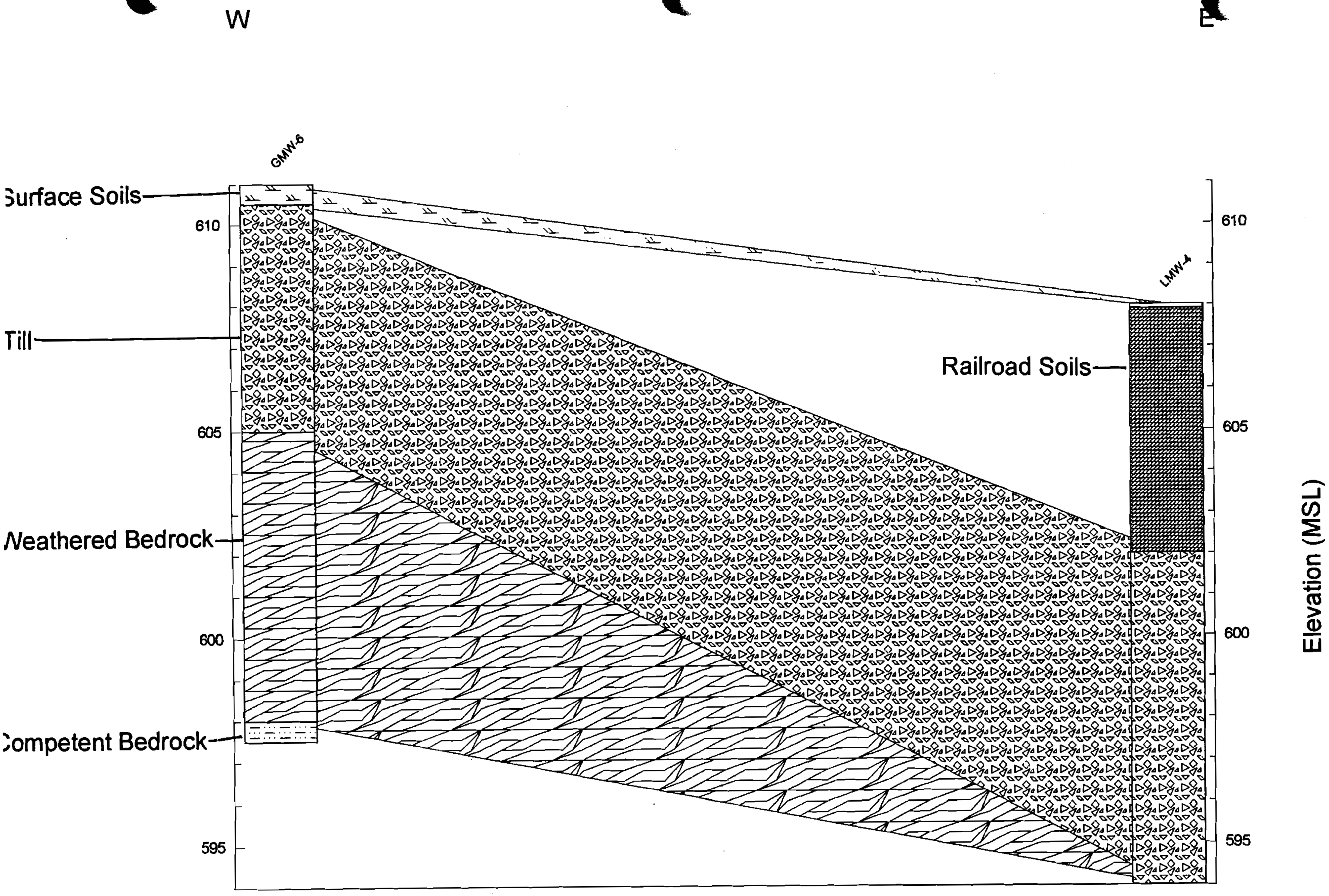

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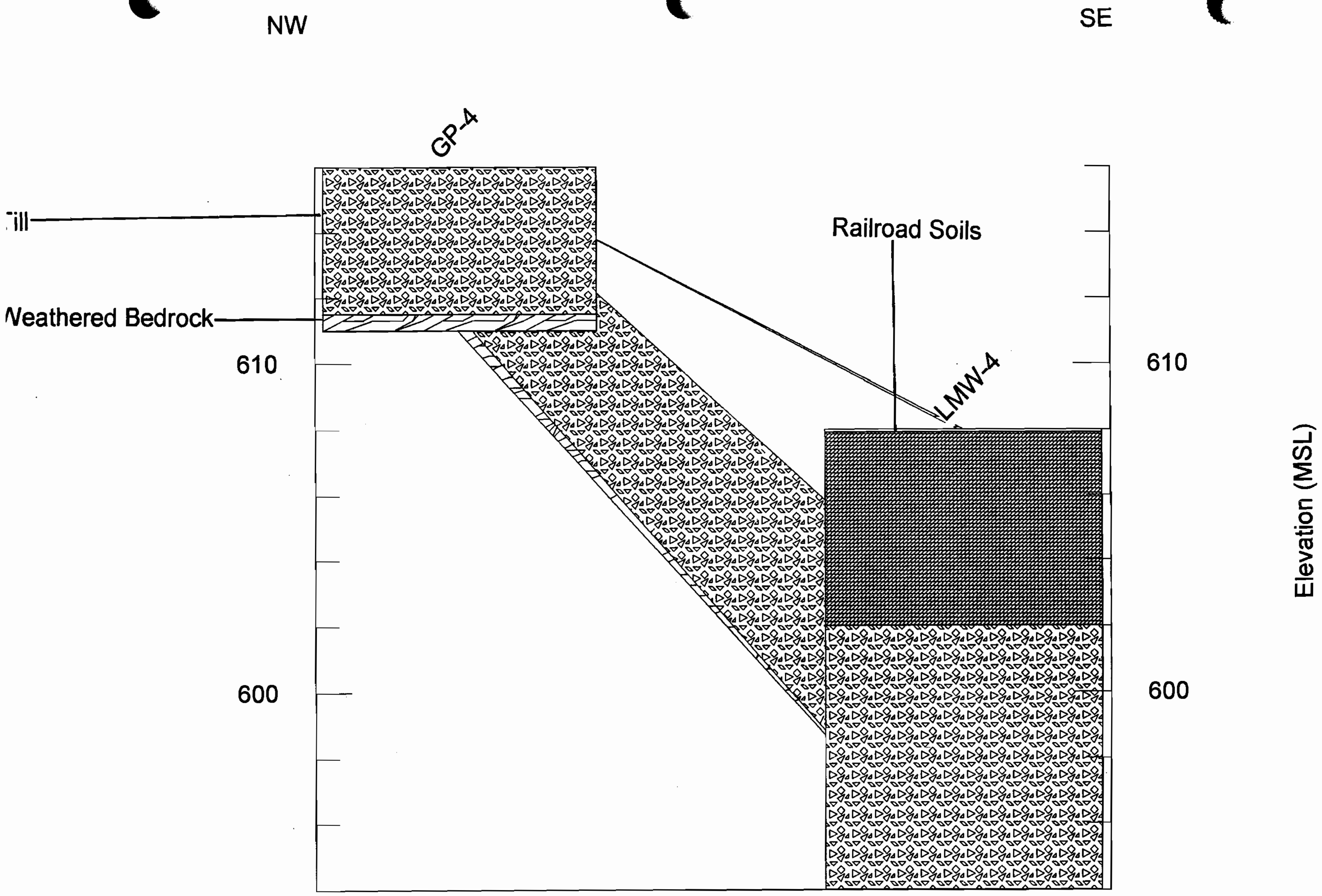

LPS Remedial Investigation
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Spring 2002

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LPS Monitoring Well Hydraulic Conductivity Results
October, 2001

Monitoring Well ID	Early-Time Analysis Hydraulic Conductivity (feet/second x 10^{-6})	Middle-Time Analysis Hydraulic Conductivity (feet/second x 10^{-6})	**Late-Time Analysis Hydraulic Conductivity (feet/second x 10^{-6})**
LMW-1	80.1	29.0	**5.10**
LMW-2	8.63	3.04	**1.3**
LMW-3	86.0	27.3	**1.67**
LMW-4	8.59	---	**2.83**

The late-time data is preferred for use to approximate the hydraulic conductivity of the aquifer material surrounding these monitoring wells as per:

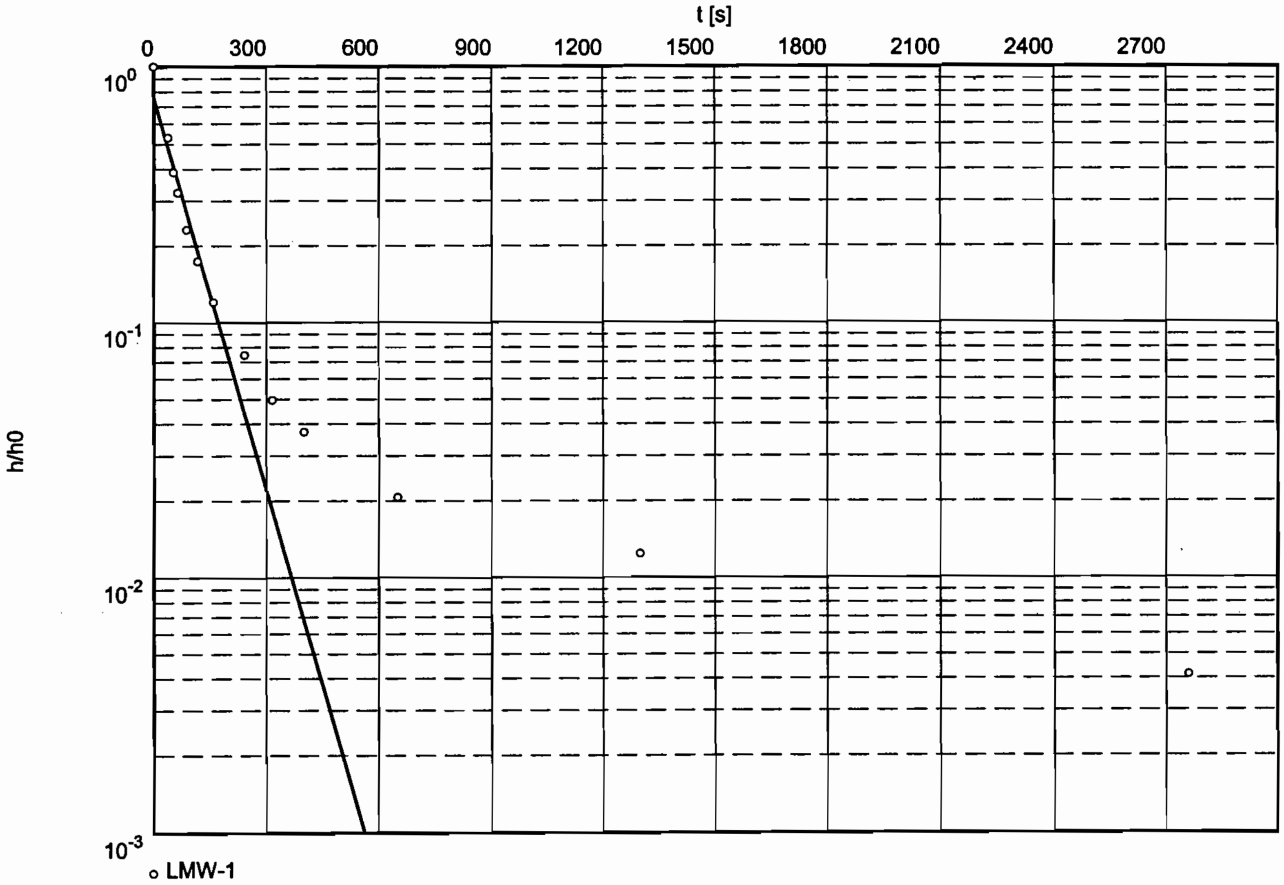
1. *The Bouwer-Rice Method Instructions;*
2. *The partially penetrating nature of the monitoring wells;*
3. *The unconfined nature of the till aquifer;*
4. *The construction details of these monitoring wells.*

Waterloo Hydrogeologic
180 Columbia St. W.
Waterloo,Ontario,Canada
ph.(519)746-1798

slug/bail test analysis
BOUWER-RICE's method

Date: 20.09.2001
Slug Test , Page 1
Project: LPS, Site # 3-36-034
Evaluated by: sjs

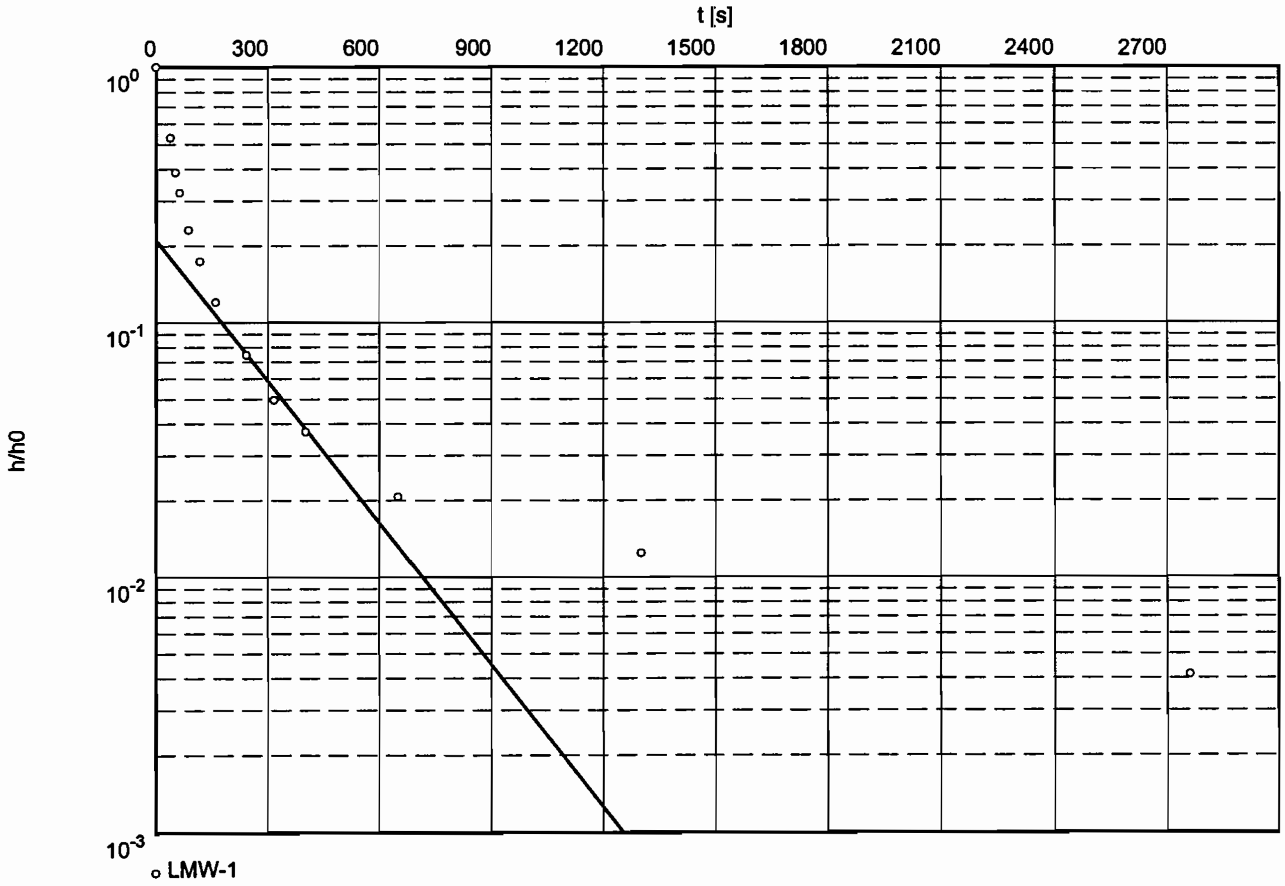
Slug Test No. 3
Test conducted on: 02.09.2001
LMW-1, Early-Time Data Analysis



Hydraulic conductivity [ft/s]: 8.01 x 10^{-5}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 20.09.2001	Slug Test , Page 2
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

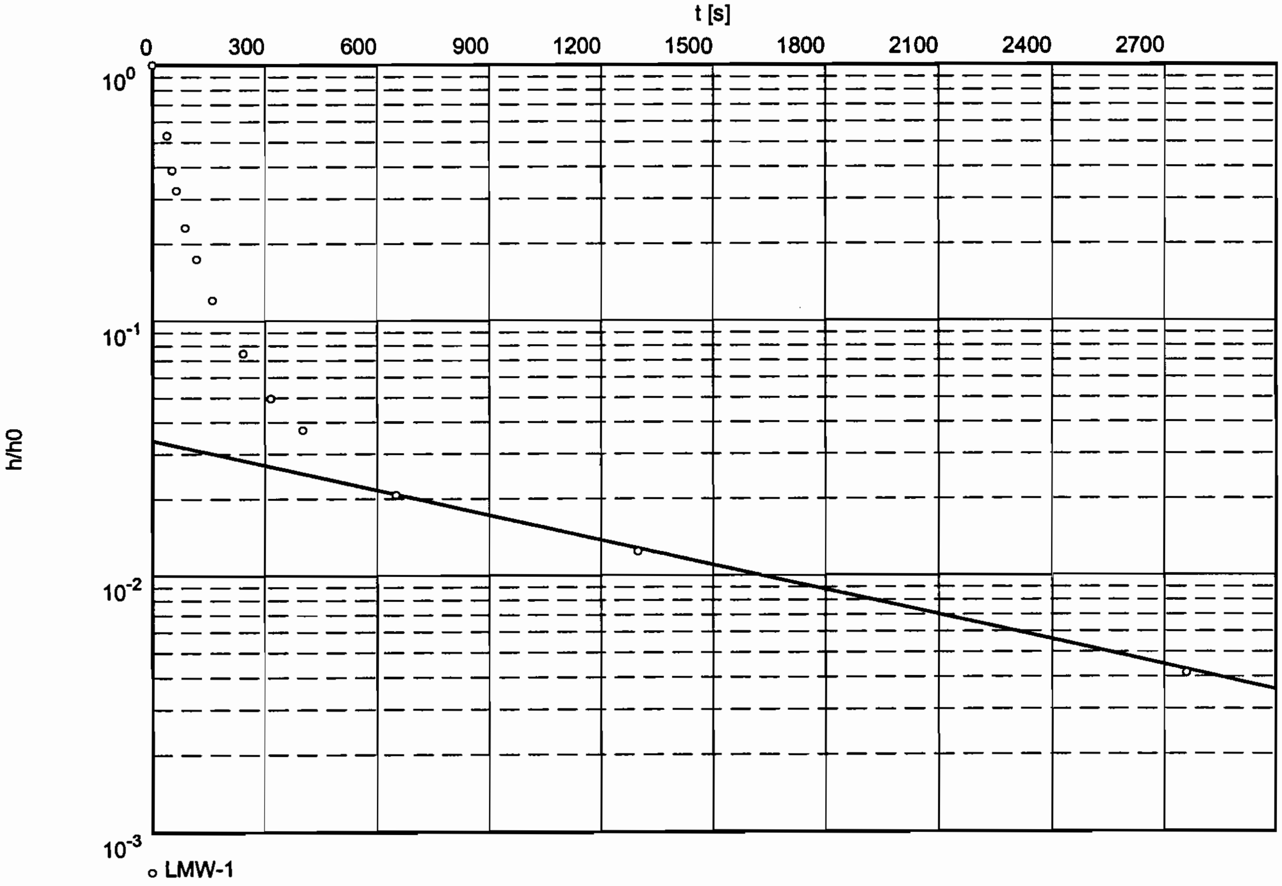
Slug Test No. 3	Test conducted on: 02.09.2001
LMW-1, Middle-Time Data Analysis	



Hydraulic conductivity [ft/s]: 2.90 x 10^{-5}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 20.09.2001	Slug Test , Page 3
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

Slug Test No. 3	Test conducted on: 02.09.2001
LMW-1, Late-Time Data Analysis	



Hydraulic conductivity [ft/s]: 5.10×10^{-6}

The slope of the late-time data is preferred for use to approximate the hydraulic conductivity of the aquifer material surrounding this monitoring well. The late-time data is favored as per:

1. The Bouwer-Rice Method instructions;
2. The partially penetrating nature of the monitoring well;
3. The unconfined nature of the till aquifer;
4. The construction details of this monitoring well.

Waterloo Hydrogeologic
180 Columbia St. W.
Waterloo,Ontario,Canada
ph.(519)746-1798

slug/bail test analysis
BOUWER-RICE's method

Date: 20.09.2001
Slug Test , Page 4
Project: LPS, Site # 3-36-034
Evaluated by: sjs

Slug Test No. 3
Test conducted on: 02.09.2001

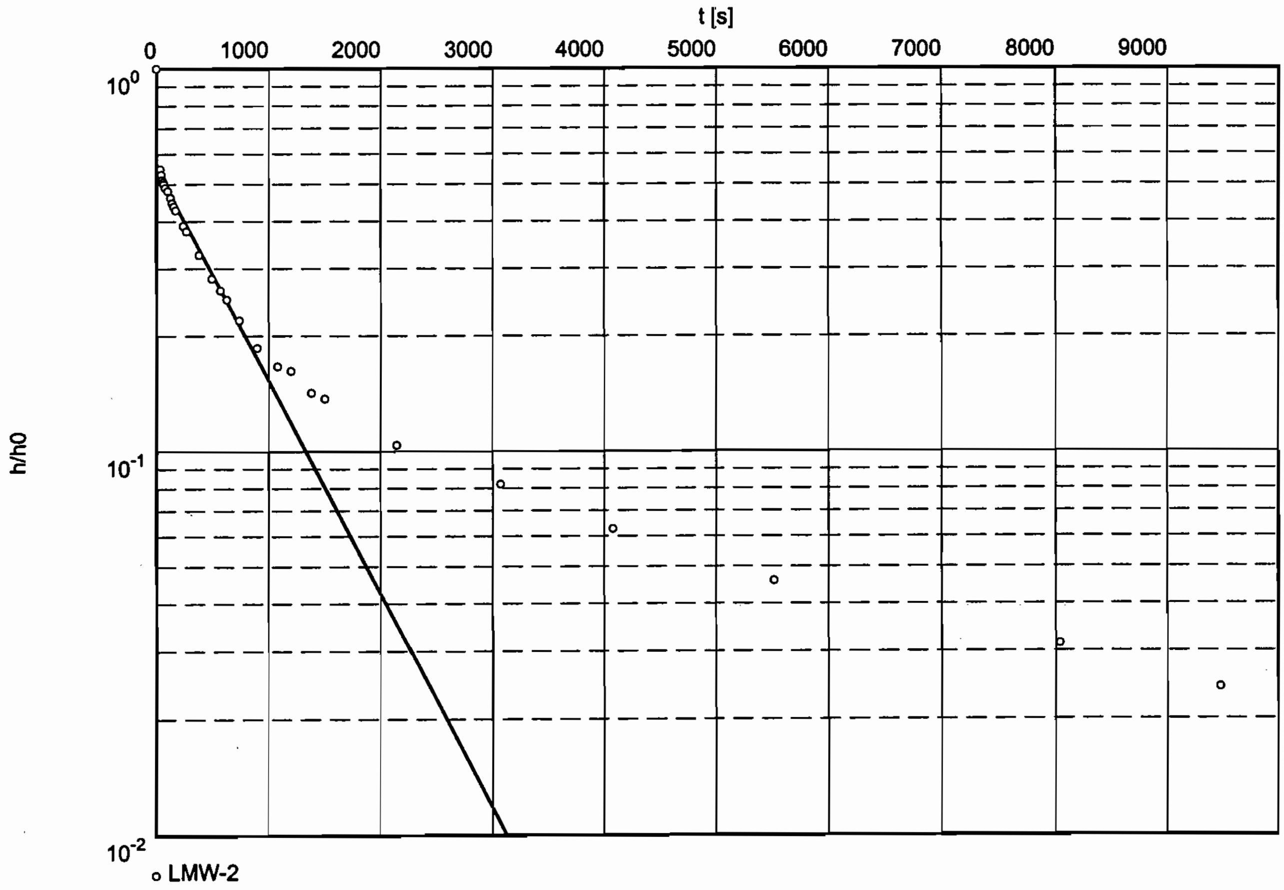
LMW-1, Late-Time Data Analysis
LMW-1

Static water level: 11.42 ft below datum

	Pumping test duration [s]	Water level [ft]	Drawdown [ft]	
1	0	9.00	-2.42	
2	39	10.14	-1.28	
3	52	10.48	-0.94	
4	64	10.64	-0.78	
5	88	10.86	-0.56	
6	118	11.00	-0.42	
7	160	11.13	-0.29	
8	242	11.24	-0.18	
9	316	11.30	-0.12	
10	401	11.33	-0.09	
11	650	11.37	-0.05	
12	1300	11.39	-0.03	
13	2760	11.41	-0.01	

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 20.09.2001	Slug Test, Page 5
		Project: LPS Site # 3-36-034	
		Evaluated by: sjs	

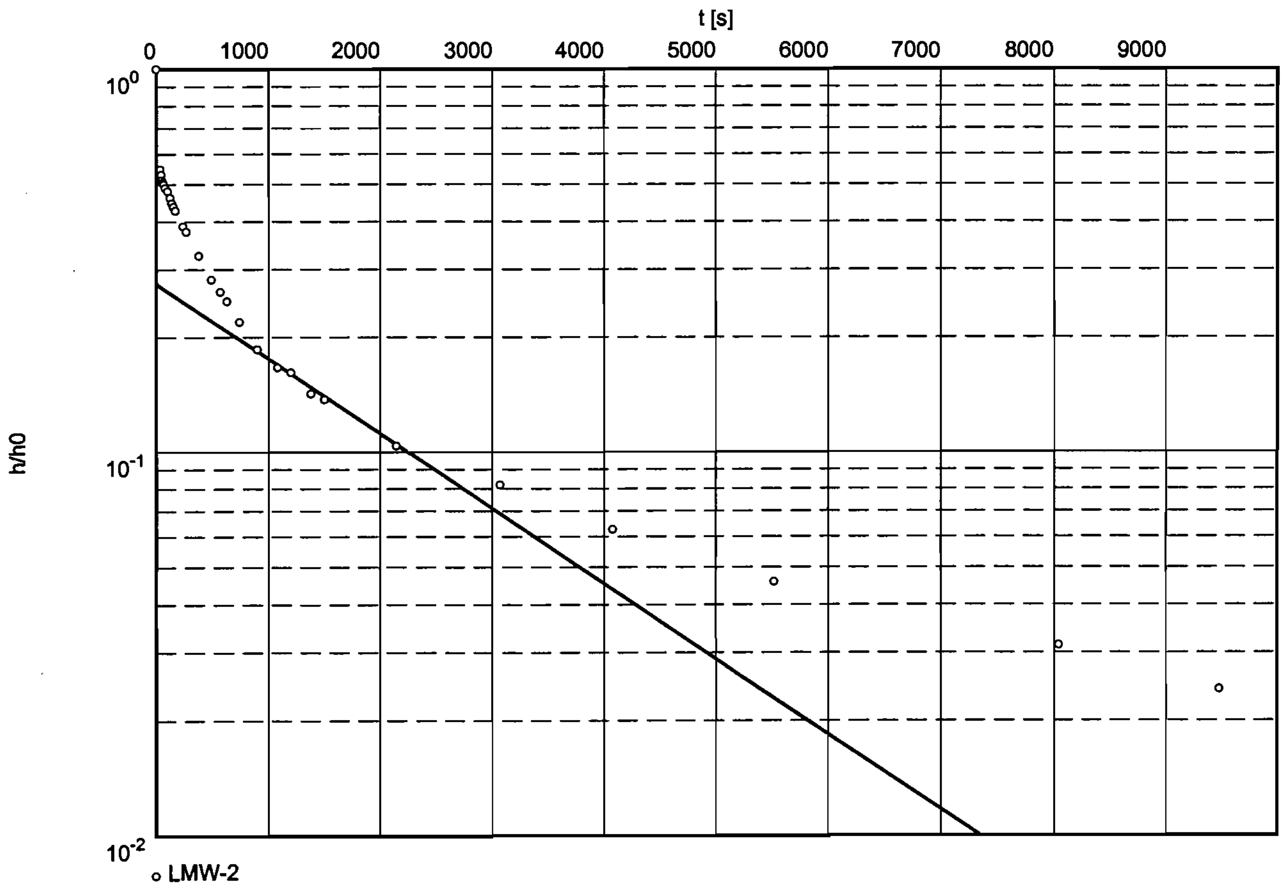
Slug Test No. 1	Test conducted on: 02.09.2001
LMW-2, Early-Time Data Analysis	



Hydraulic conductivity [ft/s]: 8.63 x 10^{-6}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 20.09.2001	Slug Test, Page 6
		Project: LPS Site # 3-36-034	
		Evaluated by: sjs	

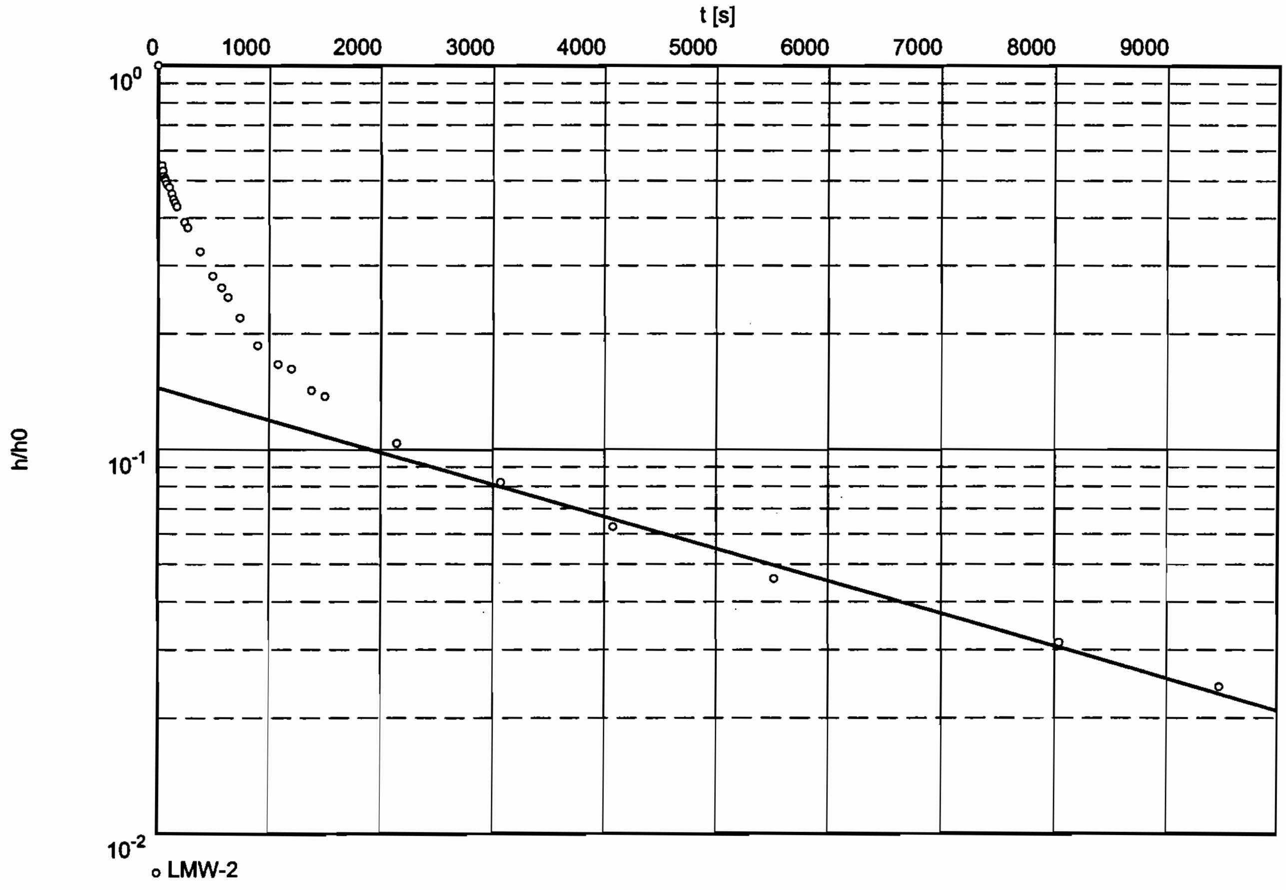
Slug Test No. 1	Test conducted on: 02.09.2001
LMW-2, Middle-Time Data Analysis	



Hydraulic conductivity [ft/s]: 3.04×10^{-6}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 20.09.2001	Slug Test, Page 7
		Project: LPS Site # 3-36-034	
		Evaluated by: sjs	

Slug Test No. 1	Test conducted on: 02.09.2001
LMW-2, Late-Time Data Analysis	



Hydraulic conductivity [ft/s]: 1.30×10^{-6}

The slope of the late-time data is preferred for use in approximating the hydraulic conductivity of the aquifer material surrounding this monitoring well. The late-time data is favored as per:

1. The Bouwer-Rice Method instructions;
2. The partially penetrating nature of the monitoring well;
3. The unconfined nature of the till aquifer;
4. The construction details of this monitoring well.

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 20.09.2001	Slug Test, Page 8
		Project: LPS Site # 3-36-034	
		Evaluated by: sjs	

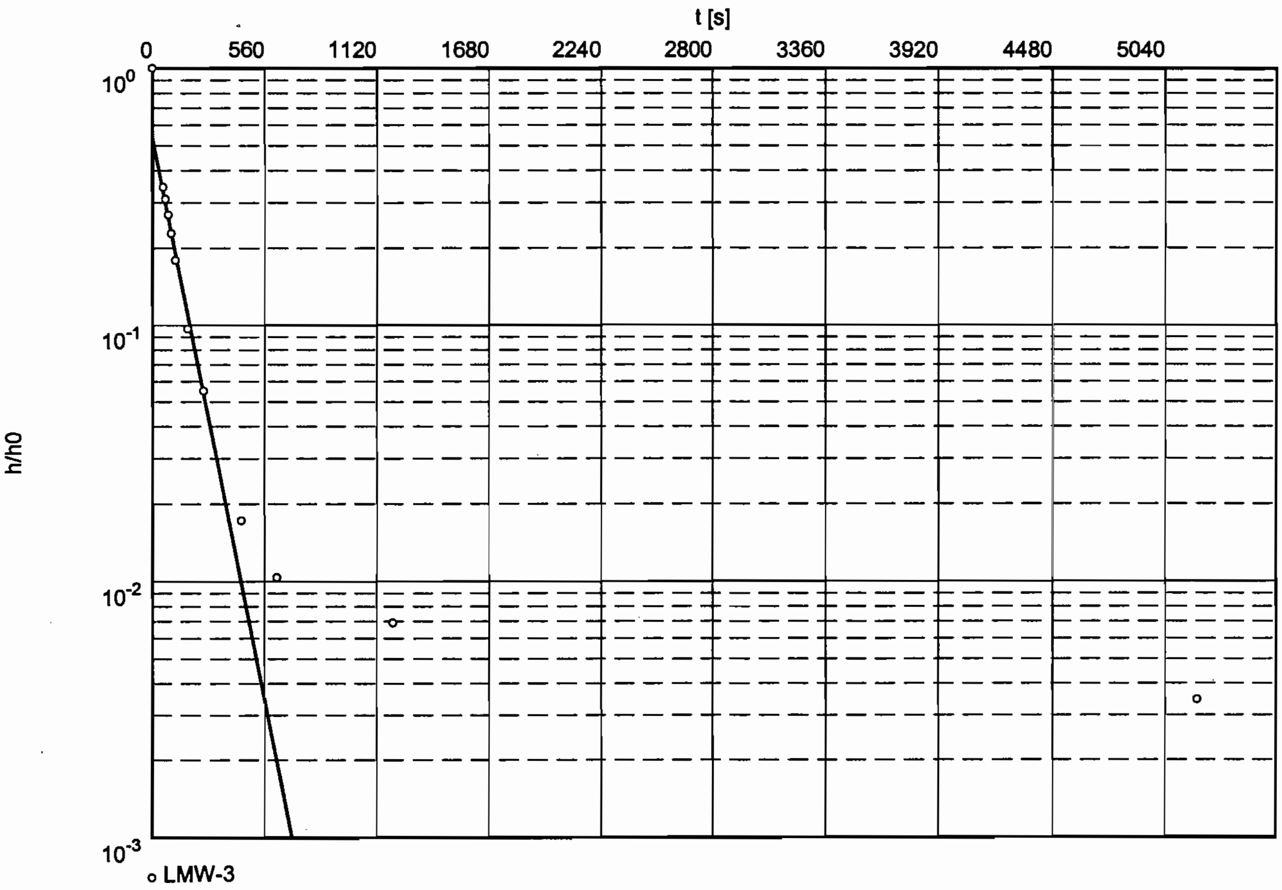
Slug Test No. 1	Test conducted on: 02.09.2001
LMW-2, Late-Time Data Analysis	LMW-2

Static water level: 9.15 ft below datum

	Pumping test duration [s]	Water level [ft]	Drawdown [ft]	
1	0	5.00	-4.15	
2	36	6.88	-2.27	
3	45	6.95	-2.20	
4	51	7.02	-2.13	
5	62	7.05	-2.10	
6	70	7.08	-2.07	
7	80	7.12	-2.03	
8	104	7.16	-1.99	
9	125	7.24	-1.91	
10	140	7.30	-1.85	
11	156	7.34	-1.81	
12	173	7.38	-1.77	
13	241	7.54	-1.61	
14	268	7.59	-1.56	
15	382	7.80	-1.35	
16	496	7.98	-1.17	
17	574	8.06	-1.09	
18	630	8.12	-1.03	
19	743	8.24	-0.91	
20	900	8.38	-0.77	
21	1080	8.46	-0.69	
22	1200	8.48	-0.67	
23	1380	8.56	-0.59	
24	1500	8.58	-0.57	
25	2145	8.72	-0.43	
26	3074	8.81	-0.34	
27	4080	8.89	-0.26	
28	5520	8.96	-0.19	
29	8040	9.02	-0.13	
30	9480	9.05	-0.10	

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 25.09.2001	Slug Test, Page 9
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

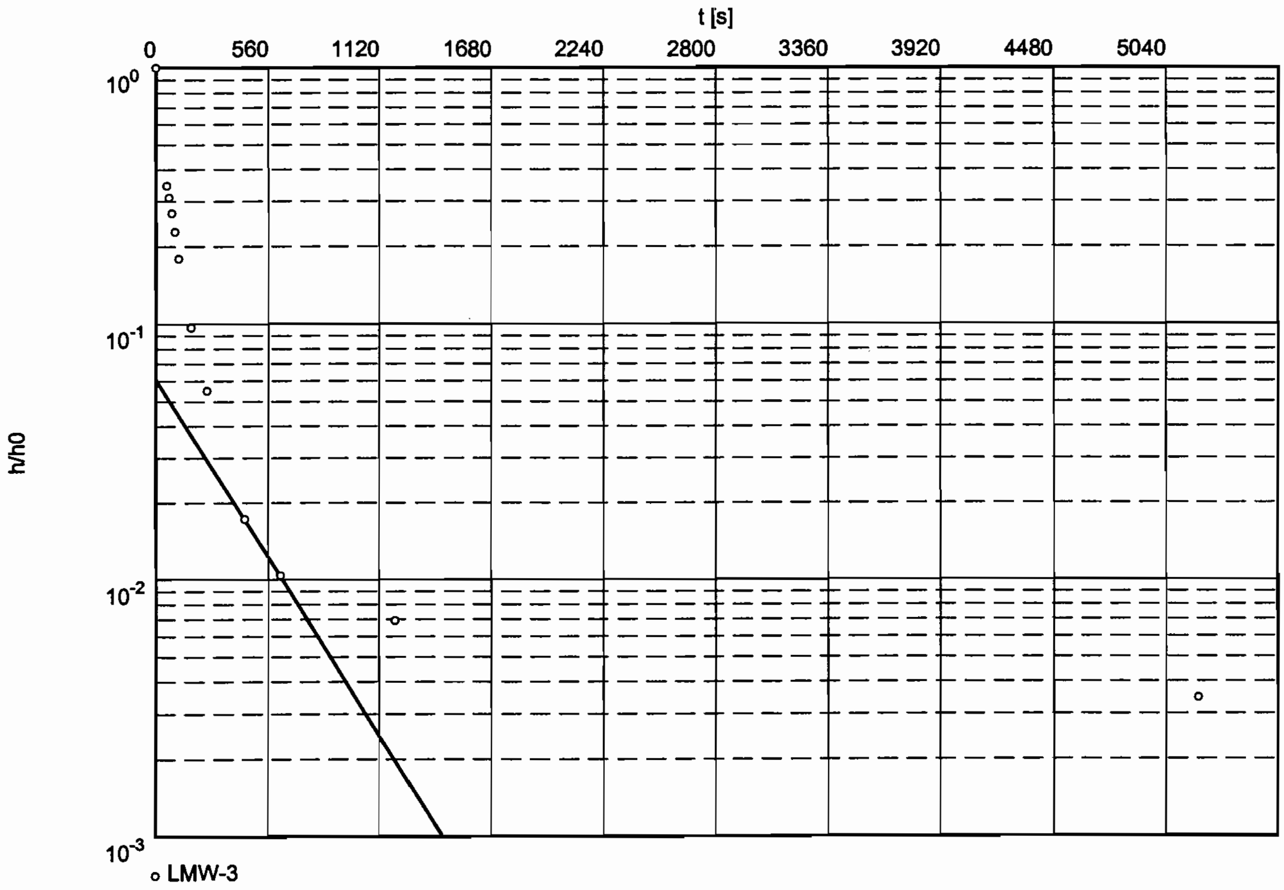
Slug Test No. 2	Test conducted on: 02.09.2001
LMW-3, Early-Time Data Analysis	



Hydraulic conductivity [ft/s]: 8.60 x 10^{-5}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 25.09.2001	Slug Test, Page 10
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

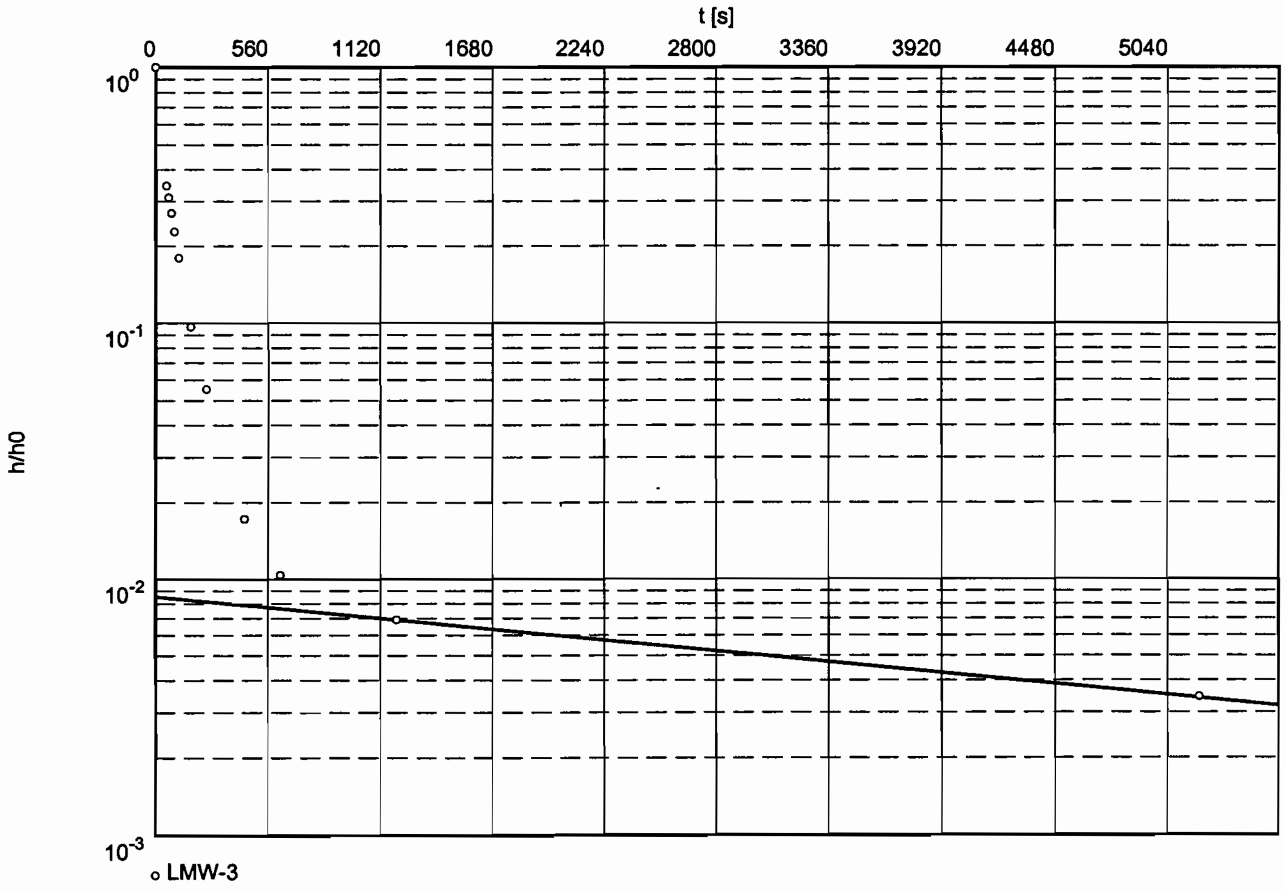
Slug Test No. 2	Test conducted on: 02.09.2001
LMW-3, Middle-Time Data Analysis	



Hydraulic conductivity [ft/s]: 2.73×10^{-5}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 25.09.2001	Slug Test, Page 11
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

Slug Test No. 2	Test conducted on: 02.09.2001
LMW-3, Late-Time Data Analysis	



Hydraulic conductivity [ft/s]: 1.67 x 10^{-6}

The slope of the late-time data is preferred for use in approximating the hydraulic conductivity of the aquifer material surrounding this monitoring well. The late-time data is favored as per:

1. The Bouwer-Rice Method instructions;
2. The partially penetrating nature of the monitoring well;
3. The unconfined nature of the till aquifer;
4. The construction details of this monitoring well.

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 25.09.2001	Slug Test, Page 12
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

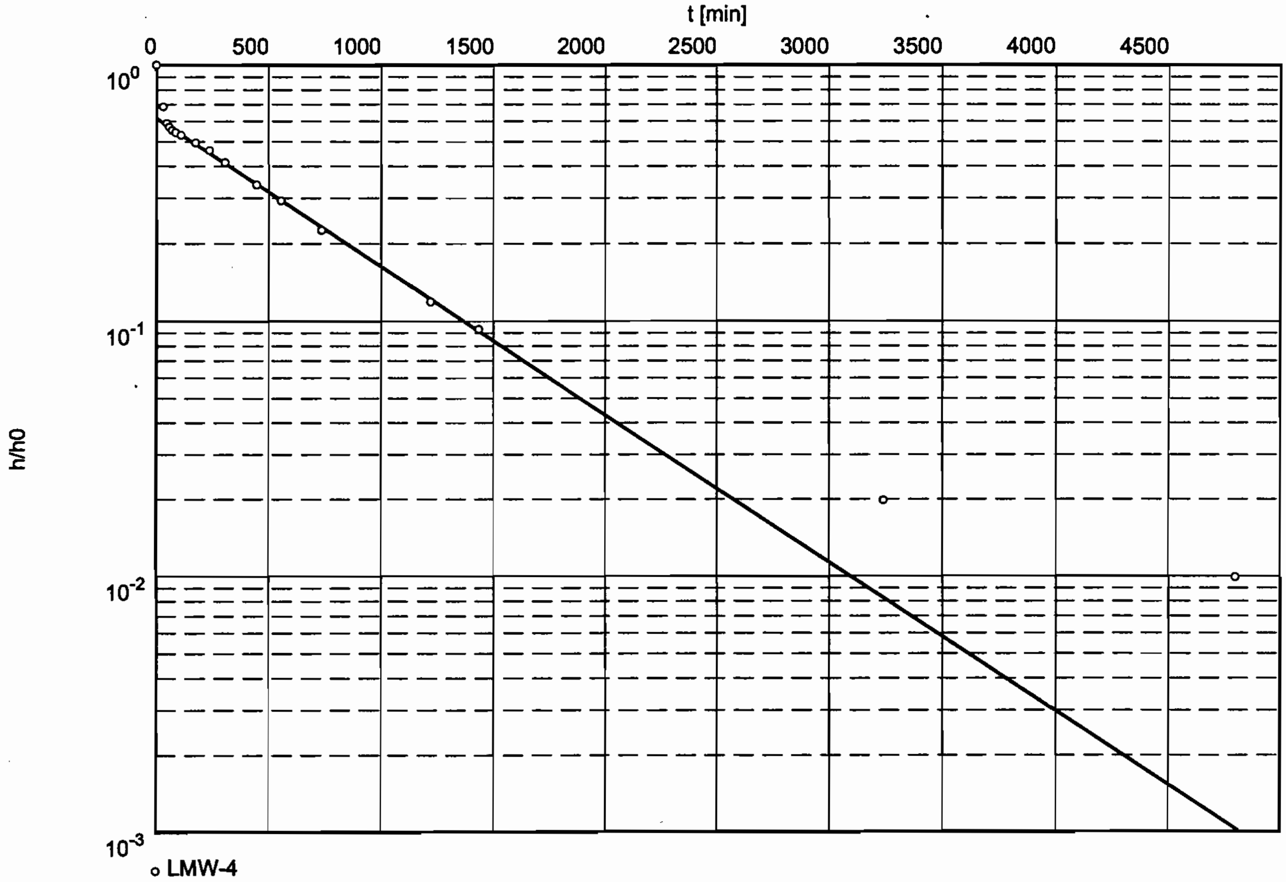
Slug Test No. 2	Test conducted on: 02.09.2001
LMW-3, Late-Time Data Analysis	LMW-3

Static water level: 14.90 ft below datum

	Pumping test duration [s]	Water level [ft]	Drawdown [ft]	
1	0	12.00	-2.90	
2	54	13.90	-1.00	
3	66	14.00	-0.90	
4	80	14.12	-0.78	
5	95	14.24	-0.66	
6	116	14.38	-0.52	
7	176	14.62	-0.28	
8	256	14.74	-0.16	
9	445	14.85	-0.05	
10	622	14.87	-0.03	
11	1200	14.88	-0.02	
12	2700	14.90	0.00	
13	5200	14.91	0.01	

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 25.09.2001	Slug Test, Page 13
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

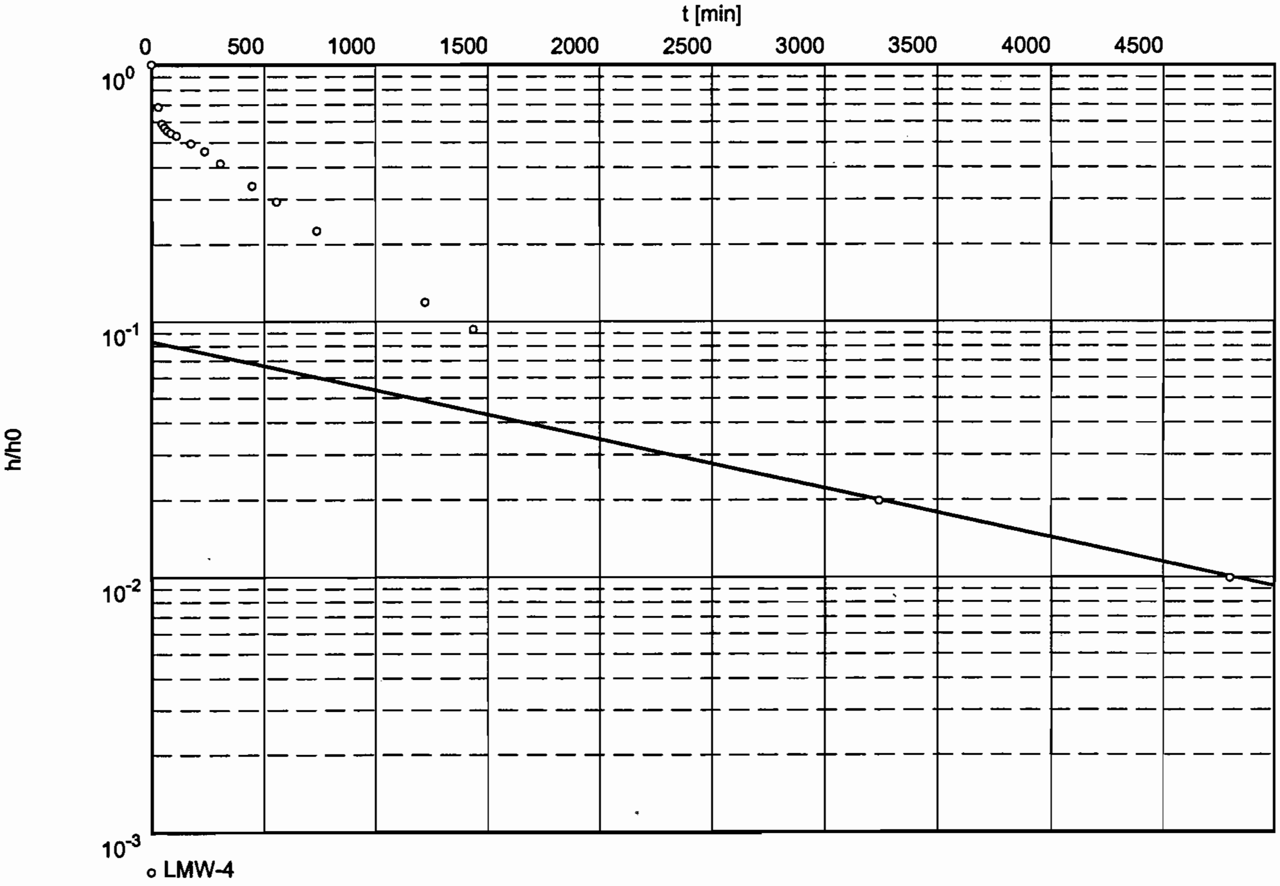
Slug Test No. 4	Test conducted on: 02.09.2001
LMW-4, Early-Time Data Analysis	



Hydraulic conductivity [ft/min]: 8.59×10^{-6}

Waterloo Hydrogeologic 180 Columbia St. W. Waterloo,Ontario,Canada ph.(519)746-1798	slug/bail test analysis BOUWER-RICE's method	Date: 25.09.2001	Slug Test, Page 14
		Project: LPS, Site # 3-36-034	
		Evaluated by: sjs	

Slug Test No. 4	Test conducted on: 02.09.2001
LMW-4, Late-Time Data Analysis	



Hydraulic conductivity [ft/min]: 2.83 x 10^{-6}

The slope of the late-time data is preferred for use in approximating the hydraulic conductivity of the aquifer material surrounding this monitoring well. The late-time data is favored as per:

1. The Bouwer-Rice Method instructions;
2. The partially penetrating nature of the monitoring well;
3. The unconfined nature of the till aquifer;
4. The construction details of this monitoring wel

Waterloo Hydrogeologic
180 Columbia St. W.
Waterloo,Ontario,Canada
ph.(519)746-1798

slug/bail test analysis
BOUWER-RICE's method

Date: 25.09.2001
Slug Test, Page 15
Project: LPS, Site # 3-36-034
Evaluated by: sjs

Slug Test No. 4
Test conducted on: 02.09.2001

LMW-4, Late-Time Data Analysis
LMW-4

Static water level: 10.06 ft below datum

	Pumping test duration [min]	Water level [ft]	Drawdown [ft]	
1	0.00	5.00	-5.06	
2	32.00	6.60	-3.46	
3	47.00	7.08	-2.98	
4	58.00	7.18	-2.88	
5	71.00	7.26	-2.80	
6	88.00	7.32	-2.74	
7	111.00	7.38	-2.68	
8	176.00	7.56	-2.50	
9	237.00	7.73	-2.33	
10	307.00	7.97	-2.09	
11	447.00	8.35	-1.71	
12	555.00	8.58	-1.48	
13	735.00	8.92	-1.14	
14	1218.00	9.46	-0.60	
15	1435.00	9.59	-0.47	
16	3240.00	9.96	-0.10	
17	4800.00	10.01	-0.05	

LMW-5 Water Level Measurements
Lubricant Packaging & Supply Site
Middletown, NY

Date	SWL Measurement (TOC 2" PVC)	Ground Water Elevation*
08/31/01	Well Construction Completed	-----
09/01/01	Well Completely Bailed	-----
09/02/01	45.8 (TD =47.4')	561.6
09/07/01	42.9	564.5
09/14/01	37.3	570.1
09/19/01	28.3	579.1
09/24/01	21.6	585.8
10/04/01	13.8	593.6
10/24/01	11.1	596.3
11/19/01	11.8' (bailed 6 gallons following measurement)	595.6
11/19/01	38.2 (following well purge)	569.2
11/24/01	29.3	578.1
12/01/01	20.8	586.6
12/05/01	17.5	589.9
12/19/01	13.1	594.3
12/27/01	10.9	596.5
01/03/02	10	597.4
01/18/02	10	597.4
01/18/02	38.1 (following bailing, removed ~ 6 gallons)	569.3
01/19/02	35.7 (well sampled)	571.7

*2" PVC TOC Elevation = 607.4'

NEW YORK STATE
DEPARTMENT OF

ENVIRONMENTAL
CONSERVATION

Availability of Remedial Investigation Work Plan

● ● ● ●

This Fact Sheet is to inform you about the availability of the Final Remedial Investigation Work Plan for the Lubricant Packaging Site in Middletown, NY. A summary of the activities to be performed and background information on the site are presented in this Fact Sheet.

The complete work plan for the Remedial Investigation is available in the document repositories listed on Page 2 of this Fact Sheet. A list of contacts available for more information can also be found on page 2.

FACT SHEET

April 2001

Lubricant Packaging and Supply Site
17 Industrial Place, Middletown, NY
NYSDEC Site #3-36-034

Remedial Investigation to Begin at Lubricant Packaging

* * *

Remedial Investigation Work Plan Available

* * *

The former owner of the Lubricant Packaging & Supply Company, with oversight by the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH), is about to begin a formal remedial investigation of hazardous waste contamination at the company's former business location at 17 Industrial Place in Middletown, NY. The site is located in an industrial park off Highland Avenue extension, Middletown, New York (see Figure 1, Site Location). Soil and ground water at this location were contaminated by leaks or spills of oils and degreasing solvents formerly used at the manufacturing and supply facility. In 1995, NYSDEC listed the Lubricant Packaging & Supply Site as a Class 2 site on the NY State Registry of Inactive Hazardous Waste Disposal Sites. A class 2 designation means that there is a "significant threat to the public health or environment - action required."

The Remedial Investigation: The study being conducted at the Lubricant Packaging & Supply Site is called a "Remedial Investigation". The site owner has agreed to perform this examination (with NYSDEC and NYSDOH oversight and final approval) to clearly identify the nature and extent of any hazardous waste contamination, define ways in which such contamination could migrate from the site, and measure contamination in soil, ground water, surface water, and air.

See Page 3 of this fact sheet for a summary of the major elements of the Remedial Investigation. The complete Work Plan for the Remedial Investigation is available for review at the repositories listed below.

One of the former business activities at the Lubricant Packaging and Supply Company Site utilized the solvent, 1,1,l -trichloroethane (TCA) to degrease specialty ball bearings for industrial clients. TCA was also repackaged into small volume containers for industrial clients who used the pure solvent for degreasing purposes. TCA was bought and stored in drums and/or tanks at various locations on the property. In 1986, the bearing, packaging and lubricant supply business was sold to a new owner at another location. Three months after the sale, during the transfer and organization of sold and unsold inventory and waste, a NYSDEC inspection identified contaminated soil containing TCA. A Phase II Investigation of the property was conducted in 1993 & 1994 by the property owner to determine the source areas of soil contamination on the site. The investigation discovered that TCA contamination of soil and ground water took place from 1962 to 1986 due to leaks or spills of oils and solvents during the routine course of business activities on the property. The approximate extent and level of TCA contamination was delineated during the Phase II investigation; the results of the investigation were presented to NYSDEC in a report in November, 1994.

ACTIONS TAKEN TO PROTECT PEOPLE AND THE ENVIRONMENT

In 1995, NYSDEC listed the Lubricant Packaging & Supply Site as a class 2 site on the NY State Registry of Inactive Hazardous Waste Disposal Sites. A Remedial Investigation is needed to fully define the extent of soil and ground water contamination at the site. Because Lubricant Packaging & Supply was sold to another business in 1986, the hazardous solvent TCA is no longer used or stored at the facility. As determined in the Phase II investigation, soil contamination is limited to sections of the former Lubricant Packaging & Supply property, which occupies approximately one acre along Industrial Place. There are no known active private or public water supply wells in the vicinity of the property with the information available to date.

THE REMEDIAL INVESTIGATION

Whenever possible, NYSDEC seeks to negotiate Orders on Consent (legal agreements with Potentially Responsible Parties (PRPs)). Under these Orders, the investigation and remediation of a site is carried out and paid for by the PRP with State oversight and direction. The Remedial Investigation (RI) of this site is being performed by the former owner of the Lubricant Packaging & Supply Company under the terms of an Order on Consent with NYSDEC.

Activities conducted during an RI often include extensive sampling and laboratory analyses. These activities are performed to fully define the nature and extent of any hazardous waste contamination and define ways in which contamination could migrate from the site. Contamination is measured in soil, groundwater, surface water, and other media as appropriate.

The New York State Department of Health recommends investigation activities that will be performed during the RI to ensure that all human exposure pathways are delineated. This includes identifying the ways contamination can reach people from the site through ingestion, inhalation or dermal contact.

Highlights of the Investigation: The RI will identify and assess areas of contamination on the site, including soil and groundwater from deep and shallow wells. The information gathered during this study will be used to determine if any significant environmental or health impacts exist as a result of solvents (i.e. trichloroethane) released on the site. The RI results will also be used to evaluate and select any remedial actions, if required. Also during the RI, the original well survey of known

Activity	Time
Set up document repositories	Start of RI (Spring 2001)
RI Fact Sheet	Start of RI (Spring 2001)
Mailing describing Proposed Remedial Action Plan (PRAP) and public comment period	During PRAP stage
30-day public comment period for PRAP	During PRAP stage
Public meeting to discuss PRAP	Within 30-day PRAP comment period
Mailing describing selected site remedy (ROD) and response to comments	After remedy is selected

As documents are generated during the remedial process, they will be placed in the site's document repositories. Documents currently available include the Order on Consent, the Phase II Report of 1994, and the approved RI Work Plan.

CHEMTECH 284 Sheffield Street • Mountainside, NJ 07092 Phone: 908.789.8900 Fax: 908.789.8922

DATA PACKAGE FOR RESULTS SUMMARY

PROJECT NAME: LPS SITE

STEVEN J. SAINES
257 MIDLAND PLACE
LOGAN, OH 43138
740-385-7810

CHEMTECH PROJECT NO.	**N5790**
ATTENTION	**STEVEN J. SAINES**

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
LMW-1

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091023.D

Level: (low/med) ______ Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	43	
75-35-4	1,1-Dichloroethene	13	
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	100	
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	200	
56-23-5	Carbon Tetrachloride	5	U
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	4.8	J
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-1

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5790

Site: LPS SITE

Location: LB16001

Group: 5971-VOA

Matrix: (soil/water) WATER

Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: VD091023.D

Level: (low/med)

Date Received: 9/5/01

% Moisture: not dec. 100

Date Analyzed: 9/11/01

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/L

CAS No.	Compound	Concentration	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

Page 2 of 2

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-2

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O02

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091024.D

Level: (low/med) Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	14	
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	21	
75-35-4	1,1-Dichloroethene	5	U
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	2.3	J
75-34-3	1,1-Dichloroethane	42	
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	450	E
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	46	
56-23-5	Carbon Tetrachloride	46	
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	85	
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	55	
127-18-4	Tetrachloroethene	53	
108-90-7	Chlorobenzene	6.2	
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-2

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O02

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091024.D

Level: (low/med) ______ Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

Concentration Units: (ug/L or ug/Kg) ug/L

CAS No.	Compound	Concentration	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

Page 2 of 2

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-2DL

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O02DL

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091421.D

Level: (low/med) ______ Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/15/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 20.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	100	UD
75-01-4	Vinyl Chloride	100	UD
74-83-9	Bromomethane	100	UD
75-00-3	Chloroethane	100	UD
75-35-4	1,1-Dichloroethene	100	UD
67-64-1	Acetone	100	UD
75-15-0	Carbon Disulfide	100	UD
75-09-2	Methylene Chloride	100	UD
156-60-5	trans-1,2-Dichloroethene	100	UD
75-34-3	1,1-Dichloroethane	100	UD
78-93-3	2-Butanone	100	UD
156-59-2	cis-1,2-Dichloroethene	380	D
67-66-3	Chloroform	100	UD
71-55-6	1,1,1-Trichloroethane	100	UD
56-23-5	Carbon Tetrachloride	100	UD
71-43-2	Benzene	100	UD
107-06-2	1,2-Dichloroethane	100	UD
79-01-6	Trichloroethene	54	JD
78-87-5	1,2-Dichloropropane	100	UD
75-27-4	Bromodichloromethane	100	UD
108-10-1	4-Methyl-2-Pentanone	100	UD
108-88-3	Toluene	100	UD
10061-02-6	t-1,3-Dichloropropene	100	UD
10061-01-5	cis-1,3-Dichloropropene	100	UD
79-00-5	1,1,2-Trichloroethane	100	UD
591-78-6	2-Hexanone	100	UD
124-48-1	Dibromochloromethane	100	UD
127-18-4	Tetrachloroethene	100	UD
108-90-7	Chlorobenzene	100	UD
100-41-4	Ethyl Benzene	100	UD
136777-61-2	m/p-Xylenes	100	UD
95-47-6	o-Xylene	100	UD
100-42-5	Styrene	100	UD

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-2DL

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O02DL

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091421.D

Level: (low/med) Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/15/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 20.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Concentration Units:

CAS No.	Compound	(ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	100	UD
79-34-5	1,1,2,2-Tetrachloroethane	100	UD

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
LMW-3

Lab Name: CHEMTECH   Contract: STEVEN J. SAINES

Project No.: N5790   Site: LPS SITE   Location: LB16001   Group: 5971-VOA

Matrix: (soil/water) WATER   Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) ML   Lab File ID: VD091025.D

Level: (low/med)   Date Received: 9/5/01

% Moisture: not dec. 100   Date Analyzed: 9/11/01

GC Column: RTX624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	200	
75-35-4	1,1-Dichloroethene	60	
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	150	
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	32	
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	400	E
56-23-5	Carbon Tetrachloride	430	E
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	49	
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	4.6	J
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-3

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5790

Site: LPS SITE

Location: LB16001

Group: 5971-VOA

Matrix: (soil/water) WATER

Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: VD091025.D

Level: (low/med)

Date Received: 9/5/01

% Moisture: not dec. 100

Date Analyzed: 9/11/01

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

Page 2 of 2

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-3DL

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O03DL

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091422.D

Level: (low/med) ____ Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/15/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: ____ (uL) Soil Aliquot Volume: ____ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	50	UD
75-01-4	Vinyl Chloride	50	UD
74-83-9	Bromomethane	50	UD
75-00-3	Chloroethane	160	D
75-35-4	1,1-Dichloroethene	40	JD
67-64-1	Acetone	50	UD
75-15-0	Carbon Disulfide	50	UD
75-09-2	Methylene Chloride	50	UD
156-60-5	trans-1,2-Dichloroethene	50	UD
75-34-3	1,1-Dichloroethane	130	D
78-93-3	2-Butanone	50	UD
156-59-2	cis-1,2-Dichloroethene	24	JD
67-66-3	Chloroform	50	UD
71-55-6	1,1,1-Trichloroethane	420	D
56-23-5	Carbon Tetrachloride	430	D
71-43-2	Benzene	50	UD
107-06-2	1,2-Dichloroethane	50	UD
79-01-6	Trichloroethene	46	JD
78-87-5	1,2-Dichloropropane	50	UD
75-27-4	Bromodichloromethane	50	UD
108-10-1	4-Methyl-2-Pentanone	50	UD
108-88-3	Toluene	50	UD
10061-02-6	t-1,3-Dichloropropene	50	UD
10061-01-5	cis-1,3-Dichloropropene	50	UD
79-00-5	1,1,2-Trichloroethane	50	UD
591-78-6	2-Hexanone	50	UD
124-48-1	Dibromochloromethane	50	UD
127-18-4	Tetrachloroethene	50	UD
108-90-7	Chlorobenzene	50	UD
100-41-4	Ethyl Benzene	50	UD
136777-61-2	m/p-Xylenes	50	UD
95-47-6	o-Xylene	50	UD
100-42-5	Styrene	50	UD

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-3DL

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5790
Site: LPS SITE
Location: LB16001
Group: 5971-VOA
Matrix: (soil/water) WATER
Lab Sample ID: O03DL
Sample wt/vol: 5.0 (g/mL) ML
Lab File ID: VD091422.D
Level: (low/med)
Date Received: 9/5/01
% Moisture: not dec. 100
Date Analyzed: 9/15/01
GC Column: RTX624
ID: 0.53 (mm)
Dilution Factor: 10.0
Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	50	UD
79-34-5	1,1,2,2-Tetrachloroethane	50	UD

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
LMW-4

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5790
Site: LPS SITE
Location: LB16001
Group: 5971-VOA

Matrix: (soil/water) WATER
Lab Sample ID: O04

Sample wt/vol: 5.0 (g/mL) ML
Lab File ID: VD091026.D

Level: (low/med)
Date Received: 9/5/01

% Moisture: not dec. 100
Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/L

CAS No.	Compound		Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	5	U
75-35-4	1,1-Dichloroethene	12	
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	11	
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	6.5	
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	170	
56-23-5	Carbon Tetrachloride	170	
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	5.6	
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	25	
127-18-4	Tetrachloroethene	23	
108-90-7	Chlorobenzene	3.9	J
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	2.1	J
100-42-5	Styrene	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-4

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5790

Site: LPS SITE

Location: LB16001

Group: 5971-VOA

Matrix: (soil/water) WATER

Lab Sample ID: O04

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: VD091026.D

Level: (low/med)

Date Received: 9/5/01

% Moisture: not dec. 100

Date Analyzed: 9/11/01

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-6

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5790

Site: LPS SITE

Location: LB16001

Group: 5971-VOA

Matrix: (soil/water) WATER

Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: VD091027.D

Level: (low/med)

Date Received: 9/5/01

% Moisture: not dec. 100

Date Analyzed: 9/11/01

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	5	U
75-35-4	1,1-Dichloroethene	5	U
67-64-1	Acetone	2	J
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	5.8	
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	11	
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	52	
127-18-4	Tetrachloroethene	50	
108-90-7	Chlorobenzene	3.4	J
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

MW-6

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5790

Site: LPS SITE

Location: LB16001

Group: 5971-VOA

Matrix: (soil/water) WATER

Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: VD091027.D

Level: (low/med)

Date Received: 9/5/01

% Moisture: not dec. 100

Date Analyzed: 9/11/01

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

Page 2 of 2

FORM I VOA

3/90

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-DUP

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O06

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091028.D

Level: (low/med) ______ Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	15	
75-35-4	1,1-Dichloroethene	12	
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	100	
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	3.7	J
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	210	
56-23-5	Carbon Tetrachloride	230	
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	5.2	
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	3.1	J
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-DUP

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O06

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091028.D

Level: (low/med) Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/L

CAS No.	Compound		Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

VOABLANK

Lab Name: CHEMTECH   Contract: STEVEN J. SAINES

Project No.: N5790   Site: LPS SITE   Location: LB16001   Group: 5971-VOA

Matrix: (soil/water) WATER   Lab Sample ID: O07

Sample wt/vol: 5.0 (g/mL) ML   Lab File ID: VD091021.D

Level: (low/med)   Date Received: 9/5/01

% Moisture: not dec. 100   Date Analyzed: 9/11/01

GC Column: RTX624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: (uL)   Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	5	U
75-35-4	1,1-Dichloroethene	5	U
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	5	U
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

Page 1 of 2

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

VOABLANK

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O07

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091021.D

Level: (low/med) Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

Page 2 of 2

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-EQBL

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O08

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091022.D

Level: (low/med) Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/L

CAS No.	Compound	ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	5	U
75-35-4	1,1-Dichloroethene	5	U
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	5	U
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-EQBL

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5790 Site: LPS SITE Location: LB16001 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O08

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VD091022.D

Level: (low/med) Date Received: 9/5/01

% Moisture: not dec. 100 Date Analyzed: 9/11/01

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

Page 2 of 2

CHEMTECH 284 Sheffield Street • Mountainside, NJ 07092 Phone: 908.789.8900 Fax: 908.789.8922

ANALYTICAL RESULTS SUMMARY

PROJECT NAME: LPS SITE

STEVEN J. SAINES
257 MIDLAND PLACE
LOGAN, OH 43138
740-385-7810

CHEMTECH PROJECT #	**P1210**
ATTENTION :	**STEVEN J. SAINES**

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DRAPER-UP

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: P1210
Site: LPS SITE
Location: LB19017
Group: 5971-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: VA012510.D

Level: (low/med) LOW
Date Received: 1/23/02

% Moisture: not dec. 25
Date Analyzed: 1/25/02

GC Column: RTX624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: ______ (uL)
Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	3.8	U
75-01-4	Vinyl Chloride	2.4	U
74-83-9	Bromomethane	2.6	U
75-00-3	Chloroethane	3	U
75-35-4	1,1-Dichloroethene	2.1	U
67-64-1	Acetone	7.7	U
75-15-0	Carbon Disulfide	1.3	U
75-09-2	Methylene Chloride	1.3	JB
156-60-5	trans-1,2-Dichloroethene	2.3	U
75-34-3	1,1-Dichloroethane	1.3	U
78-93-3	2-Butanone	7.5	U
156-59-2	cis-1,2-Dichloroethene	2.4	U
67-66-3	Chloroform	1.3	U
71-55-6	1,1,1-Trichloroethane	1.9	U
56-23-5	Carbon Tetrachloride	1.4	U
71-43-2	Benzene	1.3	U
107-06-2	1,2-Dichloroethane	3.2	U
79-01-6	Trichloroethene	3.7	U
78-87-5	1,2-Dichloropropane	4.8	U
75-27-4	Bromodichloromethane	1.3	U
108-10-1	4-Methyl-2-Pentanone	4	U
108-88-3	Toluene	1.7	U
10061-02-6	t-1,3-Dichloropropene	2.2	U
10061-01-5	cis-1,3-Dichloropropene	1.3	U
79-00-5	1,1,2-Trichloroethane	1.4	U
591-78-6	2-Hexanone	16	U
124-48-1	Dibromochloromethane	1.3	U
127-18-4	Tetrachloroethene	2.2	U
108-90-7	Chlorobenzene	1.3	U
100-41-4	Ethyl Benzene	1.9	U
136777-61-2	m/p-Xylenes	2	U
95-47-6	o-Xylene	2.2	U
100-42-5	Styrene	1.3	U

Sm
02-04-02

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DRAPER-UP

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: P1210

Site: LPS SITE

Location: LB19017

Group: 5971-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: VA012510.D

Level: (low/med) LOW

Date Received: 1/23/02

% Moisture: not dec. 25

Date Analyzed: 1/25/02

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	1.3	U
79-34-5	1,1,2,2-Tetrachloroethane	3	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET

TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

DRAPER-UP

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No. P1210

Site: LPS SITE

Location: LB19017

Group: 5971-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: VA012510.D

Level: (low/med) LOW

Date Received: 1/23/02

% Moisture: not dec. 24.5

Date Analyzed: 1/25/02

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: 1 (uL)

Soil Aliquot Volume: 1 (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

Number TICs found: 1

CAS Number	Compound Name	RT	Est. Conc.	Q
1.	Unknown	15.08	6.8	J
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02.04.02

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DRAPER-MID

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: P1210 Site: LPS SITE Location: LB19017 Group: 5971-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O02

Sample wt/vol: 5.0 (g/mL) G Lab File ID: VA012415.D

Level: (low/med) LOW Date Received: 1/23/02

% Moisture: not dec. 36 Date Analyzed: 1/24/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	4.4	U
75-01-4	Vinyl Chloride	2.9	U
74-83-9	Bromomethane	3	U
75-00-3	Chloroethane	3.5	U
75-35-4	1,1-Dichloroethene	2.5	U
67-64-1	Acetone	9	U
75-15-0	Carbon Disulfide	1.6	U
75-09-2	Methylene Chloride	4.9	B
156-60-5	trans-1,2-Dichloroethene	2.7	U
75-34-3	1,1-Dichloroethane	1.6	U
78-93-3	2-Butanone	8.8	U
156-59-2	cis-1,2-Dichloroethene	2.8	U
67-66-3	Chloroform	1.6	U
71-55-6	1,1,1-Trichloroethane	2.3	U
56-23-5	Carbon Tetrachloride	1.6	U
71-43-2	Benzene	1.6	U
107-06-2	1,2-Dichloroethane	3.8	U
79-01-6	Trichloroethene	4.3	U
78-87-5	1,2-Dichloropropane	5.6	U
75-27-4	Bromodichloromethane	1.6	U
108-10-1	4-Methyl-2-Pentanone	4.7	U
108-88-3	Toluene	1.9	U
10061-02-6	t-1,3-Dichloropropene	2.6	U
10061-01-5	cis-1,3-Dichloropropene	1.6	U
79-00-5	1,1,2-Trichloroethane	1.7	U
591-78-6	2-Hexanone	19	U
124-48-1	Dibromochloromethane	1.6	U
127-18-4	Tetrachloroethene	2.5	U
108-90-7	Chlorobenzene	1.6	U
100-41-4	Ethyl Benzene	2.3	U
136777-61-2	m/p-Xylenes	2.4	U
95-47-6	o-Xylene	2.6	U
100-42-5	Styrene	1.6	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DRAPER-MID

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: P1210
Site: LPS SITE
Location: LB19017
Group: 5971-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O02
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: VA012415.D
Level: (low/med) LOW
Date Received: 1/23/02
% Moisture: not dec. 36
Date Analyzed: 1/24/02
GC Column: RTX624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	1.6	U
79-34-5	1,1,2,2-Tetrachloroethane	3.5	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

DRAPER-MID

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No. P1210 Site: LPS SITE Location: LB19017 Group: 5971-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O02

Sample wt/vol: 5.0 (g/mL) G Lab File ID: VA012415.D

Level: (low/med) LOW Date Received: 1/23/02

% Moisture: not dec. 35.8 Date Analyzed: 1/24/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: 1 (uL) Soil Aliquot Volume: 1 (uL)

Concentration Units:

Number TICs found: 0 (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DRAPER-DOWN

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: P1210 Site: LPS SITE Location: LB19167 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VG013107.D

Level: (low/med) ______ Date Received: 1/23/02

% Moisture: not dec. 100 Date Analyzed: 1/31/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	5	U
75-35-4	1,1-Dichloroethene	5	U
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	1.6	J
56-23-5	Carbon Tetrachloride	5	U
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	5	U
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

DRAPER-DOWN

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: P1210 Site: LPS SITE Location: LB19167 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VG013107.D

Level: (low/med) ______ Date Received: 1/23/02

% Moisture: not dec. 100 Date Analyzed: 1/31/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

DRAPER-DOWN

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No. P1210 Site: LPS SITE Location: LB19167 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VG013107.D

Level: (low/med) Date Received: 1/23/02

% Moisture: not dec. 100 Date Analyzed: 1/31/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Number TICs found: 1

Concentration Units: (ug/L or ug/Kg) ug/L

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 1634-04-4	Propane, 2-methoxy-2-methyl-	11.10	51	J
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-5

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: P1210 Site: LPS SITE Location: LB19167 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O04

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VG013108.D

Level: (low/med) ______ Date Received: 1/23/02

% Moisture: not dec. 100 Date Analyzed: 1/31/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	5	U
75-35-4	1,1-Dichloroethene	5	U
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	21	
56-23-5	Carbon Tetrachloride	5	U
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	5	U
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

LMW-5

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: P1210

Site: LPS SITE

Location: LB19167

Group: 5971-VOA

Matrix: (soil/water) WATER

Lab Sample ID: O04

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: VG013108.D

Level: (low/med)

Date Received: 1/23/02

% Moisture: not dec. 100

Date Analyzed: 1/31/02

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

Page 2 of 2

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
LMW-5

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No. P1210
Site: LPS SITE
Location: LB19167
Group: 5971-VOA
Matrix: (soil/water) WATER
Lab Sample ID: O04
Sample wt/vol: 5.0 (g/mL) ML
Lab File ID: VG013108.D
Level: (low/med)
Date Received: 1/23/02
% Moisture: not dec. 100
Date Analyzed: 1/31/02
GC Column: RTX624 ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

Number TICs found: 0

Concentration Units:
(ug/L or ug/Kg) ug/L

CAS Number	Compound Name	RT	Est. Conc.	Q
1.				
2.				
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRIPBLANK

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: P1210 Site: LPS SITE Location: LB19167 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VG013106.D

Level: (low/med) _____ Date Received: 1/23/02

% Moisture: not dec. 100 Date Analyzed: 1/31/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

Concentration Units:
(ug/L or ug/Kg) ug/L

CAS No.	Compound		Q
74-87-3	Chloromethane	5	U
75-01-4	Vinyl Chloride	5	U
74-83-9	Bromomethane	5	U
75-00-3	Chloroethane	5	U
75-35-4	1,1-Dichloroethene	5	U
67-64-1	Acetone	5	U
75-15-0	Carbon Disulfide	5	U
75-09-2	Methylene Chloride	5	U
156-60-5	trans-1,2-Dichloroethene	5	U
75-34-3	1,1-Dichloroethane	5	U
78-93-3	2-Butanone	5	U
156-59-2	cis-1,2-Dichloroethene	5	U
67-66-3	Chloroform	5	U
71-55-6	1,1,1-Trichloroethane	5	U
56-23-5	Carbon Tetrachloride	5	U
71-43-2	Benzene	5	U
107-06-2	1,2-Dichloroethane	5	U
79-01-6	Trichloroethene	5	U
78-87-5	1,2-Dichloropropane	5	U
75-27-4	Bromodichloromethane	5	U
108-10-1	4-Methyl-2-Pentanone	5	U
108-88-3	Toluene	5	U
10061-02-6	t-1,3-Dichloropropene	5	U
10061-01-5	cis-1,3-Dichloropropene	5	U
79-00-5	1,1,2-Trichloroethane	5	U
591-78-6	2-Hexanone	5	U
124-48-1	Dibromochloromethane	5	U
127-18-4	Tetrachloroethene	5	U
108-90-7	Chlorobenzene	5	U
100-41-4	Ethyl Benzene	5	U
136777-61-2	m/p-Xylenes	5	U
95-47-6	o-Xylene	5	U
100-42-5	Styrene	5	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

TRIPBLANK

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: P1210 Site: LPS SITE Location: LB19167 Group: 5971-VOA

Matrix: (soil/water) WATER Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) ML Lab File ID: VG013106.D

Level: (low/med) ______ Date Received: 1/23/02

% Moisture: not dec. 100 Date Analyzed: 1/31/02

GC Column: RTX624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/L	Q
75-25-2	Bromoform	5	U
79-34-5	1,1,2,2-Tetrachloroethane	5	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

TRIPBLANK

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No. P1210

Site: LPS SITE

Location: LB19167

Group: 5971-VOA

Matrix: (soil/water) WATER

Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) ML

Lab File ID: VG013106.D

Level: (low/med)

Date Received: 1/23/02

% Moisture: not dec. 100

Date Analyzed: 1/31/02

GC Column: RTX624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

Concentration Units:
(ug/L or ug/Kg) ug/L

Number TICs found: 0

CAS Number	Compound Name	RT	Est. Conc.	Q
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CHEMTECH 205 Campus Plaza 1 • Edison, NJ 08837 Phone: 732.225.4111 Fax: 732.225.4110

DATA PACKAGE FOR RESULTS SUMMARY

PROJECT NAME: LPS SITE

STEVEN J. SAINES
257 MIDLAND PLACE
LOGAN OH, 43138
740-380-5445

CHEMTECH PROJECT NO.	N5080ASP
ATTENTION	STEVEN J. SAINES

Since 1967

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-1@6Y2

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0309.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 12
Date Analyzed: 7/15/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	ug/Kg	Q
74-87-3	Chloromethane	5.7	U
75-01-4	Vinyl Chloride	5.7	U
74-83-9	Bromomethane	5.7	U
75-00-3	Chloroethane	5.7	U
75-35-4	1,1-Dichloroethene	5.7	U
67-64-1	Acetone	11	
75-15-0	Carbon Disulfide	5.7	U
75-09-2	Methylene Chloride	1.2	J
156-60-5	trans-1,2-Dichloroethene	5.7	U
75-34-3	1,1-Dichloroethane	5.7	U
78-93-3	2-Butanone	5.7	U
156-59-2	cis-1,2-Dichloroethene	5.7	U
67-66-3	Chloroform	5.7	U
71-55-6	1,1,1-Trichloroethane	5.7	U
56-23-5	Carbon Tetrachloride	5.7	U
71-43-2	Benzene	5.7	U
107-06-2	1,2-Dichloroethane	5.7	U
79-01-6	Trichloroethene	5.7	U
78-87-5	1,2-Dichloropropane	5.7	U
75-27-4	Bromodichloromethane	5.7	U
108-10-1	4-Methyl-2-Pentanone	5.7	U
108-88-3	Toluene	5.7	U
10061-02-6	t-1,3-Dichloropropene	5.7	U
10061-01-5	cis-1,3-Dichloropropene	5.7	U
79-00-5	1,1,2-Trichloroethane	5.7	U
591-78-6	2-Hexanone	5.7	U
124-48-1	Dibromochloromethane	5.7	U
127-18-4	Tetrachloroethene	5.7	U
108-90-7	Chlorobenzene	5.7	U
100-41-4	Ethyl Benzene	5.7	U
136777-61-2	m/p-Xylenes	5.7	U
95-47-6	o-Xylene	5.7	U
100-42-5	Styrene	5.7	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-1@6Y2

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0309.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 12 Date Analyzed: 7/15/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.7	U
79-34-5	1,1,2,2-Tetrachloroethane	5.7	U

Page 2 of 2

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
GP-1@6Y2

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O01

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0309.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 11.6
Date Analyzed: 7/15/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: 1 (uL)
Soil Aliquot Volume: 1 (uL)

Number TICs found: 0

Concentration Units:
(ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP-5@7Y2

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O02

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0310.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 13
Date Analyzed: 7/15/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	Concentration (ug/Kg)	Q
74-87-3	Chloromethane	5.8	U
75-01-4	Vinyl Chloride	5.8	U
74-83-9	Bromomethane	5.8	U
75-00-3	Chloroethane	5.8	U
75-35-4	1,1-Dichloroethene	5.8	U
67-64-1	Acetone	13	
75-15-0	Carbon Disulfide	5.8	U
75-09-2	Methylene Chloride	1.7	J
156-60-5	trans-1,2-Dichloroethene	5.8	U
75-34-3	1,1-Dichloroethane	5.8	U
78-93-3	2-Butanone	5.8	U
156-59-2	cis-1,2-Dichloroethene	5.8	U
67-66-3	Chloroform	5.8	U
71-55-6	1,1,1-Trichloroethane	5.8	U
56-23-5	Carbon Tetrachloride	5.8	U
71-43-2	Benzene	5.8	U
107-06-2	1,2-Dichloroethane	5.8	U
79-01-6	Trichloroethene	5.8	U
78-87-5	1,2-Dichloropropane	5.8	U
75-27-4	Bromodichloromethane	5.8	U
108-10-1	4-Methyl-2-Pentanone	5.8	U
108-88-3	Toluene	5.8	U
10061-02-6	t-1,3-Dichloropropene	5.8	U
10061-01-5	cis-1,3-Dichloropropene	5.8	U
79-00-5	1,1,2-Trichloroethane	5.8	U
591-78-6	2-Hexanone	5.8	U
124-48-1	Dibromochloromethane	5.8	U
127-18-4	Tetrachloroethene	5.8	U
108-90-7	Chlorobenzene	5.8	U
100-41-4	Ethyl Benzene	5.8	U
136777-61-2	m/p-Xylenes	5.8	U
95-47-6	o-Xylene	5.8	U
100-42-5	Styrene	5.8	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-5@7Y2

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O02
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0310.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 13
Date Analyzed: 7/15/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.8	U
79-34-5	1,1,2,2-Tetrachloroethane	5.8	U

Page 2 of 2

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-5@7Y2

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O02
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0310.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 13.3
Date Analyzed: 7/15/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: 1 (uL)
Soil Aliquot Volume: 1 (uL)

Number TICs found: 0

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-8@8

Lab Name: CHEMTECH   Contract: STEVEN J. SAINES

Project No.: N5080   Site: LPS SITE   Location: LB14992   Group: 5970-VOA

Matrix: (soil/water) SOIL   Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: B0311.D

Level: (low/med) LOW   Date Received: 7/6/01

% Moisture: not dec. 11   Date Analyzed: 7/16/01

GC Column: DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______ (uL)   Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	5.6	U
75-01-4	Vinyl Chloride	5.6	U
74-83-9	Bromomethane	5.6	U
75-00-3	Chloroethane	5.6	U
75-35-4	1,1-Dichloroethene	5.6	U
67-64-1	Acetone	5.6	U
75-15-0	Carbon Disulfide	5.6	U
75-09-2	Methylene Chloride	0.6	J
156-60-5	trans-1,2-Dichloroethene	5.6	U
75-34-3	1,1-Dichloroethane	5.6	U
78-93-3	2-Butanone	5.6	U
156-59-2	cis-1,2-Dichloroethene	5.6	U
67-66-3	Chloroform	5.6	U
71-55-6	1,1,1-Trichloroethane	5.6	U
56-23-5	Carbon Tetrachloride	5.6	U
71-43-2	Benzene	5.6	U
107-06-2	1,2-Dichloroethane	5.6	U
79-01-6	Trichloroethene	5.6	U
78-87-5	1,2-Dichloropropane	5.6	U
75-27-4	Bromodichloromethane	5.6	U
108-10-1	4-Methyl-2-Pentanone	5.6	U
108-88-3	Toluene	5.6	U
10061-02-6	t-1,3-Dichloropropene	5.6	U
10061-01-5	cis-1,3-Dichloropropene	5.6	U
79-00-5	1,1,2-Trichloroethane	5.6	U
591-78-6	2-Hexanone	5.6	U
124-48-1	Dibromochloromethane	5.6	U
127-18-4	Tetrachloroethene	5.6	U
108-90-7	Chlorobenzene	5.6	U
100-41-4	Ethyl Benzene	5.6	U
136777-61-2	m/p-Xylenes	5.6	U
95-47-6	o-Xylene	5.6	U
100-42-5	Styrene	5.6	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP-8@8

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0311.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 11
Date Analyzed: 7/16/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.6	U
79-34-5	1,1,2,2-Tetrachloroethane	5.6	U

Page 2 of 2

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-8@8

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O03

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0311.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 11 Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: 1 (uL) Soil Aliquot Volume: 1 (uL)

Concentration Units:

Number TICs found: 0 (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-11@9

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O04

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0312.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 14
Date Analyzed: 7/16/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	ug/Kg	Q
74-87-3	Chloromethane	5.8	U
75-01-4	Vinyl Chloride	5.8	U
74-83-9	Bromomethane	5.8	U
75-00-3	Chloroethane	5.8	U
75-35-4	1,1-Dichloroethene	1.4	J
67-64-1	Acetone	15	
75-15-0	Carbon Disulfide	5.8	U
75-09-2	Methylene Chloride	5.8	U
156-60-5	trans-1,2-Dichloroethene	5.8	U
75-34-3	1,1-Dichloroethane	5.8	U
78-93-3	2-Butanone	5.8	U
156-59-2	cis-1,2-Dichloroethene	5.8	U
67-66-3	Chloroform	5.8	U
71-55-6	1,1,1-Trichloroethane	5.8	U
56-23-5	Carbon Tetrachloride	5.8	U
71-43-2	Benzene	5.8	U
107-06-2	1,2-Dichloroethane	5.8	U
79-01-6	Trichloroethene	5.8	U
78-87-5	1,2-Dichloropropane	5.8	U
75-27-4	Bromodichloromethane	5.8	U
108-10-1	4-Methyl-2-Pentanone	5.8	U
108-88-3	Toluene	5.8	U
10061-02-6	t-1,3-Dichloropropene	5.8	U
10061-01-5	cis-1,3-Dichloropropene	5.8	U
79-00-5	1,1,2-Trichloroethane	5.8	U
591-78-6	2-Hexanone	5.8	U
124-48-1	Dibromochloromethane	5.8	U
127-18-4	Tetrachloroethene	5.8	U
108-90-7	Chlorobenzene	5.8	U
100-41-4	Ethyl Benzene	5.8	U
136777-61-2	m/p-Xylenes	5.8	U
95-47-6	o-Xylene	5.8	U
100-42-5	Styrene	5.8	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-11@9

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O04

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0312.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 14 Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.8	U
79-34-5	1,1,2,2-Tetrachloroethane	5.8	U

Page 2 of 2

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-11@9

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O04

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0312.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 14.2

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: 1 (uL)

Soil Aliquot Volume: 1 (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

Number TICs found: 5

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 823-76-7	Ethanone, 1-cyclohexyl-	23.06	9.8	J
2. 15869-89-3	Octane, 2,5-dimethyl-	23.99	9.5	J
3. 124-18-5	Decane	25.19	10	J
4. 2847-72-5	Decane, 4-methyl-	25.93	10	J
5. 1120-21-4	Undecane	28.29	13	J
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP 14@7

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0342.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 12

Date Analyzed: 7/17/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: ______ (uL)

Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	28	U
75-01-4	Vinyl Chloride	28	U
74-83-9	Bromomethane	28	U
75-00-3	Chloroethane	28	U
75-35-4	1,1-Dichloroethene	28	U
67-64-1	Acetone	65	B
75-15-0	Carbon Disulfide	28	U
75-09-2	Methylene Chloride	28	U
156-60-5	trans-1,2-Dichloroethene	28	U
75-34-3	1,1-Dichloroethane	28	U
78-93-3	2-Butanone	28	U
156-59-2	cis-1,2-Dichloroethene	28	U
67-66-3	Chloroform	28	U
71-55-6	1,1,1-Trichloroethane	28	U
56-23-5	Carbon Tetrachloride	28	U
71-43-2	Benzene	28	U
107-06-2	1,2-Dichloroethane	28	U
79-01-6	Trichloroethene	28	U
78-87-5	1,2-Dichloropropane	28	U
75-27-4	Bromodichloromethane	28	U
108-10-1	4-Methyl-2-Pentanone	28	U
108-88-3	Toluene	3.6	J
10061-02-6	t-1,3-Dichloropropene	28	U
10061-01-5	cis-1,3-Dichloropropene	28	U
79-00-5	1,1,2-Trichloroethane	28	U
591-78-6	2-Hexanone	28	U
124-48-1	Dibromochloromethane	28	U
127-18-4	Tetrachloroethene	4	J
108-90-7	Chlorobenzene	28	U
100-41-4	Ethyl Benzene	28	U
136777-61-2	m/p-Xylenes	28	U
95-47-6	o-Xylene	28	U
100-42-5	Styrene	28	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP 14@7

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0342.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 12 Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	28	U
79-34-5	1,1,2,2-Tetrachloroethane	28	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP 14@7

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O05

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0342.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 12.1 Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: 1 (uL) Soil Aliquot Volume: 1 (uL)

Concentration Units:

Number TICs found: 10 (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 111-84-2	Nonane	21.78	380	J
2. 1678-92-8	Cyclohexane, propyl-	23.06	470	J
3. 124-18-5	Decane	25.23	510	J
4. 2847-72-5	Decane, 4-methyl-	25.97	530	J
5. 1678-93-9	Cyclohexane, butyl-	26.51	250	J
6.	Unknown	27.10	380	J
7. 493-01-6	Naphthalene, decahydro-, cis	27.52	320	J
8. 1120-21-4	Undecane	28.30	780	J
9. 535-77-3	Benzene, 1-methyl-3-(1-methy	28.69	240	J
10.	Unknown	29.07	240	J
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP 2@5

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O06
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0343.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 10
Date Analyzed: 7/17/01
GC Column: DB624 ID: 0.53 (mm)
Dilution Factor: 5.0
Soil Extract Volume: ______ (uL)
Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	28	U
75-01-4	Vinyl Chloride	28	U
74-83-9	Bromomethane	28	U
75-00-3	Chloroethane	28	U
75-35-4	1,1-Dichloroethene	28	U
67-64-1	Acetone	76	B
75-15-0	Carbon Disulfide	28	U
75-09-2	Methylene Chloride	5.7	J
156-60-5	trans-1,2-Dichloroethene	28	U
75-34-3	1,1-Dichloroethane	28	U
78-93-3	2-Butanone	28	U
156-59-2	cis-1,2-Dichloroethene	28	U
67-66-3	Chloroform	28	U
71-55-6	1,1,1-Trichloroethane	28	U
56-23-5	Carbon Tetrachloride	28	U
71-43-2	Benzene	28	U
107-06-2	1,2-Dichloroethane	28	U
79-01-6	Trichloroethene	28	U
78-87-5	1,2-Dichloropropane	28	U
75-27-4	Bromodichloromethane	28	U
108-10-1	4-Methyl-2-Pentanone	28	U
108-88-3	Toluene	28	U
10061-02-6	t-1,3-Dichloropropene	28	U
10061-01-5	cis-1,3-Dichloropropene	28	U
79-00-5	1,1,2-Trichloroethane	28	U
591-78-6	2-Hexanone	28	U
124-48-1	Dibromochloromethane	28	U
127-18-4	Tetrachloroethene	28	U
108-90-7	Chlorobenzene	28	U
100-41-4	Ethyl Benzene	28	U
136777-61-2	m/p-Xylenes	28	U
95-47-6	o-Xylene	28	U
100-42-5	Styrene	28	U

SAMPLE NO.

GP 2@5

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O06

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0343.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 10 Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	28	U
79-34-5	1,1,2,2-Tetrachloroethane	28	U

Page 2 of 2

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP 2@5

Lab Name: CHEMTECH　Contract: STEVEN J. SAINES

Project No.: N5080　Site: LPS SITE　Location: LB14992　Group: 5970-VOA

Matrix: (soil/water) SOIL　Lab Sample ID: O06

Sample wt/vol: 5.0 (g/mL) G　Lab File ID: B0343.D

Level: (low/med) LOW　Date Received: 7/6/01

% Moisture: not dec. 10.1　Date Analyzed: 7/17/01

GC Column: DB624　ID: 0.53 (mm)　Dilution Factor: 5.0

Soil Extract Volume: 1 (uL)　Soil Aliquot Volume: 1 (uL)

Concentration Units:

Number TICs found: 10　(ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 4923-77-7	Cyclohexane, 1-ethyl-2-methy	22.25	410	J
2. 6221-55-2	Bicyclo[3.2.1]octane	22.79	470	J
3.	Unknown	23.07	880	J
4.	Unknown	23.34	570	J
5. 7094-26-0	Cyclohexane, 1,1,2-trimethyl	24.15	1000	J
6.	Unknown	24.69	430	J
7. 4291-79-6	Cyclohexane, 1-methyl-2-prop	24.93	320	J
8. 2847-72-5	Decane, 4-methyl-	25.97	1000	J
9. 1678-93-9	Cyclohexane, butyl-	26.52	360	J
10.	Unknown	27.06	430	J
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP 6@10

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O07

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0344.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 13

Date Analyzed: 7/17/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: ______ (uL)

Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	29	U
75-01-4	Vinyl Chloride	29	U
74-83-9	Bromomethane	29	U
75-00-3	Chloroethane	29	U
75-35-4	1,1-Dichloroethene	29	U
67-64-1	Acetone	110	B
75-15-0	Carbon Disulfide	29	U
75-09-2	Methylene Chloride	13	J
156-60-5	trans-1,2-Dichloroethene	29	U
75-34-3	1,1-Dichloroethane	29	U
78-93-3	2-Butanone	29	U
156-59-2	cis-1,2-Dichloroethene	29	U
67-66-3	Chloroform	29	U
71-55-6	1,1,1-Trichloroethane	29	U
56-23-5	Carbon Tetrachloride	29	U
71-43-2	Benzene	29	U
107-06-2	1,2-Dichloroethane	29	U
79-01-6	Trichloroethene	29	U
78-87-5	1,2-Dichloropropane	29	U
75-27-4	Bromodichloromethane	29	U
108-10-1	4-Methyl-2-Pentanone	29	U
108-88-3	Toluene	29	U
10061-02-6	t-1,3-Dichloropropene	29	U
10061-01-5	cis-1,3-Dichloropropene	29	U
79-00-5	1,1,2-Trichloroethane	29	U
591-78-6	2-Hexanone	29	U
124-48-1	Dibromochloromethane	29	U
127-18-4	Tetrachloroethene	3.8	J
108-90-7	Chlorobenzene	29	U
100-41-4	Ethyl Benzene	29	U
136777-61-2	m/p-Xylenes	10	J
95-47-6	o-Xylene	29	U
100-42-5	Styrene	29	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP 6@10

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O07

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0344.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 13

Date Analyzed: 7/17/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	ug/Kg	Q
75-25-2	Bromoform	29	U
79-34-5	1,1,2,2-Tetrachloroethane	29	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP 6@10

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O07

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0344.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 12.6 Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: 1 (uL) Soil Aliquot Volume: 1 (uL)

Concentration Units:

Number TICs found: 10 (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 111-84-2	Nonane	21.79	2600	J
2. 6236-88-0	Cyclohexane, 1-ethyl-4-methy	22.25	1400	J
3. 2613-61-8	Heptane, 2,4,6-trimethyl-	22.44	360	J
4.	Unknown	22.79	1800	J
5. 1678-92-8	Cyclohexane, propyl-	23.10	4600	J
6.	Unknown	23.37	2000	J
7. 124-18-5	Decane	25.28	620	J
8. 2847-72-5	Decane, 4-methyl-	25.97	620	J
9. 1120-21-4	Undecane	28.30	390	J
10. 5911-04-6	Nonane, 3-methyl-	30.32	350	J
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-9@8

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O08

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0324.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 14 Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	5.8	U
75-01-4	Vinyl Chloride	5.8	U
74-83-9	Bromomethane	5.8	U
75-00-3	Chloroethane	5.8	U
75-35-4	1,1-Dichloroethene	5.8	U
67-64-1	Acetone	5.8	U
75-15-0	Carbon Disulfide	5.8	U
75-09-2	Methylene Chloride	5.8	U
156-60-5	trans-1,2-Dichloroethene	5.8	U
75-34-3	1,1-Dichloroethane	5.8	U
78-93-3	2-Butanone	5.8	U
156-59-2	cis-1,2-Dichloroethene	5.8	U
67-66-3	Chloroform	5.8	U
71-55-6	1,1,1-Trichloroethane	5.8	U
56-23-5	Carbon Tetrachloride	5.8	U
71-43-2	Benzene	5.8	U
107-06-2	1,2-Dichloroethane	5.8	U
79-01-6	Trichloroethene	5.8	U
78-87-5	1,2-Dichloropropane	5.8	U
75-27-4	Bromodichloromethane	5.8	U
108-10-1	4-Methyl-2-Pentanone	5.8	U
108-88-3	Toluene	5.8	U
10061-02-6	t-1,3-Dichloropropene	5.8	U
10061-01-5	cis-1,3-Dichloropropene	5.8	U
79-00-5	1,1,2-Trichloroethane	5.8	U
591-78-6	2-Hexanone	5.8	U
124-48-1	Dibromochloromethane	5.8	U
127-18-4	Tetrachloroethene	5.8	U
108-90-7	Chlorobenzene	5.8	U
100-41-4	Ethyl Benzene	5.8	U
136777-61-2	m/p-Xylenes	5.8	U
95-47-6	o-Xylene	5.8	U
100-42-5	Styrene	5.8	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP-9@8

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O08

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0324.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 14
Date Analyzed: 7/16/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.8	U
79-34-5	1,1,2,2-Tetrachloroethane	5.8	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
GP-9@8

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O08
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0324.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 13.7
Date Analyzed: 7/16/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: 1 (uL)
Soil Aliquot Volume: 1 (uL)

Number TICs found: 0
Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP-12@4

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O09
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0325.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 14
Date Analyzed: 7/16/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 10.0
Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	58	U
75-01-4	Vinyl Chloride	58	U
74-83-9	Bromomethane	58	U
75-00-3	Chloroethane	58	U
75-35-4	1,1-Dichloroethene	58	U
67-64-1	Acetone	180	
75-15-0	Carbon Disulfide	58	U
75-09-2	Methylene Chloride	58	U
156-60-5	trans-1,2-Dichloroethene	58	U
75-34-3	1,1-Dichloroethane	58	U
78-93-3	2-Butanone	58	U
156-59-2	cis-1,2-Dichloroethene	58	U
67-66-3	Chloroform	58	U
71-55-6	1,1,1-Trichloroethane	58	U
56-23-5	Carbon Tetrachloride	58	U
71-43-2	Benzene	58	U
107-06-2	1,2-Dichloroethane	58	U
79-01-6	Trichloroethene	58	U
78-87-5	1,2-Dichloropropane	58	U
75-27-4	Bromodichloromethane	58	U
108-10-1	4-Methyl-2-Pentanone	9.5	J
108-88-3	Toluene	58	U
10061-02-6	t-1,3-Dichloropropene	58	U
10061-01-5	cis-1,3-Dichloropropene	58	U
79-00-5	1,1,2-Trichloroethane	58	U
591-78-6	2-Hexanone	58	U
124-48-1	Dibromochloromethane	58	U
127-18-4	Tetrachloroethene	58	U
108-90-7	Chlorobenzene	58	U
100-41-4	Ethyl Benzene	58	U
136777-61-2	m/p-Xylenes	58	U
95-47-6	o-Xylene	58	U
100-42-5	Styrene	58	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-12@4

Lab Name: CHEMTECH   Contract: STEVEN J. SAINES

Project No.: N5080   Site: LPS SITE   Location: LB14992   Group: 5970-VOA

Matrix: (soil/water) SOIL   Lab Sample ID: O09

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: B0325.D

Level: (low/med) LOW   Date Received: 7/6/01

% Moisture: not dec. 14   Date Analyzed: 7/16/01

GC Column: DB624   ID: 0.53 (mm)   Dilution Factor: 10.0

Soil Extract Volume: ______ (uL)   Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	58	U
79-34-5	1,1,2,2-Tetrachloroethane	58	U

Page 2 of 2

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-12@4

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O09

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0325.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 14.4

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 10.0

Soil Extract Volume: 1 (uL)

Soil Aliquot Volume: 1 (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

Number TICs found: 9

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 95-36-3	1,2,4-Trimethylbenzene	25.89	380	J
2. 622-96-8	Benzene, 1-ethyl-4-methyl-	26.94	300	J
3.	Unknown	27.52	220	J
4. 1120-21-4	Undecane	28.29	530	J
5. 527-84-4	Benzene, 1-methyl-2-(1-methy	28.49	230	J
6. 99-87-6	Benzene, 1-methyl-4-(1-methy	28.68	220	J
7.	Unknown	29.65	210	J
8. 95-93-2	Benzene, 1,2,4,5-tetramethyl	30.81	140	J
9. 112-40-3	Dodecane	31.09	210	J
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP-14@11

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O10
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0326.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 19
Date Analyzed: 7/16/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: ______ (uL)
Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	6.2	U
75-01-4	Vinyl Chloride	6.2	U
74-83-9	Bromomethane	6.2	U
75-00-3	Chloroethane	6.2	U
75-35-4	1,1-Dichloroethene	6.2	U
67-64-1	Acetone	23	
75-15-0	Carbon Disulfide	6.2	U
75-09-2	Methylene Chloride	6.2	U
156-60-5	trans-1,2-Dichloroethene	6.2	U
75-34-3	1,1-Dichloroethane	6.2	U
78-93-3	2-Butanone	6.2	U
156-59-2	cis-1,2-Dichloroethene	6.2	U
67-66-3	Chloroform	6.2	U
71-55-6	1,1,1-Trichloroethane	6.2	U
56-23-5	Carbon Tetrachloride	6.2	U
71-43-2	Benzene	6.2	U
107-06-2	1,2-Dichloroethane	6.2	U
79-01-6	Trichloroethene	6.2	U
78-87-5	1,2-Dichloropropane	6.2	U
75-27-4	Bromodichloromethane	6.2	U
108-10-1	4-Methyl-2-Pentanone	6.2	U
108-88-3	Toluene	6.2	U
10061-02-6	t-1,3-Dichloropropene	6.2	U
10061-01-5	cis-1,3-Dichloropropene	6.2	U
79-00-5	1,1,2-Trichloroethane	6.2	U
591-78-6	2-Hexanone	6.2	U
124-48-1	Dibromochloromethane	6.2	U
127-18-4	Tetrachloroethene	6.2	U
108-90-7	Chlorobenzene	6.2	U
100-41-4	Ethyl Benzene	6.2	U
136777-61-2	m/p-Xylenes	6.2	U
95-47-6	o-Xylene	6.2	U
100-42-5	Styrene	6.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-14@11

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O10

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0326.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 19

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: ______ (uL)

Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	6.2	U
79-34-5	1,1,2,2-Tetrachloroethane	6.2	U

Page 2 of 2

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-14@11

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O10

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0326.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 18.7

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: 1 (uL)

Soil Aliquot Volume: 1 (uL)

Concentration Units:
(ug/L or ug/Kg) ug/Kg

Number TICs found: 0

CAS Number	Compound Name	RT	Est. Conc.	Q
1.				
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1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-3@3Y2

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O11

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0327.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 10 Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: ______ (uL) Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	5.6	U
75-01-4	Vinyl Chloride	5.6	U
74-83-9	Bromomethane	5.6	U
75-00-3	Chloroethane	5.6	U
75-35-4	1,1-Dichloroethene	5.6	U
67-64-1	Acetone	11	
75-15-0	Carbon Disulfide	5.6	U
75-09-2	Methylene Chloride	5.6	U
156-60-5	trans-1,2-Dichloroethene	5.6	U
75-34-3	1,1-Dichloroethane	5.6	U
78-93-3	2-Butanone	5.6	U
156-59-2	cis-1,2-Dichloroethene	5.6	U
67-66-3	Chloroform	5.6	U
71-55-6	1,1,1-Trichloroethane	5.6	U
56-23-5	Carbon Tetrachloride	5.6	U
71-43-2	Benzene	5.6	U
107-06-2	1,2-Dichloroethane	5.6	U
79-01-6	Trichloroethene	5.6	U
78-87-5	1,2-Dichloropropane	5.6	U
75-27-4	Bromodichloromethane	5.6	U
108-10-1	4-Methyl-2-Pentanone	5.6	U
108-88-3	Toluene	5.6	U
10061-02-6	t-1,3-Dichloropropene	5.6	U
10061-01-5	cis-1,3-Dichloropropene	5.6	U
79-00-5	1,1,2-Trichloroethane	5.6	U
591-78-6	2-Hexanone	5.6	U
124-48-1	Dibromochloromethane	5.6	U
127-18-4	Tetrachloroethene	5.6	U
108-90-7	Chlorobenzene	5.6	U
100-41-4	Ethyl Benzene	5.6	U
136777-61-2	m/p-Xylenes	5.6	U
95-47-6	o-Xylene	5.6	U
100-42-5	Styrene	5.6	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-3@3Y2

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O11

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0327.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 10
Date Analyzed: 7/16/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.6	U
79-34-5	1,1,2,2-Tetrachloroethane	5.6	U

Page 2 of 2

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-3@3Y2

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O11
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0327.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 10.1
Date Analyzed: 7/16/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: 1 (uL)
Soil Aliquot Volume: 1 (uL)

Concentration Units:
Number TICs found: 0
(ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-7@8

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O12

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0328.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 12

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: ______ (uL)

Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	28	U
75-01-4	Vinyl Chloride	28	U
74-83-9	Bromomethane	28	U
75-00-3	Chloroethane	28	U
75-35-4	1,1-Dichloroethene	28	U
67-64-1	Acetone	47	
75-15-0	Carbon Disulfide	28	U
75-09-2	Methylene Chloride	28	U
156-60-5	trans-1,2-Dichloroethene	28	U
75-34-3	1,1-Dichloroethane	28	U
78-93-3	2-Butanone	28	U
156-59-2	cis-1,2-Dichloroethene	28	U
67-66-3	Chloroform	28	U
71-55-6	1,1,1-Trichloroethane	160	
56-23-5	Carbon Tetrachloride	28	U
71-43-2	Benzene	28	U
107-06-2	1,2-Dichloroethane	28	U
79-01-6	Trichloroethene	7.3	J
78-87-5	1,2-Dichloropropane	28	U
75-27-4	Bromodichloromethane	28	U
108-10-1	4-Methyl-2-Pentanone	28	U
108-88-3	Toluene	28	U
10061-02-6	t-1,3-Dichloropropene	28	U
10061-01-5	cis-1,3-Dichloropropene	28	U
79-00-5	1,1,2-Trichloroethane	28	U
591-78-6	2-Hexanone	28	U
124-48-1	Dibromochloromethane	28	U
127-18-4	Tetrachloroethene	46	
108-90-7	Chlorobenzene	28	U
100-41-4	Ethyl Benzene	20	J
136777-61-2	m/p-Xylenes	230	
95-47-6	o-Xylene	420	
100-42-5	Styrene	28	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-7@8

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O12

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0328.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 12

Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	28	U
79-34-5	1,1,2,2-Tetrachloroethane	28	U

1E

VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-7@8

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O12

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0328.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 12.1 Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 5.0

Soil Extract Volume: 1 (uL) Soil Aliquot Volume: 1 (uL)

Number TICs found: 9

Concentration Units:
(ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 111-84-2	Nonane	21.75	630	J
2. 638-04-0	Cyclohexane, 1,3-dimethyl-,	22.25	370	J
3. 6221-55-2	Bicyclo[3.2.1]octane	22.75	490	J
4. 823-76-7	Ethanone, 1-cyclohexyl-	23.06	1200	J
5. 124-18-5	Decane	25.24	290	J
6. 2847-72-5	Decane, 4-methyl-	25.93	430	J
7. 6975-98-0	Decane, 2-methyl-	27.21	550	J
8. 13151-34-3	Decane, 3-methyl-	27.45	300	J
9. 1120-21-4	Undecane	28.30	600	J
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-10@8

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O15

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0332.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 11

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: ______ (uL)

Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	5.6	U
75-01-4	Vinyl Chloride	5.6	U
74-83-9	Bromomethane	5.6	U
75-00-3	Chloroethane	5.6	U
75-35-4	1,1-Dichloroethene	5.6	U
67-64-1	Acetone	5.6	U
75-15-0	Carbon Disulfide	5.6	U
75-09-2	Methylene Chloride	5.6	U
156-60-5	trans-1,2-Dichloroethene	5.6	U
75-34-3	1,1-Dichloroethane	5.6	U
78-93-3	2-Butanone	5.6	U
156-59-2	cis-1,2-Dichloroethene	5.6	U
67-66-3	Chloroform	5.6	U
71-55-6	1,1,1-Trichloroethane	5.6	U
56-23-5	Carbon Tetrachloride	5.6	U
71-43-2	Benzene	5.6	U
107-06-2	1,2-Dichloroethane	5.6	U
79-01-6	Trichloroethene	5.6	U
78-87-5	1,2-Dichloropropane	5.6	U
75-27-4	Bromodichloromethane	5.6	U
108-10-1	4-Methyl-2-Pentanone	5.6	U
108-88-3	Toluene	5.6	U
10061-02-6	t-1,3-Dichloropropene	5.6	U
10061-01-5	cis-1,3-Dichloropropene	5.6	U
79-00-5	1,1,2-Trichloroethane	5.6	U
591-78-6	2-Hexanone	5.6	U
124-48-1	Dibromochloromethane	5.6	U
127-18-4	Tetrachloroethene	5.6	U
108-90-7	Chlorobenzene	5.6	U
100-41-4	Ethyl Benzene	5.6	U
136777-61-2	m/p-Xylenes	5.6	U
95-47-6	o-Xylene	5.6	U
100-42-5	Styrene	5.6	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-10@8

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O15

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0332.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 11
Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: ______ (uL)
Soil Aliquot Volume: ______ (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.6	U
79-34-5	1,1,2,2-Tetrachloroethane	5.6	U

Page 2 of 2

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-10@8

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O15

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0332.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 11.2

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: 1 (uL)

Soil Aliquot Volume: 1 (uL)

Number TICs found: 0

Concentration Units:
(ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
1.				
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VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-12@8

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O16

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0308.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 11
Date Analyzed: 7/15/01

GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	5.6	U
75-01-4	Vinyl Chloride	5.6	U
74-83-9	Bromomethane	5.6	U
75-00-3	Chloroethane	5.6	U
75-35-4	1,1-Dichloroethene	5.6	U
67-64-1	Acetone	7.7	
75-15-0	Carbon Disulfide	5.6	U
75-09-2	Methylene Chloride	5.6	U
156-60-5	trans-1,2-Dichloroethene	5.6	U
75-34-3	1,1-Dichloroethane	5.6	U
78-93-3	2-Butanone	5.6	U
156-59-2	cis-1,2-Dichloroethene	5.6	U
67-66-3	Chloroform	5.6	U
71-55-6	1,1,1-Trichloroethane	5.6	U
56-23-5	Carbon Tetrachloride	5.6	U
71-43-2	Benzene	5.6	U
107-06-2	1,2-Dichloroethane	5.6	U
79-01-6	Trichloroethene	5.6	U
78-87-5	1,2-Dichloropropane	5.6	U
75-27-4	Bromodichloromethane	5.6	U
108-10-1	4-Methyl-2-Pentanone	5.6	U
108-88-3	Toluene	5.6	U
10061-02-6	t-1,3-Dichloropropene	5.6	U
10061-01-5	cis-1,3-Dichloropropene	5.6	U
79-00-5	1,1,2-Trichloroethane	5.6	U
591-78-6	2-Hexanone	5.6	U
124-48-1	Dibromochloromethane	5.6	U
127-18-4	Tetrachloroethene	5.6	U
108-90-7	Chlorobenzene	5.6	U
100-41-4	Ethyl Benzene	5.6	U
136777-61-2	m/p-Xylenes	5.6	U
95-47-6	o-Xylene	5.6	U
100-42-5	Styrene	5.6	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-12@8

Lab Name: CHEMTECH   Contract: STEVEN J. SAINES

Project No.: N5080   Site: LPS SITE   Location: LB14992   Group: 5970-VOA

Matrix: (soil/water) SOIL   Lab Sample ID: O16

Sample wt/vol: 5.0 (g/mL) G   Lab File ID: B0308.D

Level: (low/med) LOW   Date Received: 7/6/01

% Moisture: not dec. 11   Date Analyzed: 7/15/01

GC Column: DB624   ID: 0.53 (mm)   Dilution Factor: 1.0

Soil Extract Volume: ______ (uL)   Soil Aliquot Volume: ______ (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	ug/Kg	Q
75-25-2	Bromoform	5.6	U
79-34-5	1,1,2,2-Tetrachloroethane	5.6	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-12@8

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O16
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0308.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 11.2
Date Analyzed: 7/15/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: 1 (uL)
Soil Aliquot Volume: 1 (uL)

Concentration Units:
Number TICs found: 0
(ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP 4@5

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O17
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0338.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 11
Date Analyzed: 7/17/01
GC Column: DB624
ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	5.6	U
75-01-4	Vinyl Chloride	5.6	U
74-83-9	Bromomethane	5.6	U
75-00-3	Chloroethane	5.6	U
75-35-4	1,1-Dichloroethene	5.6	U
67-64-1	Acetone	15	B
75-15-0	Carbon Disulfide	5.6	U
75-09-2	Methylene Chloride	1.6	J
156-60-5	trans-1,2-Dichloroethene	5.6	U
75-34-3	1,1-Dichloroethane	5.6	U
78-93-3	2-Butanone	5.6	U
156-59-2	cis-1,2-Dichloroethene	2	J
67-66-3	Chloroform	5.6	U
71-55-6	1,1,1-Trichloroethane	1.1	J
56-23-5	Carbon Tetrachloride	5.6	U
71-43-2	Benzene	5.6	U
107-06-2	1,2-Dichloroethane	5.6	U
79-01-6	Trichloroethene	26	
78-87-5	1,2-Dichloropropane	5.6	U
75-27-4	Bromodichloromethane	5.6	U
108-10-1	4-Methyl-2-Pentanone	5.6	U
108-88-3	Toluene	7.7	
10061-02-6	t-1,3-Dichloropropene	5.6	U
10061-01-5	cis-1,3-Dichloropropene	5.6	U
79-00-5	1,1,2-Trichloroethane	5.6	U
591-78-6	2-Hexanone	5.6	U
124-48-1	Dibromochloromethane	5.6	U
127-18-4	Tetrachloroethene	0.9	J
108-90-7	Chlorobenzene	5.6	U
100-41-4	Ethyl Benzene	5.6	U
136777-61-2	m/p-Xylenes	5.6	U
95-47-6	o-Xylene	5.6	U
100-42-5	Styrene	5.6	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP 4@5

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O17

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0338.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 11
Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.6	U
79-34-5	1,1,2,2-Tetrachloroethane	5.6	U

Page 2 of 2

FORM I VOA

3/90

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
GP 4@5

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O17

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0338.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 11 Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: 1 (uL) Soil Aliquot Volume: 1 (uL)

Concentration Units:
Number TICs found: 0 (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
1.				
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP 7@13

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O18

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0339.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 7 Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	5.4	U
75-01-4	Vinyl Chloride	5.4	U
74-83-9	Bromomethane	5.4	U
75-00-3	Chloroethane	5.4	U
75-35-4	1,1-Dichloroethene	5.4	U
67-64-1	Acetone	19	B
75-15-0	Carbon Disulfide	5.4	U
75-09-2	Methylene Chloride	5.4	U
156-60-5	trans-1,2-Dichloroethene	5.4	U
75-34-3	1,1-Dichloroethane	5.4	U
78-93-3	2-Butanone	5.4	U
156-59-2	cis-1,2-Dichloroethene	5.4	U
67-66-3	Chloroform	5.4	U
71-55-6	1,1,1-Trichloroethane	1.2	J
56-23-5	Carbon Tetrachloride	5.4	U
71-43-2	Benzene	5.4	U
107-06-2	1,2-Dichloroethane	5.4	U
79-01-6	Trichloroethene	5.4	U
78-87-5	1,2-Dichloropropane	5.4	U
75-27-4	Bromodichloromethane	5.4	U
108-10-1	4-Methyl-2-Pentanone	5.4	U
108-88-3	Toluene	7.5	
10061-02-6	t-1,3-Dichloropropene	5.4	U
10061-01-5	cis-1,3-Dichloropropene	5.4	U
79-00-5	1,1,2-Trichloroethane	5.4	U
591-78-6	2-Hexanone	5.4	U
124-48-1	Dibromochloromethane	5.4	U
127-18-4	Tetrachloroethene	7.2	
108-90-7	Chlorobenzene	5.4	U
100-41-4	Ethyl Benzene	5.4	U
136777-61-2	m/p-Xylenes	1.3	J
95-47-6	o-Xylene	2.8	J
100-42-5	Styrene	5.4	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.
GP 7@13

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES

Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA

Matrix: (soil/water) SOIL
Lab Sample ID: O18

Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0339.D

Level: (low/med) LOW
Date Received: 7/6/01

% Moisture: not dec. 7
Date Analyzed: 7/17/01

GC Column: DB624 ID: 0.53 (mm)
Dilution Factor: 1.0

Soil Extract Volume: (uL)
Soil Aliquot Volume: (uL)

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
75-25-2	Bromoform	5.4	U
79-34-5	1,1,2,2-Tetrachloroethane	5.4	U

Page 2 of 2

FORM I VOA

3/90

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.
GP 7@13

Lab Name: CHEMTECH
Contract: STEVEN J. SAINES
Project No.: N5080
Site: LPS SITE
Location: LB14992
Group: 5970-VOA
Matrix: (soil/water) SOIL
Lab Sample ID: O18
Sample wt/vol: 5.0 (g/mL) G
Lab File ID: B0339.D
Level: (low/med) LOW
Date Received: 7/6/01
% Moisture: not dec. 7.2
Date Analyzed: 7/17/01
GC Column: DB624 ID: 0.53 (mm)
Dilution Factor: 1.0
Soil Extract Volume: 1 (uL)
Soil Aliquot Volume: 1 (uL)

Number TICs found: 0
Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
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1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP 11@3Y2

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O19

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0340.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 11

Date Analyzed: 7/17/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	Concentration Units: (ug/L or ug/Kg) ug/Kg	Q
74-87-3	Chloromethane	28	U
75-01-4	Vinyl Chloride	28	U
74-83-9	Bromomethane	28	U
75-00-3	Chloroethane	28	U
75-35-4	1,1-Dichloroethene	28	U
67-64-1	Acetone	98	B
75-15-0	Carbon Disulfide	28	U
75-09-2	Methylene Chloride	5.7	J
156-60-5	trans-1,2-Dichloroethene	28	U
75-34-3	1,1-Dichloroethane	28	U
78-93-3	2-Butanone	28	U
156-59-2	cis-1,2-Dichloroethene	28	U
67-66-3	Chloroform	28	U
71-55-6	1,1,1-Trichloroethane	28	U
56-23-5	Carbon Tetrachloride	28	U
71-43-2	Benzene	28	U
107-06-2	1,2-Dichloroethane	28	U
79-01-6	Trichloroethene	28	U
78-87-5	1,2-Dichloropropane	28	U
75-27-4	Bromodichloromethane	28	U
108-10-1	4-Methyl-2-Pentanone	28	U
108-88-3	Toluene	28	U
10061-02-6	t-1,3-Dichloropropene	28	U
10061-01-5	cis-1,3-Dichloropropene	28	U
79-00-5	1,1,2-Trichloroethane	28	U
591-78-6	2-Hexanone	28	U
124-48-1	Dibromochloromethane	28	U
127-18-4	Tetrachloroethene	28	U
108-90-7	Chlorobenzene	28	U
100-41-4	Ethyl Benzene	28	U
136777-61-2	m/p-Xylenes	28	U
95-47-6	o-Xylene	28	U
100-42-5	Styrene	28	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP 11@3Y2

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O19

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0340.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 11

Date Analyzed: 7/17/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	ug/Kg	Q
75-25-2	Bromoform	28	U
79-34-5	1,1,2,2-Tetrachloroethane	28	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP 11@3Y2

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O19

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0340.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 10.9

Date Analyzed: 7/17/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 5.0

Soil Extract Volume: 1 (uL)

Soil Aliquot Volume: 1 (uL)

Number TICs found: 10

Concentration Units:
(ug/L or ug/Kg) ug/Kg

CAS Number	Compound Name	RT	Est. Conc.	Q
1. 3728-54-9	Cyclohexane, 1-ethyl-2-methy	21.47	440	J
2. 4926-78-7	Cyclohexane, 1-ethyl-4-methy	22.25	670	J
3. 1192-37-6	Cyclohexane, methylene-	22.79	490	J
4.	Unknown	23.06	890	J
5. 1331-43-7	Cyclohexane, diethyl-	23.37	480	J
6.	Unknown	24.69	340	J
7. 4291-80-9	Cyclohexane, 1-methyl-3-prop	24.92	470	J
8. 2847-72-5	Decane, 4-methyl-	25.97	440	J
9.	Unknown	27.02	510	J
10. 1120-21-4	Undecane	28.30	340	J
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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

SAMPLE NO.

GP-13@6Y2

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O20

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0323.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 10

Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: (uL)

Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	ug/Kg	Q
74-87-3	Chloromethane	5.5	U
75-01-4	Vinyl Chloride	5.5	U
74-83-9	Bromomethane	5.5	U
75-00-3	Chloroethane	5.5	U
75-35-4	1,1-Dichloroethene	5.5	U
67-64-1	Acetone	5.5	U
75-15-0	Carbon Disulfide	5.5	U
75-09-2	Methylene Chloride	5.5	U
156-60-5	trans-1,2-Dichloroethene	5.5	U
75-34-3	1,1-Dichloroethane	5.5	U
78-93-3	2-Butanone	5.5	U
156-59-2	cis-1,2-Dichloroethene	5.5	U
67-66-3	Chloroform	5.5	U
71-55-6	1,1,1-Trichloroethane	5.5	U
56-23-5	Carbon Tetrachloride	5.5	U
71-43-2	Benzene	5.5	U
107-06-2	1,2-Dichloroethane	5.5	U
79-01-6	Trichloroethene	5.5	U
78-87-5	1,2-Dichloropropane	5.5	U
75-27-4	Bromodichloromethane	5.5	U
108-10-1	4-Methyl-2-Pentanone	5.5	U
108-88-3	Toluene	5.5	U
10061-02-6	t-1,3-Dichloropropene	5.5	U
10061-01-5	cis-1,3-Dichloropropene	5.5	U
79-00-5	1,1,2-Trichloroethane	5.5	U
591-78-6	2-Hexanone	5.5	U
124-48-1	Dibromochloromethane	5.5	U
127-18-4	Tetrachloroethene	5.5	U
108-90-7	Chlorobenzene	5.5	U
100-41-4	Ethyl Benzene	5.5	U
136777-61-2	m/p-Xylenes	5.5	U
95-47-6	o-Xylene	5.5	U
100-42-5	Styrene	5.5	U

SAMPLE NO.

GP-13@6Y2

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

Lab Name: CHEMTECH Contract: STEVEN J. SAINES

Project No.: N5080 Site: LPS SITE Location: LB14992 Group: 5970-VOA

Matrix: (soil/water) SOIL Lab Sample ID: O20

Sample wt/vol: 5.0 (g/mL) G Lab File ID: B0323.D

Level: (low/med) LOW Date Received: 7/6/01

% Moisture: not dec. 10 Date Analyzed: 7/16/01

GC Column: DB624 ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

Concentration Units: (ug/L or ug/Kg) ug/Kg

CAS No.	Compound	ug/Kg	Q
75-25-2	Bromoform	5.5	U
79-34-5	1,1,2,2-Tetrachloroethane	5.5	U

1E
VOLATILE ORGANICS ANALYSIS DATA SHEET
TENTATIVELY IDENTIFIED COMPOUNDS

SAMPLE NO.

GP-13@6Y2

Lab Name: CHEMTECH

Contract: STEVEN J. SAINES

Project No.: N5080

Site: LPS SITE

Location: LB14992

Group: 5970-VOA

Matrix: (soil/water) SOIL

Lab Sample ID: O20

Sample wt/vol: 5.0 (g/mL) G

Lab File ID: B0323.D

Level: (low/med) LOW

Date Received: 7/6/01

% Moisture: not dec. 9.9

Date Analyzed: 7/16/01

GC Column: DB624

ID: 0.53 (mm)

Dilution Factor: 1.0

Soil Extract Volume: 1 (uL)

Soil Aliquot Volume: 1 (uL)

Concentration Units:

(ug/L or ug/Kg) ug/Kg

Number TICs found: 0

CAS Number	Compound Name	RT	Est. Conc.	Q
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Appendix M

Private Water Supply Location Map

Map Key	Street Address
1	391–407 Highland Ave. Ext.
2	3 Maples Road
3	11 Maples Road
4	24 Maples Road
5	31 Maples Road
6	35 Maples Road
7	45 Maples Road
8	47 Maples Road
9	66 Maples Road
10	94 Maples Road
11	105 Maples Road
12	220 Maples Road
13	1 Bisch Road
14	5 Bisch Road
15	30 Bisch Road
16	43 Bisch Road
17	51 Bisch Road
18	69 Bisch Road
19	79 Bisch Road
20	33 O'Brian Road
21	80 O'Brian Road
22	63 Midland Lake Road
23	61 Midland Lake Road
24	80 Midland Lake Road
25	70 Midland Lake Road
26	60 Midland Lake Road
27	630 Cottage Street
28	?# Cottage Street
29	187 Mud Mills Road
30	183 Mud Mills Road
31	167 Mud Mills Road
32	165 Mud Mills Road
33	159 Mud Mills Road
34	?# Mud Mills Road
35	200 Mud Mills Road
36	119 Mud Mills Road
37	103 Mud Mills Road
38	102 Mud Mills Road
39	100 Mud Mills Road
40	80 Mud Mills Road
41	44 Mud Mills Road
42	26 Mud Mills Road
43	24 Mud Mills Road
44	20–22 Mud Mills Road

SURVEY NOTES:

Water Supply Survey Conducted on July 2, 2002 by S. J. Saines.
Wells identified by visual inspection and/or interview of residents.
Red points on the map are not intended to imply the specific location of wells, only the presence of a well on the property.
All other properties on this map receive water service from either the City of Middletown or the Town of Wallkill.
Some properties in the Washington Heights section of the Town of Wallkill still have wells on their property, which dates to a period prior to the discovery of ground water contamination at the General Switch Site. These residents are connected to Town of Wallkill water lines, but retain the wells for various reasons (i.e. watering plants, avoiding the expense of well decomissioning).

Legend of Major Symbols	
🟦	Parcels
∼	Unpaved Roads
⌒	Surface Water Bodies
╱	Paved Streets
▱	Buildings

Northern Middletown Industrial Park
Private Water Supply Locations

LOCATION: City of Middletown & Town of Wallkill
Orange County, New York State

DATA SOURCE: Orange County Water Authority
MAP FOR: George Saines
SCALE: 1" = 400'
COMPILED BY: S. J. Saines

Steven J. Saines
257 Midland Place
Logan, Ohio 43138–1234
740–385–7810

DATE: July, 2002
DIGITAL DATA DATE: 1995
REV. 2
SHEET: 1 of 1