HEAVENLY WATERS RUN PRELIMINARY SITE INVESTIGATION REPORT

U.S. ROUTE 1 BEL AIR BYPASS
HEAVENLY WATERS RUN STUDY AREA
Part A
HARFORD COUNTY

CONTRACT NO. BCS 94-01A
PROJECT NO. HA 888-B12

Submitted
December, 1996

Prepared for:

Maryland
State Highway Administration

Prepared by:

Gannett Fleming
ENGINEERS AND PLANNERS

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NATURAL ENVIRONMENTAL INVENTORY AND ANALYSIS SERVICES - STATEWIDE

CONTRACT NO. BCS 94-01A
WORK ASSIGNMENT NO. 5: PART A
PROJECT NO. HA 888-B12

US ROUTE 1: BEL AIR BYPASS
HARFORD COUNTY

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HEAVENLY WATERS RUN PRELIMINARY SITE INVESTIGATION

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HEAVENLY WATERS RUN PRELIMINARY SITE INVESTIGATION

PROJECT DESCRIPTION

The Maryland State Highway Administration (MD SHA) is evaluating the Heavenly Waters Run study area for road access and widening modifications to U.S. Route 1 Bypass (Bel Air Bypass) in the vicinity of the town of Bel Air, Harford County, Maryland (see Figure 1, Project Location Map). A component of the highway access and widening modifications involves the realignment of Heavenly Waters Run stream.

As part of the Section 404 CWA permit review, the U.S. Army Corps of Engineers (USACOE) performed aquatic macroinvertebrate population surveys on May 24, 1996 and June 13, 1996 within Heavenly Waters Run above and within the zone of influence of Tollgate Road Sanitary Landfill (Tollgate Landfill). As a result of these investigations the USACOE determined that populations of macroinvertebrate species are below expected numbers within the portion of Heavenly Waters Run within the vicinity of Tollgate Landfill. The USACOE has stated "that there is reason to believe that there may be contaminants bound within the substrate in the lower reaches of Heavenly Waters Run" (see Appendix A: USACOE correspondence). Therefore, the USACOE is requiring "chemical substrate sampling in the areas of Heavenly Waters Run that will be affected by the

As the first of a two-part task assignment, Gannett Fleming was contracted by the Maryland State Highway Administration (MDSHA) to perform a Preliminary Site Investigation (PSI) of Heavenly Waters Run, adjacent to the Tollgate Landfill. The objective of the PSI is to locate and analyze existing information on this waterway and review the any chemical sampling analyses results performed for samples taken within Heavenly Waters Run.

The Tollgate Landfill is within the watershed of Heavenly Waters Run. Tollgate Landfill is currently listed on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) National Priorities List as a Superfund site. In pursuance of the PSI the Maryland Department of the Environment and the Harford County Department of Public Works were contacted to obtain existing information (See Appendix B: State and Local

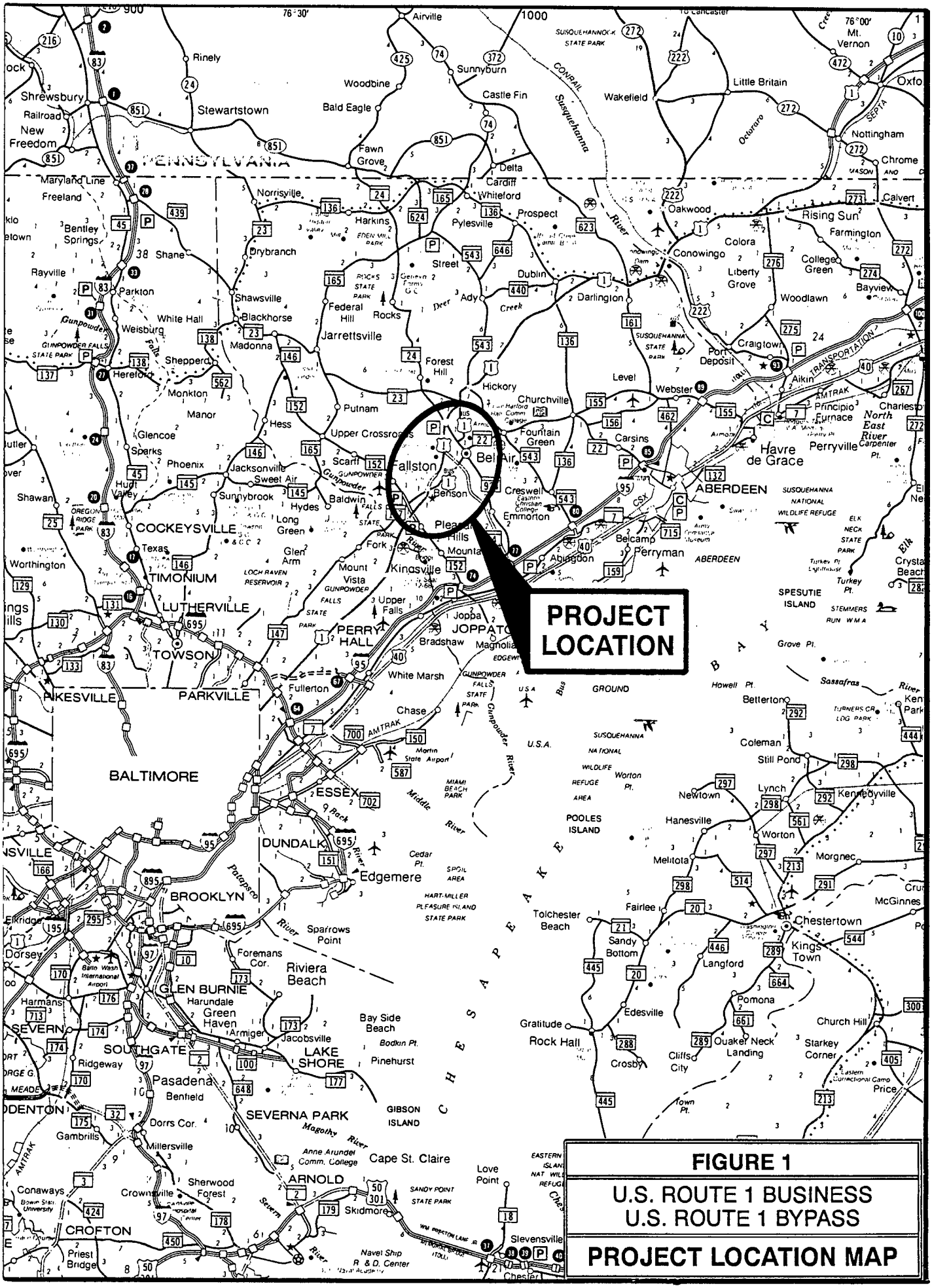

FIGURE 1

U.S. ROUTE 1 BUSINESS
U.S. ROUTE 1 BYPASS

PROJECT LOCATION MAP

Correspondence). This report summarizes the findings of the PSI.

STUDY AREA DESCRIPTION

The Heavenly Water Run study area is located in Harford County, Maryland (Figure 2, Study Area Map). The study area extends in a northerly alignment, encompassing the Heavenly Waters Run stream complex between Tollgate Road, and north of the US 1/MD 24 interchange. The land use in the study area consists of residential, highway right-of-way, roadway, disturbed land (cleared and graded), and forest. A portion of the nearby Tollgate Landfill drains eastward into Heavenly Waters Run. Figure 3 is the USGS topographic map for the study area.

The area is within the Eastern Piedmont Plateau of the Atlantic Coastal Plain Physiographic province within the Bush River drainage sub-basin. The soils within the study area are shown in Figure 4, Soils Map. The majority of the soils within the Heavenly Waters Run study area are classified as silty loam.

Waterways located in the study area include a number of unnamed intermittent streams. These streams all are within the Heavenly Waters Run watershed. Heavenly Waters Run drains into Winters Run, Winters Run drains into the Bush River and then into the Chesapeake Bay. Downstream of the study area, several points along Winters Run serve as surface water intakes for public potable water systems.

METHODOLOGY

Data collection for the Heavenly Waters Run study area PSI and Tollgate Landfill background study required contacting State and local agencies to obtain available files and record data. The Maryland Department of the Environment (MDE) and the Harford County Department of Public Works, Division of Environmental Affairs (Harford County) were contacted to obtain any pertinent information within their files (see Appendix B: State and Local Correspondence). On December 9, 1996 Harford County was visited and a thorough search of the locally available files was conducted. On December 10, 1996 MDE was visited and a thorough search of the available state files was conducted. The findings of those investigations are discussed in the Results section of this report.

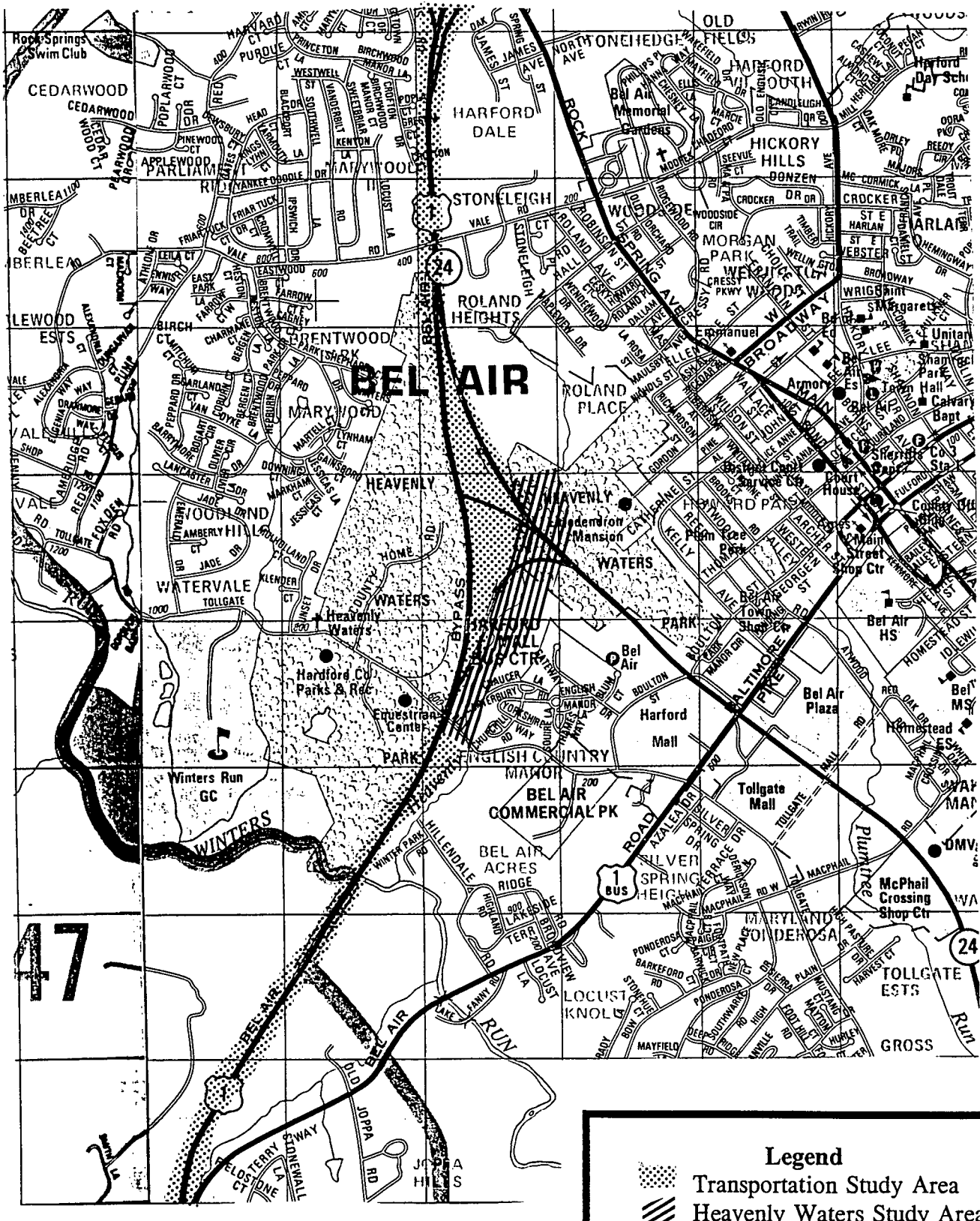

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Figure 2: Study Area Map
Heavenly Waters Run Preliminary Site Investigation
Scale 1:24000
Source: Alexandria Drafting Company, Harford County

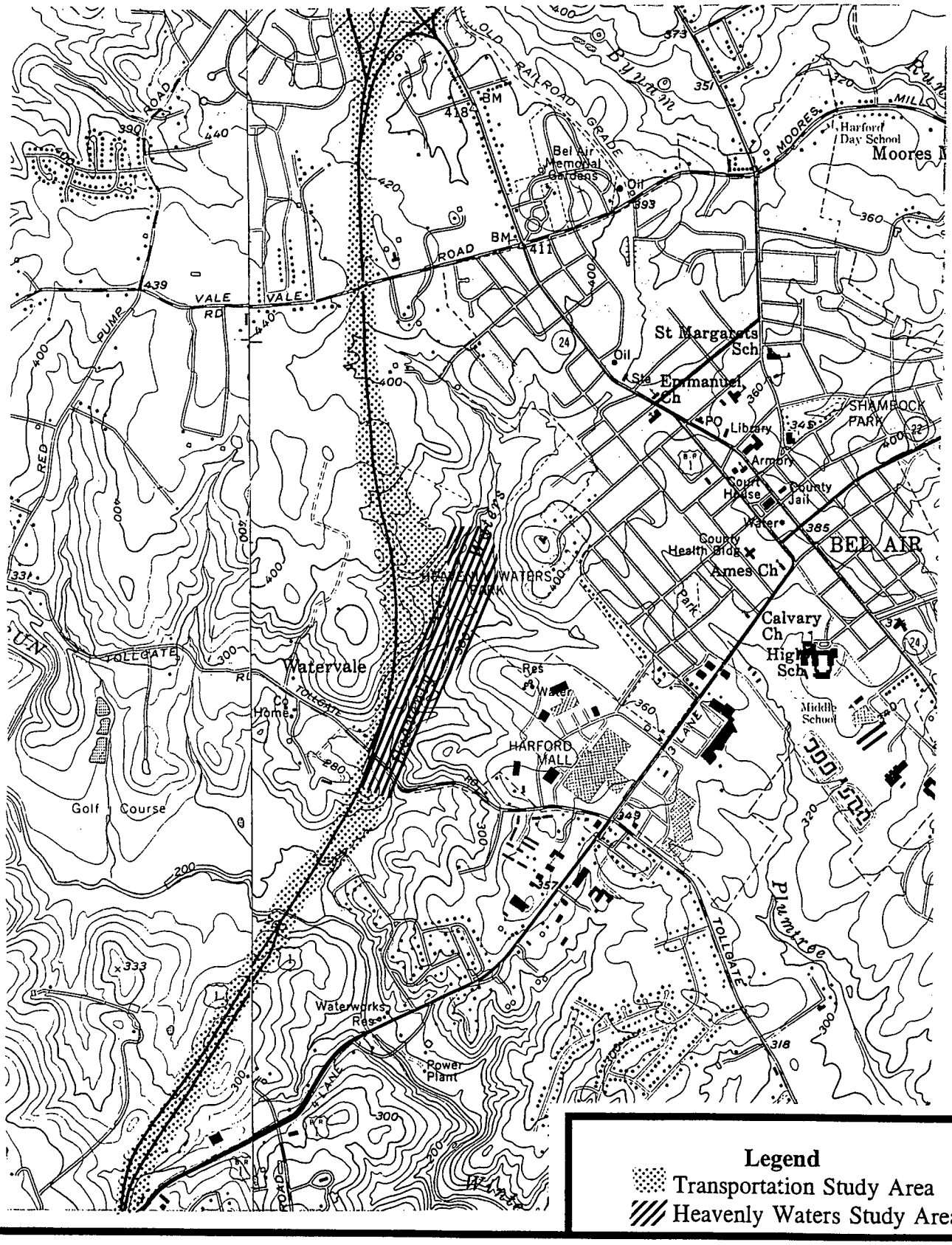

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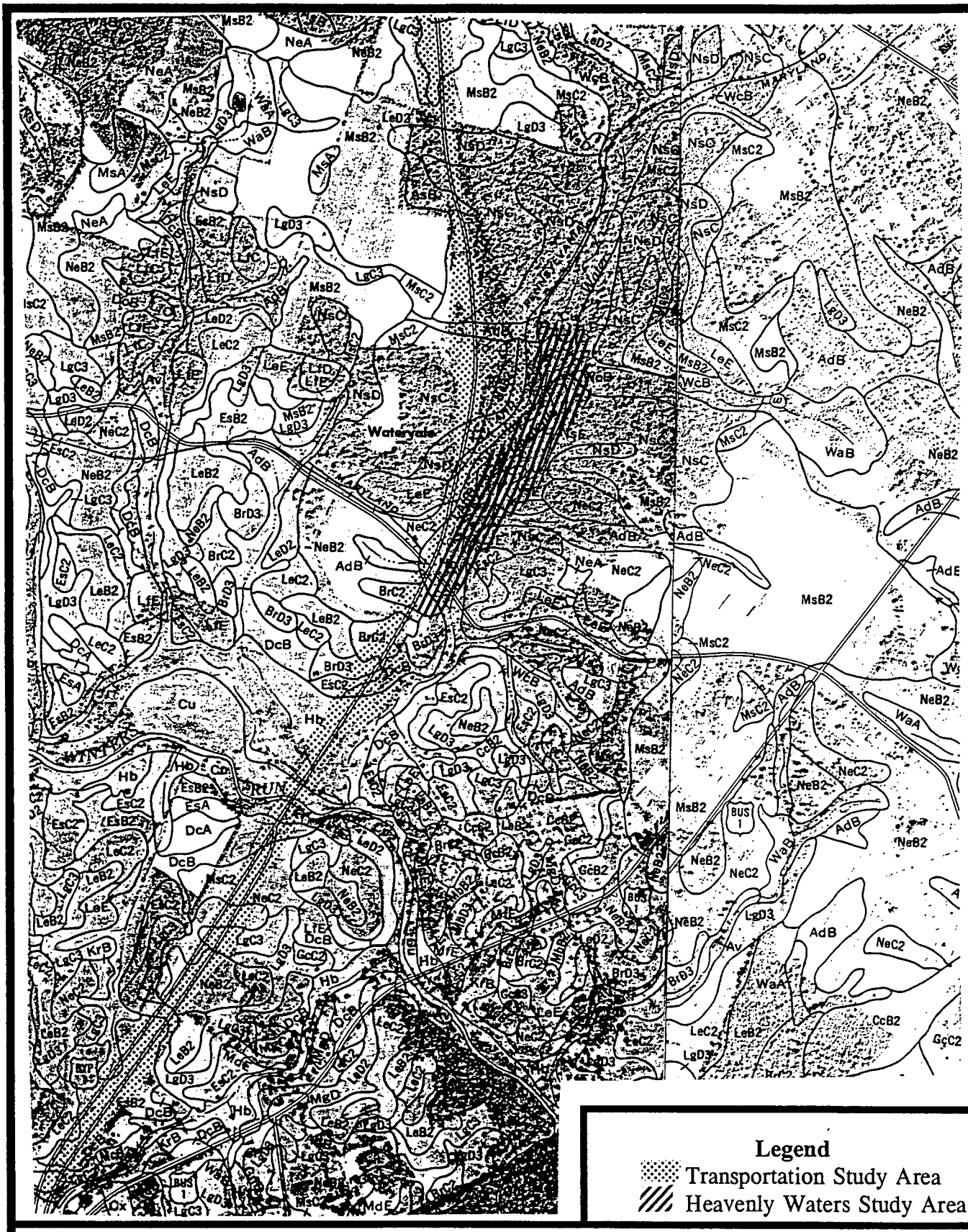
Figure 3: USGS Topographic Map
Heavenly Waters Run Preliminary Site Investigation
Scale 1:24000
Source: USGS, 7.5 Minute Quadrangle, Bel Air/Jarrettsville



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Engineers and Planners

Figure 4: Soil Map
Heavenly Waters Run Preliminary Site Investigation
Scale 1:18540
Source: Harford County Soil Survey Map, USDA

Wetlands within the study area were previously delineated by Gannett Fleming and confirmed in the field by the USACOE in 1996. Both palustrine and riverine wetlands are located within the Heavenly Waters Run study area. Wetland delineation surveys were conducted in accordance with the 1987 Army Corps of Engineers Wetland Delineation Manual. Wetlands were classified in accordance with the United States Fish and Wildlife Service's (USFWS) "Classification of Wetlands and Deepwater Habitats of the United States". Wetlands were assigned a qualitative value according to the functions performed, based on field observations. The 1996 wetland delineation field work employed Global Positioning System (GPS) survey techniques to map the wetlands.

RESULTS

The most significant finding within the Harford County database is the recently released April 1996 Groundwater Monitoring Report: Tollgate Landfill, released November 21, 1996. Appendix C: Harford County Monitoring Report contains sections of this report that are pertinent to surface waters within Heavenly Waters Run. This report presents the results of a water sampling event conducted by Harford County in the vicinity of Tollgate Landfill in April, 1996. This monitoring event was the first semiannual sampling episode conducted as part of a long-term environmental monitoring program. The report contains thorough chemical sample analyses for a suite of analytical parameters of known and potential groundwater and surface water contaminants at the site. The April, 1996 sampling event included two surface water locations within Heavenly Waters Run (SW-3 and SW-4) within the Tollgate Landfill zone of influence. Surface water samples were collected at two points within the central portion of the stream. A sample was collected for field analysis of pH, temperature, and specific conductance.

Sample SW-3 was taken in the lower portion of the Heavenly Waters Run study area, located approximately 40 feet upstream of Tollgate Road. Sample SW-4 was taken in the mid-portion of the Heavenly Waters Run study area, located approximately 1,500 feet upstream of Tollgate Road. On April 11, 1996 the water temperature within Heavenly Waters Run was approximately 10.5 degrees celsius, the pH of the water was approximately 7.75.

Sampling Summary Report

Surface water samples SW-3 and SW-4 were analyzed to determine the existing concentrations of a suite of specific contaminants within the aqueous media. Contaminant concentrations were compared against the Maximum Contaminant Level (MCL) for each analyte to determine the potential threat posed by each contaminant concentration. The MCL is the maximum permissible concentration level of a contaminant in drinking water. Surface water samples SW-3 and SW-4 were analyzed to determine the existing concentrations of the following inorganics: arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel, potassium, selenium, silver, sodium, and zinc. The following inorganics occurred at concentrations below detection limits: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, and silver. Table 1 reflects the detectable inorganics, the observed concentration, and the Maximum Contaminant Level (MCL):

TABLE 1
Heavenly Waters Run
Surface Water Inorganics Sample Analysis Results

Inorganics	SW-4 (mg/L)	SW-3 (mg/L)	MCL (mg/L)
Barium*	0.01	0.012	2
Calcium*	16.9	18.7	N/A
Iron*	0.157	0.177	N/A
Magnesium*	8.81	9.23	N/A
Potassium*	0.8	1.38	N/A
Sodium*	18.7	21.9	N/A
Zinc	0.011	0.030	N/A

N/A indicates that there is no MCL concentration for that contaminant.
* indicates compounds not included in the U.S. Environmental Protection Agency (EPA) list of 126 priority pollutants

The only inorganic compound that appears on the EPA list of priority pollutants at a detectable concentration is zinc. There is no MCL concentration for zinc. Ecological screening values (ESVs) are based upon contaminant levels associated with a low probability of unacceptable risks to ecological receptors. ESVs are based on conservative endpoints and sensitive ecological effects data. ESVs represent a preliminary screening of site contaminant levels, and should not

be used as remediation levels. Freshwater surface water screening values have been developed by the EPA, were obtained from Water Quality Criteria documents, and represent the chronic ambient water quality criterion (AWQC) values for the protection of aquatic life. The AWQC surface water values are intended to protect 95% of the species, 95% of the time. Table 2, below, reiterates the detected concentrations of zinc is surface water samples SW-4 and SW-3 from the Harford County Monitoring Report and states the EPA Region 3 Freshwater AWQC values for zinc at the acute and chronic screening levels:

TABLE 2
Heavenly Waters Run
Surface Water AWQC Values for Zinc

Compound	SW-4 (mg/L)	SW-3 (mg/L)	Acute Screening Value (mg/L)	Chronic Screening Value (mg/L)
Zinc	0.011	0.030	0.130	0.120

Surface water samples SW-3 and SW-4 were also analyzed to determine the existing concentrations of the following organics: acetone, benzene, bromochloride, 2-butanone (MEK), carbon tetrachloride, chloroethane, chloroform, chloromethane, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,2-dichloroethene, 1,2-dichloropropane, ethylbenzene, methylene chloride, 4-methyl-2-pentanone (MBK), styrene, tetrachloroethene, toluene, 1,1,2-trichloroethane, 1,1,1-trichloroethane, trichloroethene, trichloroflouromethane, vinyl chloride, and total xylenes. Within the surface waters, no organic contaminants occur within detectable concentration limits.

CONCLUSIONS

Concentrations of zinc within Heavenly Waters Run are below the AWQC values for acute and chronic exposure. In general, macroinvertebrates are more tolerant of elevated inorganic concentrations than other species classes. Therefore, it can be concluded that although zinc contamination may play a marginal role in the observed depressed macroinvertebrate populations within Heavenly Waters Run, it is likely that one or more other factors are influencing reduced macroinvertebrate population levels.

The most significant gap in the sample data is the absence of semi-volatile and pesticide analysis of the surface water samples. This absence is understandable from the standpoint of the landfill because pesticides would absorb into the on-site soils and would not likely migrate off-site through groundwater and surface water. Therefore, there is no need for the landfill to address pesticide contamination of off-site surface waters. However, the recently-available sample data indicates that there are no significant concentrations of inorganic or volatile organic contaminants within the surface waters of Heavenly Waters Run. Although semi-volatile organic compounds were not analyzed, they usually do not significantly impact macroinvertebrate species. Pesticide exposure will elicit a decreased macroinvertebrate population effect. Pesticide contamination of the sediments (or surface water) could be one possible factor affecting depressed macroinvertebrate populations.

The August 28, 1996 correspondence from the USACOE recommends that samples be obtained from four sites within the Heavenly Waters Run study area. The four USACOE recommended sample sites are listed below:

- Site A: Between wetlands 7 and 10 within the existing channel
- Site B: Proposed stream relocation area
- Site C: Wetland 13, in vicinity of railroad berm
- Site D: Heavenly Waters upstream, above the Tollgate Landfill zone of influence

The USACOE also recommends that water and substrate samples should be taken at each site, and that at each site multiple substrate samples should be gathered from three areas (2 from opposite shallow sides, and one from deep center). Sediment samples should be obtained to a depth of six inches. The USACOE further recommends that all samples be analyzed for the metals and organic contaminants listed on the United States Environmental Protection Agency Priority Pollutants list.

The existing sample data clearly demonstrates that volatile organic compounds (VOCs) and inorganic contaminants are not present within the surface water at significant concentrations. Because there is an absence of concentrations in the surface water it is unlikely that these contaminants are present within the sediments at concentrations sufficient to degrade the

macroinvertebrate populations. As the objective of this sampling event is to determine whether a chemical contaminant is reducing macroinvertebrate populations within Heavenly Waters Run, multiple sediment stations within each sample point are unnecessary. Also, the small size of Heavenly Waters Run precludes any value to multiple sediment stations within each sample.

The USACOE comments were formulated before the recently released Harford County sampling report data was available. Based upon the findings and analysis of the Harford County data we recommend that MD SHA obtain USACOE concurrence to pursue a reduced sampling event within Heavenly Waters Run.

Based upon the aforementioned assumptions the following is an amended sampling proposal. Samples will be obtained at the four recommended sample sites. Figure 5 is the PSI Sample Map showing the Heavenly Waters Run study area and proposed sample locations. One sediment and one aqueous sample will be manually obtained at each sample site (there is no aqueous component to sample site B). Substrate samples will be obtained from the greatest depth feasible, not to exceed six inches. Due to the bedrock nature of the stream's substrate it may not be possible to manually extract sediment samples to a six-inch depth. Because the April 1996 sampling event analyzed for inorganic and volatile organic portions of the EPA priority pollutants list, sediment and aqueous samples will only be analyzed for pesticide and PCB concentrations. Sampling will be conducted in early 1997. The USACOE will be provided two weeks notification prior to the sample collection event.

WETLAND 6B
WETLANDS EXTEND BEYOND STUDY AREA LIMITS

WETLAND 7

WETLAND 8

WETLAND 9

WETLAND 11

WETLAND 12A

WETLAND 12B

WETLAND 12C

N 616500

N 617000

E 979000

E 979500

MATCH LINE SEE SHEET 2 OF 2

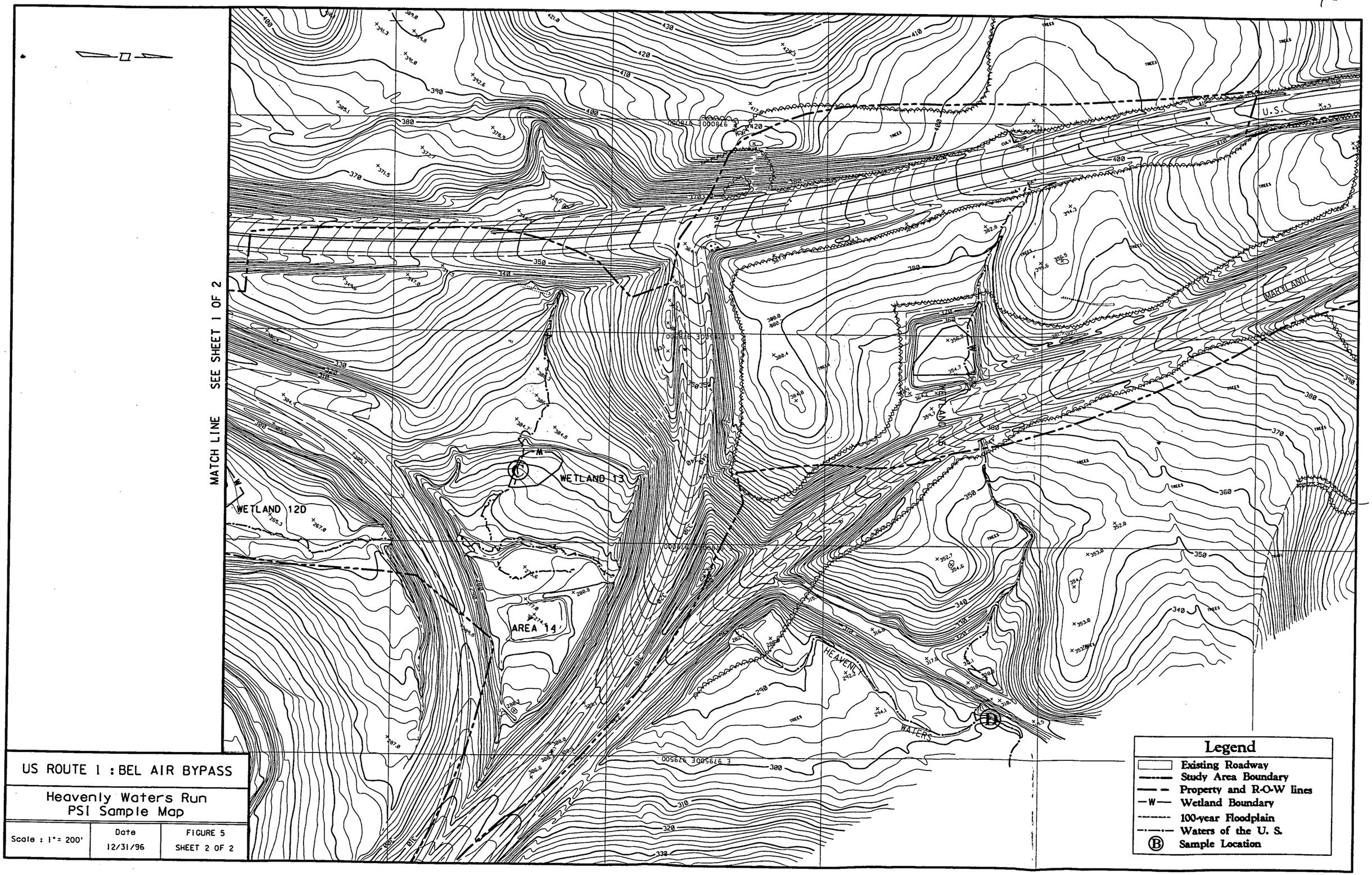
Legend

- Existing Roadway
- Study Area Boundary
- Property and R-O-W lines
- W — Wetland Boundary
- 100-year Floodplain
- Waters of the U. S.
- Ⓑ Sample Location

US ROUTE 1 : BEL AIR BYPASS

Heavenly Waters Run
PSI Sample Map

Scale : 1" = 200'	Date 12/31/96	FIGURE 5 SHEET 1 OF 2



US ROUTE 1 : BEL AIR BYPASS

Heavenly Waters Run
PSI Sample Map

Scale : 1"= 200'	Date 12/31/96	FIGURE 5 SHEET 2 OF 2

LIST OF CONTRIBUTORS

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Professional Experience: 20 years
Certification: Certified Hazardous Materials Manager
Education: B.S., Chemistry
M.S., Chemistry
Ph.D., Environmental Sciences and Engineering
Post-Doctoral Fellow, Geography and Environmental Engineering
40-Hour Hazardous Materials Health and Safety Course

Richard A. Pugh, C.E.
Registration: Certified Ecologist
Certification: Certified Wetland Delineator, USACOE-Baltimore District
Professional Experience: 12 years
Education: B.A., Biology
M.S., Biology

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APPENDIX A

USACOE CORRESPONDENCE

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 1715
BALTIMORE, MARYLAND 21203-1715

REPLY TO
ATTENTION OF:

AUG 28 1996

Operations Division

Subject: CENAB-OP-RX(MD SHA/~~US 1 FROM MD 147 TO MD 23/HARFORD~~ Bypass COUNTY, MD)96-00152-12

Ms. Linda Kelbaugh
Maryland State Highway Administration
707 North Calvert Street
Baltimore, Maryland 21203-0717

Dear Ms. Kelbaugh:

During the Jurisdictional Determinations for the subject project, which occurred in March and April of 1996, an informal macroinvertebrate sampling of Heavenly Waters Run was conducted to determine the condition of the stream in the lower reach where a stream relocation associated with the project is proposed. The results of the sampling produced extremely low populations of aquatic macroinvertebrates in the vicinity of Wetlands 6 through 12. An investigation just upstream of Wetland 12, in the vicinity of Wetland 13, indicated that a number of seeps and a small tributary in the vicinity of Wetland 13 feed directly into Heavenly Waters Run from the Tollgate landfill.

More extensive sampling was conducted on May 24 and June 13 at a number of points on Heavenly Waters Run both above and below the influence of the Tollgate landfill. Samples obtained in the lower reaches of the stream, within the influence of the landfill, produced a very limited number of Caddis Fly larvae of the genus Hydropsyche, which are considered pollution tolerant. Sampling in the upper reaches, in the vicinity of Hall Street, produced an abundance of aquatic macroinvertebrates including; Ephemeroptera, Plecoptera, Coleoptera, Neuroptera, and Tricoptera which were determined to be pollution intolerant. The aquatic life present in the upper reaches of Heavenly Waters Run should have also occurred in the lower reaches since stream morphology and water temperature remain relatively constant from the headwaters to Heavenly Waters Run's confluence with Winters Run.

Chemical sampling data from MDE and Harford County indicates that the water quality of Heavenly Waters Run has vastly improved in the recent past. However, the results of the macroinvertebrate sampling indicate that there is reason to believe that there may be contaminants bound within the substrate in the lower reaches of Heavenly Waters Run. Since all plans advanced to the Corps indicate that the lower reaches of Heavenly Waters Run will be relocated, this office will require chemical substrate sampling in the areas of Heavenly Waters Run that will be affected by the

relocation. Chemical sampling will serve to determine if there are any hazardous material issues associated with the proposed relocation. This office recommends that samples should be obtained from at least four individual sites spaced throughout the project area in Heavenly Waters Run. Samples should be obtained in the vicinity of Wetlands 7 through 10 where the relocation is proposed; in the location of the proposed relocated channel to investigate the presence of any contaminants; in the vicinity of Wetland 13 near the railroad berm; and in the upper reaches of Heavenly Waters Run, out of the influence of the landfill which will serve as a control or reference sample. Refer to the enclosed map for recommended sample points (enclosure 1). Sampling should be conducted during low or average flow conditions.

Water and substrate samples should be taken at each site. Within each sample site, substrate material should be obtained from three areas, one from each shallow side of the pool and one from the center of the pool. Samples should to be obtained to a depth of six inches. Water samples should be obtained from the deepest portion of the pool at each site. MD SHA should ensure that all samples obtained are analyzed for the metals and organic contaminants listed on the enclosed EPA Priority Pollutants list (enclosure 2).

Should it be determined that the substrate contains contaminants, precautionary steps will be necessary to ensure that a plume of contaminants is not released downstream to Winters Run and Belair's water supply during the relocation. In addition, the original streambed will have to be contained to keep the contaminants from the environment. MD SHA will notify this office of the date that the sampling will occur at least two weeks in advance.

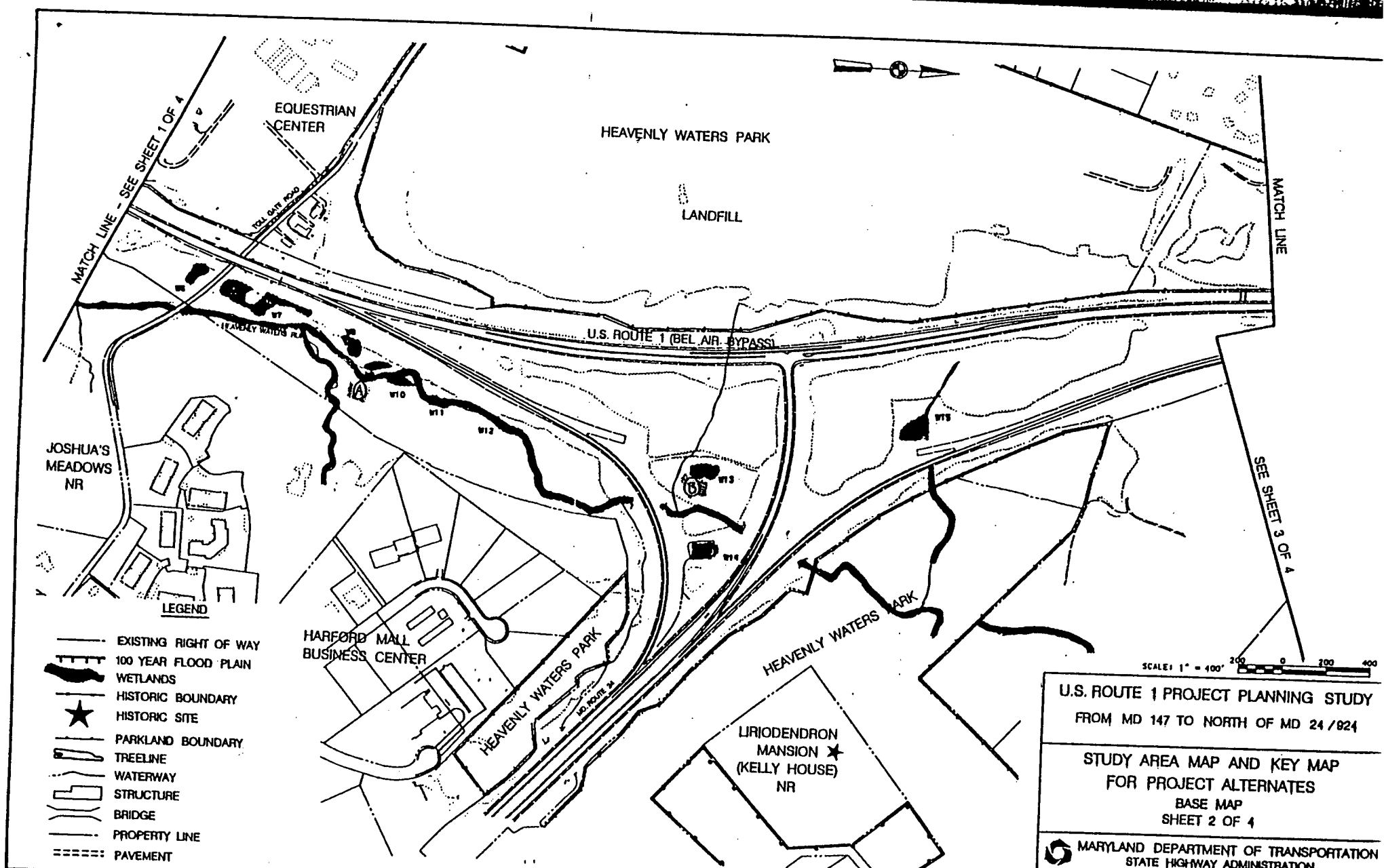
If you have any questions concerning this matter, please contact Mr. Steve Elinsky of this office at (410) 962-4503.

Sincerely,

Keith A. Harris
Chief, Special Projects Section

Copy Furnished:

Bill Schultz, USFWS CBFO
Danielle Algazi, USEPA Region 3
Renee Sigel, FHWA
Dave Boellner, MDE
Greg Golden, DNR



U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

STUDY AREA MAP AND KEY MAP FOR PROJECT ALTERNATES

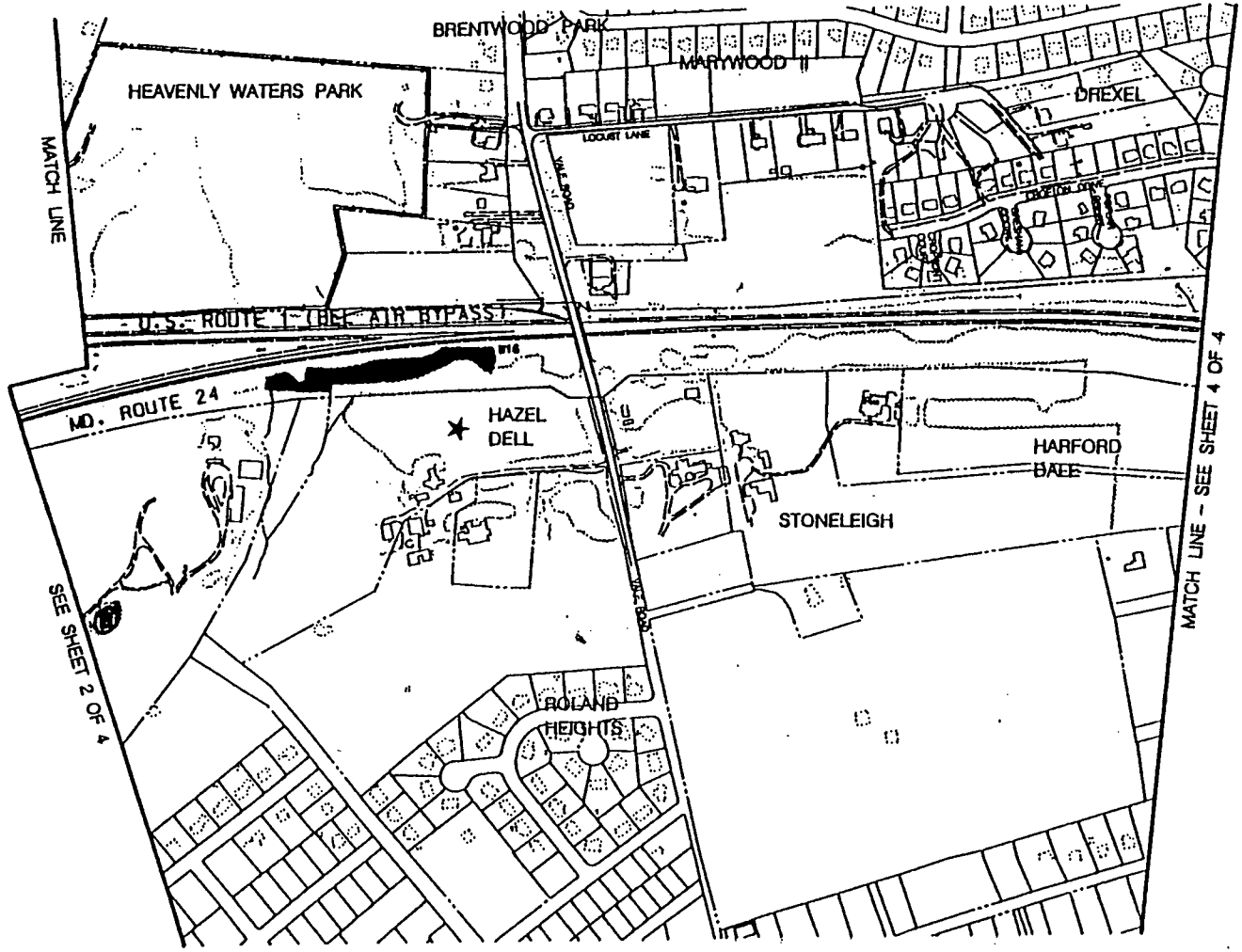
BASE MAP

SHEET 2 OF 4

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

DATE: OCT. 23, 1995 | FIGURE 1

(ENCLOSURE 1)



LEGEND

- EXISTING RIGHT OF WAY
- 100 YEAR FLOOD PLAIN
- WETLANDS
- HISTORIC BOUNDARY
- HISTORIC SITE
- PARKLAND BOUNDARY
- TREELINE
- WATERWAY
- STRUCTURE
- BRIDGE
- PROPERTY LINE
- PAVEMENT

SCALE: 1" = 400' 200 0 200 400

U.S. ROUTE 1 PROJECT PLANNING STUDY

FROM MD 147 TO NORTH OF MD 24 / 924

STUDY AREA MAP AND KEY MAP FOR PROJECT ALTERNATES

BASE MAP
SHEET 3 OF 4

MARYLAND DEPARTMENT OF TRANSPORTATION
STATE HIGHWAY ADMINISTRATION

DATE: OCT. 23, 1995 | FIGURE 1

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State Adoption/Proposal of Numeric Criteria for Priority Pollutants as of August, 1988

Environmental Protection Agency
Office of Water
Office of Water Regulations and Standards
Criteria and Standards Division
Standards Branch

(ENCLOSURE 2)

APPENDIX

LIST OF 126 PRIORITY POLLUTANTS

PRIORITY POLLUTANT	NO. OF STATES WHERE A NUMERIC CRITERION IS ADOPTED OR PROPOSED
ACENAPHTHENE	18
ACENAPTHYLENE (PAH)	15
ACROLEIN	24
ACRYLONITRILE	23
ALDRIN	41
ANTIMONY	24
ANTHRACENE	5
ARSENIC	45
ASBESTOS	19
1,2 BENZANTHRACENE (PAH)	20
BENZENE	29
BENZIDINE	28
BENZO (A) PYRENE (3,4-BENZOPYRENE) (PAH)	20
3,4 BENZOFLUORANTHENE (PAH)	19
BENZO(K)FLUORANTHENE (PAH)	20
1,12 BENZOPERYLENE (PAH)	19
BERYLLIUM	29
BROMOFORM (TRIBROMOMETHANE)	23
BROMOMETHANE (METHYL BROMIDE)	19
4-BROMOPHENYL PHENYL ETHER	6
CADMIUM	45
CARBON TETRACHLORIDE (TETRACHLOROMETHANE)	27
CHLORDANE	42
CHLOROBENZENE (MONOCHLOROBENZENE)	28
CHLORODIBROMOMETHANE (HALOMETHANE)	22
CHLOROETHANE (MONOCHLOROETHANE)	3
CHLOROETHYL ETHER (BIS-2)	24
1 CHLOROETHOXY METHANE (BIS-2)	19
2 CHLOROETHYL VINYL ETHER	5
4-CHLORO-3-METHYLPHENOL	15
CHLOROMETHANE (METHYL CHLORIDE)	21
CHLOROFORM (TRICHLOROMETHANE)	26
2 CHLOROPHENOL	27
CHLOROISOPROPYL ETHER (BIS-2)	20
2 CHLORONAPHTHALENE	6

LIST OF 126 PRIORITY POLLUTANTS
(continued)

PRIORITY POLLUTANT	NO. OF STATES WHERE A NUMERIC CRITERION IS ADOPTED OR PROPOSED
4 CHLOROPHENYL PHENYL ETHER	4
CHROMIUM (HEX)	43
(TRI)	44
CHYRSENE (PAH)	15
COPPER	42
CYANIDE	40
4,4 DDT	39
4,4 DDE	21
4,4 DDD	21
DIBENZO(a,h)ANTHRACENE (PAH)	19
1,2 DICHLOROBENZENE	25
1,3 DICHLOROBENZENE	25
1,4 DICHLOROBENZENE	25
3,3 DICHLOROBENZIDINE	21
DICHLOROETHANE 1,1	3
DICHLOROETHANE 1,2	30
1,1 DICHLOROETHYLENE	28
1,2-TRANS-DICHLOROETHYLENE	6
DICHLOROBROMOMETHANE (HALOMETHANES)	22
DICHLOROMETHANE (HALOMETHANES)	22
2,4-DICHLOROPHENOL	16
DICHLOROPROPANE 1,2	17
DICHLOROPROPENE 1,3	16
DIELDRIN	40
DIMETHYLPHENOL 2,4	15
DIETHYLPHTHALATE	27
DIMETHYLPHTHALATE	27
DINITROTOLUENE 2,4	19
DINITROTOLUENE 2,6	4
2,4-DINITROPHENOL	21
DIOXIN (2,3,7,8-TCDD)	22
DIPHENYLHYDRAZINE 1,2	22
ALPHA ENDOSULFAN	38
BETA ENDOSULFAN	38
ENDOSULFAN SULFATE	40
ENDRIN	44

LIST OF 126 PRIORITY POLLUTANTS
(continued)

PRIORITY POLLUTANT	NO. OF STATES WHERE A NUMERIC CRITERION IS ADOPTED OR PROPOSED
ENDRIN ALDEHYDE	16
ETHYLBENZENE	25
FLUORENE (PAH)	18
FLUORANTHENE	23
HEPATACHLOR	39
HEPATACHLOR EPOXIDE	16
HEXACHLOROETHANE	20
HEXACHLOROBENZENE	26
HEXACHLOROBUTADIENE	24
HEXACHLOROCYCLOHEXANE (LINDANE)	41
HEXACHLOROCYCLOHEXANE (ALPHA)	20
HEXACHLOROCYCLOHEXANE (BETA)	20
HEXACHLOROCYCLOHEXANE (DELTA)	5
HEXACHLOROCYCLOPENTADIENE	23
IDENO (1,2,3-cd) PYRENE (PAH)	19
ISOPHORONE	23
LEAD	45
MERCURY	44
NAPHTHALENE	9
NICKEL	39
NITROBENZENE	24
2 NITROPHENOL	6
4 NITROPHENOL	6
4,6-DINITRO-2-METHYLPHENOL	14
NITROSODIMETHYLAMINE N	21
NITROSODIPHENYLAMINE-N	21
NITROSODI-N-PROPYLAMINE-N	5
PCB 1242	41
PCB 1254	41
PCB 1221	41
PCB 1232	41
PCB 1248	41
PCB 1260	41
PCB 1016	41
PHENOL	39
PENTACHLOROPHENOL	28
PHENANTHRENE (PAH)	20
BIS(2 ETHYL HEXYL) PHTHALATE	27
BUTYL BENZYL PHTHALATE	12
DI-N-BUTYL PHTHALATE	26

LIST OF 126 PRIORITY POLLUTANTS
(continued)

PRIORITY POLLUTANT	NO. OF STATES WHERE A NUMERIC CRITERION IS ADOPTED OR PROPOSED
DI-N-OCTYL-PHTHALATE	10
PYRENE (PAH)	20
SELENIUM	45
SILVER	41
TETRACHLOROETHANE 1,1,2,2	23
TETRACHLOROETHYLENE	25
THALLIUM	24
TOLUENE	25
TOXAPHENE	40
1,2,4 TRICHLOROBENZENE	8
TRICHLOROETHANE 1,1,1	25
TRICHLOROETHANE 1,1,2	24
TRICHLOROETHYLENE	26
TRICHLOROPHENOL 2,4,6	25
VINYL CHLORIDE (CHLOROETHYLENE)	24
ZINC	43

APPENDIX B

STATE AND LOCAL CORRESPONDENCE

30

Gannett Fleming
ENGINEERS AND PLANNERS

GANNETT FLEMING, INC.
Suite 200
East Quadrangle
The Village of Cross Keys
Baltimore, MD 21210
Fax: (410) 433-6520
Office: (410) 433-8832

November 5, 1996

Don Mauldin
Maryland Department of the Environment
2500 Broening Highway
Baltimore, Maryland 21224

RE: Requests to review Maryland Department of the Environment (MDE) Hazardous Waste Management records for the Toll Gate Landfill in Harford County, MD

Dear Mr. Mauldin:

Gannett Fleming has been contracted by the Maryland State Highway Administration (SHA) to perform an environmental site assessments, including hazardous materials inventories, for the Heavenly Waters stream complex and Toll Gate Landfill in Harford County. I am writing to request an opportunity to visit your offices in Baltimore to meet with a representative of MDE's Hazardous Waste Management section and to review whatever records may be available for sites within the project study areas. Included is a map is the study area.

The principal areas of concern, in Harford County, near the town of Bel Air, are:

1) The Toll Gate Landfill. We are seeking any sample data analysis results, risk assessment documentation, and/or contamination studies pertinent to the Toll Gate Landfill and immediate vicinity.

and

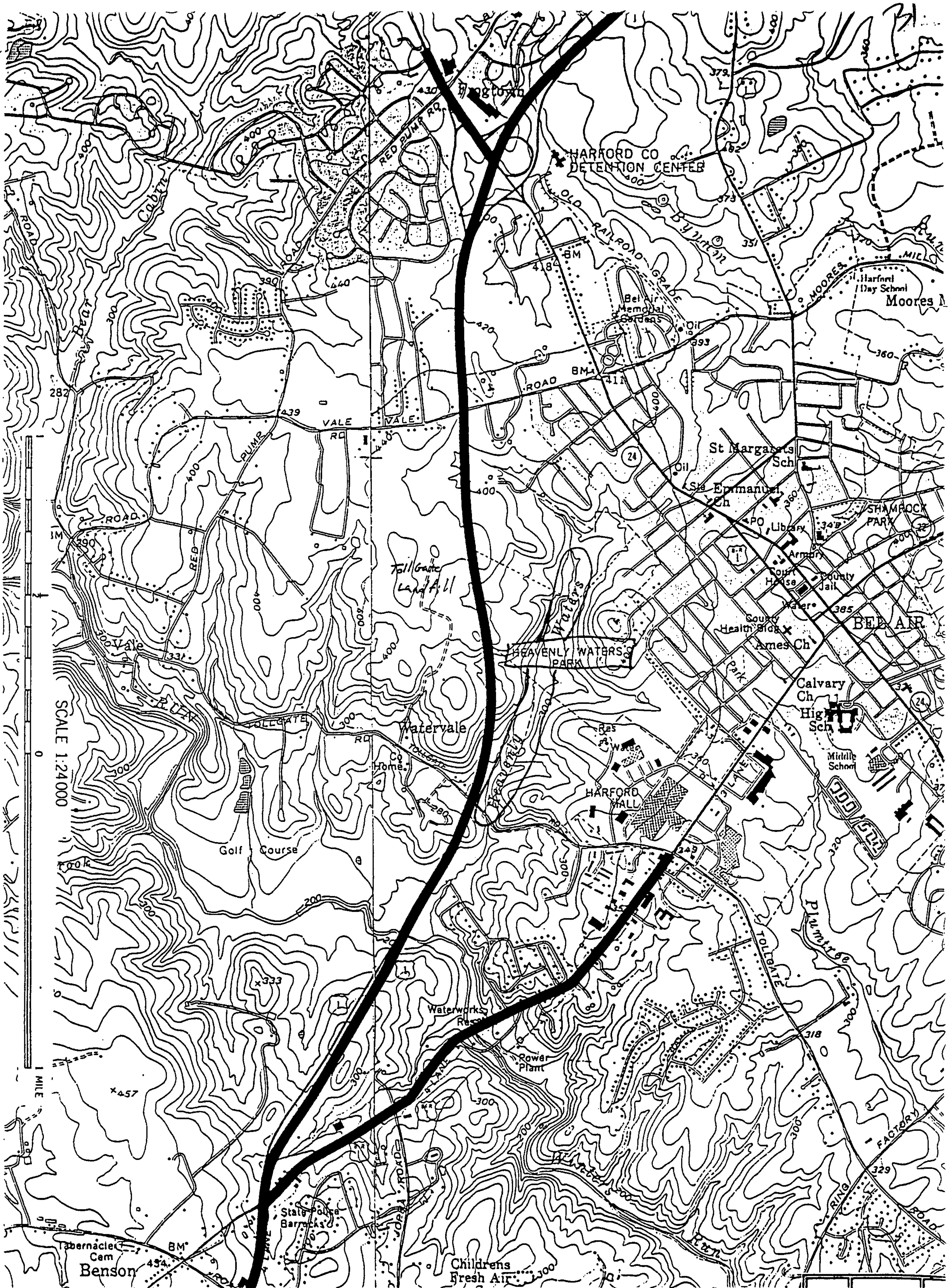
2) The Heavenly Waters Stream Valley/Heavenly Waters Park. We are seeking any sample data analysis results, risk assessment documentation, and/or contamination studies pertinent to the Heavenly Waters Stream Valley.

Please contact me at the above address, or by phone at (410) 433-8832, to arrange this meeting, or if there are any questions or concerns. I would like to meet as soon as possible. Thank you for your assistance in this matter.

Sincerely,

Aaron M. Keel
Environmental Scientist
Gannett Fleming

Enclosures
cc: C. Yen
R. Pugh


HARFORD CO
DETENTION CENTER
RED PUMP RD
OLD RAILROAD GRADE
Bel Air Memorial Gardens
Harford Day School
Moores M
ROAD
VALE
VALE RD
RED PUMP ROAD
St Margarets Sch
Sts Emmanuel Ch
PO
Library
SHAMROCK PARK
Armory
Court House
County Jail
Water
BEL AIR
County Health Bldg
Ames Ch
Toll Gate Landfill
HEAVENLY WATERS PARK
Calvary Ch
High Sch
Middle School
Vale
Bear Cabin
RUN
TOLLGATE RD
Watervale
Co Home
Res
Water
HARFORD MALL
Golf Course
SCALE 1:24000
1 MILE
LANE
TOLLGATE
Plumtree
Waterworks Res
Power Plant
RING FACTORY ROAD
State Police Barracks
Tabernacle Cem
BM
Benson
Childrens Fresh Air

32

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

Jane Nishida
Secretary

NOV 8 1996

RECEIVED

NOV 14 1996

GANNETT FLEMING
BALTIMORE

AARON M.KEEL
GANNETT FLEMING,INC
CROSS KEYS,EAST QUADRANGLE,SUITE 200
BALTIMORE, MD 21210
PIA# 96-10906- TOLL GATE,HEAVENLY WATERS

Dear Requester:

This acknowledges your Public Information Act (PIA) request has been received by the Maryland Department of the Environment. Your request has been assigned the Public Information Act control number listed above. Please use this number in all correspondence with us when referring to your request. You will be advised by mail on the results of a file search based on the information you requested. All questions concerning this request should be directed to me at the letterhead address.

Please be assured your request will be processed as quickly as possible.

Sincerely,

Donald W. Mauldin

Donald W. Mauldin
PIA Liaison
Waste Management Administration

DWM:lak

cc: PIA Request File

33

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

Jane T. Nishida
Secretary

NOV 19 1996

RECEIVED

NOV 22 1996

GANNETT FLEMING
BALTIMORE

Requester:

AARON M.KEEL
GANNETT FLEMING,INC
CROSS KEYS,EAST QUADRANGLE,SUITE 200
BALTIMORE, MD 21210

RE: PIA# 96-10906- TOLLGATE LF & HEAVENLY WATERS PARK

This is in response to your request for information from the Maryland Department of the Environment, Waste Management Administration.

__(1) No information or data is found for the referenced request on routine search of Administration files.

__(2) Information and data responsive to your request is enclosed.

__(3) No further information or data is found on routine search of files.

✓(4) Information and data is available on the referenced request. Please call the telephone number above between 8:30 a.m. and 4:30 p.m. if you wish to make an appointment to inspect the files or call and state that you wish to have documents collected, photocopied and mailed to you at your expense.

__(5) Our bill for services rendered _____ is enclosed/_____ will be sent under separate cover. See itemization below.

Search: _____

Copying: _____

Mailing fee: _____

TOTAL: _____

__(6) Search was limited to the following Divisions or Programs:

_____.

__(7) Based on the limited information you provided, we cannot make an accurate search of our records. This administration does not index records according to vicinities or tax-parcel map designations. If you have an inquiry about a particular facility and this Administration maintains records on such a facility, then you may, upon request, review all portions of that file which are considered public information.

__(8) Please see attachment.

__(9) Note:

13/10 10¢

Ton's of Files

Donald W. Mauldin
Public Information Act Coordinator
Waste Management Administration

MARYLAND DEPARTMENT OF THE ENVIRONMENT
2500 Broening Highway • Baltimore, Maryland 21224
(410) 631-3000

Parris N. Glendening
Governor

DEC 11 1996

Jane Nishida
Secretary

RECEIVED
DEC 13 1996
GANNETT FLEMING
BALTIMORE

Requester: AARON M.KEEL
GANNETT FLEMING,INC
CROSS KEYS,EAST QUADRANGLE,SUITE 200
BALTIMORE, MD 21210
PIA# 96-10906- TOLLGATE LF & HEAVENLY WATERS PARK

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This is in response to your request for information from the Maryland Department of the Environment, Waste Management Administration.

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___(5) Our bill for services rendered _____ is enclosed/ _____ will be sent under separate cover. See itemization below.

search: _____

copying: _____

mailing fee: _____

TOTAL: _____

___(6) Search was limited to the following Divisions or Programs:

_____

_____

___(7) Based on the limited information you provided, we cannot make an accurate search of our records. This Administration does not index records according to vicinities or tax-parcel map designations. If you have an inquiry about a particular facility and this Administration maintains records on such a facility, then you may, upon request, review all portions of that file which are considered public information.

___(8) Please see attachment.

___(9) Note:

Donald W. Mauldin

Donald W. Mauldin
Public Information Act Coordinator
Waste Management Administration

Gannett Fleming
ENGINEERS AND PLANNERS

GANNETT FLEMING, INC.
Suite 200
East Quadrangle
The Village of Cross Keys
Baltimore, MD 21210
Fax: (410) 433-6520
Office: (410) 433-8832

November 5, 1996

Dan Pazdersky
Harford County Department of Public Works
Division of Environmental Affairs
1807 North Fountain Green Road
Bel Air, Maryland 21015

RE: Requests to review Harford County sampling data records for the Heavenly Water Park and Toll Gate Landfill in Harford County, MD

Dear Mr. Pazdersky:

Gannett Fleming is charged by the Maryland State Highway Administration (SHA) to perform an environmental site assessments, including hazardous materials inventories, for the Heavenly Waters stream complex and Toll Gate Landfill in Harford County. I am writing to request an opportunity to visit your offices to meet with a representative of Harford County's Environmental Affairs Division and to review whatever records may be available for sites within the project study areas. Included is a map is the study area.

The principal areas of concern, near the town of Bel Air, are:

1) The Toll Gate Landfill. We are seeking any sample data analysis results, risk assessment documentation, and/or contamination studies pertinent to the Toll Gate Landfill and immediate vicinity.

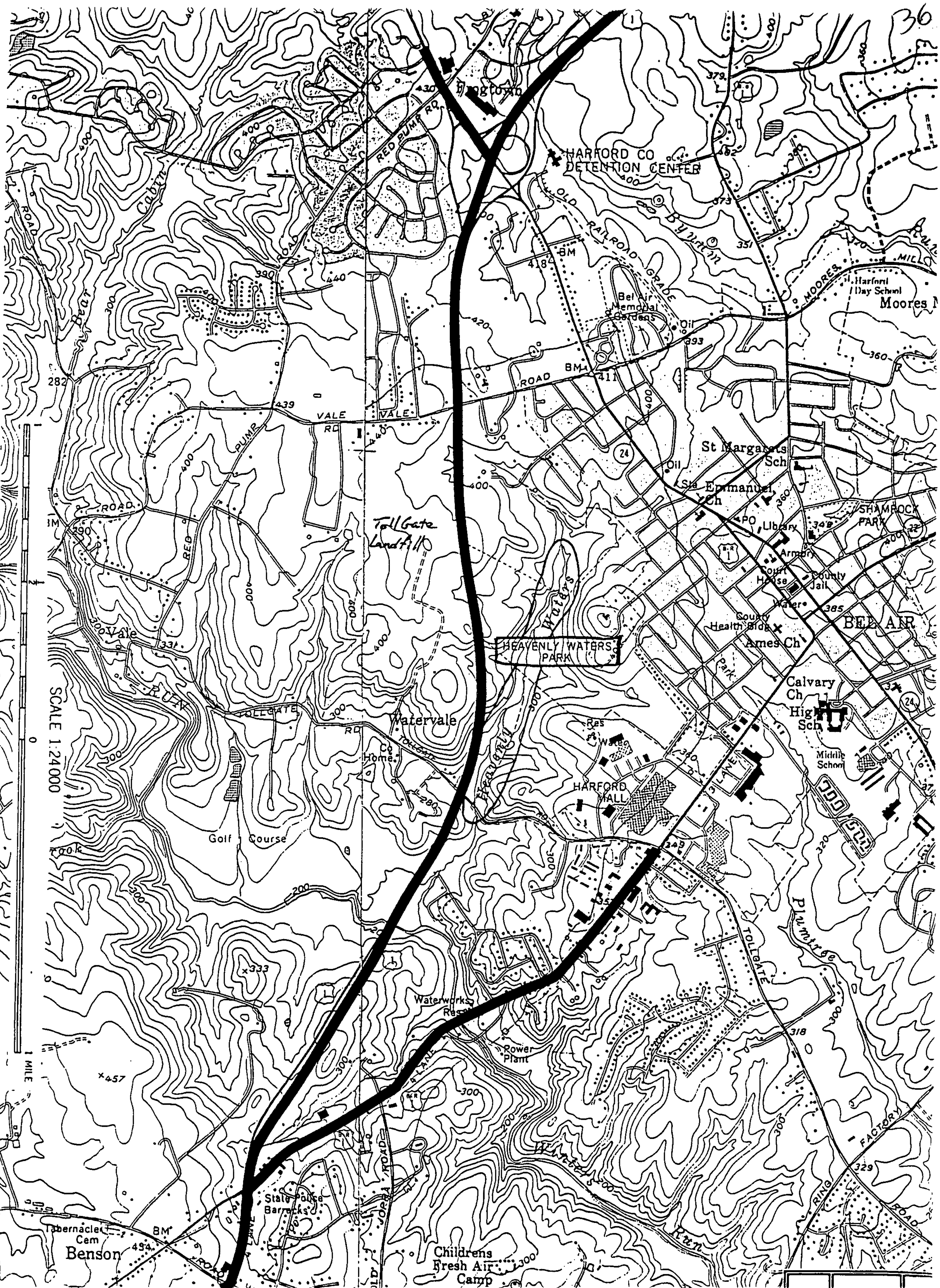
2) The Heavenly Waters Stream Valley/Heavenly Waters Park. We are seeking any sample data analysis results, risk assessment documentation, and/or contamination studies pertinent to the Heavenly Waters Stream Valley.

Please contact me at the above address, or by phone at (410) 433-8832, to arrange this meeting, or if there are any questions or concerns. I would like to meet as soon as possible. Thank you for your assistance in this matter.

Sincerely,

Aaron M. Keel
Environmental Scientist
Gannett Fleming

Enclosures
cc: C. Yen
R. Pugh


Frogtown
RED PUMP RD
HARFORD CO
DETENTION CENTER
OLD RAILROAD GRADE
Bynum
MOORES
MILL
Harford Day School
Bel Air Memorial Gardens
Oil
VALE ROAD
VALE RD
RED PUMP ROAD
Bear Cabin
ROAD
Tollgate Landfill
St Margarets Sch
Emmanuel Ch
SHAMROCK PARK
PO
Library
Armory
Court House
County Jail
Water
County Health Bldg
Ames Ch
BEL AIR
Heavenly Waters
HEAVENLY WATERS PARK
Park
Calvary Ch
High Sch
Middle School
Vale
RUN
TOLLGATE RD
Watervale
Co Home
Res
Water
HARFORD MALL
LANE
Golf Course
TOLLGATE
Plumtree
Waterworks Res
Power Plant
SCALE 1:24000
1 MILE
4 LANE
JOPPA ROAD
Winters Run
RING FACTORY ROAD
State Police Barracks
Tabernacle Cem
Benson
Childrens Fresh Air Camp

NOTE TO FILE

November 22, 1996

RE: US ROUTE 1: 30409 HAZARDOUS MATERIALS INVESTIGATION: PART A

IN PURSUANCE OF PART A: DOCUMENT BACKGROUND INVESTIGATION

Aaron Keel has scheduled meetings with MDE and HARFORD CO. P&Z to review their available files on the Tollgate Landfill and Heavenly Waters Park sampling history data.

I will meet with **HARFORD COUNTY DPW: ENVIRONMENTAL AFFAIRS** on MONDAY **DECEMBER 9, 1996** at 10:00am.

I will meet with **MARYLAND DEPARTMENT OF THE ENVIRONMENT**, Hazardous Materials on TUESDAY, **DECEMBER 10, 1996** at 10:00 am.

cc: CHEN YEN

APPENDIX C

HARFORD COUNTY MONITORING REPORT

APRIL 1996
GROUNDWATER MONITORING REPORT
TOLLGATE LANDFILL
HARFORD COUNTY, MARYLAND

PREPARED BY:

HARFORD COUNTY DEPARTMENT OF PUBLIC WORKS
DIVISION OF ENVIRONMENTAL AFFAIRS

21 November 1996

SECTION 2
INTRODUCTION

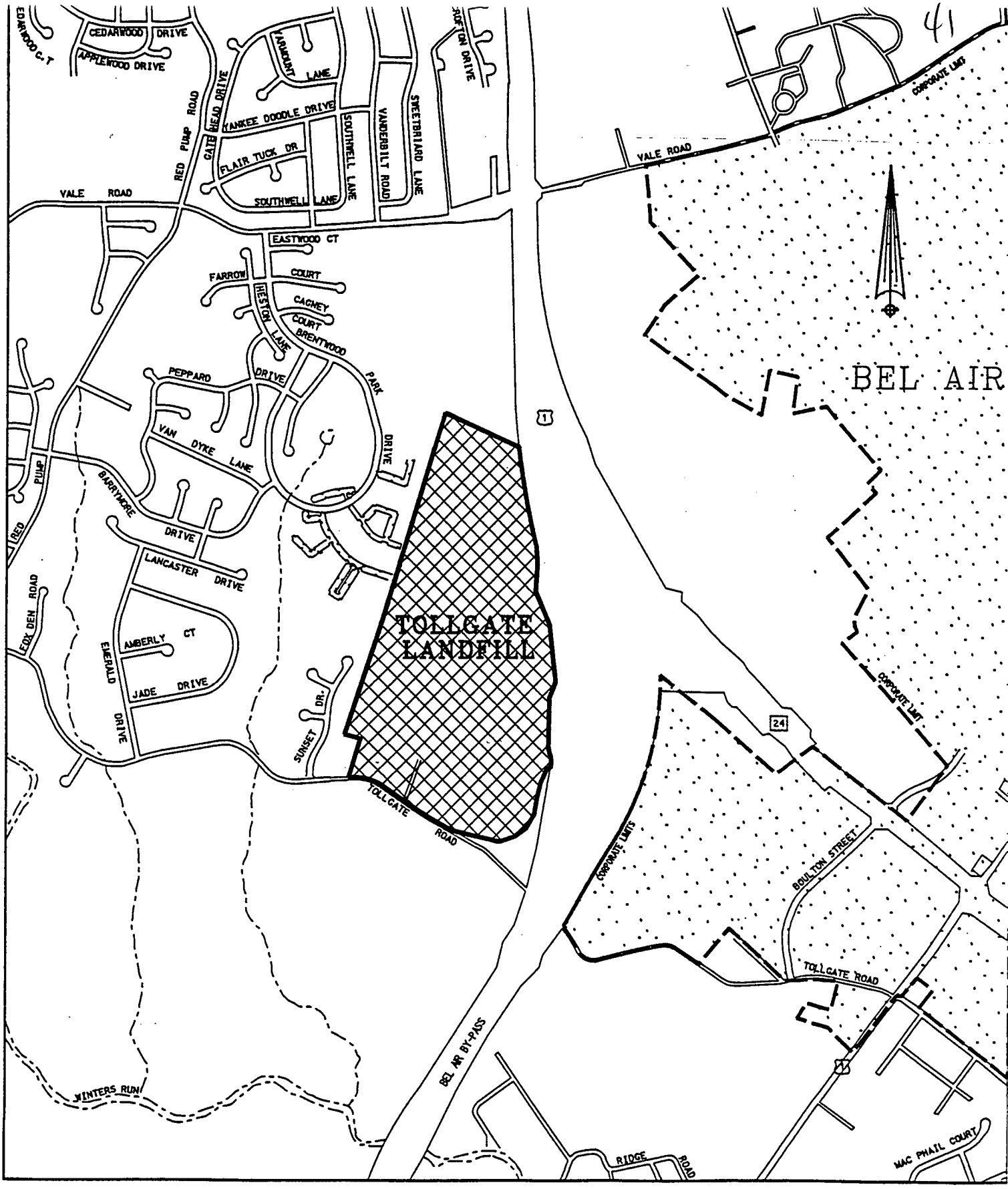
2.1 Purpose

This report presents the results of a water sampling event conducted at the Tollgate Landfill in April 1996. This monitoring event constitutes the first semiannual sampling conducted at the site as part of a long term environmental monitoring program. The suite of analytical parameters has been selected to evaluate and monitor known and potential impacts to groundwater and surface water at the site.

2.2 Site Location and Description

The Tollgate Landfill is located on property owned by Harford County Government, and is situated approximately one mile west of the town of Bel Air (see Figure 2-1). Tollgate Landfill is a closed solid waste management facility owned by the Harford County Government and monitoring and remediation of the site is the responsibility of the Harford County Department of Public Works, Division of Environmental Affairs.

The Tollgate Landfill site consists of approximately 128 acres. The property is bounded on the east by the U.S. Route 1 Bypass, on the south by Tollgate Road, on the west by the Woodland Hills and Brentwood Park subdivisions, and on the north by properties along Vale Road. Two distinct portions of the site have been used for waste disposal: a 7 acre old municipal and rubble landfill area, and a 55 acre municipal solid waste landfill area. Two portions of the site are used for activities in support of the landfill remediation. A maintenance facility and yard are located in the east central portion of the site, and the groundwater treatment/landfill gas flare are located in the west-central portion of the site. The remainder of the site has not been used for landfilling, and presently is wooded or vacant land.



LOCATION MAP - TOLLGATE LANDFILL

SCALE: 1" = 1200'

2.3 Background

The Tollgate Landfill was operated from 1954 through 1987. From 1954 through 1969, a portion of the site was operated by the Town of Bel Air as an open burning dump and landfill under a lease arrangement with Harford County. The Harford County Government operated the site as a burning dump until approximately 1970. Burning dumps were typical methods of refuse disposal during that period. Beginning in 1970, the facility was operated as a sanitary landfill, which is distinguished from a dump by the systematic covering and burial of refuse. In 1987, the County ceased refuse disposal operations at the site.

During the 1980s, groundwater monitoring results indicated that the Tollgate Landfill had affected the groundwater underlying the site, and that a plume of chemical compounds was present at the site headed primarily to the south, and to a lesser extent to the west. The chemical compounds of concern in the groundwater are predominantly volatile organic compounds.

A program of landfill remediation has been implemented, which includes capping, landfill gas control, and groundwater remediation. The cap installed at the site consists of a synthetic membrane liner, overlain by a synthetic composite drainage layer, which is covered by soil which protects the cap and promotes surface drainage. The surface is vegetated with grasses and legumes. Capping was completed in 1995.

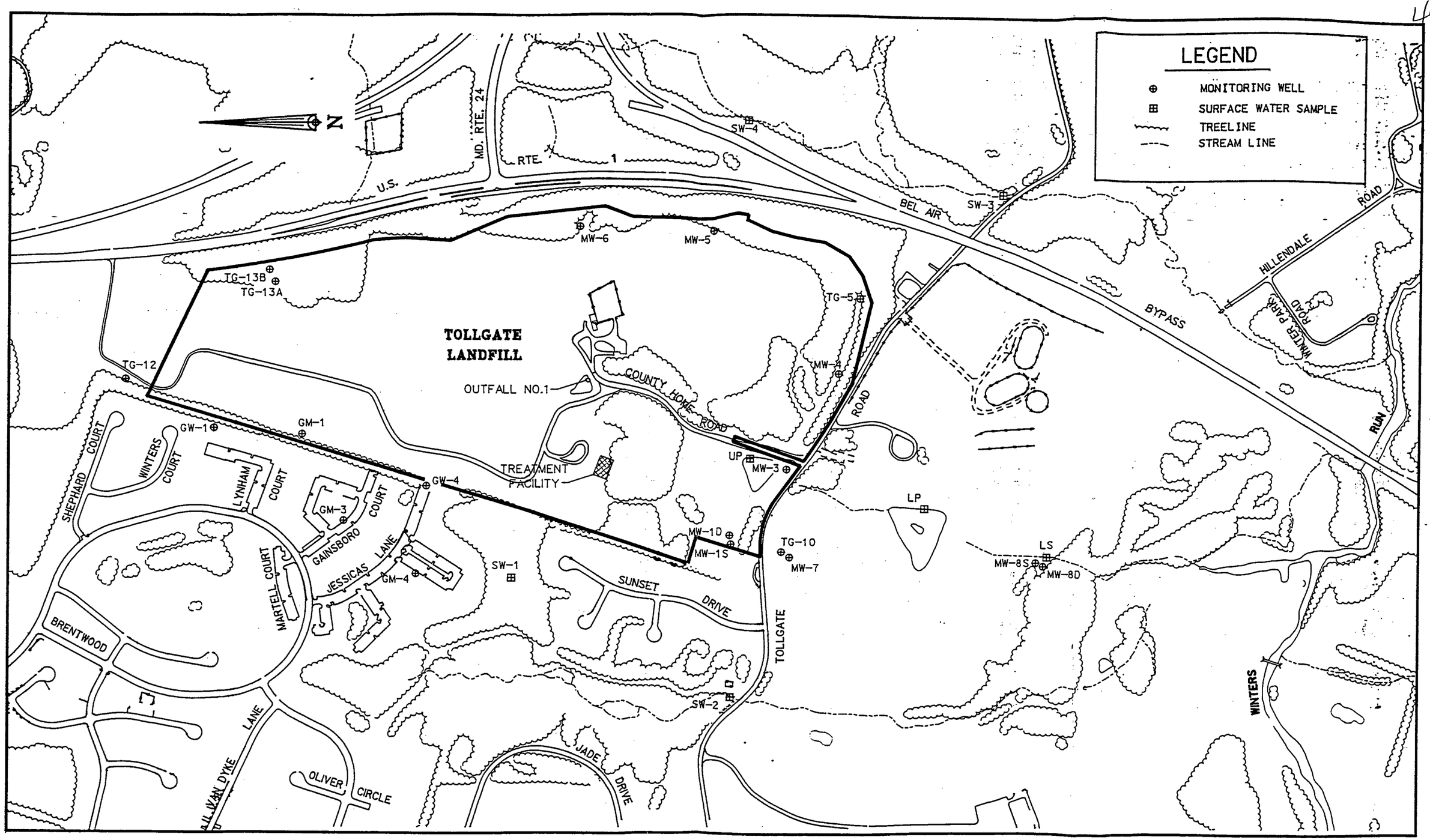
The presence and concentration of subsurface methane at the site warranted the installation of a system to collect and safely dispose of the gas. This system, which is referred to as the Central Gas Control System, consists of a series of wells drilled into the landfill which are connected to blowers and an enclosed flare. The system extracts the gas from the landfill under a partial vacuum, and destroys the gas by combustion in the flare. The Central Gas Control System has been operating since 1992.

A groundwater extraction and treatment system has been operating at the site since 1992. A series of water wells which pump the groundwater to an onsite water treatment system have been installed along the western property line adjacent to Brentwood Park. This system collects groundwater for treatment at an onsite facility prior to discharge to surface water. The system is operated in compliance with an NPDES permit (State Discharge Permit No. 91-DP-2887). A project to install additional groundwater extraction wells in the southern portion of the site and upgrade the treatment system to accommodate the larger flows is underway.

2.4 Geology and Hydrogeology

The Tollgate Landfill is located in the Piedmont Physiographic Province, which is generally characterized by folded and faulted metamorphic and igneous rocks of Precambrian and early Paleozoic age. Bedrock in the Piedmont is typically overlain by a varying thickness of saprolite and residual soils. According to the "Geologic Map of Harford County" (Southwick and Owens 1968), the Tollgate Landfill is underlain by Paleozoic age Baltimore Gabbro. The northern portion is mapped as consisting primarily of massive gabbro, while the southern portion of the site is mapped as epidiorite and amphibole. The extreme south-eastern portion of the site is mapped as Paleozoic age Port Deposit Gneiss.

The hydrogeology of the Tollgate Landfill is typical of the characteristic groundwater flow in the Piedmont Province, with the groundwater flow mimicking the surface water flow paths. The central portion of the Tollgate Landfill is located on top of a hill representing a flow divide, the eastern portion of the site draining toward Heavenly Waters, and the western portion draining toward an unnamed stream originating in the subdivision of Brentwood Park. A third stream flows south from the southern portion of the landfill site.



HARFORD COUNTY GOVERNMENT
ENVIRONMENTAL AFFAIRS DIVISION

500 300 100 0 500
400 200 1000
SCALE IN FEET

WATER SAMPLE LOCATION MAP
SPRING 1996

FIGURE 2-2

SECTION 3
SAMPLING PROCEDURES

The April 1996 sampling event included all monitoring wells included on the listing of Table 2-1. In addition, samples were obtained from seven surface water locations on the perimeter of the landfill.

Sampling was conducted during the period of 2 April 1996 through 11 April 1996 by staff of the Harford County Department of Public Works, Division of Environmental Affairs.

3.1 Water Level Measurements

Prior to purging each monitoring well, the depth to the water surface was measured using an electronic water level indicator. The probe was slowly lowered into the well until the water table was encountered, and the probe was raised or lowered slightly to accurately gauge water depth. The measurements were recorded to the 0.01 foot interval and referenced to the top of the PVC casing for each well. The reference elevation for each well is known based upon topographic survey, allowing the calculation of water surface elevations at each monitoring well location. A summary of the monitoring well elevations is presented in Table 3-1. The bottom of the well was sounded to determine the total water column height in each monitoring well.

Water level measurements were also obtained from monitoring wells not sampled as part of the subject sampling event for purposes of preparing a groundwater elevation map. These wells were not sampled because they are redundant locations or of questionable construction.

3.2 Well Purging

Monitoring wells were purged prior to sampling to ensure that water samples were representative of the water in the surrounding formation. Purging was accomplished either by

The samples for volatile organic compound (VOC) analysis were collected first, and the remainder of the sampling containers were collected in random order for each well. An aliquot was collected for field filtering in sample containers that had been washed in a solution of Alconox®, rinsed with tap water and triple rinsed with deionized water. Samples were placed in laboratory prepared sampling containers and preserved in accordance with Table 3-3. Field filtering was completed using disposable 0.45 μm filter cartridges prior to being placed in sample containers and preserved in accordance with Table 3-3. The aliquot to be filtered was withdrawn from the temporary container using new dedicated Tygon® tubing and a vacuum pump which forced the water through the filter cartridge. The filters and tubing were discarded after use.

The sample collected from the groundwater treatment system influent was obtained from a tap on the inlet side of the air stripping tower. Prior to collecting the sample, the tap was cleared of debris and rinsed. The flow rate was adjusted to minimize turbulence while collecting the samples for volatile organic compound analysis. All other sample containers were filled directly from the tap.

Surface water samples were collected from streams and ponds in the vicinity of the landfill. Stream samples were collected from the central portion of the stream using a pre-cleaned polyethylene container. Prior to filling the sample containers, the container was rinsed with stream water and the rinse water was discarded. The sample containers for VOC analysis were filled first, and the remaining sample containers were filled in a random order. An aliquot was collected for field analysis of pH, temperature and specific conductance.

3.4 Sample Handling and Preservation

Samples were preserved in laboratory preserved bottles and labeled with the sampling location, date, time, site name and preservative (if any). Samples were placed on ice in coolers provided by the contract laboratory and retained in the custody of the sampling team or in a locked storage facility until relinquished to the laboratory personnel following each day of

SECTION 4
ANALYTICAL RESULTS AND EVALUATION

Field and analytical data have been reviewed and tabulated, and a discussion of the results is presented in this Section. Analytical data have been compared to field and trip blanks, and to duplicate samples where appropriate. Summary tables of detected chemical constituents are provided, as well as tabulated data for groundwater and surface water samples for each of the analytical groups (Water Quality Parameters, Metals, and VOCs). Where appropriate, comparisons to drinking water standards are made.

This report is intended to present the results of the subject sampling round (April 1996), and is not intended to make evaluations of trends or comparisons with background wells.

4.1 Piezometric Relationship

A groundwater elevation contour map has been prepared using data collected during the subject groundwater monitoring round, and is enclosed as Figure 2-3. The flow patterns reflect a general flow direction from north to south. The central topographic ridge which trends north - south represents an approximate divide in groundwater flow directions. The western portion of the site drains southwest toward the stream west of Sunset Drive, while the eastern portion of the site drains toward Heavenly Waters, which parallels the U.S. Route 1 Bypass. The central portion of the site drains to the south toward the stream flowing along County Home Road.

The groundwater flow patterns of the Tollgate Landfill have been previously characterized as part of a hydrogeologic investigation conducted by Geraghty and Miller, Inc. (1994). Groundwater elevations and flow paths measured during the April 1996 sampling round (Table 3-1) and the map prepared from those results (Figure 2-3) are in general conformance with the findings of the earlier evaluations.

4.2 Sample Analytical Results

Analytical results provided by the contract laboratory have been tabulated and are discussed in detail below. A summary table (Table 4-1) has been prepared which includes all chemical constituents which were observed above the laboratory reported quantitation level. For purposes of clarity in this table, compounds which were not observed in a sample are noted as "U". Concentrations of a compound which exceed an established Maximum Contaminant Level (MCL) as set forth by the Safe Drinking Water Act are shaded. Data presented on the summary table include only metals analytical results for the field filtered samples collected from monitoring wells. It is noted that the data is presented in the tables in a general clockwise sequence from the north (upgradient) portion of the site, followed by east, south and west.

Copies of laboratory analytical results for all samples are included in the appendices. The results are grouped by sampling day, and are provided in Appendices A through F for each of the sampling days.

4.2.1 Groundwater

Twenty-two monitoring wells were sampled during the subject event, with duplicate samples being collected from two locations (monitoring wells MW-4 and MW-1D). Several of the monitoring wells are installed as clusters. Monitoring wells TG-13A and TG-13B are a pair of wells installed in close proximity. TG-13A is the deeper well, and was installed to monitor groundwater in the competent bedrock; TG-13B is more shallow, and was installed to monitor groundwater in the regolith overlying the competent bedrock. Two shallow/deep clusters of monitoring wells are installed in the southern portion of the site: MW-1S and MW-1D, and MW-8S and MW-8D. Monitoring wells GM-1A, GM-1B, GM-1C, and GM-1D are installed as a nested set within the same borehole, and are intended to monitor the vertical distribution of chemical constituents. The screened interval of GM-1A is the most shallow, and GM-1D is the deepest.

No significant concerns with metals analytical data are noted. All laboratory analyses were completed prior to the maximum allowable sample holding times.

4.2.2. Surface Water

Seven surface water locations were sampled during the subject event. Two samples (SW-1 and SW-2) were taken from the stream originating in the subdivision of Brentwood Park, two were taken from Heavenly Waters (SW-3 and SW-4), and one (Lower Stream) was taken from the stream which flows south from the south of the landfill. The Upper Pond and the Lower Pond samples were analyzed for volatile organic chemicals only; the ponds are located on the drainage which flows south from the south of the landfill.

4.2.2.1 Water Quality Parameters

The list of analytical parameters discussed herein as "water quality parameters" are generally useful in determining the relative quality of surface water and impacts from sources of chemical constituents. This list includes pH, alkalinity, hardness, ammonia, nitrate, chloride, turbidity, specific conductance, sulfate, dissolved solids, and chemical oxygen demand (COD). Of this list, only nitrate has an established MCL (10 mg/ℓ).

A review of the data indicates no elevated or anomalous readings for any of the parameters.

The nitrate concentrations reported for surface water samples ranged from than 1.42 mg/ℓ to a maximum of 2.37 mg/ℓ. None of the observed concentrations exceeded the MCL of 10 mg/ℓ.

Target holding times for various analytical parameters are listed in Table 3-4. All holding times for indicator parameters were met.

TABLE 3-4
ANALYTICAL METHODS AND HOLDING TIMES

Parameter	Method	Holding Time
pH	Field Measured	N/A
Specific Conductance	Field Measured	N/A
Total Alkalinity	EPA 310.1	14 days
Hardness	EPA 130.2	6 months
Ammonia	EPA 350.2	28 days
Nitrate	SW 846 - 9056	14 days
Chloride	SW 846 - 9056	28 days
Turbidity	EPA 180.1	2 days
Sulfate	SW 846 - 9056	28 days
Total Dissolved Solids	EPA 160.1	7 days
Chemical Oxygen Demand (COD)	EPA 410.4	28 days
Arsenic	SW 846 - 6010	6 months
Barium	SW 846 - 6010	6 months
Cadmium	SW 846 - 6010	6 months
Calcium	SW 846 - 6010	6 months
Chromium	SW 846 - 6010	6 months
Copper	SW 846 - 6010	6 months
Iron	SW 846 - 6010	6 months
Lead	SW 846 - 6010	6 months
Magnesium	SW 846 - 6010	6 months
Mercury	EPA 245.1	28 days
Nickel	SW 846 - 6010	6 months
Potassium	SW 846 - 6010	6 months
Selenium	SW 846 - 7740	6 months
Silver	SW 846 - 7760	6 months
Sodium	SW 846 - 6010	6 months
Zinc	SW 846 - 6010	6 months
Volatile Organic Compounds (VOCs)	EPA 8260	14 days

Tabulated water quality parameters for surface water are presented in Table 4-3. Copies of laboratory reports for each day's samples are attached in Appendix F.

4.2.2.2 Volatile Organic Compounds

Samples collected from surface waters were analyzed for VOCs using Method 8260. The list of reported VOCs has been established to comply with regulatory requirements of RCRA. Table 4-1 provides a summary of the VOCs detected and the respective concentration. A tabulated listing of all VOC results is presented in Table 4-5, and copies of laboratory results and documentation are attached as Appendix F.

Volatile organic compounds were identified in 4 of the 7 surface water samples of the subject sampling event. A total of 6 compounds were observed at concentrations exceeding the laboratory quantitation level in at least one surface water sample.

The highest total concentration of VOCs was observed in the sample collected from the upper pond (60.7 $\mu g/\ell$).

One compound, trichloroethene (TCE), was detected in surface water samples at concentrations exceeding its MCL. The MCL for TCE is 5 $\mu g/\ell$. TCE was observed at concentrations of 35 $\mu g/\ell$ and 8.5 $\mu g/\ell$ in samples collected from the upper pond and the location of SW-1, respectively. The upper pond is immediately downgradient from the southern portion of Tollgate landfill. SW-1 is located in the western drainage along Brentwood Park.

4.2.2.3 Metals

Samples collected from five surface water locations during the subject sampling event were analyzed for arsenic, barium, cadmium, calcium, chromium, copper, iron, lead, magnesium, mercury, nickel, potassium, selenium, silver, sodium, and zinc. Laboratory analyses were

TABLE 4-1 SUMMARY OF ANALYTICAL RESULTS
TOLLGATE LANDFILL, APRIL 1996

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	MCL	GM-1D	GW-1	Stripper Influent	SW-4	SW-3	Upper Pond	Lower Pond	Lower stream	SW-1	SW-2
Date		04/09/96	04/10/96	04/02/96	04/11/96	04/11/96	04/11/96	04/11/96	04/10/96	04/11/96	04/11/96
pH		N/S	6.16	6.68	7.80	7.71	N/S	N/S	8.25	6.93	7.43
Temperature (deg - C)		N/S	13.2	12.8	10.6	10.3	N/S	N/S	8.1	8.9	8.7
Total Alkalinity (as mg/l - CaCO3)		N/S	13	29	45	53	N/S	N/S	78	29	40
Hardness, Total (as mg/l - CaCO3)		N/S	38	56	80	80	N/S	N/S	84	48	62
Ammonia (as mg/l - N)		N/S	U	U	U	U	N/S	N/S	U	U	U
Nitrate (as mg/l - N)	10.00	N/S	6.55	3.70	1.67	1.69	N/S	N/S	1.42	1.60	2.37
Chloride (mg/l)		N/S	7.41	8.30	39.20	54.60	N/S	N/S	20.90	7.69	13.30
Turbidity (NTU)		N/S	200	0.2	2	1.8	N/S	N/S	47	8.9	2.3
Specific Conductance (umhos/cm)		N/S	119.5	116.2	274	331	N/S	N/S	289	109.8	169
Sulfate (mg/l)		N/S	U	10.6	18.3	19.8	N/S	N/S	19.1	17.9	17.6
Dissolved Solids (mg/l)		N/S	86	76	150	170	N/S	N/S	160	70	72
COD (mg/l)		N/S	U	U	U	U	N/S	N/S	17	U	U
Acetone		55	U	U	U	U	U	U	B	U	U
Benzene	5	3.1	U	U	U	U	U	U	U	U	U
Bromochloromethane		U	U	U	U	U	U	U	U	U	U
2-Butanone (MEK)		U	U	U	U	U	U	U	U	U	U
Carbon Tetrachloride	5	U	U	U	U	U	U	U	U	U	U
Chloroethane		3.3	U	U	U	U	U	U	U	U	U
Chloroform		U	U	2.2	U	U	U	U	U	U	U
Chloromethane		U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	600	1.3	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	70	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	5	13	U	2.1	U	U	U	U	U	U	U
1,1-Dichloroethane		259	U	32	U	U	2.2	U	U	U	U
1,1-Dichloroethene	7	5.6	U	7	U	U	2.4	U	U	U	U
cis-1,2-Dichloroethene	70	460	U	117	U	U	17	1.6	U	0.8	U
trans-1,2-Dichloroethene	100	2.2	U	U	U	U	U	U	U	U	U
1,2-Dichloropropane	5	2.4	U	U	U	U	U	U	U	U	U
Ethylbenzene	700	U	U	U	U	U	U	U	U	U	U
Methylene chloride	5	216	U	B	U	U	U	U	U	U	U
4-Methyl-2-Pentanone (MIBK)		6.2	U	U	U	U	U	U	U	U	U
Styrene	100	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	5	11	U	4.4	U	U	1.6	U	U	U	U
Toluene	1,000	0.7	U	U	U	U	U	U	U	U	U
1,1,2-Trichloroethane	5	U	U	1.5	U	U	U	U	U	U	U
1,1,1-Trichloroethane	200	8.6	U	23	U	U	2.5	U	U	0.6	U
Trichloroethene	5	1020	U	278	U	U	35	4.2	1.9	8.5	U
Trichlorofluoromethane		U	U	U	U	U	U	U	U	U	U
Vinyl Chloride	2	4.8	U	1.1	U	U	U	U	U	U	U
Xylenes, Total	10,000	6.4	U	U	U	U	U	U	U	U	U
Barium	2	N/S	U	U	0.01	0.012	N/S	N/S	0.021	0.007	0.007
Calcium		N/S	7.4	12.3	16.9	18.7	N/S	N/S	19.9	9.59	14.3
Copper	1	N/S	U	0.033	U	U	N/S	N/S	0.004	U	U
Iron		N/S	U	U	0.157	0.177	N/S	N/S	2.46	0.671	0.138
Magnesium		N/S	4.52	5.24	8.81	9.23	N/S	N/S	8.06	4.51	7.19
Nickel	0.1	N/S	U	U	U	U	N/S	N/S	U	U	U
Potassium		N/S	U	U	0.8	1.38	N/S	N/S	2.2	0.751	0.582
Sodium		N/S	1.84	2.35	18.7	21.9	N/S	N/S	10.8	2.54	4.13
Zinc		N/S	U	0.011	0.011	0.03	N/S	N/S	0.008	U	U

Concentration of VOCs reported in ug/l; other units in mg/l
U = below quantitation level
Shading = exceeds MCL
B = Questionable detection, identified in related blank

conducted on unfiltered samples to determine concentrations of total metals; only the Lower Stream sample was field filtered to determine dissolved metal concentrations.

Table 4-1 provides an overview of the metals detected in samples from surface waters, and the respective concentrations. Only the dissolved concentrations are included in Table 4-1 for the purpose of clarity. Table 4-7 includes the results from analysis of the filtered samples from the Lower Stream, and copies of laboratory results are attached in the appendices. Analytical results for unfiltered samples are presented in Table 4-8, and laboratory results are attached in the appendices.

Arsenic

Arsenic was not detected in any of the filtered or unfiltered surface water samples.

Barium

Barium was detected in the five unfiltered samples and the single filtered sample collected from surface waters. The highest observed concentration of barium in any of the samples was 0.021 mg/ℓ (lower stream), which is below the MCL of 2 mg/ℓ.

Cadmium

Cadmium was not detected in any of the surface water samples.

Calcium

Calcium was detected in the samples collected from all surface water locations. The concentrations in the unfiltered lower stream sample was only slightly higher than the concentration in the filtered sample. The highest observed concentration of calcium in any of the samples was 19.9 mg/ℓ, which was in the unfiltered sample from the lower stream.

Chromium

Chromium was not detected in any of the surface water samples.

TABLE 4-8
UNFILTERED SAMPLE METAL ANALYSIS RESULTS
TOLLGATE LANDFILL, APRIL 1996

	Arsenic		Barium		Cadmium		Calcium		Chromium		Copper		Iron		Lead		Magnesium		Mercury		Nickel		Potassium	
MCL	0.05		2		0.005				0.1		1				0.015				0.002		0.1			
TG-12	0.038	U	0.003	U	0.004	U	7.23		0.008	U	0.003	U	5.16		0.024	U	5.14		0.0002	U	0.011	U	0.39	U
TG-13A	0.038	U	0.003	U	0.004	U	12.4		0.008	U	0.003	U	11.3		0.024	U	2.55		0.0002	U	0.011	U	0.39	U
TG-13B	0.038	U	0.003	U	0.004	U	11.9		0.008	U	0.003	U	30.4		0.024	U	6.06		0.0002	U	0.011	U	0.39	U
MW-6	0.038	U	0.006		0.004	U	40.4		0.008	U	0.003	U	0.233		0.024	U	16.4		0.0002	U	0.011	U	0.396	
MW-5	0.038	U	0.003	U	0.004	U	53.8		0.024		0.003		3.71		0.024	U	19.8		0.0002	U	0.011	U	0.39	U
TG-5	0.038	U	0.008		0.004	U	15.2		0.012		0.003	U	0.61		0.024	U	7.72		0.0002	U	0.011	U	0.39	U
MW-4	0.038	U	0.016		0.004	U	27.3		0.008	U	0.003	U	0.365		0.024	U	10.2		0.0002	U	0.011	U	1.25	
MW-4 (dup)	0.038	U	0.018		0.004	U	27.2		0.008	U	0.003	U	0.373		0.024	U	10.2		0.0002	U	0.011	U	1.38	
MW-3	0.038	U	0.041		0.004	U	31.9		0.008	U	0.006		0.009	U	0.024	U	13.3		0.0002	U	0.011	U	1.9	
MW-8S	0.038	U	0.031		0.004	U	12.5		0.009		0.004		3.28		0.024	U	5.84		0.0002	U	0.011	U	0.431	
MW-8D	0.038	U	0.03		0.004	U	13.1		0.008	U	0.003	U	0.075		0.024	U	5.33		0.0002	U	0.011	U	0.473	
TG-10	0.038	U	0.06		0.004	U	25.6		0.008	U	0.003	U	24.4		0.024	U	10.7		0.0002	U	0.011	U	1.95	
MW-7	0.038	U	0.701		0.004	U	144		0.099		0.069		56.4		0.096		18		0.0002	U	0.43		286	
MW-1S	0.038	U	0.007		0.004	U	35.4		0.008	U	0.003	U	0.194		0.024	U	14.6		0.0002	U	0.011	U	2.07	
MW-1D	0.038	U	0.058		0.004	U	42.3		0.008	U	0.003		0.604		0.024	U	6.38		0.0002	U	0.011	U	160	
MW-1D (dup)	0.038	U	0.056		0.004	U	40.9		0.008	U	0.003	U	0.612		0.024	U	6.45		0.0002	U	0.011	U	163	
GM-4	0.038	U	0.036		0.004	U	58.9		0.013		0.065		29.2		0.094		27.6		0.0002	U	0.011	U	1.8	
GW-4	0.038	U	0.008		0.004	U	8.9		0.008	U	0.003	U	2.16		0.024	U	4.72		0.0002	U	0.011	U	0.688	
GM-3	0.038	U	0.03		0.004	U	10.9		0.008	U	0.054		36		0.024	U	8.88		0.0002	U	0.011	U	0.39	U
GM-1A	0.038	U	0.011		0.004	U	15.9		0.008	U	0.026		14.4		0.024	U	6.46		0.0002	U	0.011	U	0.987	
GW-1	0.038	U	0.005		0.004	U	8.02		0.008	U	0.01		9.75		0.024	U	5.63		0.0002	U	0.011	U	0.891	
Stripper Influent	0.038	U	0.003	U	0.004	U	12.2		0.048		0.298		0.195		0.024	U	5.25		0.0002	U	0.027		0.39	U
SW-4	0.038	U	0.01		0.004	U	16.9		0.008	U	0.003	U	0.157		0.024	U	8.81		0.0002	U	0.011	U	0.8	
SW-3	0.038	U	0.012		0.004	U	18.7		0.008	U	0.003	U	0.177		0.024	U	9.23		0.0002	U	0.011	U	1.38	
Lower stream	0.038	U	0.021		0.004	U	19.9		0.008	U	0.004		2.46		0.024	U	8.06		0.0002	U	0.011	U	2.2	
SW-1	0.038	U	0.007		0.004	U	9.59		0.008	U	0.003	U	0.671		0.024	U	4.51		0.0002	U	0.011	U	0.751	
SW-2	0.038	U	0.007		0.004	U	14.3		0.008	U	0.003	U	0.138		0.024	U	7.19		0.0002	U	0.011	U	0.582	

U = Below quantitation level
Reported as mg/l
Shading = exceeds MCL

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TABLE 4-8
UNFILTERED SAMPLE METAL ANALYSIS RESULTS
TOLLGATE LANDFILL, APRIL 1996

	Selenium		Silver		Sodium		Zinc	
MCL	0.05							
TG-12	0.001	U	0.01	U	2.43		0.008	
TG-13A	0.001	U	0.01	U	2.52		0.066	
TG-13B	0.001	U	0.01	U	2.27		2.970	
MW-6	0.001	U	0.01	U	6.65		0.072	
MW-5	0.001	U	0.01	U	6.05		0.016	
TG-5	0.001	U	0.01	U	6.36		0.005	
MW-4	0.001	U	0.01	U	6.2		0.019	
MW-4 (dup)	0.001	U	0.01	U	6.22		0.020	
MW-3	0.001	U	0.01	U	24.1		0.040	
MW-8S	0.001	U	0.01	U	5.91		0.010	
MW-8D	0.001	U	0.01	U	6.35		0.045	
TG-10	0.001	U	0.01	U	23.9		0.044	
MW-7	0.001	U	0.01	U	140		0.318	
MW-1S	0.001	U	0.01	U	5.6		0.010	
MW-1D	0.001	U	0.01	U	72.1		0.031	
MW-1D (dup)	0.001	U	0.01	U	73.5		0.050	
GM-4	0.001	U	0.01	U	5.92		0.049	
GW-4	0.001	U	0.01	U	2.15		0.017	
GM-3	0.001	U	0.01		2.83		0.058	
GM-1A	0.001	U	0.01	U	2.95		0.015	
GW-1	0.001	U	0.02		1.89		0.019	
Stripper Influent	0.001	U	0.01	U	2.36		0.054	
SW-4	0.001	U	0.01	U	18.7		0.011	
SW-3	0.001	U	0.01	U	21.9		0.030	
Lower stream	0.001	U	0.01	U	10.8		0.008	
SW-1	0.001	U	0.01	U	2.54		0.003	U
SW-2	0.001	U	0.01	U	4.13		0.003	U

U = Below quantitation level
Reported as mg/l
Shading = exceeds MCL

Copper

Copper was detected in the lower stream unfiltered sample only. The reported concentration of 0.004 mg/ℓ was below the MCL for copper of 1 mg/ℓ.

Iron

Iron was detected in all of the samples collected from surface waters. In the case of the lower stream, the iron concentration in the unfiltered sample was more than an order of magnitude higher than the iron concentration in the filtered sample.

Lead

Lead was not detected in any of the surface water samples.

Magnesium

Magnesium was detected in all of the samples collected from surface waters.

Mercury

Mercury was not detected in any of the surface water samples.

Nickel

Nickel was not detected in any of the surface water samples.

Potassium

Potassium was detected in all of the samples collected from surface waters.

Selenium

Selenium was not detected in any of the surface water samples.

Silver

Silver was not detected in any of the surface water samples.

Sodium

Sodium was detected in all of the samples collected from surface waters.

Zinc

Zinc was detected in the samples from SW-3, SW-4 and in the unfiltered lower stream sample. Zinc was not reported in the filtered sample for the lower stream.

4.3 Ion Balance Evaluation

Sample analysis results collected during the subject monitoring event have been evaluated with respect to cation/anion balance conditions. The principle of electroneutrality requires that ionic species in a solution be balanced. The positive charge concentration should be equal to the negative charge concentration. The purpose of the ion balance procedure is to determine if a relative balance between cationic and anionic species is represented by the collected data. A balanced condition indicates that the sampling procedures and analytical parameters appropriately characterize the groundwater condition.

Cationic species in the groundwater include hydrogen ions, dissolved metals and ammonia. Anionic species include hydroxyl ions, nitrate, chloride, sulfate, carbonate and bicarbonate. For purpose of this evaluation, the alkalinity of each sample was measured in the laboratory and reported as a concentration of calcium carbonate. The alkalinity of a solution is actually a measurement of acid neutralizing capacity. In this evaluation, the alkalinity accounts for the cumulative ionic charge of hydrogen, hydroxyl, carbonate and bicarbonate ions, and is included as an anionic species.

The electroneutrality condition is based upon the ions dissolved in a solution; accordingly, the laboratory results for filtered samples are used in this evaluation. The mass concentrations of each cationic and anionic species was converted to a molar concentration (mmol/ℓ) using the atomic weight or formula weight of each species. The molar concentration was then multiplied by

SECTION 5
CONCLUSIONS

Sampling of 22 monitoring wells and seven surface water locations at the Tollgate Landfill and subsequent laboratory analysis and data evaluation have provided a set of useful data for monitoring of groundwater quality at this facility. The following conclusions are based upon the findings of this report.

- Measured groundwater elevations were mapped and indicate a general flow from north to south, with a component of the flow directed to the east-southeast from the eastern portion of the site.

- Volatile organic compounds were detected in samples collected from monitoring wells on the eastern, southern and western perimeter of the site. The most elevated concentrations of VOCs were observed in samples from wells in the southern and western portion of the site. The wells in the western portion of the site are in an area being remediated by a groundwater pump and treat system. A groundwater remediation system project is underway for the area of the affected wells in the southern portion of the site.

- The Maximum Contaminant Levels (MCL) for drinking water for several chlorinated organic compounds were exceeded in samples collected from several monitoring wells located on the perimeter of the Tollgate Landfill.

- Sample analysis results from monitoring well MW-7 indicate elevated concentrations of several inorganic parameters and the ion balance evaluation indicated that the cationic to anionic species balance was out of the acceptable range. The surface casing of the well had been damaged and was subject to surface water infiltration. The results for this well may be erroneous.

- Samples were collected from monitoring wells for metals analysis. Aliquots of unfiltered and field filtered samples were analyzed to determine total and dissolved metals concentrations. None of the dissolved metals concentrations exceeded MCLs for drinking water. One metal, lead, was detected at concentrations above MCL in samples collected for total metals analysis from monitoring wells MW-7 and GM-4. Lead was not detected in the corresponding filtered sample from these locations, indicating that the metal was associated with sediments or soil matrix in the sample, and is not necessarily representative of groundwater conditions.

- Ion balance evaluation of sample results generally indicates that the groundwater is characterized appropriately; however, ion balance evaluation for several of the wells sampled are not within a range generally considered acceptable.

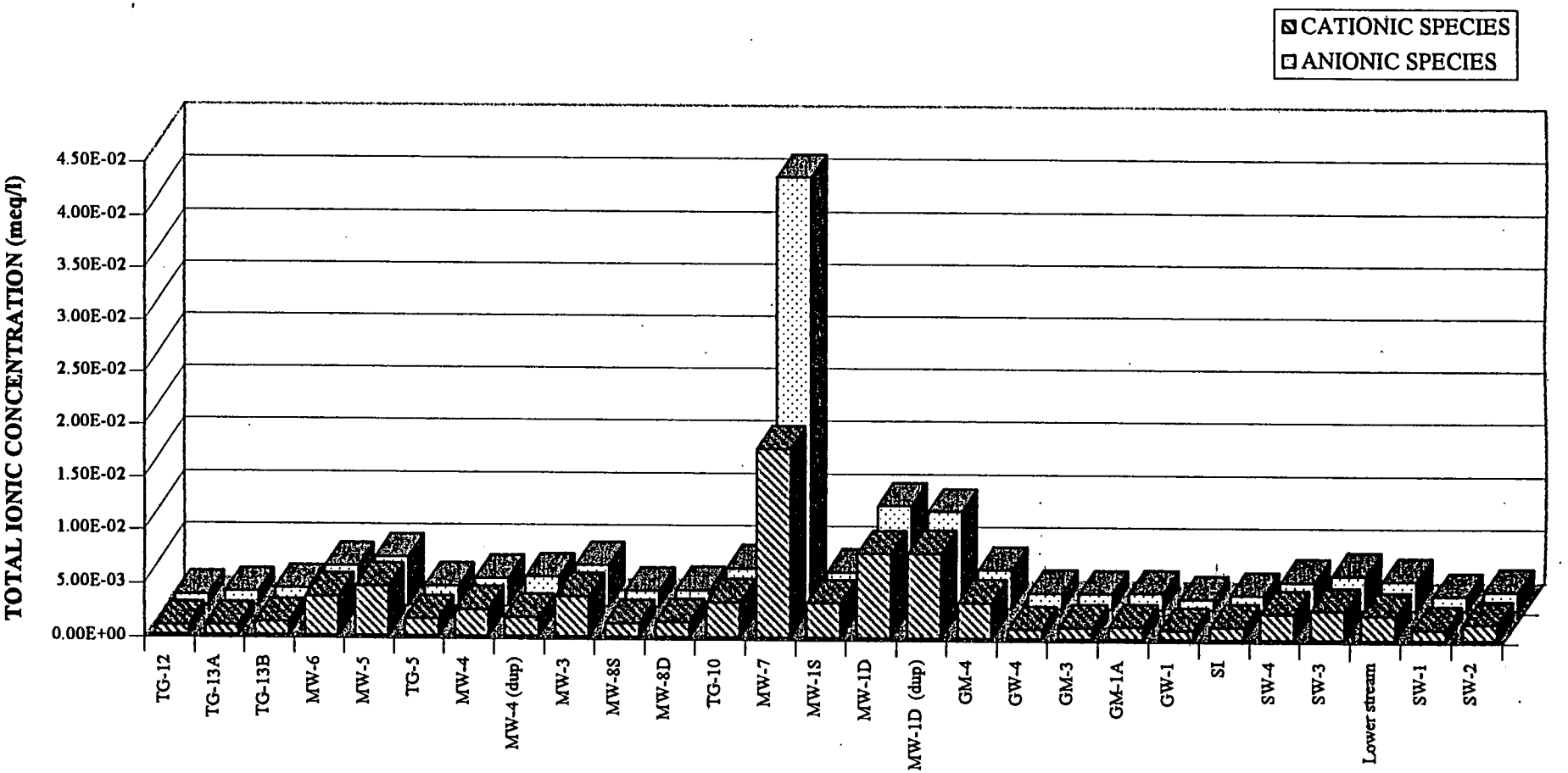
- A review of data collected from analysis of quality control samples indicates that the monitoring well and surface water analytical data are of acceptable quality. Limited concerns are noted after review of duplicate analyses, trip and field blanks, and rinsate samples.

TABLE 4-3
WATER QUALITY PARAMETERS - SURFACE WATER
TOLLGATE LANDFILL, APRIL 1996

	Date	pH	Temperature (deg - C)	Total Alkalinity (as mg/l - CaCO3)	Hardnesss, Total (as mg/l - CaCO3)	Ammonia (as mg/l - N)	Nitrate (as mg/l - N)	Chloride (mg/l)	Turbidity (NTU)	Specific Conductance (umhos/cm)	Sulfate (mg/l)	Dissolved Solids (mg/l)	COD (mg/l)
MCL							10.00						
SW-4	04/11/96	7.80	10.6	45	80	U	1.67	39.20	2	274	18.3	150	U
SW-3	04/11/96	7.71	10.3	53	80	U	1.69	54.60	1.8	331	19.8	170	U
Lower stream	04/10/96	8.25	8.1	78	84	U	1.42	20.90	47	289	19.1	160	17
SW-1	04/11/96	6.93	8.9	29	48	U	1.60	7.69	8.9	109.8	17.9	70	U
SW-2	04/11/96	7.43	8.7	40	62	U	2.37	13.30	2.3	169	17.6	72	U

U = Below quantitation level

FIGURE 4-2
IONIC SPECIES CONCENTRATIONS
TOLLGATE LANDFILL, APRIL 1996



SAMPLING LOCATION

ARTESIAN LABORATORIES

Artesian Laboratories, Inc.
630 Churchmans Road
Newark, Delaware 19702
(302) 453-6920 • 453-6986 (FAX)

REPORT OF ANALYSIS

Harford County DPW
Division of Env Affairs
1807 North Fountain Green Rd
Bel Air, MD 21015
Attn: Mr. Daniel S. Pazdersky
Invoice Number: 56537

Order #: 96-04-393
Date: 06/26/96 09:13
Work ID: Tollgate Landfill
Date Received: 04/11/96
Date Completed: 06/26/96
Client Code: HARCO_DPW

See Project Comments

SAMPLE IDENTIFICATION

Sample Number	Sample Description
01	GM-3
02	GW-1
03	SW-1
04	SW-2
05	SW-3
08	SW-4
09	Rinseate Day 6
10	TB Lot #32196
11	TB Lot# 32196

This cover page is an integral part of the analytical report that follows.

Warren Van Arsdall

Certified By
Warren Van Arsdall

TEST RESULTS BY SAMPLE

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Nickel, ICP	ND	0.011	mg/L	RJM	04/17/96 16:39
Potassium, ICP	0.582	0.39	mg/L	RJM	04/17/96 16:39
Selenium, Furnace AA	ND	0.001	mg/L	JTH	04/22/96 10:11
Silver, Flame AA	ND	0.01	mg/L	JTH	04/19/96 14:00
Sodium, ICP	4.13	0.20	mg/L	RJM	04/17/96 16:39
Zinc, ICP	ND	0.003	mg/L	RJM	04/17/96 16:39

Sample: 04C SW-2 **Category: WW**
Collected: 04/11/96 09:43

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Ammonia, Titrimetric	ND	1.0	mg/L as N	NG	04/15/96 10:00
Chemical Oxygen Demand	ND	10	mg/L	NG	04/18/96 09:00

Sample: 04D SW-2 **Category: WW**
Collected: 04/11/96 09:43

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Chloride, Ion Chrom	13.3	0.39	mg/L	JJ	04/12/96 10:01
Ion chromatography	04/12/96		date complete	JJ	
Nitrate, Ion Chrom	2.37	0.06	mg/L as N	JJ	04/12/96 10:01
Solids, Total Dissolved	72	10	mg/L	EL	04/13/96 08:35
Sulfate, Ion Chrom	17.6	0.38	mg/L	JJ	04/12/96 10:01
Total Alkalinity-Titration	40	1.0	mg/L as CaCO3	JJ	04/22/96 09:30
Turbidity	2.3	0.11	NTU	AMH	04/12/96 09:10

Sample: 04F SW-2 **Category: WW**
Collected: 04/11/96 09:43

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Total Hardness, Titration	62	1.0	mg/L as CaCO3	NG	04/17/96 10:50

Sample: 05B SW-3 Unfiltered **Category: WW**
Collected: 04/11/96 10:10

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Arsenic, ICP	ND*	0.038	mg/L	RJM	04/17/96 16:42
Barium, ICP	0.012	0.003	mg/L	RJM	04/17/96 16:42
Cadmium, ICP	ND	0.004	mg/L	RJM	04/17/96 16:42
Calcium, ICP	18.7	0.080	mg/L	RJM	04/17/96 16:42
Chromium, ICP	ND	0.008	mg/L	RJM	04/17/96 16:42
Copper, ICP	ND	0.003	mg/L	RJM	04/17/96 16:42
Digestion, Microwave	04/16/96		date digested	RJM	04/16/96 16:00
Iron, ICP	0.177	0.009	mg/L	RJM	04/17/96 16:42
Lead, ICP	ND	0.024	mg/L	RJM	04/17/96 16:42
Magnesium, ICP	9.23	0.004	mg/L	RJM	04/17/96 16:42
Mercury, Cold Vapor AA	ND	0.0002	mg/L	RJM	04/18/96 11:20
Nickel, ICP	ND	0.011	mg/L	RJM	04/17/96 16:42
Potassium, ICP	1.38	0.39	mg/L	RJM	04/17/96 16:42
Selenium, Furnace AA	ND	0.001	mg/L	JTH	04/22/96 10:11
Silver, Flame AA	ND	0.01	mg/L	JTH	04/19/96 14:00

TEST RESULTS BY SAMPLE

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Sodium, ICP	21.9	0.20	mg/L	RJM	04/17/96 16:42
Zinc, ICP	0.030	0.003	mg/L	RJM	04/17/96 16:42

Sample: 05C SW-3 **Category: WW**
Collected: 04/11/96 10:10

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Ammonia, Titrimetric	ND	1.0	mg/L as N	NG	04/15/96 10:00
Chemical Oxygen Demand	ND	10	mg/L	NG	04/18/96 09:00

Sample: 05D SW-3 **Category: WW**
Collected: 04/11/96 10:10

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Chloride, Ion Chrom	54.6	0.39	mg/L	JJ	04/12/96 10:10
Ion chromatography	04/12/96		date complete	JJ	
Nitrate, Ion Chrom	1.69	0.06	mg/L as N	JJ	04/12/96 10:10
Solids, Total Dissolved	170		mg/L	EL	04/13/96 08:35
Sulfate, Ion Chrom	19.8	0.38	mg/L	JJ	04/12/96 10:10
Total Alkalinity-Titration	53	1.0	mg/L as CaCO3	JJ	04/22/96 09:30
Turbidity	1.8	0.11	NTU	AMH	04/12/96 09:10

Sample: 05F SW-3 **Category: WW**
Collected: 04/11/96 10:10

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Total Hardness, Titration	80	1.0	mg/L as CaCO3	NG	04/17/96 10:50

Sample: 08B SW-4 Unfiltered **Category: WW**
Collected: 04/11/96 10:40

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Arsenic, ICP	ND*	0.038	mg/L	RJM	04/17/96 16:46
Barium, ICP	0.010	0.003	mg/L	RJM	04/17/96 16:46
Cadmium, ICP	ND	0.004	mg/L	RJM	04/17/96 16:46
Calcium, ICP	16.9	0.080	mg/L	RJM	04/17/96 16:46
Chromium, ICP	ND	0.008	mg/L	RJM	04/17/96 16:46
Copper, ICP	ND	0.003	mg/L	RJM	04/17/96 16:46
Digestion, Microwave	04/16/96		date digested	RJM	04/16/96 16:00
Iron, ICP	0.157	0.009	mg/L	RJM	04/17/96 16:46
Lead, ICP	ND	0.024	mg/L	RJM	04/17/96 16:46
Magnesium, ICP	8.81	0.004	mg/L	RJM	04/17/96 16:46
Mercury, Cold Vapor AA	ND	0.0002	mg/L	RJM	04/18/96 11:20
Nickel, ICP	ND	0.011	mg/L	RJM	04/17/96 16:46
Potassium, ICP	0.800	0.39	mg/L	RJM	04/17/96 16:46
Selenium, Furnace AA	ND	0.001	mg/L	JTH	04/22/96 10:11
Silver, Flame AA	ND	0.01	mg/L	JTH	04/19/96 14:00
Sodium, ICP	18.7	0.20	mg/L	RJM	04/17/96 16:46
Zinc, ICP	0.011	0.003	mg/L	RJM	04/17/96 16:46

TEST RESULTS BY SAMPLE

Sample: 08C SW-4
Collected: 04/11/96 10:40

Category: WW

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Ammonia, Titrimetric	ND	1.0	mg/L as N	NG	04/15/96 10:00
Chemical Oxygen Demand	ND	10	mg/L	NG	04/18/96 09:00

Sample: 08D SW-4
Collected: 04/11/96 10:40

Category: EE

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Chloride, Ion Chrom	39.2	0.39	mg/L	JJ	04/12/96 10:35
Ion chromatography	04/12/96		date complete	JJ	
Nitrate, Ion Chrom	1.67	0.06	mg/L as N	JJ	04/12/96 10:35
Solids, Total Dissolved	150		mg/L	EL	04/13/96 08:35
Sulfate, Ion Chrom	18.3	0.38	mg/L	JJ	04/12/96 10:35
Total Alkalinity-Titration	45	1.0	mg/L as CaCO3	JJ	04/22/96 09:30
Turbidity	2.0	0.11	NTU	AMH	04/12/96 09:10

Sample: 08F SW-4
Collected: 04/11/96 10:40

Category: WW

Test Description	Result	Det Limit	Units	By	Analyzed Dt/Tm
Total Hardness, Titration	80	1.0	mg/L as CaCO3	NG	04/17/96 10:50

TEST RESULTS BY SAMPLE

Sample Description: SW-3 Lab No: 05A
Test Description: GC/MS Volatiles,SW846 8260 Method: SW 846 8260 Test Code: VHARLL
Collected: 04/11/96 10:10 Category: WW

PARAMETER	RESULT	LIMIT
Acetone	ND	10
Acrylonitrile	ND	20
Allyl Chloride	ND	5.0
Benzene	ND	1.0
Bromochloromethane	ND	0.80
Bromodichloromethane	ND	0.70
Bromoform	ND	1.0
Bromomethane	ND	1.0
2-Butanone (MEK)	ND	10
Carbon Disulfide	ND	5.0
Carbon Tetrachloride	ND	0.90
Chlorobenzene	ND	0.70
Chloroethane	ND	0.80
Chloroform	ND	0.60
Chloromethane	ND	0.70
Chloropropene	ND	5.0
Dibromochloromethane	ND	0.80
1,2-Dibromoethane	ND	0.80
Dibromomethane	ND	0.90
1,2-Dibromo-3-Chloropropane	ND	1.6
1,2-Dichlorobenzene	ND	0.80
1,4-Dichlorobenzene	ND	0.60
trans-1,4-Dichloro-2-butene	ND	5.0
1,2-Dichloroethane	ND	0.70
1,1-Dichloroethane	ND	0.80
1,1-Dichloroethene	ND	0.60
cis-1,2-Dichloroethene	ND	0.80
trans-1,2-Dichloroethene	ND	0.90
Dichloromethane (MeCl2)	ND	1.6
1,1-Dichloropropene	ND	0.70
1,2-Dichloropropane	ND	0.70
2,2-Dichloropropane	ND	1.1
1,3-Dichloropropane	ND	0.90
cis-1,3-Dichloropropene	ND	0.40
trans-1,3-Dichloropropene	ND	0.40
Ethylbenzene	ND	0.70
Ethyl methacrylate	ND	5.0
2-Hexanone	ND	5.0
Iodomethane	ND	5.0
Isobutyl alcohol	ND	100
Methyl methacrylate	ND	5.0
4-Methyl-2-Pentanone (MIBK)	ND	10
Styrene	ND	0.80
1,1,1,2-Tetrachloroethane	ND	0.80
1,1,2,2-Tetrachloroethane	ND	0.90

TEST RESULTS BY SAMPLE

Sample Description: SW-3 Lab No: 05A
Test Description: GC/MS Volatiles,SW846 8260 Method: SW 846 8260 Test Code: VHARLL
Collected: 04/11/96 10:10 Category: WW

Tetrachloroethene	ND	0.70
Toluene	ND	0.60
1,1,2-Trichloroethane	ND	0.90
1,1,1-Trichloroethane	ND	0.60
Trichloroethene	ND	0.80
Trichlorofluoromethane	ND	0.80
1,2,3-Trichloropropane	ND	1.4
Vinyl Acetate	ND	10
Vinyl Chloride	ND	0.60
Xylenes, Total	ND	2.6

SURROGATE	%RECOVERY	LIMITS
Dibromofluoromethane	103	86 - 118
Toluene-d8	100	88 - 110
4-Bromofluorobenzene	95	86 - 115

Notes and Definitions for this Report:

DATE RUN 04/22/96 21:19:00
ANALYST ded
CONC FACTOR 1
UNITS ug/L

TEST RESULTS BY SAMPLE

Sample Description: SW-4
Test Description: GC/MS Volatiles,SW846 8260
Collected: 04/11/96 10:40

Lab No: 08A
Method: SW 846 8260
Test Code: VHARLL
Category: WW

PARAMETER	RESULT	LIMIT
Acetone	ND	10
Acrylonitrile	ND	20
Allyl Chloride	ND	5.0
Benzene	ND	1.0
Bromochloromethane	ND	0.80
Bromodichloromethane	ND	0.70
Bromoform	ND	1.0
Bromomethane	ND	1.0
2-Butanone (MEK)	ND	10
Carbon Disulfide	ND	5.0
Carbon Tetrachloride	ND	0.90
Chlorobenzene	ND	0.70
Chloroethane	ND	0.80
Chloroform	ND	0.60
Chloromethane	ND	0.70
Chloropropene	ND	5.0
Dibromochloromethane	ND	0.80
1,2-Dibromoethane	ND	0.80
Dibromomethane	ND	0.90
1,2-Dibromo-3-Chloropropane	ND	1.6
1,2-Dichlorobenzene	ND	0.80
1,4-Dichlorobenzene	ND	0.60
trans-1,4-Dichloro-2-butene	ND	5.0
1,2-Dichloroethane	ND	0.70
1,1-Dichloroethane	ND	0.80
1,1-Dichloroethene	ND	0.60
cis-1,2-Dichloroethene	ND	0.80
trans-1,2-Dichloroethene	ND	0.90
Dichloromethane (MeCl2)	ND	1.6
1,1-Dichloropropene	ND	0.70
1,2-Dichloropropane	ND	0.70
2,2-Dichloropropane	ND	1.1
1,3-Dichloropropane	ND	0.90
cis-1,3-Dichloropropene	ND	0.40
trans-1,3-Dichloropropene	ND	0.40
Ethylbenzene	ND	0.70
Ethyl methacrylate	ND	5.0
2-Hexanone	ND	5.0
Iodomethane	ND	5.0
Isobutyl alcohol	ND	100
Methyl methacrylate	ND	5.0
4-Methyl-2-Pentanone (MIBK)	ND	10
Styrene	ND	0.80
1,1,1,2-Tetrachloroethane	ND	0.80
1,1,2,2-Tetrachloroethane	ND	0.90

TEST RESULTS BY SAMPLE

Sample Description: SW-4 Lab No: 08A
Test Description: GC/MS Volatiles,SW846 8260 Method: SW 846 8260 Test Code: VHARLL
Collected: 04/11/96 10:40 Category: WW

Tetrachloroethene	ND	0.70
Toluene	ND	0.60
1,1,2-Trichloroethane	ND	0.90
1,1,1-Trichloroethane	ND	0.60
Trichloroethene	ND	0.80
Trichlorofluoromethane	ND	0.80
1,2,3-Trichloropropane	ND	1.4
Vinyl Acetate	ND	10
Vinyl Chloride	ND	0.60
Xylenes, Total	ND	2.6

SURROGATE	%RECOVERY	LIMITS		
Dibromofluoromethane	102	86	-	118
Toluene-d8	100	88	-	110
4-Bromofluorobenzene	94	86	-	115

Notes and Definitions for this Report:

DATE RUN 04/22/96 22:00:00
ANALYST ded
CONC FACTOR 1
UNITS ug/L

Tollgate Landfill, April 1996
Ion Balance Evaluation

SURFACE WATER SW-4					
	Valence	Atomic Weight g/mol	Mass Concentration mg/l	Molar Concentration mmol/l	Equivalent Concentration meq/l
CATIONS					
Arsenic	3	74.92	0.000	0.00E+00	0.00E+00
Barium	2	137.34	0.010	7.28E-08	1.46E-07
Cadmium	2	112.4	0.000	0.00E+00	0.00E+00
Calcium	2	40.08	16.900	4.22E-04	8.43E-04
Chromium	3	52	0.000	0.00E+00	0.00E+00
Copper	2	63.54	0.000	0.00E+00	0.00E+00
Iron	2	55.85	0.157	2.81E-06	5.62E-06
Lead	2	207.19	0.000	0.00E+00	0.00E+00
Magnesium	2	24.31	8.810	3.62E-04	7.25E-04
Mercury	2	200.59	0.000	0.00E+00	0.00E+00
Nickel	2	58.69	0.000	0.00E+00	0.00E+00
Potassium	1	39.1	0.800	2.05E-05	2.05E-05
Selenium	4	78.96	0.000	0.00E+00	0.00E+00
Silver	1	107.87	0.000	0.00E+00	0.00E+00
Sodium	1	22.99	18.700	8.13E-04	8.13E-04
Zinc	2	65.38	0.011	1.68E-07	3.36E-07
Ammonia	1	14.01	0.000	0.00E+00	0.00E+00
			Total Cations		2.41E-03
ANIONS					
Nitrate	1	14.01	1.670	1.19E-04	1.19E-04
Chloride	1	35.45	39.200	1.11E-03	1.11E-03
Sulfate	2	96.04	18.300	1.91E-04	3.81E-04
			Total Anions		1.61E-03
ALKALINITY					
Alkalinity	2	100.09	45.000	4.50E-04	8.99E-04
			Total Alkalinity		8.99E-04
PERCENT DIFFERENCE					**-1.98%**

Tollgate Landfill, April 1996
Ion Balance Evaluation

SURFACE WATER SW-3					
	Valence	Atomic Weight g/mol	Mass Concentration mg/l	Molar Concentration mmol/l	Equivalent Concentration meq/l
CATIONS					
Arsenic	3	74.92	0.000	0.00E+00	0.00E+00
Barium	2	137.34	0.012	8.74E-08	1.75E-07
Cadmium	2	112.4	0.000	0.00E+00	0.00E+00
Calcium	2	40.08	18.700	4.67E-04	9.33E-04
Chromium	3	52	0.000	0.00E+00	0.00E+00
Copper	2	63.54	0.000	0.00E+00	0.00E+00
Iron	2	55.85	0.177	3.17E-06	6.34E-06
Lead	2	207.19	0.000	0.00E+00	0.00E+00
Magnesium	2	24.31	9.230	3.80E-04	7.59E-04
Mercury	2	200.59	0.000	0.00E+00	0.00E+00
Nickel	2	58.69	0.000	0.00E+00	0.00E+00
Potassium	1	39.1	1.380	3.53E-05	3.53E-05
Selenium	4	78.96	0.000	0.00E+00	0.00E+00
Silver	1	107.87	0.000	0.00E+00	0.00E+00
Sodium	1	22.99	21.900	9.53E-04	9.53E-04
Zinc	2	65.38	0.030	4.59E-07	9.18E-07
Ammonia	1	14.01	0.000	0.00E+00	0.00E+00
			Total Cations		2.69E-03
ANIONS					
Nitrate	1	14.01	1.690	1.21E-04	1.21E-04
Chloride	1	35.45	54.600	1.54E-03	1.54E-03
Sulfate	2	96.04	19.800	2.06E-04	4.12E-04
			Total Anions		2.07E-03
ALKALINITY					
Alkalinity	2	100.09	53.000	5.30E-04	1.06E-03
			Total Alkalinity		1.06E-03
PERCENT DIFFERENCE					**-7.64%**

Harford County								
Tollgate Landfill - April 1996								
Parameter	MDL	units	SW-3	SW-4	RB-6	TB	TB	TG-5
1,2-Dichloroethane	0.7	ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	0.8	ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	0.6	ug/L	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.8	ug/L	ND	ND	1.7	ND	ND	ND
trans-1,2-Dichloroethene	0.9	ug/L	ND	ND	ND	ND	ND	ND
Dichloromethane (MeCl2)	1.6	ug/L	ND	ND	ND	ND	ND	ND
1,1-Dichloropropene	0.7	ug/L	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	0.7	ug/L	ND	ND	ND	ND	ND	ND
2,2-Dichloropropane	1.1	ug/L	ND	ND	ND	ND	ND	ND
1,3-Dichloropropane	0.9	ug/L	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	0.4	ug/L	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	0.4	ug/L	ND	ND	ND	ND	ND	ND
Ethylbenzene	0.7	ug/L	ND	ND	ND	ND	ND	ND
Ethyl methacrylate	5	ug/L	ND	ND	ND	ND	ND	ND
2-Hexanone	5	ug/L	ND	ND	ND	ND	ND	ND
Iodomethane	5	ug/L	ND	ND	ND	ND	ND	ND
Isobutyl alcohol	100	ug/L	ND	ND	ND	ND	ND	ND
Methyl methacrylate	5	ug/L	ND	ND	ND	ND	ND	ND
4-Methyl-2-Pentanone (MIBK)	10	ug/L	ND	ND	ND	ND	ND	ND
Styrene	0.8	ug/L	ND	ND	ND	ND	ND	ND
1,1,1,2-Tetrachloroethane	0.8	ug/L	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.9	ug/L	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.7	ug/L	ND	ND	ND	ND	ND	ND
Toluene	0.6	ug/L	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	0.9	ug/L	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.6	ug/L	ND	ND	ND	ND	ND	ND
Trichloroethene	0.8	ug/L	ND	ND	4.4	ND	ND	ND
Trichlorofluoromethane	0.8	ug/L	ND	ND	ND	ND	ND	ND
1,2,3-Trichloropropane	1.4	ug/L	ND	ND	ND	ND	ND	ND
Vinyl Acetate	10	ug/L	ND	ND	ND	ND	ND	ND
Vinyl Chloride	0.6	ug/L	ND	ND	ND	ND	ND	ND
Xylenes, Total	2.6	ug/L	ND	ND	ND	ND	ND	ND

Harford County								
Tollgate Landfill - April 1996								
Parameter	MDL	units	SW-3	SW-4	RB-6	TB	TB	TG-5
Mercury, Cold Vapor AA dissolved	0.0002	mg/L						ND
Potassium, ICP dissolved	0.39	mg/L						ND
Magnesium, ICP dissolved	0.004	mg/L						7.38
Sodium, ICP dissolved	0.2	mg/L						6.19
Lead, ICP dissolved	0.024	mg/L						ND
Nickel, ICP dissolved	0.011	mg/L						ND
Selenium, Furnace AA dissolved	0.001	mg/L						ND
Zinc, ICP dissolved	0.003	mg/L						0.005
Total Hardness, Titration	1	mg/L	80	80				80
Acetone	10	ug/L	ND	ND	ND	ND	ND	12
Acrylonitrile	20	ug/L	ND	ND	ND	ND	ND	ND
Allyl Chloride	5	ug/L	ND	ND	ND	ND	ND	ND
Benzene	1	ug/L	ND	ND	ND	ND	ND	ND
Bromochloromethane	0.8	ug/L	ND	ND	ND	ND	ND	ND
Bromodichloromethane	0.7	ug/L	ND	ND	ND	ND	ND	ND
Bromoform	1	ug/L	ND	ND	ND	ND	ND	ND
Bromomethane	1	ug/L	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	10	ug/L	ND	ND	ND	ND	ND	ND
Carbon Disulfide	5	ug/L	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	0.9	ug/L	ND	ND	ND	ND	ND	2
Chlorobenzene	0.7	ug/L	ND	ND	ND	ND	ND	ND
Chloroethane	0.8	ug/L	ND	ND	ND	ND	ND	ND
Chloroform	0.6	ug/L	ND	ND	ND	ND	ND	7.3
Chloromethane	0.7	ug/L	ND	ND	ND	ND	ND	6.3
Chloropropene	5	ug/L	ND	ND	ND	ND	ND	ND
Dibromochloromethane	0.8	ug/L	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	0.8	ug/L	ND	ND	ND	ND	ND	ND
Dibromomethane	0.9	ug/L	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-Chloropropane	1.6	ug/L	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	0.8	ug/L	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	0.6	ug/L	ND	ND	ND	ND	ND	ND
trans-1,4-Dichloro-2-butene	5	ug/L	ND	ND	ND	ND	ND	ND

Harford County								
Tollgate Landfill - April 1996								
Parameter	MDL	units	SW-3	SW-4	RB-6	TB	TB	TG-5
Silver, Flame AA, total	0.01	mg/L	ND	ND				ND
Arsenic, ICP total	0.038	mg/L	ND*	ND*				ND
Barium, ICP total	0.003	mg/L	0.012	0.01				0.008
Calcium, ICP total	0.08	mg/L	18.7	16.9				15.2
Cadmium, ICP total	0.004	mg/L	ND	ND				ND
Chromium, ICP total	0.008	mg/L	ND	ND				0.012
Copper, ICP total	0.003	mg/L	ND	ND				ND
Iron, ICP total	0.009	mg/L	0.177	0.157				0.61
Mercury, Cold Vapor AA total	0.0002	mg/L	ND	ND				ND
Potassium, ICP total	0.39	mg/L	1.38	0.8				ND
Magnesium, ICP total	0.004	mg/L	9.23	8.81				7.72
Sodium, ICP total	0.2	mg/L	21.9	18.7				6.36
Lead, ICP total	0.024	mg/L	ND	ND				ND
Nickel, ICP total	0.011	mg/L	ND	ND				ND
Selenium, Furnace AA total	0.001	mg/L	ND	ND				ND
Zinc, ICP total	0.003	mg/L	0.03	0.011				0.005
Chemical Oxygen Demand	10	mg/L	ND	ND				ND
Ammonia, Titrimetric	1	mg/L	ND	ND				ND
Total Alkalinity-Titration	1	mg/L	53	45				59
Chloride, Ion Chrom	0.39	mg/L	54.6	39.2				4.3
Nitrate, Ion Chrom	0.06	mg/L	1.69	1.67				1.7
Sulfate, Ion Chrom	0.38	mg/L	19.8	18.3				18.4
Solids, Total Dissolved	10	mg/L	170	150				120
Turbidity	0.11	NTU	1.8	2				9.5
Silver, Flame AA dissolved	0.01	mg/L						ND
Arsenic, ICP dissolved	0.038	mg/L						ND
Barium, ICP dissolved	0.003	mg/L						0.005
Calcium, ICP dissolved	0.08	mg/L						14.7
Cadmium, ICP dissolved	0.004	mg/L						ND
Chromium, ICP dissolved	0.008	mg/L						ND
Copper, ICP dissolved	0.003	mg/L						ND
Iron, ICP dissolved	0.009	mg/L						ND