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SECOND QUARTER MONITORING REPORT

APRIL TO JUNE 2004

KIN-BUC LANDFILL OPERABLE UNITS 1 AND 2

Prepared for

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EXECUTIVE SUMMARY

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which the United States Environmental Protection Agency (USEPA) placed on the National Priorities List (NPL) in 1981. A Remedial Investigation/Feasibility Study (RI/FS) was conducted between 1983 and 1988 which resulted in a Record of Decision (ROD) by USEPA in 1990 that called for source control of Operable Unit 1 (OU1).

The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall. Remedial construction activities for OU1 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted on a quarterly basis to evaluate the effectiveness of the remedial actions. This report documents the results of the monitoring activities for the Second Quarter of 2004.

Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The primary objective of the leachate collection system is to impose an inward gradient as measured across the slurry wall in the refuse unit. The primary objectives of the groundwater collection system are to prevent migration of contaminated groundwater towards the slurry wall and impose an upward gradient from the bedrock unit to the sand & gravel unit.

Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of leachate and groundwater collection systems. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall and 4 pump stations. The groundwater collection system consists of 4 pumping wells.

The hydraulic monitoring system for OU1 is located along the circumferential slurry wall with many of the wells located in 5 clusters, called transects (TLs). The hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic

unit, with 1 well inside and 1 well outside the circumferential slurry wall. Twenty-four of the monitoring wells are continuously monitored using water level recorders.

The hydraulic monitoring network consists of wells screened in the refuse, sand & gravel, and bedrock units. Well designations of G, S, and R denote hydraulic units of gravel or bedrock, sand, and refuse, respectively.

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area.

Second Quarter Hydraulic Monitoring Activities

Hydraulic monitoring was performed during the period from April through June 2004.

Hydraulic monitoring indicates that intragradient conditions in the refuse unit (lower water levels in the refuse inside the wall relative to water levels outside the wall) were maintained at transects 2, 3, 4 and 5, throughout the quarter. Intragradient conditions were indicated for a majority of the quarter for TL 1 (with the exception of April). The fact that the leachate collection system is functioning properly suggests that intragradient conditions are being maintained in the refuse unit at TL 1, even though review of the hydrographs has not consistently indicated this condition in the past. Water level elevation measurements taken from Leachate Collection Cleanout 14 through 16 are included in Table 2-6, and indicate that the leachate collection system is functioning properly.

Hydraulic control was maintained within OU1 based on the analysis of the significant influence of S&G #2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping well resulting in overall containment of groundwater in OU-1.

Leachate Withdrawal/Groundwater Pumping

The second quarter average daily groundwater extraction rate for all of the wells was 20,262.71 gpd. The total volume of groundwater collected for the quarter was 1,844,137 gallons. Leachate was collected at an average daily rate of 2,033.47 gpd for the quarter, and the total volume of leachate collected was 185,061 gallons.

Landfill Gas Monitoring

Combustible gas was not detected in any of the 6 gas monitoring wells located on the north side of OU1. Non-detection of combustible gas in the monitoring wells is indicative that the active gas collection system is functioning properly and there is no apparent off-site gas migration.

Monitoring at the flare inlet port by landfill personnel throughout the quarter indicated that the landfill gas collection system was delivering an average of 41.4 percent combustible gas to the flare.

1 INTRODUCTION

The Kin-Buc Landfill Site is a closed 200-acre industrial/commercial landfill located in Edison, New Jersey, which operated under a New Jersey Department of Environmental Protection (NJDEP) permit until 1976. The United States Environmental Protection Agency (USEPA) placed the Kin-Buc Landfill on the National Priorities List (NPL) in 1981. Between 1983 and 1988, the Respondents conducted a Remedial Investigation/Feasibility Study (RI/FS) which resulted in a Record of Decision (ROD) by USEPA in 1990 which called for source control of Operable Unit 1 (OU1), and an additional RI/FS to determine the nature and extent of contamination outside the source area, thus defining Operable Unit 2 (OU2).

Operable Unit 1 includes both Kin-Buc I and II Mounds, the former Pool C Area and a portion of the Low-Lying Area between Kin-Buc I and the Edison Landfill. The remedial action specified in the ROD for OU1 included the construction of a slurry wall around OU1, the collection and treatment of leachate and groundwater from within the containment area, and the capping of the area within the slurry wall.

Operable Unit 2 includes Mound B, Edmonds Creek and adjacent wetlands, the remaining Low-Lying Area between OU1 and the Edison Landfill, Martins Creek, and the Raritan River. The OU2 ROD called for the excavation and disposal of PCB-contaminated sediments from within the Edmonds Creek Marsh Area, the restoration of disturbed wetland areas, and groundwater/surface water monitoring.

Remedial construction activities for both OU1 and OU2 were completed by the end of August 1995.

In accordance with the RODs, hydraulic monitoring and landfill gas monitoring is conducted quarterly to evaluate the effectiveness of the remedial actions. This Second Quarter Monitoring Report (*April to June 2004*) for the Kin Buc Landfill Operable Units 1 and 2 (Report) documents the results of the monitoring activities for the Second Quarter of 2004.

2 DESCRIPTION OF MONITORING PROGRAM

2.1 Hydrogeologic background

The primary hydrogeologic units within OU1 from ground surface downward are refuse, meadow mat, sand & gravel, and bedrock. Near the northern portion of the site the bedrock is closer to the surface and there is no sand & gravel unit in that area.

The southern portion of the site is located in close proximity to the Raritan River. As a result, monitoring wells located on the southern side of OU1 are impacted by tidal fluctuations.

2.2 Remedial Objectives

The general remedial objectives of the OU1 closure and collection systems are to contain source leachate and contaminated groundwater, and to prevent further migration of site-related contaminants. The specific remedial objectives for the leachate collection, groundwater collection, and hydraulic monitoring are summarized as follows:

Aqueous Leachate Collection

- Primary
  - Collect leachate from the refuse unit within the perimeter slurry wall to impose an inward gradient as measured across the slurry wall (hydraulic containment).
- Additional Benefit
  - Reduce the downward gradient between the refuse unit and the underlying sand & gravel or bedrock units.

Sand & Gravel Groundwater Collection (in Primary OU1 Containment)

- Primary
  - Prevent migration of contaminated groundwater towards the slurry wall.
  - Impose an upward gradient from the bedrock unit to the sand & gravel unit (hydraulic containment).
- Additional Benefit
  - Impose an inward gradient within the sand & gravel unit as measured across the perimeter slurry wall (hydraulic containment).

Sand & Gravel Aquifer Groundwater Collection (in Oil Seeps Area Containment)

- Collect sand & gravel groundwater from within the Oil Seeps Area if an upward gradient between the sand & gravel and the refuse units cannot be imposed by leachate collection alone.

2.3 Hydraulic Control and Monitoring System

The hydraulic control system for OU1 consists of four (4) leachate pump stations and four (4) sand & gravel groundwater pumping wells. The leachate collection system consists of a perforated pipe that runs parallel to the inside of the perimeter slurry wall. In addition, a corrugated oily leachate collection conduit is located along the south side of Kin-Buc I mound. The layout of the collection system is depicted on Drawing 1 of this Report.

The hydraulic monitoring system for Operable Unit 1 is located along the circumferential slurry wall with many of the wells located in five (5) clusters, called transects (TLs). The OU1 hydraulic monitoring well network consists of 11 wells screened in the refuse/fill, eight (8) wells screened in the sand & gravel, and 10 wells screened within bedrock. A summary of the well network is provided in Table 2-1, and well locations are depicted on Drawing 1 of this Report.

Hydraulic monitoring wells at the transects are installed in pairs, within the same hydrogeologic unit, with one (1) well inside and one (1) well outside the circumferential slurry wall. The design of the well network allows groundwater elevations to be monitored on either side of the slurry wall and provides data to evaluate the performance of the slurry wall as a hydraulic barrier.

At TLs 2, 3, and 4, the hydraulic monitoring wells are installed in the refuse, sand & gravel, and bedrock units. At TL 1 and 5, the hydraulic monitoring wells are installed only in the refuse and bedrock units due to the absence of sand and gravel deposits in these areas. Well designations of G, S, and R respectively denote hydraulic units of gravel or bedrock, sand, and refuse.

The OU2 hydraulic monitoring well network is located in the Low-Lying Area and Mound B, and monitors groundwater elevations outside of the OU1 containment area. The hydraulic monitoring system for OU2 consists of 16 wells, as indicated in Table 2-2 and as depicted on Figure 1-1 of this Report. Water elevation measurements from the OU2 wells are taken manually, concurrent with the OU1 monitoring activities.

2.4 Second Quarter Hydraulic Monitoring Activities

Hydraulic monitoring for the Second Quarter of 2004 (April to June) took place according to the procedures and methods outlined in the Draft Operations and Maintenance (O&M) Manual for the Kin-Buc Landfill, prepared on behalf of the Respondents by Wheelabrator EOS in September 1995 and modified by a letter to EPA dated February 28, 1996.

Components of the hydraulic monitoring program consist of continuous and manual water level measurements. Manual measurements were obtained with an electronic water level indicator. Continuous water levels were obtained at one (1)-hour intervals utilizing 24 In-Situ "miniTROLL", Model SSP-100 data loggers and transducers.

On March 1, 2004, minitrolls in wells 10G and 15S were removed and replaced with SP4000 Trolls (respective ID numbers 1288 and 1259, respective starting times of 13:00 and 15:00, and respective battery capacities of 91% and 97%). On April 1, 2004, the minitroll in well 8S was removed and replaced with an SP4000 Troll (ID number 13608, starting time of 13:00, and battery capacity of 88%).

On July 1, 2004, In-Situ serviced minitrolls were reinstalled in their corresponding wells 10G, 15S, and 8S (respective ID's 7820, 10275, and 7575; respective starting time 11:00, 13:00, and 12:00; and, battery capacities of 100%). Interim SP4000 trolls in these wells were removed. Reinstallation of minitrolls included water barrier bags in order to block any external constituents impacting the bodies of the minitrolls within the wells. Minitrolls were placed in clear bags filled with de-ionized water and sealed tight, not to allow any external water to penetrate the bag and contact the troll. According to the March 1, 2004 site-wide minitroll inspection, there are an additional five (5) minitrolls that require servicing (6R, 4R, 4G, 1G, and 7R). Removal and temporary replacement of these minitrolls is scheduled for the next site visit. Discussion of associated activities will be provided in the Third Quarter 2004 Monitoring Report.

Three months of continuous water level data have been obtained from the refuse and sand & gravel wells at the site from April 1, 2004 to June 30, 2004. The minimum, maximum, and average recorded water elevations for each month in the quarter are provided in Table 2-4. Continuous groundwater elevation graphs organized by transect location and hydrogeologic unit are provided in Appendix A of this Report. Evaluations of the recorded data are performed on a monthly basis and sent to Waste Management as Monthly Hydraulic Monitoring Reports. Copies of these monthly evaluations are provided in Appendix B of this Report.

Manual groundwater elevation measurements were obtained from the monitoring wells in OU1 and OU2 during site visits on May 6, 2004, June 3, 2004, and July 1, 2004. The manually recorded water level monitoring results are provided in Table 2-5 of this Report.

2.5 Continuous Hydraulic Monitoring Results vs. Manual Elevation Measurements

The continuous water level monitoring information collected by the Trolls was compared with the data collected from the manual recordings to provide information on the relative accuracy of manual versus automatic recordings. Table 2-5 of this Report presents the difference between the manual water level elevation measurements and Troll recordings for the same day and hour. The average differences between the manual and continuous measurements were at or below 0.084 feet for all wells. Based on this comparison, the data recorded by the Trolls is satisfactory and reflects accurate groundwater elevations. Exceptions to this average include wells 3G, 6G, 10G, and 15S. Actions will be taken to address the significant differences in water elevation measurements within these wells during the next scheduled site visit. Further discussion regarding water elevation discrepancies within these aforementioned wells is provided in the June 2004 Hydraulic Monitoring Report in Appendix B of this Report.

3 HYDRAULIC MONITORING

The following presents an evaluation of the results of hydraulic monitoring performed during the second quarter 2004.

3.1 Assessment of Hydraulic Conditions in the Refuse Unit

As defined in the Record of Decision (ROD) for OU1, the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. The following is a description of the flow characteristics based on the hydrographs.

TL No. 1 (Well 1G/Well 2G) – Hydrograph No. 1

Intragradient conditions were observed throughout most of the quarter as indicated by the monitoring wells inside and outside the wall at this location. The average quarterly water elevations for wells 1G (inside) and 2G (outside) were 11.94 and 12.08 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.14 feet in an outward direction. High water levels in Well 1G have been observed on several previous occasions and may be related to localized conditions around the well.

Water level elevation measurements taken from Leachate Collection Cleanouts 14 through 16 are included in Table 2-6. The water level elevations observed for Leachate Collection Cleanouts 14 during the second quarter are all between 9.59 and 10.70 feet msl. The water level elevations for Cleanouts 15 through 16 were dry (less than the cleanouts invert elevation) with the exception of Cleanout 15 during the July 1, 2004 hydraulic monitoring event. Respective water level elevations observed for Cleanouts 15N and 15E on July 1, 2004 were 9.26 and 9.29. Overall, there is an indication that groundwater flow is from the inside to the Leachate Collection Cleanouts. The leachate collection system is therefore functioning properly and suggests significant capture of leachate. Appendix B (Monthly Hydraulic Evaluations) of this Report provides an analysis of the hydraulic performance at Transect 1.

TL No. 2 (Well 3G/Well 4G) – Hydrograph No. 2

Intragradient conditions were maintained at TL No. 2 in the refuse unit throughout the quarter. The average quarterly water elevations for wells 3G (inside) and 4G (outside) were 7.50 and 11.34 feet msl, respectively. The average head elevation difference between the two wells was approximately 3.84 feet in an inward direction.

TL No. 3 (Well 5G/Well 6G) – Hydrograph No. 3

Intragradient conditions were maintained at TL No. 3 in the refuse unit throughout the quarter. The average quarterly water elevations for wells 5G (inside) and 6G (outside) were 9.62 and 13.07 feet msl, respectively. The head elevation difference between the two wells was approximately 3.45 feet in an inward direction.

TL No. 4 Well 15G/Well 13G) Oil Seeps Area – Hydrograph No. 4

Intragradient conditions were maintained at TL No. 4, Oil Seeps Area, in the refuse unit throughout the quarter. The average quarterly water elevations for wells 15G (inside) and 13G (outside) were 1.52 and 6.69 feet msl, respectively. The head elevation difference between the two wells was approximately 5.17 feet in an inward direction.

TL No. 5 (Well 9G/Well 10G) – Hydrograph No. 5

Intragradient conditions were maintained at TL No. 5 in the refuse unit throughout the quarter. The average quarterly water elevations for wells 9G (inside) and 10G (outside) were 7.32 and 8.16 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.84 feet in an inward direction.

3.2 Assessment of Hydraulic Conditions in the Sand & Gravel Unit

For the sand and gravel unit, the performance objectives call for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on the hydrographs.

Horizontal Flow

TL No. 2 (Well 3S/Well 4S) – Hydrograph No. 6

Intragradient conditions were maintained at TL No. 2 in the sand & gravel unit throughout the quarter. The average quarterly water elevations for wells 3S (inside) and 4S (outside) were 0.59 and 0.84 feet msl, respectively. The average head elevation difference between the two wells was approximately 0.25 feet in an inward direction.

TL No. 3 (Well 5S/Well 6S) – Hydrograph No. 7

Slight intragradient conditions were maintained at TL No. 3 in the sand & gravel unit throughout the quarter. The average quarterly water elevations for wells 5S (inside) and 6S (outside) were 1.26 and 1.43 feet msl, respectively. The head elevation difference between the two wells was approximately 0.17 feet in an inward direction.

TL No. 4 (Well 7S/Well 8S) – Hydrograph No. 8

Intragradient conditions were maintained at TL No. 4 in the sand & gravel unit throughout the quarter. The average quarterly water elevations for wells 7S (inside) and 8S (outside) were 1.50 and 2.55 feet msl, respectively. The head elevation difference between the two wells was approximately 1.05 feet in an inward direction.

TL No. 4 (Well 15S/Well 13S) Oil Seeps Area – Hydrograph No. 9

Intragradient conditions were maintained at TL No. 4 in the sand & gravel unit throughout the quarter. The average quarterly water elevations for wells 15S (inside) and 13S (outside) were 0.11 and 2.20 feet msl, respectively. The head elevation difference between the two wells was approximately 2.09 feet in an outward direction. Water levels from Well 15G are included in the hydrograph for comparison.

Vertical Flow

TL No. 2 (Well 3S/Well 3RR) – Inside; (Well 4S/Well 4R) – Outside
Hydrograph Nos. 10 and 11

Although upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 2 throughout the quarter, containment is still maintained by pumping wells SG-2 and SG-3 (see Section 3.2.1). The average quarterly water elevations for wells 3S (sand & gravel) and 3RR (bedrock) were 0.59 and 0.54 feet msl, respectively. The difference in average quarterly water elevations was approximately 0.05 feet in a downward direction.

Containment is being maintained by pumping wells SG-2 and SG-3 even though the elevations do not reflect upward gradient conditions between the bedrock and overlying sand & gravel units outside the slurry wall (see Section 3.2.1). The average quarterly water elevations for wells 4S (sand & gravel) and 4R (bedrock) were 0.84 and 0.69 feet msl, respectively. The difference in average quarterly water elevations was approximately 0.15 feet in a downward direction.

TL No. 3 (Well 5S/Well 5R) – Inside; (Well 6S/Well 6R) – Outside
Hydrograph Nos. 12 and 13

Inside the slurry wall at TL No. 3, slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units throughout the quarter. The average quarterly water elevations for wells 5S (sand & gravel) and 5R (bedrock) were 1.26 and 1.41 feet msl, respectively. The difference in average quarterly water elevations was 0.15 feet in an upward direction.

Outside the slurry wall at TL No. 3, slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units. The average quarterly water elevations for wells 6S (sand & gravel) and 6R (bedrock) were 1.43 and 1.59, respectively. The difference in average quarterly water elevations was 0.16 feet.

TL No. 4 (Well 7S/Well 7R) – Inside; (Well 8S/Well 8RR) – Outside
Hydrograph Nos. 14 and 15

Slight upward gradient conditions were maintained between the bedrock and overlying sand & gravel units inside the slurry wall at TL No. 4 throughout the quarter. The average quarterly water elevations for wells 7S (sand & gravel) and 7R (bedrock) were 1.50 and 1.59 feet msl, respectively. The difference in average quarterly water elevations was 0.09 feet.

Although upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units outside the slurry wall at TL No. 4 throughout the quarter, containment is still maintained by pumping wells SG-2 and SG-3 (see Section 3.2.1). The average quarterly water elevations for wells 8S (sand & gravel) and 8RR (bedrock) were 2.55 feet and 2.47 feet msl, respectively. The difference in average quarterly water elevations was 0.08 feet.

3.2.1 Analysis

While initial review of the hydrographs indicate that certain performance objectives may not be met, (uniform achievement of upward gradients from the bedrock to the sand and gravel, and inward gradients across the slurry wall) containment was still maintained this quarter by the pumping well SG-2 in combination with SG-3. Figures 1 through 4 (See

Appendix B of this Report) depict horizontal or vertical flow vectors within the sand and gravel or bedrock units. These diagrams show that although downward groundwater flow from the sand and gravel to the bedrock may occur locally within the slurry wall, the zone of influence of the pumping wells includes the sand and gravel units and the upper portion of the bedrock within the slurry wall. Regardless of whether groundwater is flowing vertically upward or downward within the slurry wall in the sand and gravel and upper bedrock, it will eventually migrate laterally toward the pumping wells, and will be captured. Examination of the pumping results indicates that this process is more efficient if SG-3 is pumped in conjunction with SG-2.

3.3 OU2 Hydraulic Monitoring

The synoptic groundwater elevations obtained during the second quarter of 2004 indicate both upward and downward hydraulic gradients.

4 LEACHATE WITHDRAWAL/GROUNDWATER PUMPING

The performance of the site hydraulic controls is largely dependent upon groundwater pumping and leachate withdrawal rates. The design aqueous leachate and groundwater (GW) collection rates called for a ratio of 3:1, groundwater to leachate of 30,000 gpd groundwater, and 10,000 gpd leachate. The collection rates differed from the design rates due to variations between design assumptions and actual site conditions. Collection rates are also adjusted based on changing site and operational conditions.

Operation records are maintained at the site and contain estimated daily averages for leachate and groundwater withdrawal. The monthly volumes collected and the daily average collection rates are provided below:

Monitoring Period	Groundwater S&G No. 1	Groundwater S&G No. 2	Groundwater S&G No. 3	Groundwater S&G No. 4	Leachate
April	0 gal.	474,457 gal.	172,073 gal.	0 gal.	60,905 gal.
	0 gpd	15,815.23 gpd	5,735.77 gpd	0 gpd	2,030.17 gpd
May	0 gal.	458,590 gal.	176,698 gal.	0 gal.	63,513 gal.
	0 gpd	14,793.23 gpd	5,699.94 gpd	0 gpd	2,048.81 gpd
June	0 gal.	391,877 gal.	170,442 gal.	0 gal.	60,643 gal.
	0 gpd	13,062.57 gpd	5,681.40 gpd	0 gpd	2,021.43 gpd
Quarter	**0 gal.**	**1,324,924 gal.**	**519,213 gal.**	**0 gal.**	**185,061 gal.**
	0 gpd	**14,557.01 gpd**	**5,705.70 gpd**	**0 gpd**	**2,033.47 gpd**

The volume of groundwater collected in the second quarter is 1,844,137 gallons. The average daily groundwater withdrawal rate for the second quarter is 20,262.71 gpd.

5 LANDFILL GAS MIGRATION MONITORING

Landfill gas migration monitoring was performed at the operational flare port inlet and the six (6) gas migration monitoring wells located along the northern edge of the landfill boundary.

5.1 Landfill Gas Migration

The purpose of the gas migration monitoring program is to monitor for off-site gas migration in those areas where gas migration or accumulation could lead to explosive conditions. Six (6) gas migration monitoring wells are located outside of the circumferential slurry wall along the northern edge of the landfill boundary. The well locations are depicted on Drawing 1 and are spaced in 200-foot increments.

All areas of OU1 exterior to the slurry wall contain waste materials except along the northern edge of the landfill boundary. High levels of gas are not expected to be detected along the northern boundary because the slurry wall will act as an effective barrier, and the presence of an active gas extraction system and the high water table will inhibit gas migration.

Gas monitoring in other areas of the site containing waste materials will likely reveal combustible gas. However, since no on-site OU1 buildings are present (except the leachate treatment facility, which has its own engineered gas monitoring and control system), gas migration monitoring in the waste areas is not required by the O&M manual.

5.2 Gas Monitoring Well Results

Measurements of percent combustible gas (% methane) and percent lower explosive limit (% LEL) were performed in the six (6) gas migration monitoring wells along the northern boundary of the site on May 6, 2004. The wells were monitored in accordance with the Routine Operations and Maintenance of the Kin-Buc Landfill Draft O&M Manual (Wheelabrator, 1995), included as Attachment 1 of this Report. A Landtec GEM 500 sampling device was used to measure the concentration of combustible gas at each well by attaching the meter's sample tubing to the well head petcock and drawing the sample through the meter. Detectable levels of percent combustible gas and percent lower

explosive limit were not observed in any gas monitoring wells. The results for the six (6) gas migration monitoring wells are shown in Table 5-1 of this Report.

5.3 Operational Flare Monitoring Results

The percent combustible gas by volume (% methane) at the landfill's operational flare port inlet was recorded throughout the second quarter of 2004. All readings were collected with a Landtec GEM 500 Gas Analyzer, equipped with a charcoal filter. Monitoring performed on May 6, 2004 revealed combustible gas at 52.2 percent at the flare port inlet. Please note that the gas monitoring was done at this time for the second quarter.

The following summarizes the flare station operation during the second quarter:

Date	Gas Flow (SCFM)	Methane % by volume
4/5/04	100	37.4
4/28/04	84	36.7
5/25/04	95	41.4
6/9/04	94	50.2
Averages for Second Quarter	93	41.4

Note: Flare station data provided by Landfill personnel.

6 CONCLUSIONS

Significant conclusions for the Second Quarter of 2004 monitoring program are as follows:

- In the refuse unit, intragradient conditions were maintained over the entire quarter at Transects 2, 3, 4, and 5. An average daily leachate extraction rate of 2,033.47 gpd was collected.

- Intragradient conditions were indicated for most of the quarter by the monitoring wells in the refuse unit at Transect 1 with the exception of the April 2004 period. Levels in the leachate collection system indicate intragradient conditions are present at this location.

- Hydraulic control was maintained within OU-1 this quarter based on the analysis of the significant influence of S&G#2 with a combination of S&G#3, S&G#4, and S&G#1 acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping wells resulting in overall containment of groundwater in OU-1.

- In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively. These lower pumping rates will be evaluated to confirm continued hydraulic control of OU-1 groundwater.

- Maintaining a leachate collection rate of 1,500 gpd is recommended.

- Combustible gas as a percent of total gas and the lower explosive limit was not detected in the six (6) monitoring wells located on the northern boundary of the site. The flare was operational and the average percent methane for the quarter at the flare port inlet was 52.2 percent. Based on the non-detection of combustible gas in the monitoring wells, it is concluded that the active gas collection system is functioning properly and there is no off-site gas migration.

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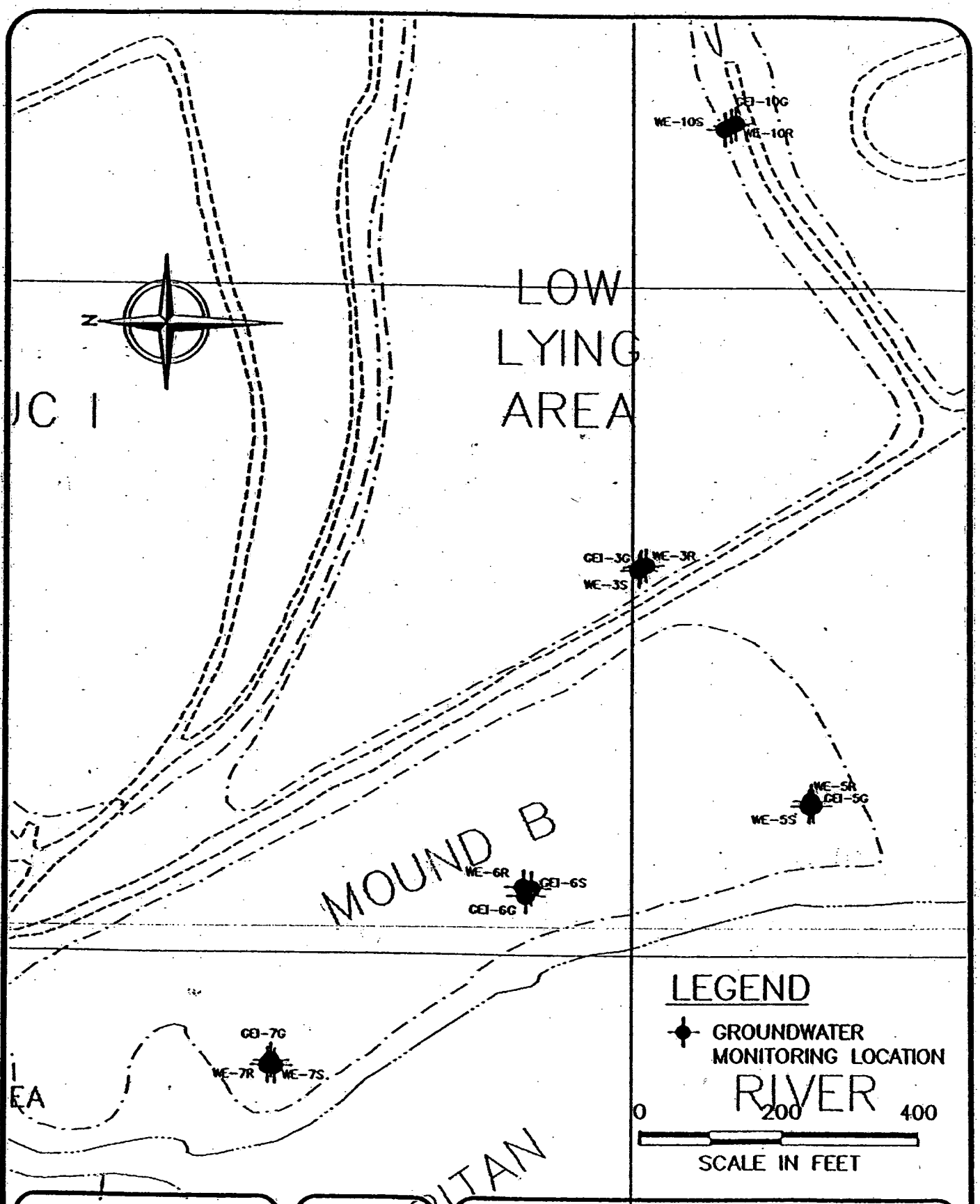
Groundwater Pumping Well Performance Evaluation Report, IT Corporation, July 2000.

Figure



EMCON

DATE
DWN
APP
REV
PROJECT NO.
12568-001.000

FIGURE 1-1
KINBUC LANDFILL

EDISON TOWNSHIP, NEW JERSEY
OU2 GROUNDWATER
MONITORING LOCATIONS

ENE-MTOWN2/DATA: N:\DWG\12568001\MAKBF-01.dwg Xrefs: MAKBWED1, MAKBTWO1, MAKBBD01
Scale: 1 = 1.00 DimScale: 1 = 200.00 Date: 11/11/96 Time: 1:36 PM Operator: FDEGEORG

Drawing

TABLES

Table 2-1

Kin-Buc Landfill
Operable Unit 1
Continuous Hydraulic Monitoring Well Network/Transects

Transect Location No.	Screened Hydrogeologic Unit	Well Location Inside Slurry Wall	Well Location Outside Slurry Wall
1	Refuse/Fill	W-1G	W-2G
2	Refuse/Fill	W-3G	W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill	W-5G	W-6G
	Sand and Gravel	W-5S	W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill(1)	W-15G	W-13G
	Sand and Gravel(1)	W-15S	W-13S
	Sand and Gravel(2)	W-7S	W-8S
	Bedrock (2)	W-7R	W-8RR
5	Refuse/Fill	W-9G	W-10G

Notes: (1) Wells located across the extended slurry wall.
(2) Wells located across the OU1 circumferential slurry wall.

Table 2-2

Kin-Buc Landfill
Operable Unit 2
Hydraulic Monitoring Network

Well Location	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-10G	Fill/Refuse
WE-10S	Sand & Gravel
WE-10R	Bedrock
GEI-3G	Fill/Refuse
WE-3S	Sand & Gravel
WE-3R	Bedrock
Mound B	
GEI-5G	Fill/Refuse
WE-5S	Sand & Gravel
WE-5R	Bedrock
GEI-6G	Fill/Refuse
GEI-6S	Sand & Gravel
WE-6R	Bedrock
GEI-7G	Fill/Refuse
WE-7S	Sand & Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock

Table 2-3
KinBuc Landfil
Operable Units 1 and 2
Second Quarter 2004
Manually Recorded Water Level Elevations

Well ID	TOC Bottom	TOC Ref Elevation	May 6, 2004		June 3, 2004		July 1,2004	
			TOC Static	Elevation	TOC Static	Elevation	TOC Static	Elevation
OU1								
W-1G	20.50	30.78	11.71	19.07	10.53	20.25	12.45	18.33
W-2G	20.38	30.77	11.82	18.95	12.47	18.30	12.54	18.23
W-3G	19.07	20.73	6.83	13.9	6.85	13.88	6.79	13.94
W-3S	31.48	20.79	0.39	20.4	0.81	19.98	0.53	20.26
W-3RR	54.40	21.16	0.41	20.75	0.9	20.26	0.65	20.51
W-4G	17.57	20.23	11.5	8.73	11.24	8.99	10.78	9.45
W-4S	31.58	19.71	0.82	18.89	1.49	18.22	1.16	18.55
W-4R	54.92	20.61	0.89	19.72	1.46	19.15	1.18	19.43
W-5G	24.36	23.94	9.63	14.31	9.6	14.34	9.63	14.31
W-5S	30.33	24.33	1.05	23.28	1.49	22.84	1.17	23.16
W-5R	41.64	24.11	0.9	23.21	1.31	22.80	1.03	23.08
W-6G	23.99	23.69	13.11	10.58	12.78	10.91	12.42	11.27
W-6S	38.49	24.00	1.26	22.74	1.74	22.26	1.36	22.64
W-6R	50.43	23.99	1.32	22.67	0.84	23.15	1.43	22.56
W-7S	29.34	11.61	1.38	10.23	1.63	9.98	1.33	10.28
W-7R	45.13	11.05	1.48	9.57	1.77	9.28	1.46	9.59
W-8S	28.86	10.92	3.06	7.86	2.52	8.40	2.3	8.62
W-8RR	41.60	9.51	2.98	6.53	2.44	7.07	2.26	7.25
W-9G	21.93	27.34	7.36	19.98	7.53	19.81	7.44	19.9
W-10G	22.56	27.43	8.58	18.85	8.65	18.78	8.63	18.8
W-13G	10.30	10.17	6.72	3.45	6.67	3.50	6.45	3.72
W-13S	29.32	10.10	2.34	7.76	2.2	7.90	1.89	8.21
W-15G	16.99	16.18	N/A	N/A	N/A	N/A	N/A	N/A
W-15S	33.36	16.05	2.23	13.82	2.3	13.75	1.98	14.07
OU2								
GEI-10G	13.91	13.65	0.95	12.70	1.22	12.43	1.59	12.06
WE-10S	29.57	14.99	13.61	1.38	13.42	1.57	13.78	1.21
WE-10R	41.74	13.96	12.58	1.38	12.38	1.58	12.74	1.22
GEI-3G	13.54	16.73	N/A	N/A	N/A	N/A	N/A	N/A
WE-3S	25.67	15.12	14.17	0.95	14.20	0.92	14.55	0.57
WE-3R	46.51	14.99	13.76	1.23	14.15	0.84	14.48	0.51
GEI-5G	14.60	16.08	9.08	7.00	9.10	6.98	9.33	6.75
WE-5S	25.84	15.04	13.45	1.59	14.19	0.85	14.51	0.53
WE-5R	49.64	15.31	13.87	1.44	14.60	0.71	14.91	0.40
GEI-6G	14.97	19.76	11.81	7.95	11.80	7.96	11.79	7.97
GEI-6S	43.67	20.99	N/A	N/A	N/A	N/A	N/A	N/A
WE-6R	47.12	19.62	17.17	2.45	19.75	-0.13	20.04	-0.42
GEI-7G	13.74	17.23	N/A	N/A	12.81	4.42	dry	N/A
WE-7S	30.07	15.86	13.55	2.31	15.78	0.08	16.11	-0.25
WE-7R	72.88	15.93	15.02	0.91	14.79	1.14	15.17	0.76

NOTE:
(1) All level, reference, bottom measurements recorded to the top of PVC inner casing.
(2) TOC - Top of protective casing (outer casing)
(3) TPVC - Top of well casing (inner casing)

Table 2-4

KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2004
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	April	11.72	11.99	11.85	W-2G	April	11.48	11.73	11.64
	May	11.68	11.88	11.77		May	11.70	12.52	12.11
	June	11.86	12.40	12.21		June	12.40	12.56	12.51
	2nd Quarter	11.68	12.40	11.94		2nd Quarter	11.48	12.56	12.08
W-3G	April	7.28	7.85	7.54	W-4G	April	11.08	11.78	11.47
	May	7.24	7.73	7.50		May	11.27	11.66	11.47
	June	7.28	7.65	7.44		June	10.76	11.44	11.06
	2nd Quarter	7.24	7.85	7.50		2nd Quarter	10.76	11.78	11.34
W-3S	April	0.07	1.37	0.58	W-4S	April	-0.43	2.10	0.80
	May	-0.01	1.20	0.54		May	-0.28	2.24	0.80
	June	0.33	1.05	0.66		June	-0.15	2.42	0.90
	2nd Quarter	-0.01	1.37	0.59		2nd Quarter	-0.43	2.42	0.84
W-5G	April	9.46	9.93	9.65	W-6G	April	12.82	13.81	13.30
	May	9.38	9.79	9.63		May	12.77	13.66	13.20
	June	9.43	9.76	9.58		June	12.31	13.22	12.70
	2nd Quarter	9.38	9.93	9.62		2nd Quarter	12.31	13.81	13.07
W-5S	April	0.76	2.02	1.26	W-6S	April	0.92	2.21	1.43
	May	0.72	1.86	1.24		May	0.89	2.04	1.41
	June	0.87	1.89	1.29		June	1.01	2.10	1.45
	2nd Quarter	0.72	2.02	1.26		2nd Quarter	0.89	2.21	1.43
W-7S	April	1.08	2.17	1.51	W-8S	April	1.39	3.97	2.59
	May	1.08	1.99	1.47		May	2.04	4.13	2.55
	June	1.23	2.00	1.52		June	1.90	4.78	2.50
	2nd Quarter	1.08	2.17	1.50		2nd Quarter	1.39	4.78	2.55
W-15S	April	-0.27	0.82	0.13	W-13S	April	1.78	3.05	2.22
	May	-0.25	0.80	0.10		May	1.78	3.13	2.20
	June	-0.30	0.98	0.09		June	1.71	3.51	2.18
	2nd Quarter	-0.30	0.98	0.11		2nd Quarter	1.71	3.51	2.20
W-15G	April	1.41	1.60	1.50	W-13G	April	6.54	7.64	6.74
	May	1.32	1.78	1.52		May	6.61	6.88	6.76
	June	1.31	1.62	1.52		June	6.32	6.85	6.57
	2nd Quarter	1.31	1.78	1.52		2nd Quarter	6.32	7.04	6.69
W-9G	April	7.11	7.44	7.25	W-10G	April	8.04	8.16	8.12
	May	7.15	7.55	7.31		May	8.11	8.23	8.16
	June	7.33	7.56	7.41		June	8.12	8.25	8.20
	2nd Quarter	7.11	7.56	7.32		2nd Quarter	8.04	8.25	8.16
W-3RR	April	-0.15	1.51	0.51	W-4R	April	-0.65	2.03	0.66
	May	-0.27	1.43	0.50		May	-0.51	2.18	0.66
	June	-0.03	1.49	0.62		June	-0.40	2.39	0.75
	2nd Quarter	-0.27	1.51	0.54		2nd Quarter	-0.65	2.39	0.69
W-5R	April	0.90	2.17	1.40	W-6R	April	1.09	2.33	1.58
	May	0.87	1.99	1.38		May	1.07	2.19	1.57
	June	1.06	2.01	1.45		June	1.18	2.24	1.61
	2nd Quarter	0.87	2.17	1.41		2nd Quarter	1.07	2.33	1.59
W-7R	April	1.15	2.24	1.58	W-8RR	April	1.94	3.86	2.48
	May	1.16	2.09	1.55		May	1.94	4.06	2.48
	June	1.34	2.10	1.62		June	1.84	4.73	2.45
	2nd Quarter	1.15	2.24	1.59		2nd Quarter	1.84	4.73	2.47

Table 2-5
KinBuc Landfill Operable Unit 1
Second Quarter 2004
Troll Water Elevations vs. Manual Water Elevations

OU 1	May 6, 2004			June 3, 2004			July 1, 2004			Average
Well ID	Troll	Manual	Difference	Troll	Manual	Difference	Troll	Manual	Difference	Difference
W-1G	11.704	11.71	0.006	11.889	10.53	1.359	12.409	12.45	0.041	0.47
W-2G	11.805	11.82	0.015	12.445	12.47	0.025	12.492	12.54	0.048	0.03
W-3G	7.384	6.83	0.554	7.387	6.85	0.537	7.336	6.79	0.546	0.55
W-3S	0.31	0.39	0.080	0.725	0.81	0.085	0.431	0.53	0.099	0.09
W-3RR	0.387	0.41	0.023	0.86	0.9	0.040	0.591	0.65	0.059	0.04
W-4G	11.485	11.5	0.015	11.222	11.24	0.018	10.739	10.78	0.041	0.02
W-4S	0.8	0.82	0.020	1.445	1.49	0.045	1.143	1.16	0.017	0.03
W-4R	0.808	0.89	0.082	1.374	1.46	0.086	1.071	1.18	0.109	0.09
W-5G	9.543	9.63	0.087	9.523	9.6	0.077	9.51	9.63	0.120	0.09
W-5S	0.992	1.05	0.058	1.414	1.49	0.076	1.082	1.17	0.088	0.07
W-5R	0.871	0.9	0.029	1.313	1.31	0.003	0.983	1.03	0.047	0.03
W-6G	13.579	13.11	0.469	13.221	12.78	0.441	12.858	12.42	0.438	0.45
W-6S	1.204	1.26	0.056	1.667	1.74	0.073	1.292	1.36	0.068	0.07
W-6R	1.342	1.32	0.022	1.827	0.84	0.987	1.41	1.43	0.020	0.34
W-7S	1.334	1.38	0.046	1.591	1.63	0.039	1.271	1.33	0.059	0.05
W-7R	1.432	1.48	0.048	1.714	1.77	0.056	1.402	1.46	0.058	0.05
W-8S	3.083	3.06	0.023	2.513	2.52	0.007	2.31	2.3	0.010	0.01
W-8RR	3.006	2.98	0.026	2.455	2.44	0.015	2.267	2.26	0.007	0.02
W-9G	7.317	7.36	0.043	7.481	7.53	0.049	7.381	7.44	0.059	0.05
W-10G	8.159	8.58	0.421	8.237	8.65	0.413	8.176	8.63	0.454	0.43
W-13G	6.751	6.72	0.031	6.671	6.67	0.001	6.467	6.45	0.017	0.02
W-13S	2.355	2.34	0.015	2.226	2.2	0.026	1.896	1.89	0.006	0.02
W-15G	1.468	N/A	N/A	1.489	N/A	N/A	1.515	N/A	N/A	N/A
W-15S	0.148	2.23	2.082	0.212	2.3	2.088	-0.113	1.98	2.093	2.09

Table 2-6
Kin-Buc Landfill
Leachate Cleanout Monitoring
2004

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		9.97		9.90		9.69		9.74		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na
3/4/2003	13.21	9.66	13.15	9.62	17.22	9.29	17.20	9.31	dry	na	dry	na
4/1/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.79	9.72	dry	na	dry	na
5/8/2003	13.05	9.82	12.97	9.80	17.01	9.50	16.96	9.55	dry	na	dry	na
6/3/2003	13.11	9.76	13.14	9.63	17.09	9.42	17.04	9.47	dry	na	dry	na
6/30/2003	12.92	9.95	12.85	9.92	16.83	9.68	16.79	9.72	dry	na	dry	na
8/11/2003	12.91	9.96	12.84	9.93	16.82	9.69	16.78	9.73	dry	na	dry	na
9/5/2003	13.00	9.87	12.92	9.85	16.93	9.58	16.88	9.63	dry	na	dry	na
9/29/2003	12.99	9.88	12.91	9.86	16.93	9.58	16.90	9.61	dry	na	dry	na
11/3/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.78	9.73	dry	na	dry	na
12/2/2003	13.01	9.86	12.93	9.84	16.95	9.56	16.94	9.57	dry	na	dry	na
12/29/2003	12.8	10.07	12.74	10.03	16.7	9.81	16.67	9.84	dry	na	dry	na
2/2/2004	13.12	9.75	13.05	9.72	dry	na	dry	na	dry	na	dry	na
3/1/2004	13.08	9.79	13.03	9.74	dry	na	dry	na	dry	na	dry	na

Table 2-6
Kin-Buc Landfill
Leachate Cleanout Monitoring
2004

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
4/1/2004	12.89	9.98	12.825	9.95	dry	na	dry	na	dry	na	dry	na
5/6/2004	12.17	10.70	13.1	9.67	dry	na	dry	na	dry	na	dry	na
6/3/2004	13.21	9.66	13.14	9.63	dry	na	dry	na	dry	na	dry	na
7/1/2004	13.23	9.64	13.18	9.59	17.25	9.26	17.22	9.29	dry	na	dry	na

Table 5-1

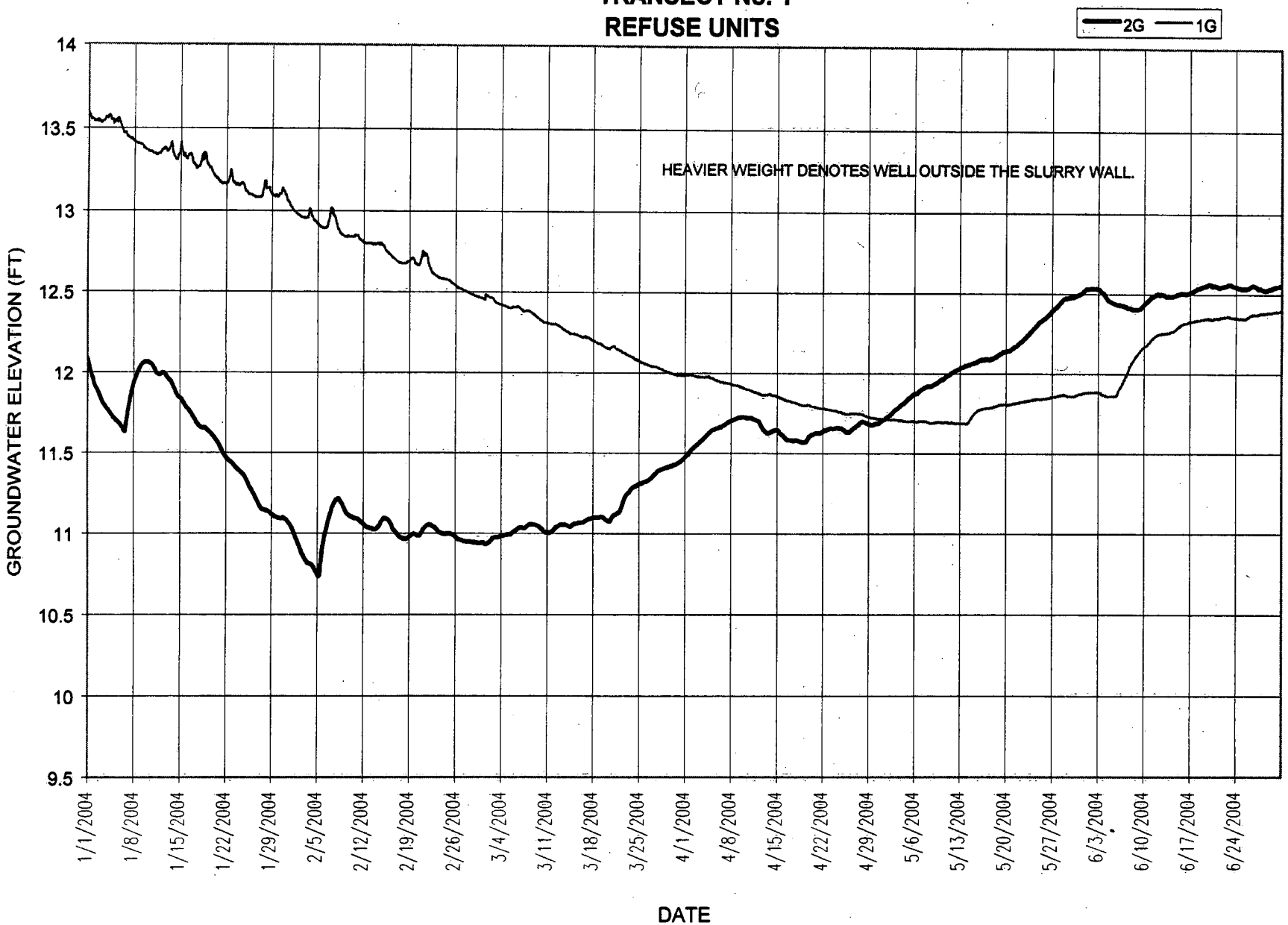
Kin-Buc Landfill
Operable Unit 1
Second Quarter 2004 Modified Program
Gas Monitoring Well Network/Results

Well (Network) Location	Monitoring Result	
	% LEL	% GAS
GMW-01	0	0
GMW-02	0	0
GMW-03	0	0
GMW-04	0	0
GMW-05	0	0
GMW-06	0	0
Operational Flare Inlet	NA	52.2

APPENDIX A

CONTINUOUS WATER LEVEL MONITORING RESULTS

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
TRANSECT No. 1
REFUSE UNITS



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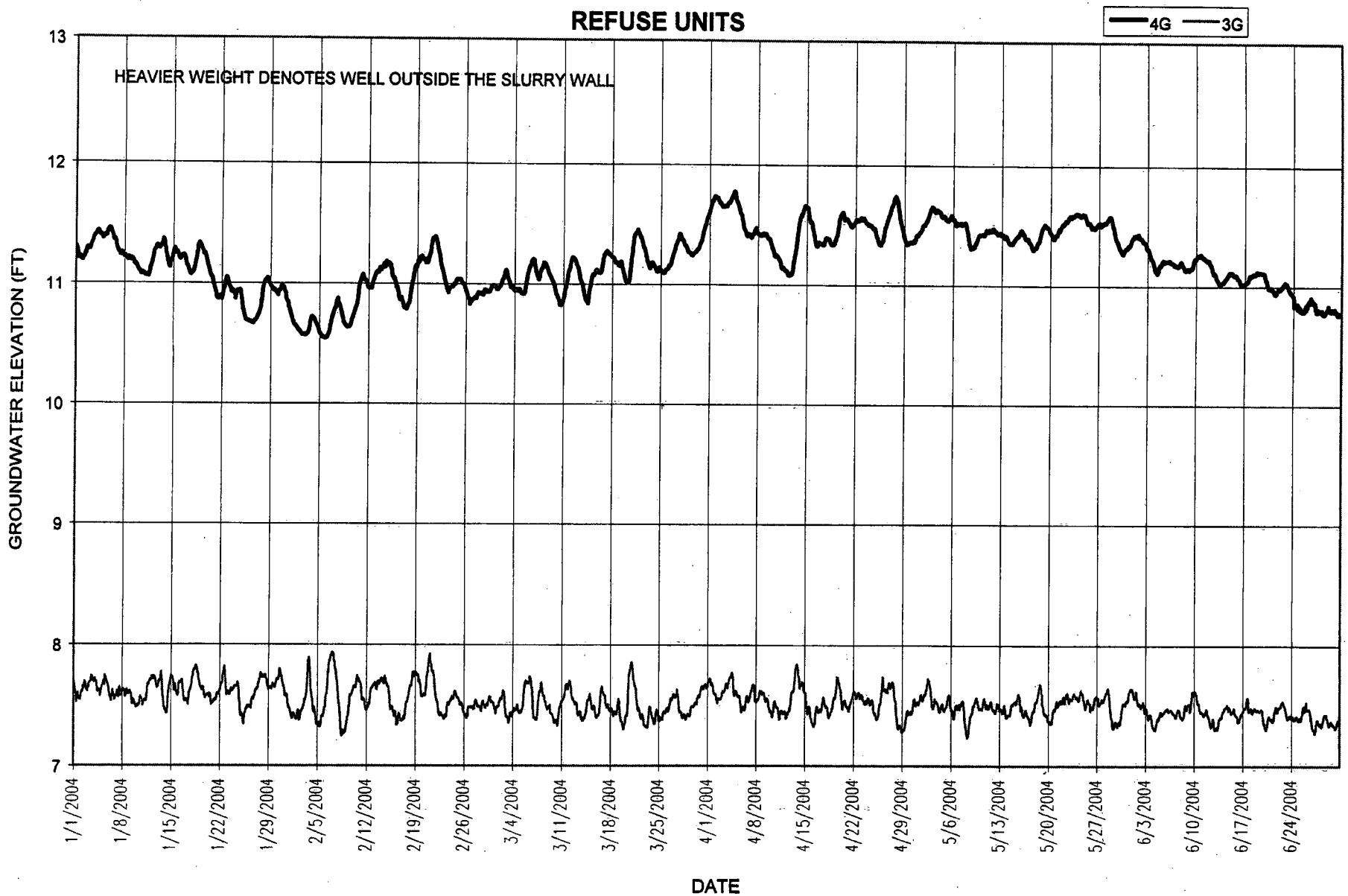
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #2
TRANSECT No.2
REFUSE UNITS



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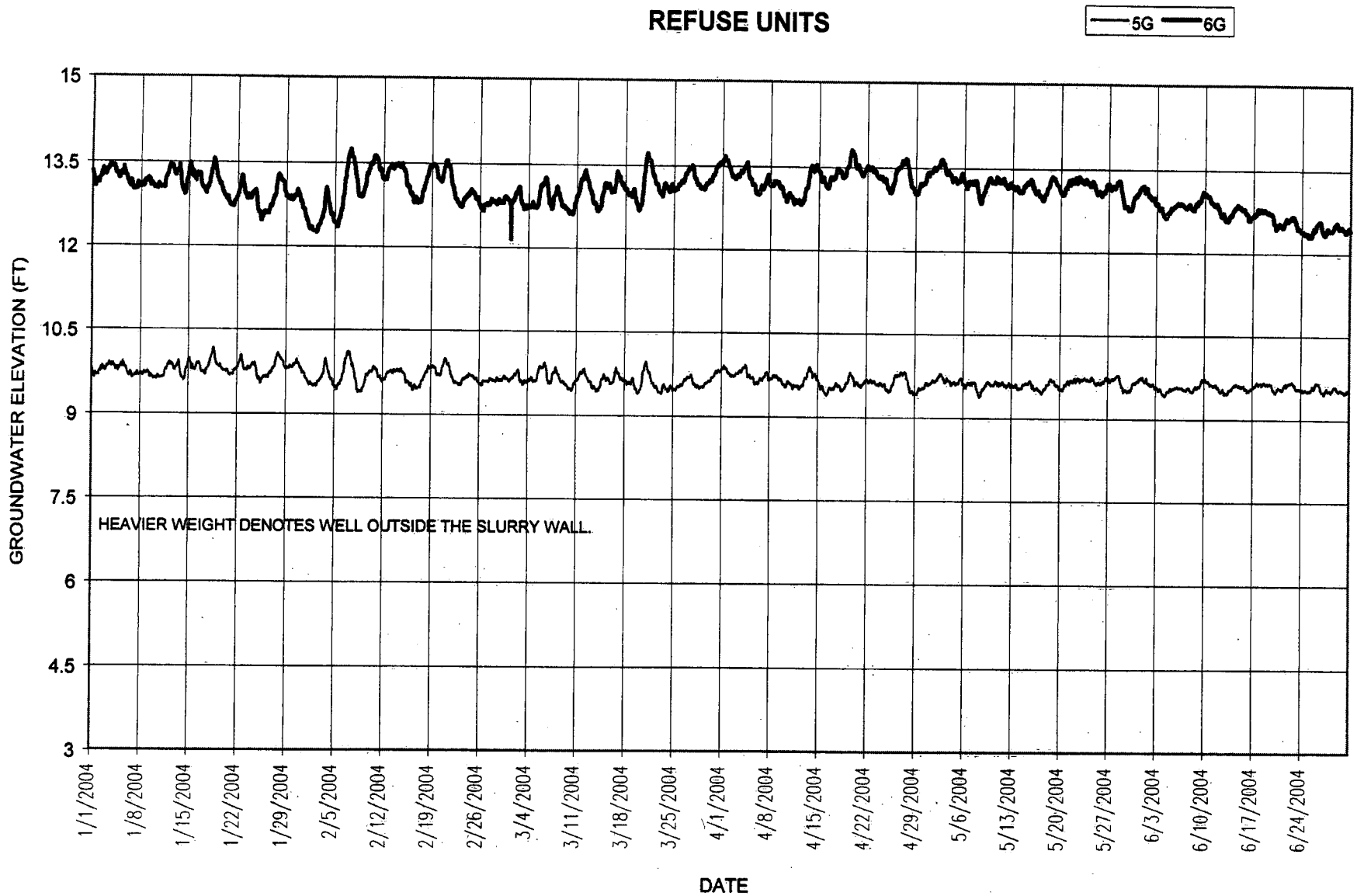
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH # 3
TRANSECT No.3
REFUSE UNITS



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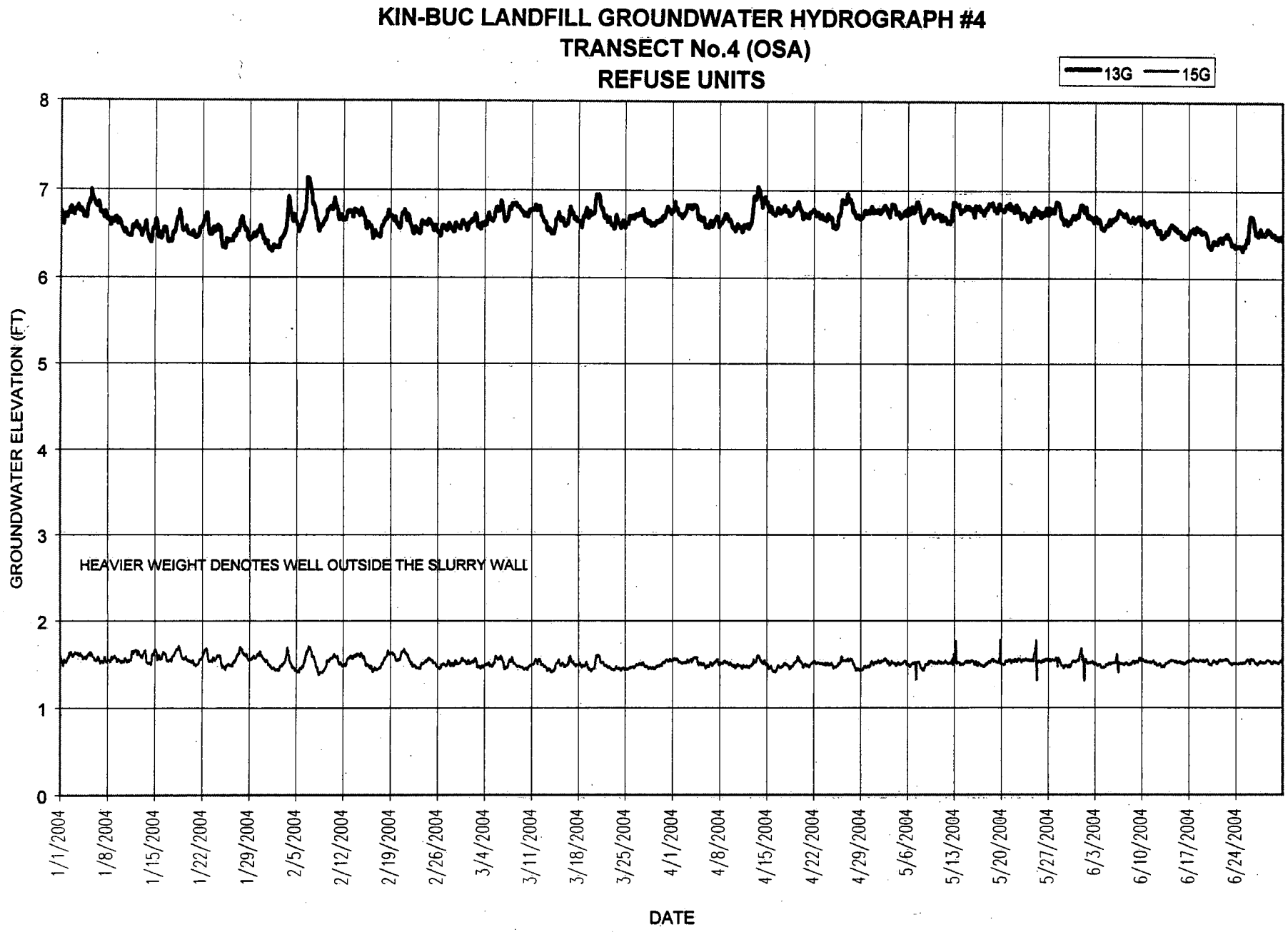

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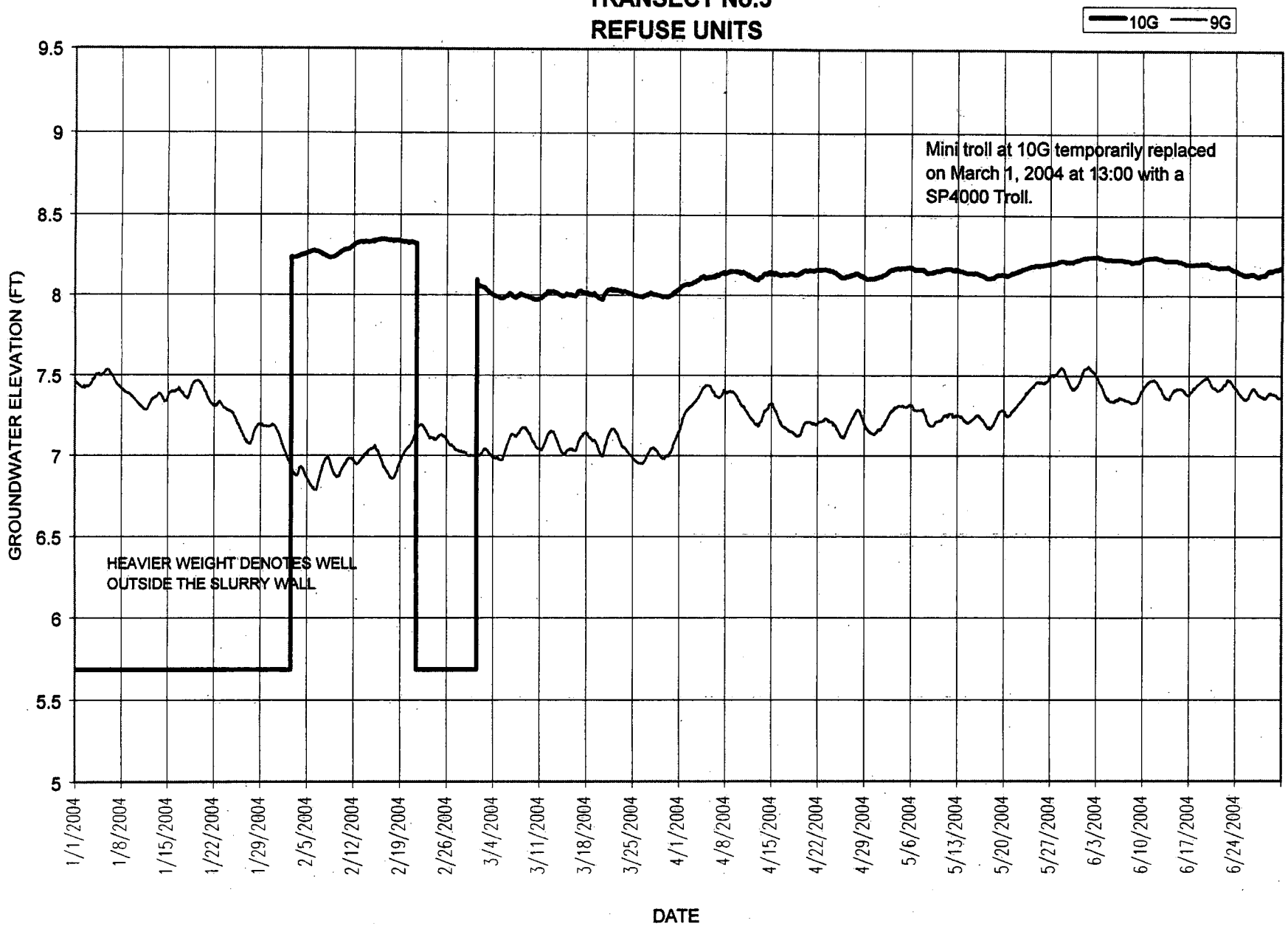
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #5
TRANSECT No.5
REFUSE UNITS



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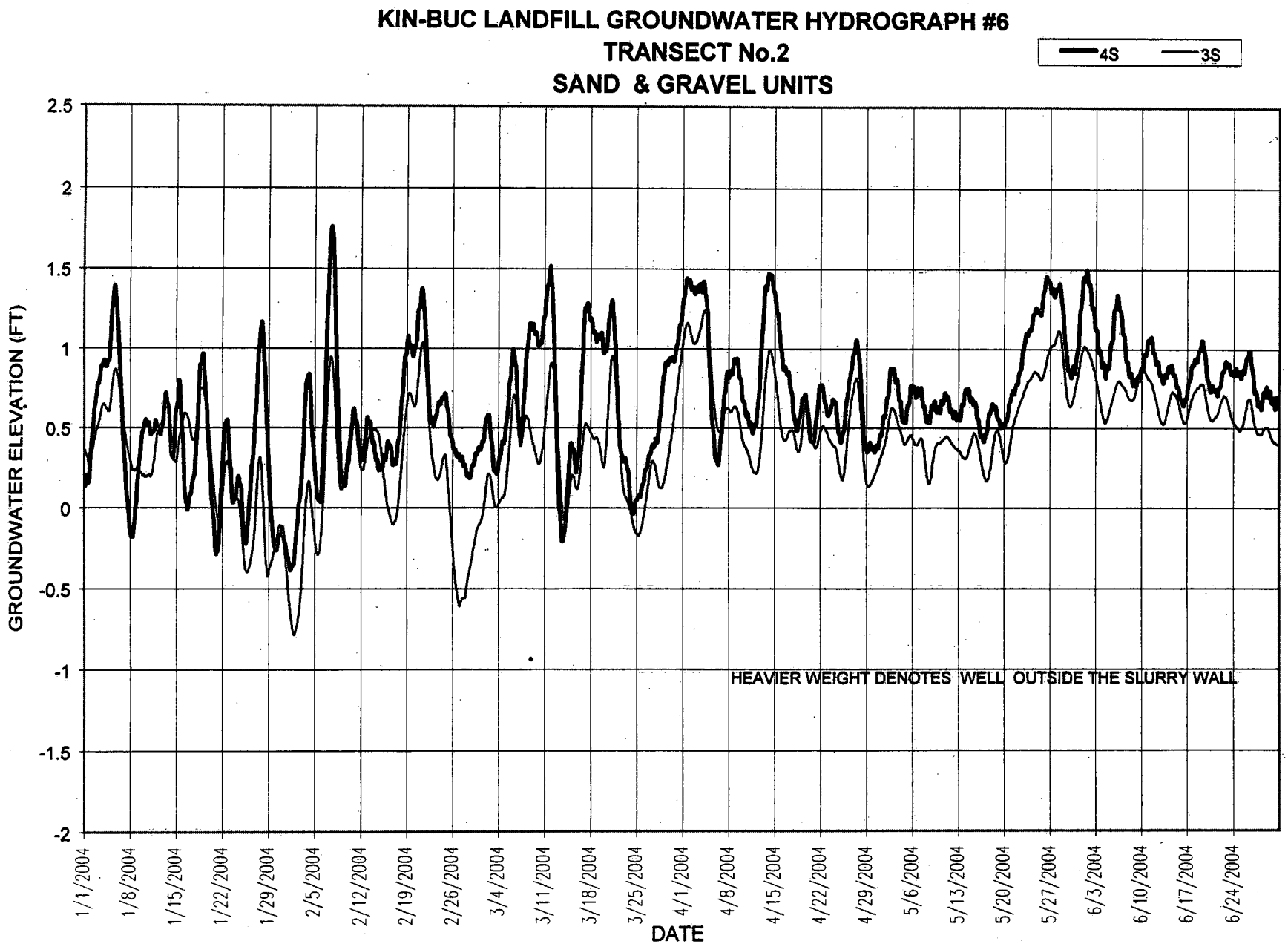

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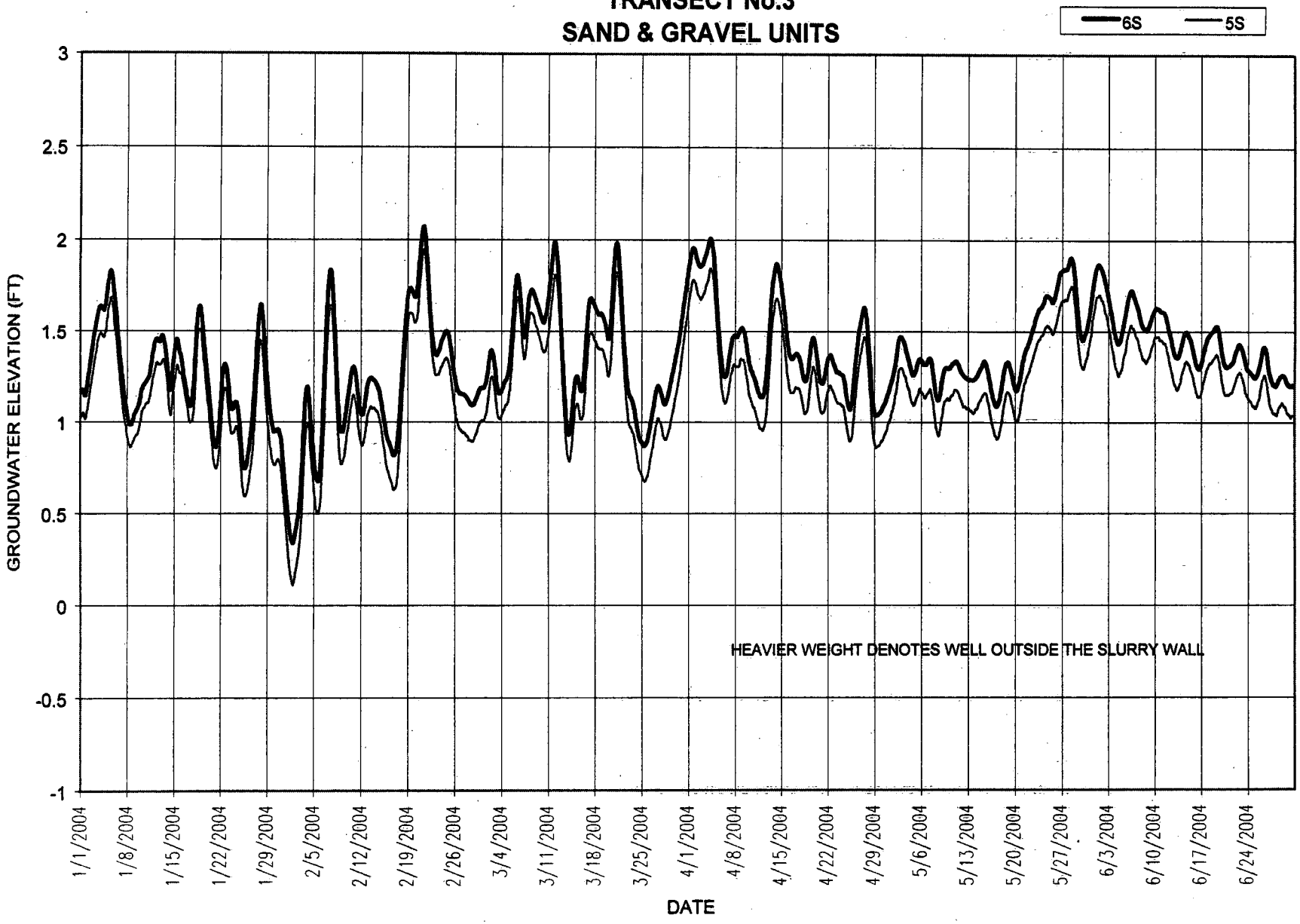
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #7
TRANSECT No.3
SAND & GRAVEL UNITS



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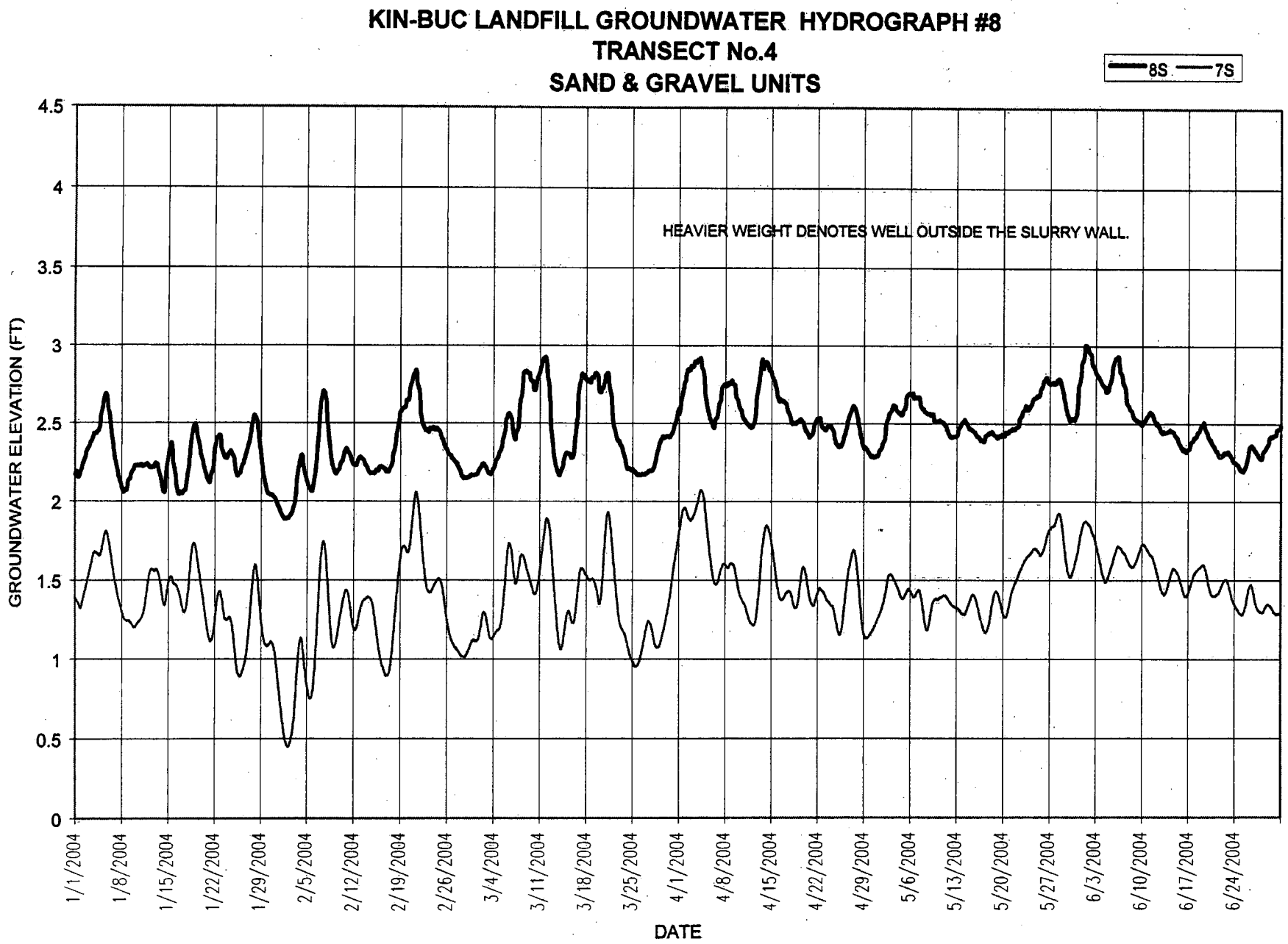

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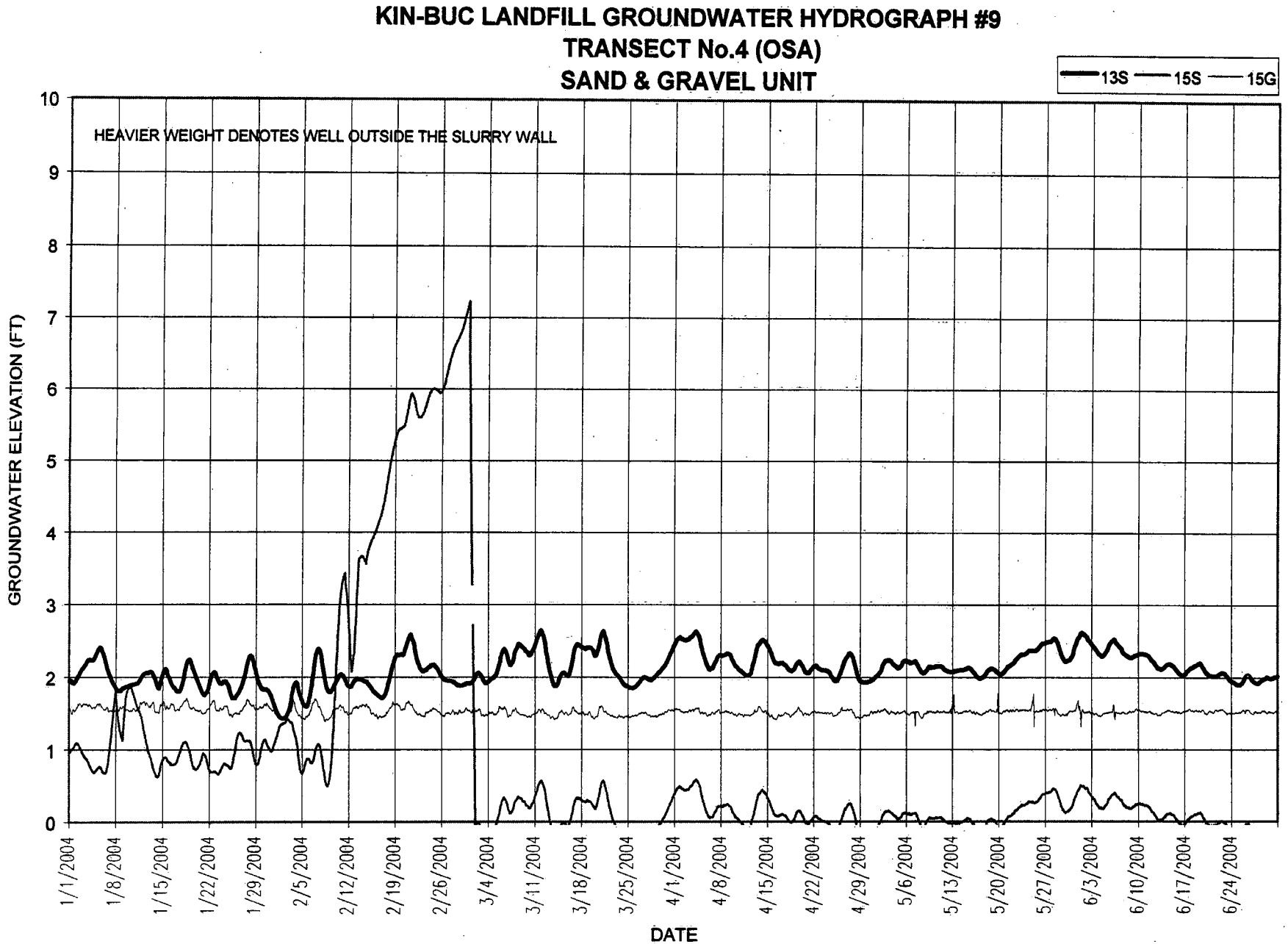

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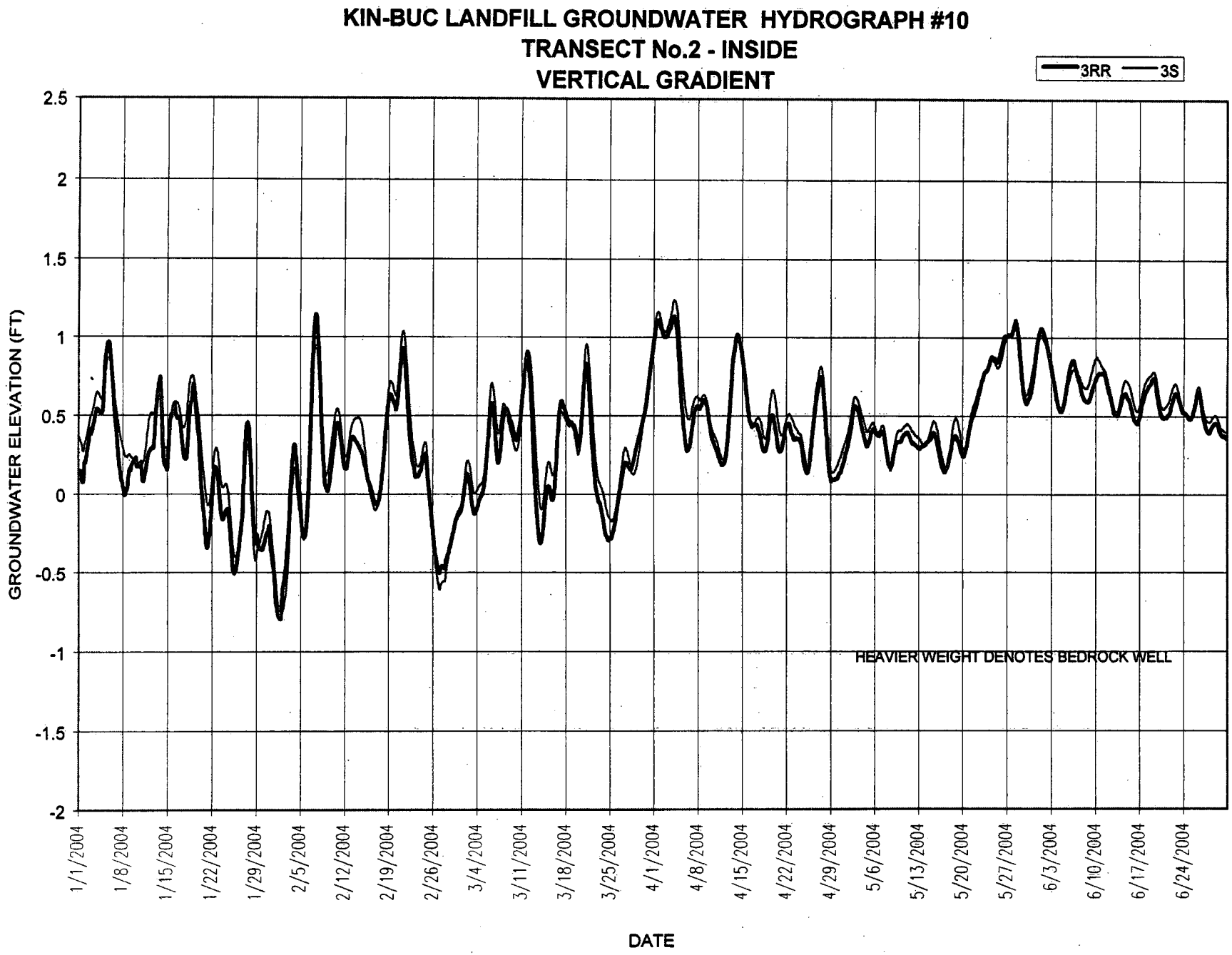

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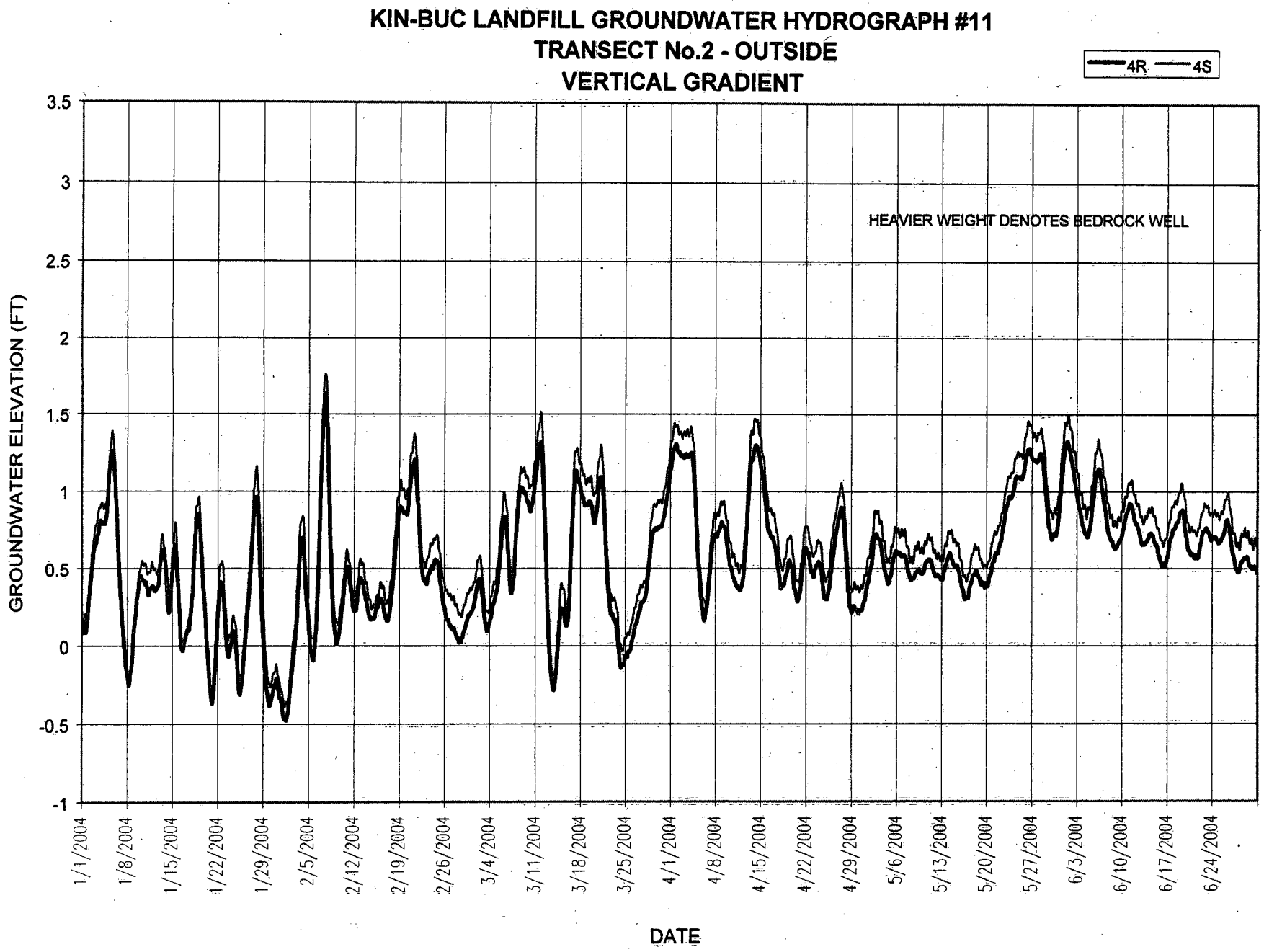

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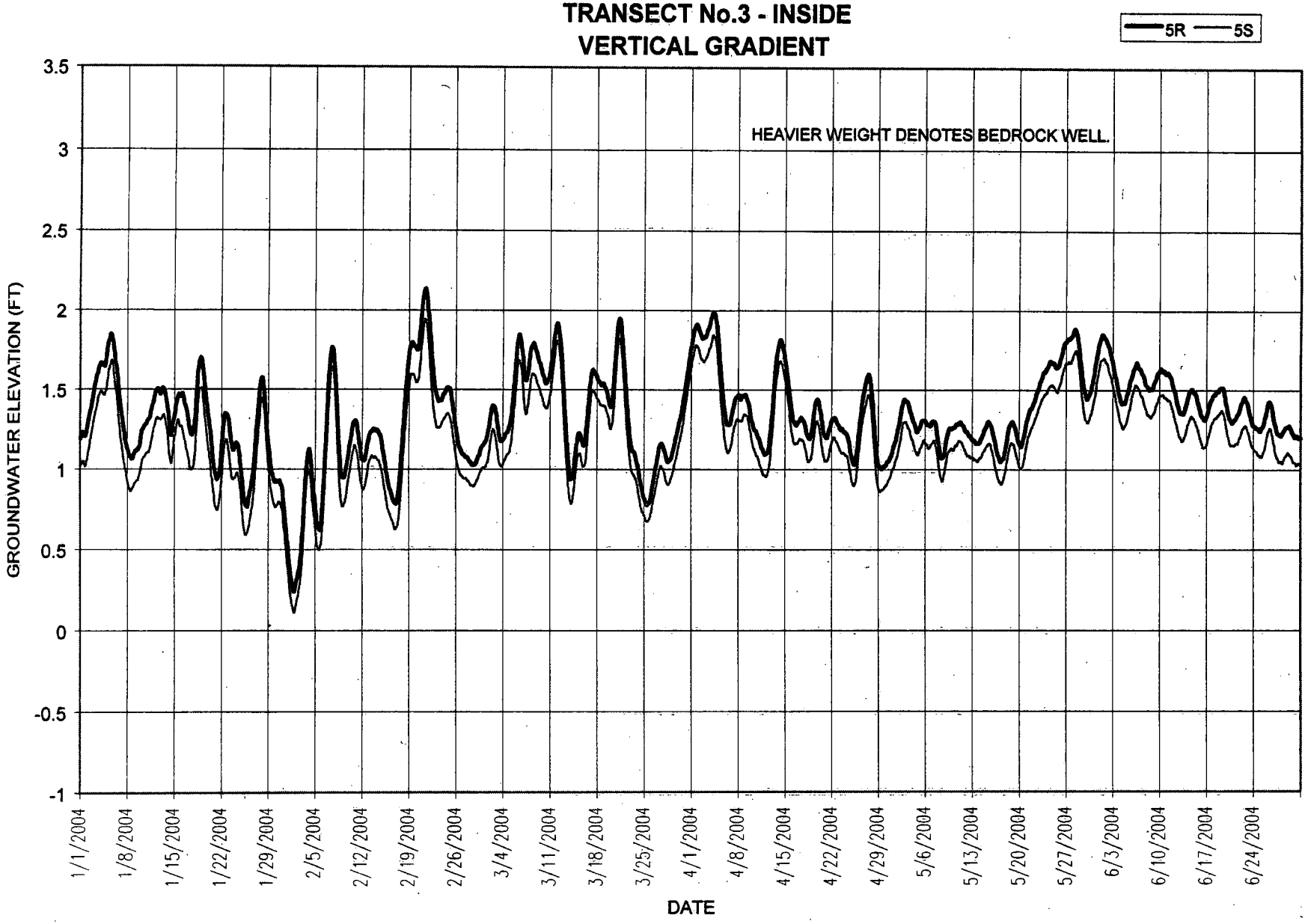
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



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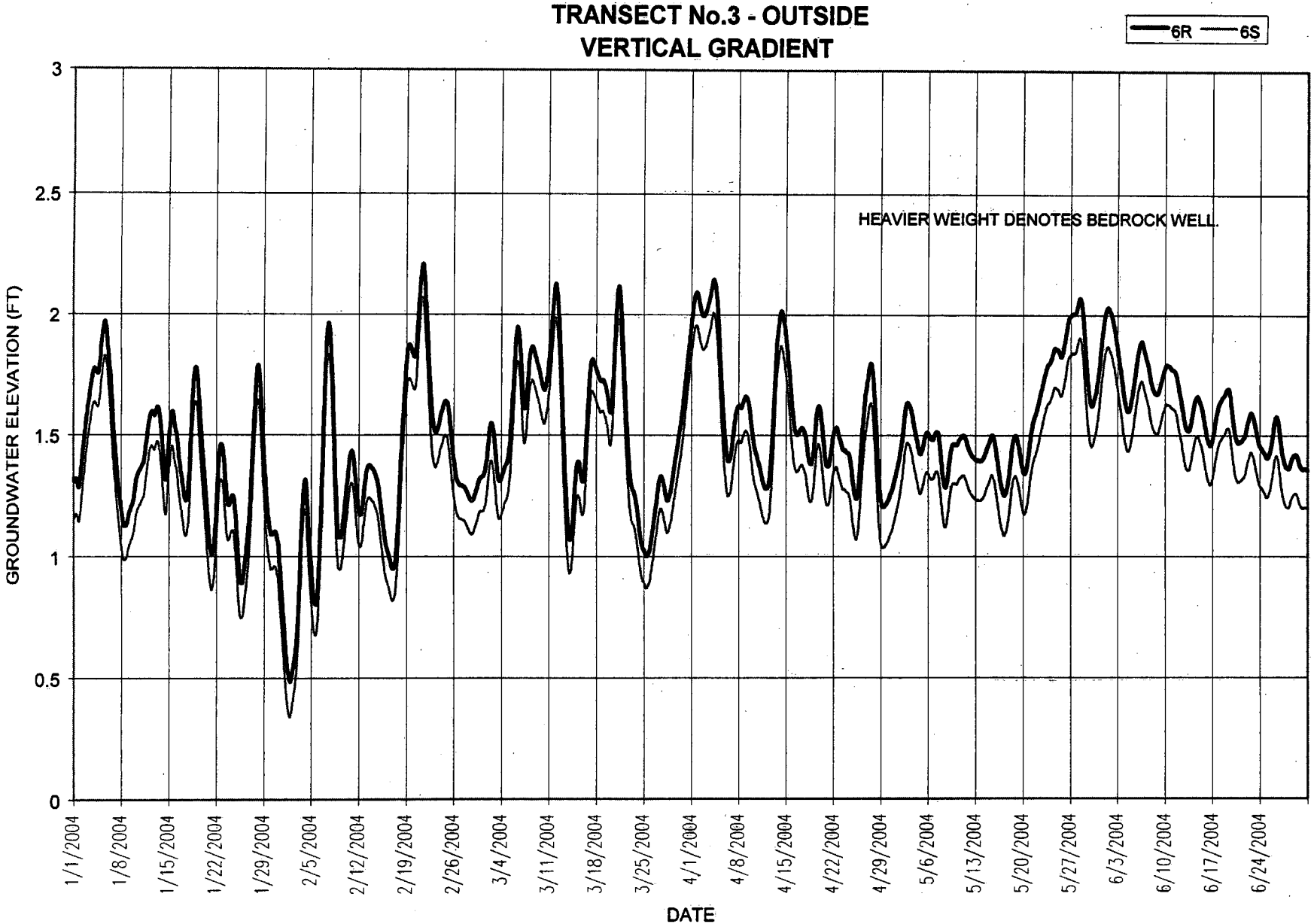
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #13
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



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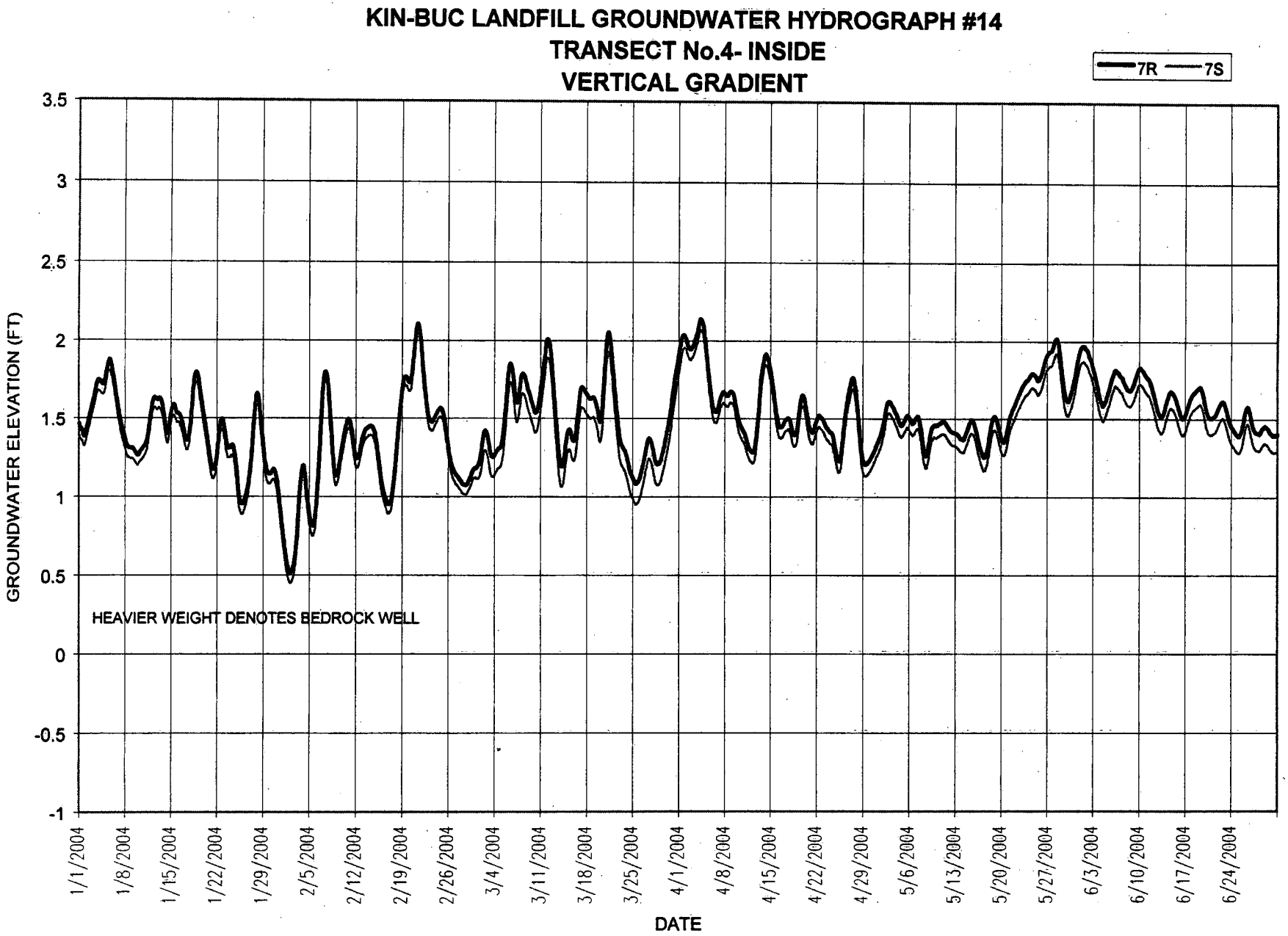

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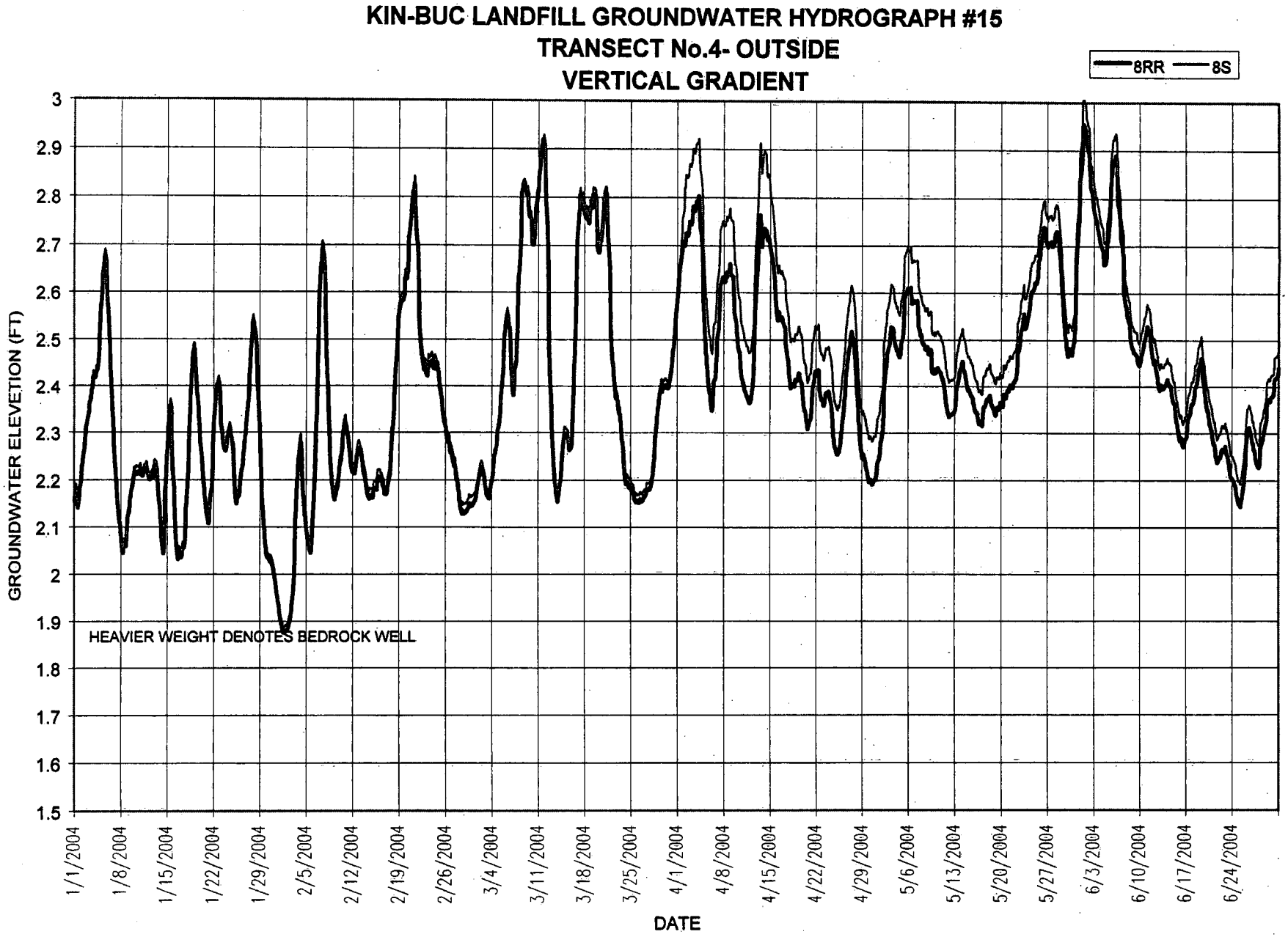


S:\PROJ\KINBUC\102052\Monthly Reports 2004\June2004 not complete\Hydrographs\Trans4May: 8rr-8s

APPENDIX B

MONTHLY HYDRAULIC EVALUATIONS

EMCON/OWT, Inc.
4 Commerce Drive South
Harriman, NY 10926
845.492.3100
Fax: 845.492.3101

Shaw® EMCON/OWT, Inc.

June 16, 2004
Project 102052

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for April 2004

Dear Mr. Januszkiewicz:

A site visit was completed on May 6, 2004 to download the April 2004 water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of April 2004 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid-July 2004.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. Table 2 presents the troll water elevations versus the manual water elevations. The continuous water level elevation data when compared with manual readings indicated that the miniTrolls are functioning properly and are recording accurate data, except for the few instances discussed in the following sections, where recommendations are made for checking the conditions at the well and transducer/mini-troll set-up.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference as Attachment 1. The water levels in wells on the outside of the slurry wall vary over the course of the day due to the tidal influence at the site. For clarity, Hydrographs 6 through 15 show the average water level in the wells over a 24-hour period (12 hours before, and 12 hours after).

Refuse

As defined in the Record of Decision (ROD) for Operable Unit 1 (OU-1), the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. Based on the hydrographs the following is presented.

Transect 1-Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were not observed throughout the month of April. The average monthly water elevations for April at Wells 1G (inside) and 2G (outside) were 11.85 and 11.64 feet msl, respectively. However, there has been a steady decline of groundwater levels in W-1G inside the slurry wall. Water level elevation measurements taken from Leachate Collection Cleanouts 14 through 16 are included in Table 3. As depicted in table 3, the leachate collection system

is functioning properly, suggesting significant capture of leachate. The evaluation of the hydraulic conditions in the refuse at Transect 1 is provided in Attachment 2.

Transect 2-Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month of April. The transducer/mini troll in that location should also be checked for proper operation. The average monthly water elevations for the month of April at Wells 3G (inside) and 4G (outside) were 7.54 and 11.47 feet msl, respectively. As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.554) for W-3G is relatively high and not typical. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Transect 3-Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month of April. The transducer/mini troll in that location should also be checked for proper operation. The average monthly water elevations for the month of April at Wells 5G (inside) and 6G (outside) were 9.65 and 13.30 feet msl, respectively. As indicated in Table 2 of this report, the difference in manual versus troll elevation readings for W-6G was 0.469. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Transect 4-Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month of April. The average monthly water elevations for the month of April at Wells 15G (inside) and 13G (outside) were 1.50 and 6.74 feet msl, respectively.

Transect 5-Refuse (9G/10G)/Hydrograph No. 5 – The transducer/mini troll at this well location was temporarily replaced on March 1, 2004 at 13:00 with a SP4000 (S/N 1288). Intragradient conditions were maintained throughout the month of April. The average monthly water elevations for the month of April at Wells 9G (inside) and 10G (outside) were 7.25 and 8.12 feet msl, respectively. Past observations consistently showed intragradient conditions at this location. The transducer/mini troll is being repaired.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.421) for W-10G is relatively high and not typical. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Sand and Gravel/Bedrock

For the sand and gravel unit, the performance objectives calls for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on visual observation of the hydrographs.

Horizontal Flow

Transect 2-Sand and Gravel (3S/4S)/Hydrograph No. 6 – Intragradient conditions were maintained through most, but not the entire month of April. Containment is being maintained by the pumping wells. The average monthly water elevations for the month of April at Wells 3S (inside) and 4S (outside) were 0.58 and 0.80 feet msl, respectively.

Transect 3-Sand and Gravel (5S/6S)/Hydrograph No. 7 – Intragradient conditions were maintained throughout the month of April. The average monthly water elevations for Wells 5S (inside) and 6S (outside) were 1.26 and 1.43 feet msl, respectively.

Transect 4-Sand and Gravel (7S/8S)/Hydrograph No. 8- Intragradient conditions were maintained throughout the month of April. The average monthly water elevations for the month of April at Wells 7S (inside) and 8S (outside) were 1.51 and 2.59 feet msl, respectively.

Transect 4 Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 – On March 1, 2004 at 15:00 the transducer/mini troll in well 15S was temporarily replaced with a SP4000 (S/N 1259). Intragradient conditions were maintained throughout the month of April. The average monthly water elevations for the month of April at Wells 15S (inside) and 13S (outside) were 0.13 and 2.22 feet msl, respectively. Water levels from Well 15G in the refuse unit are included on the hydrograph for comparison.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (2.082) for W-15S is relatively high and not typical. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Vertical Flow-Inside Slurry Wall

Transect 2-Vertical Gradient (3S/3RR)-Inside/Hydrograph No.10 – Upward gradient conditions were not co nsistently observed between the bedrock and overlying sand & gravel units inside the slurry wall for most of the month of April. The average monthly water elevations for the month of April at Wells 3S (sand & gravel) and 3RR (bedrock) were 0.58 and 0.51 feet msl, respectively.

Transect 3-Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall for most of the month of April. The average monthly water elevations for the month of April at Wells 5S (sand & gravel) and 5R (bedrock) were 1.26 and 1.40 feet msl, respectively.

Transect 4-Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month of April. The average monthly water

elevations for the month of April at Wells 7S (sand & gravel) and 7R (bedrock) were 1.51 and 1.58 feet msl, respectively.

Vertical Flow-Outside Slurry Wall

Transect 2-Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall for the entire month of April. The average monthly water elevations for the month of April at Wells 4S (sand & gravel) and 4R (bedrock) were 0.80 and 0.66 feet msl, respectively.

Transect 3-Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of April. The average monthly water elevations for the month of April at Wells 6S (sand & gravel) and 6R (bedrock) were 1.43 and 1.58 feet msl, respectively.

Transect 4-Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month of April. The average monthly water elevations for the month of April at Wells 8S (sand & gravel) and 8RR (bedrock) were 2.59 and 2.48 feet msl, respectively.

An initial review of the hydrographs indicates that certain performance objectives associated with the sand and gravel and bedrock units may not be met, specifically associated with the uniform achievement of upward gradients from the bedrock to the overlying sand and gravel inside the wall (e.g. Hydrograph 10). However previous investigations performed at the site would indicate that complete control of OU-1 groundwater can be achieved notwithstanding indications of downward flow from the sand and gravel to the bedrock, or outward flow across the slurry wall within the sand and gravel unit. This is based on the findings of the considerable pumping influence of the sand and gravel pumping wells, in particular S&G#2, in achieving hydraulic control at the site (see Groundwater Pumping Well Performance Evaluation Report, July 2000).

The influence of the pumping well can be demonstrated by review of a plan view groundwater contour map of the sand and gravel (Figure 1) and equipotential profiles and vector diagrams (Figures 1, 2, 3, and 4) that have been prepared for a period of time when the vertical gradient between the sand and gravel and the bedrock was downward at Transect 2. For this evaluation, a snapshot of groundwater elevations from the monitoring wells and pumping wells was obtained for April 23, 2004. At this time, S&G#2 was pumping at a rate of about 11.0 gallons per minute (gpm) or about 15,840 gallons per day, and S&G#3 was pumping at a rate of about 3.99 gallons per minute (gpm) or about 5,745 gallons per day. During April, there was a downward vertical gradient observed most of the time between the sand and gravel and the bedrock inside and outside the slurry wall at

Transect No.2 as evidenced by higher heads in the sand and gravel wells relative to bedrock wells.

Figures 1 through 4 incorporate the heads induced by pumping and show the considerable pumping influence of S&G#2. Specifically, groundwater flowing downward from the sand and gravel into the bedrock subsequently flows toward the pumping well. This occurs both inside and outside of the slurry wall. Also, groundwater within the sand and gravel unit flows toward the pumping well. The considerable pumping influence demonstrated at S&G#2, in conjunction with the fact that natural groundwater gradients in both the sand & gravel and bedrock flow predominantly towards the area of S&G#2, result in the complete capture of OU-1 groundwater at these pumping rates.

Groundwater and Leachate Collection

Based on data provided by Veolia Water, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from April 1 to 30, 2004:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	474,457 gal.	172,073 gal.	0 gal.	60,905 gal.
0 gpd	15,815.23 gpd	5,735.77 gpd	0 gpd	2,030.17 gpd

For the month of April, a total of 646,530 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 21,551 gpd. The extraction rate from S&G No. 1 was 0 gpd; 15,815.23 gpd for S&G No. 2; 5,735.77 gpd for S&G No. 3; and 0 gpd for S&G No. 4. The leachate extraction rate was 2,030.17 gpd for the month of April.

CONCLUSIONS

Intragradient conditions were maintained in the refuse unit at Transects 2, 3, 4, and 5. The transducer for monitoring well 10G (Transect 5) is being repaired and a substitute transducer has been installed to monitor water levels in the interim.

Intragradient conditions were not maintained throughout the month of April by the monitoring wells at Transect 1, although levels in the leachate collection system indicate intragradient conditions are present at this location. Groundwater levels are dropping in W-1G inside the slurry wall.

Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G#2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured

by the pumping wells (S&G#2 and also S&G#3) resulting in overall containment of groundwater in OU-1.

In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively. These pumping rates will continue to be evaluated to confirm continued hydraulic control of OU-1 groundwater.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

EMCON/OWT, Inc.

Timothy S. Pagano, CPG
Senior Hydrogeologist

Steven P. Goldberg, Ph.D
Senior Hydrogeologist

Attachments

cc: Glenn Grieb, US Filter
Jeff Shanks, WM, Inc.

[redacted]Buc[redacted]ill O[redacted]e Un[redacted]nd 2[redacted]

Continuous Hydraulic Monitoring Results

2004

Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	April	11.72	11.99	11.85	W-2G	April	11.48	11.73	11.64
W-3G	April	7.28	7.85	7.54	W-4G	April	11.08	11.78	11.47
W-3S	April	0.07	1.37	0.58	W-4S	April	-0.43	2.10	0.80
W-5G	April	9.46	9.93	9.65	W-6G	April	12.82	13.81	13.30
W-5S	April	0.76	2.02	1.26	W-6S	April	0.92	2.21	1.43
W-7S	April	1.08	2.17	1.51	W-8S	April	1.39	3.97	2.59
W-15S	April	-0.27	0.82	0.13	W-13S	April	1.78	3.05	2.22
W-15G	April	1.41	1.60	1.50	W-13G	April	6.54	7.64	6.74
W-9G	April	7.11	7.44	7.25	W-10G	April	8.04	8.16	8.12
W-3RR	April	-0.15	1.51	0.51	W-4R	April	-0.65	2.03	0.66
W-5R	April	0.90	2.17	1.40	W-6R	April	1.09	2.33	1.58
W-7R	April	1.15	2.24	1.58	W-8RR	April	1.94	3.86	2.48

Table 2
KinBuc Landfill Operable Unit 1
April 2004
Troll Elevations vs. Manual Elevations

OU 1 Well ID	May 6, 2004		
	Troll	Manual	Difference
W-1G	11.704	11.71	0.006
W-2G	11.805	11.82	0.015
W-3G	7.384	6.83	0.554
W-3S	0.31	0.39	0.080
W-3RR	0.387	0.41	0.023
W-4G	11.485	11.5	0.015
W-4S	0.8	0.82	0.020
W-4R	0.808	0.89	0.082
W-5G	9.543	9.63	0.087
W-5S	0.992	1.05	0.058
W-5R	0.871	0.9	0.029
W-6G	13.579	13.11	0.469
W-6S	1.204	1.26	0.056
W-6R	1.342	1.32	0.022
W-7S	1.334	1.38	0.046
W-7R	1.432	1.48	0.048
W-8S	3.083	3.06	0.023
W-8RR	3.006	2.98	0.026
W-9G	7.317	7.36	0.043
W-10G	8.159	8.58	0.421
W-13G	6.751	6.72	0.031
W-13S	2.355	2.34	0.015
W-15G	1.468	N/A	N/A
W-15S	0.148	2.23	2.082

Table 2-1

Kin-Buc Landfill
Operable Unit 1
Continuous Hydraulic Monitoring Well Network/Transects

Transect Location No.	Screened Hydrogeologic Unit	Well Location Inside Slurry Wall	Well Location Outside Slurry Wall
1	Refuse/Fill	W-1G	W-2G
2	Refuse/Fill	W-3G	W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill	W-5G	W-6G
	Sand and Gravel	W-5S	W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill[1]	W-15G	W-13G
	Sand and Gravel[1]	W-15S	W-13S
	Sand and Gravel	W-7S	W-8S
	Bedrock	W-7R	W-8RR
5	Refuse/Fill	W-9G	W-10G

Notes: [1] Wells located across the extended slurry wall.

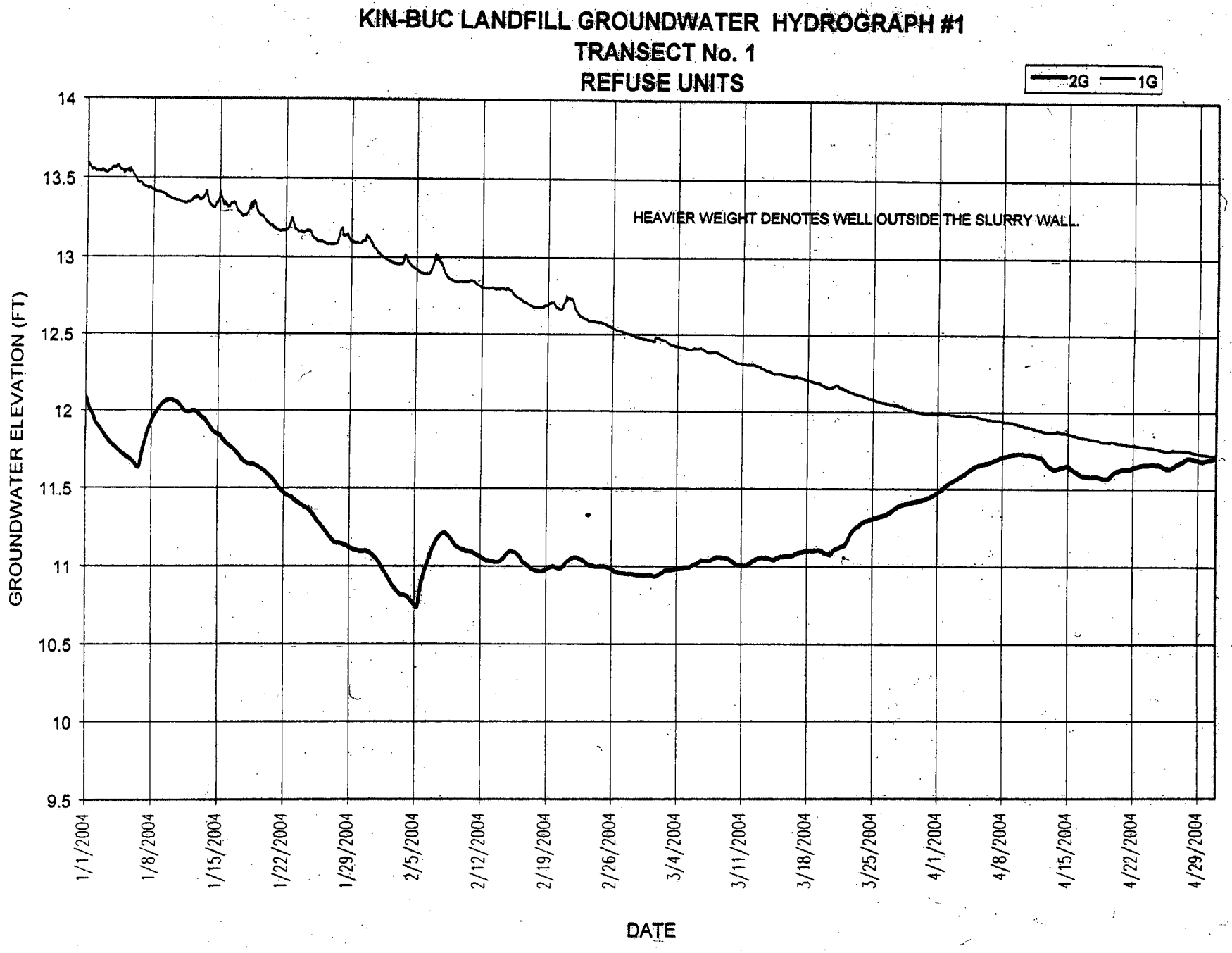
Table 2-2

Kin-Buc Landfill
Operable Unit 2
Hydraulic Monitoring Network

Well Location	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-10G	Fill/Refuse
WE-10S	Sand & Gravel
WE-10R	Bedrock
GEI-3G	Fill/Refuse
WE-3S	Sand & Gravel
WE-3R	Bedrock
Mound B	
GEI-5G	Fill/Refuse
WE-5S	Sand & Gravel
WE-5R	Bedrock
GEI-6G	Fill/Refuse
GEI-6S	Sand & Gravel
WE-6R	Bedrock
GEI-7G	Fill/Refuse
WE-7S	Sand & Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock

Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2004

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.09		10.06		9.85		9.93		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na
3/4/2003	13.21	9.66	13.15	9.62	17.22	9.29	17.20	9.31	dry	na	dry	na
4/1/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.79	9.72	dry	na	dry	na
5/8/2003	13.05	9.82	12.97	9.80	17.01	9.50	16.96	9.55	dry	na	dry	na
6/3/2003	13.11	9.76	13.14	9.63	17.09	9.42	17.04	9.47	dry	na	dry	na
6/30/2003	12.92	9.95	12.85	9.92	16.83	9.68	16.79	9.72	dry	na	dry	na
8/11/2003	12.91	9.96	12.84	9.93	16.82	9.69	16.78	9.73	dry	na	dry	na
9/5/2003	13.00	9.87	12.92	9.85	16.93	9.58	16.88	9.63	dry	na	dry	na
9/29/2003	12.99	9.88	12.91	9.86	16.93	9.58	16.90	9.61	dry	na	dry	na
11/3/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.78	9.73	dry	na	dry	na
12/2/2003	13.01	9.86	12.93	9.84	16.95	9.56	16.94	9.57	dry	na	dry	na
12/29/2003	12.8	10.07	12.74	10.03	16.7	9.81	16.67	9.84	dry	na	dry	na
2/2/2004	13.12	9.75	13.05	9.72	dry	na	dry	na	dry	na	dry	na
3/1/2004	13.08	9.79	13.03	9.74	dry	na	dry	na	dry	na	dry	na
4/1/2004	12.89	9.98	12.825	9.95	dry	na	dry	na	dry	na	dry	na
5/6/2004	12.17	10.70	13.1	9.67	dry	na	dry	na	dry	na	dry	na



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KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #2
TRANSECT No.2
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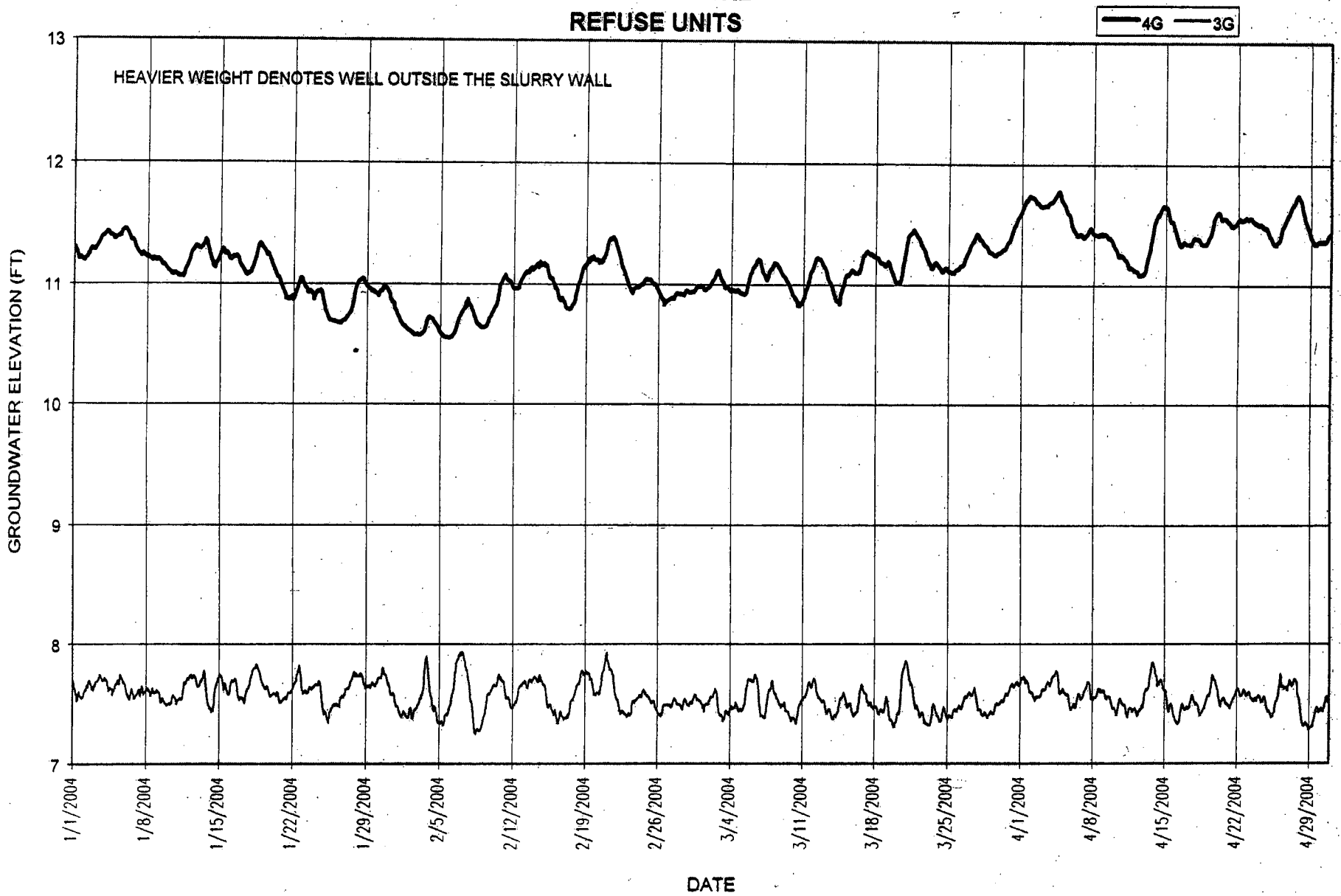

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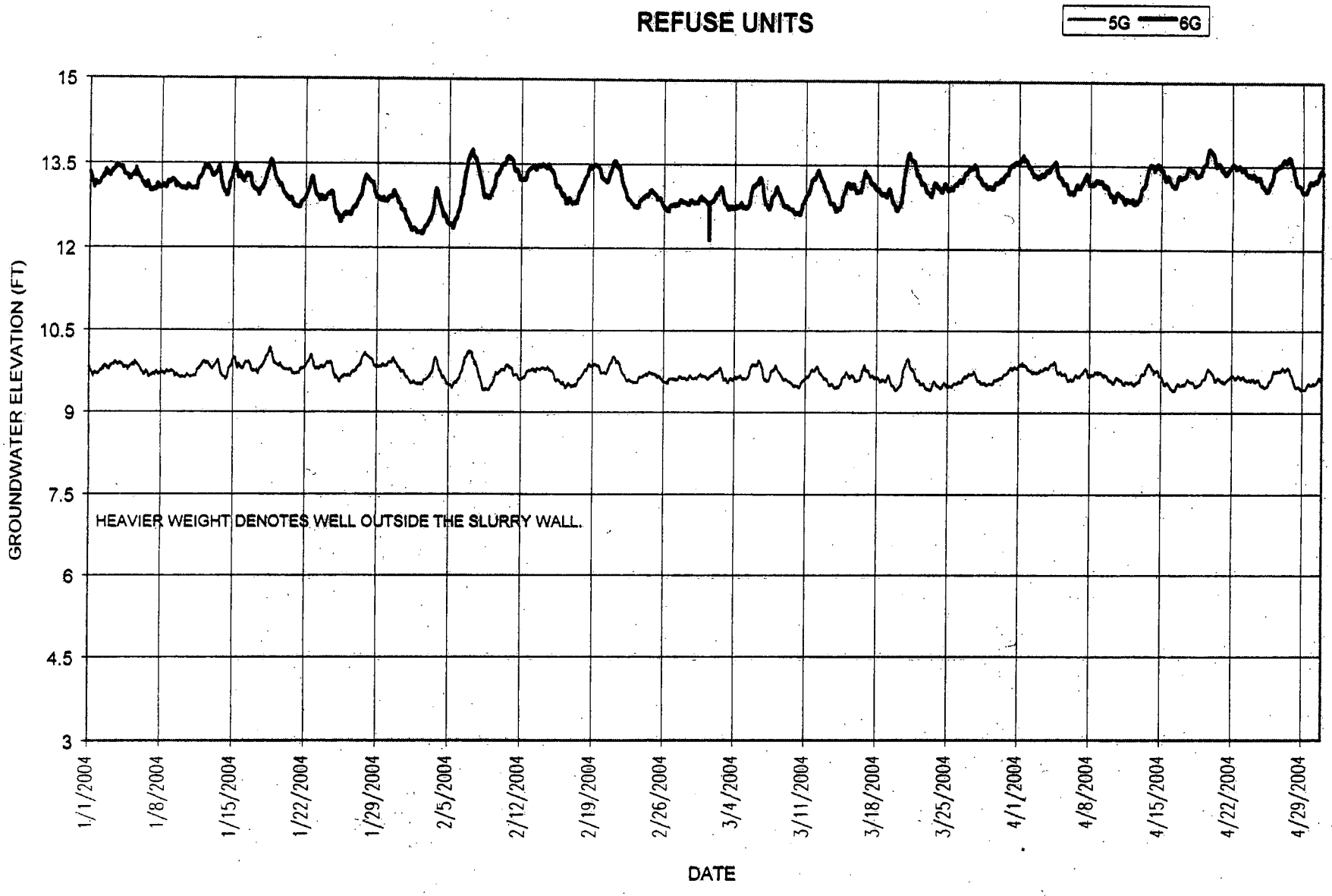

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TRANSECT No.4 (OSA)
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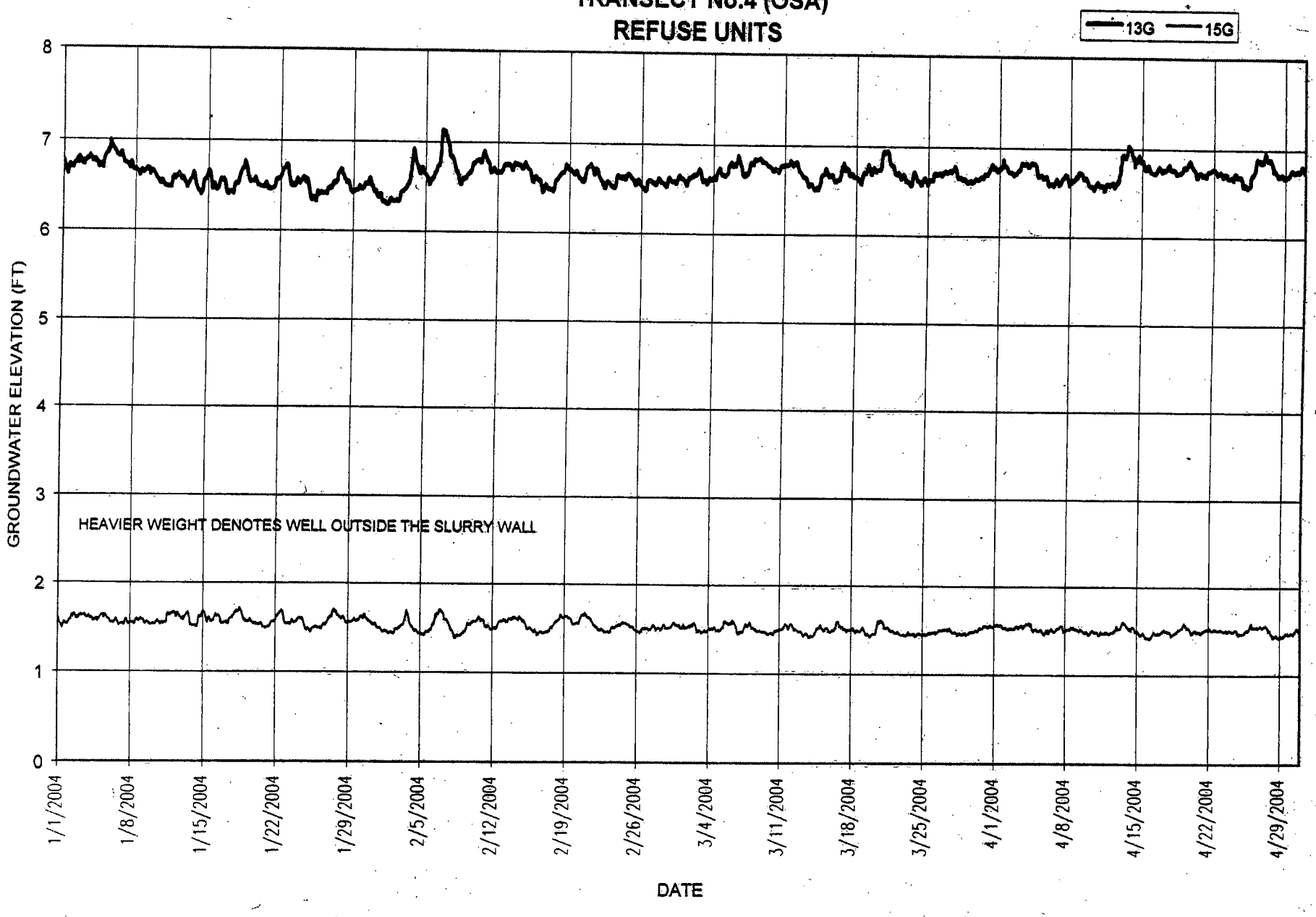

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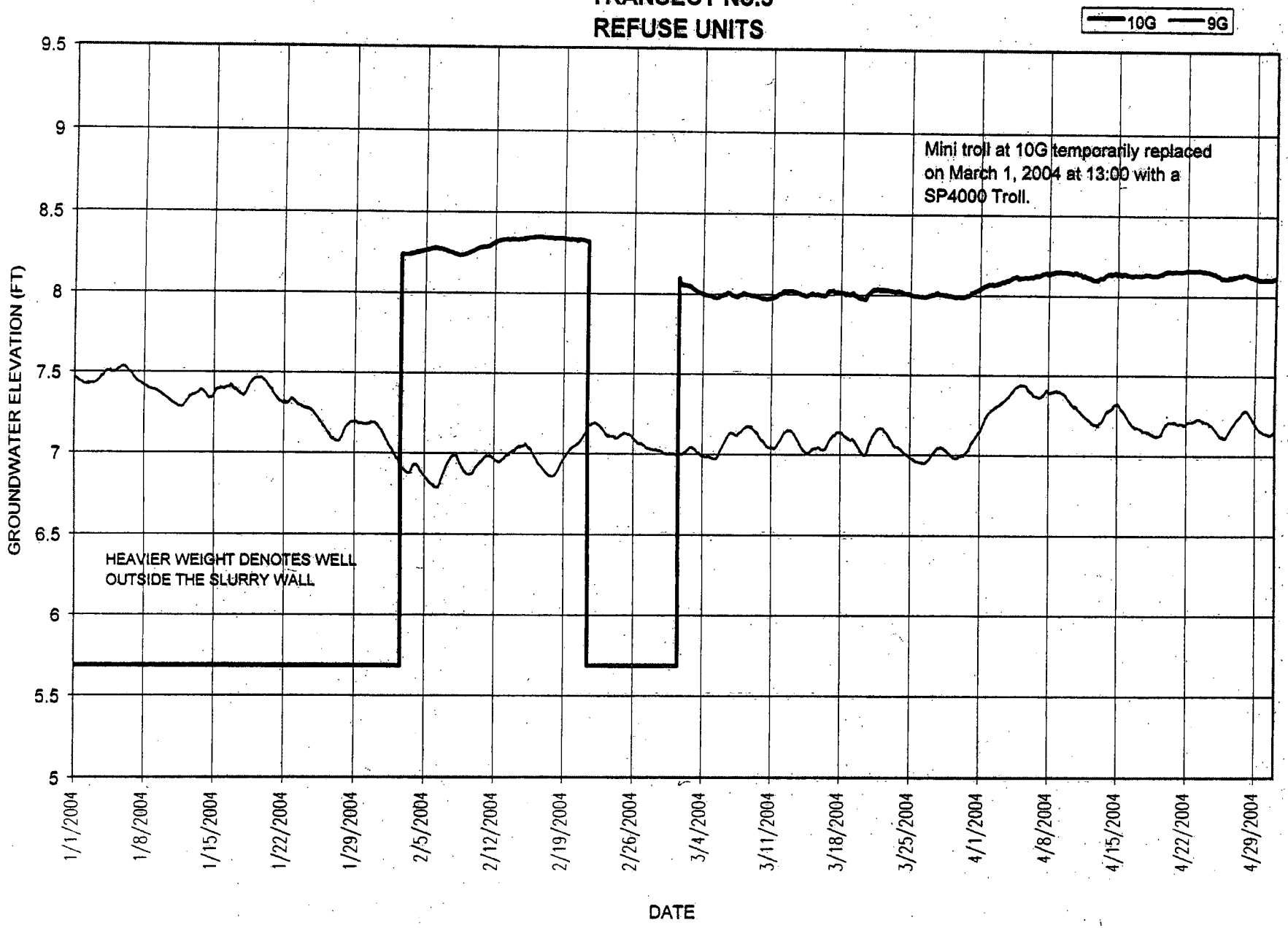
TRANSECT No.5
REFUSE UNITS



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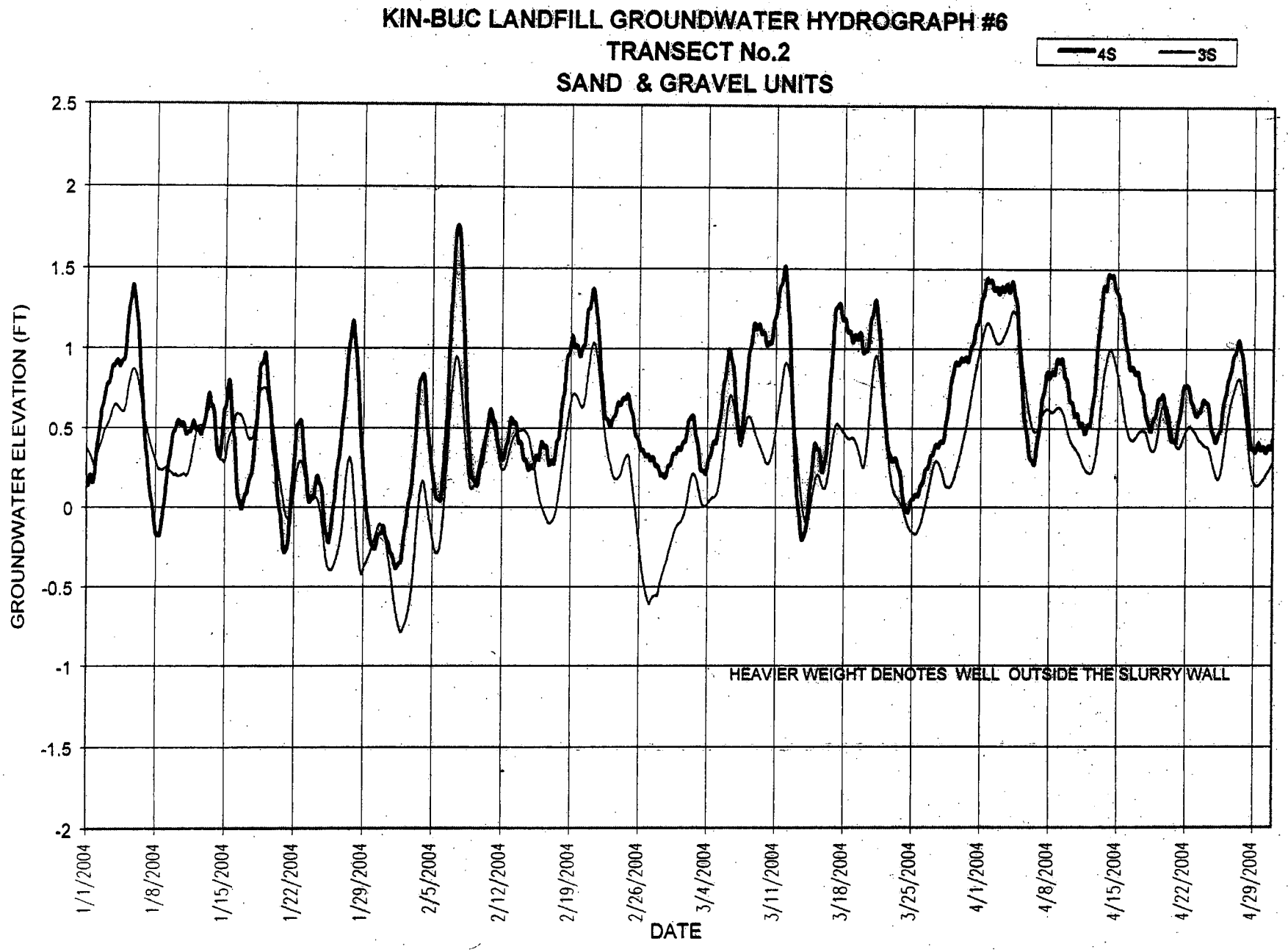

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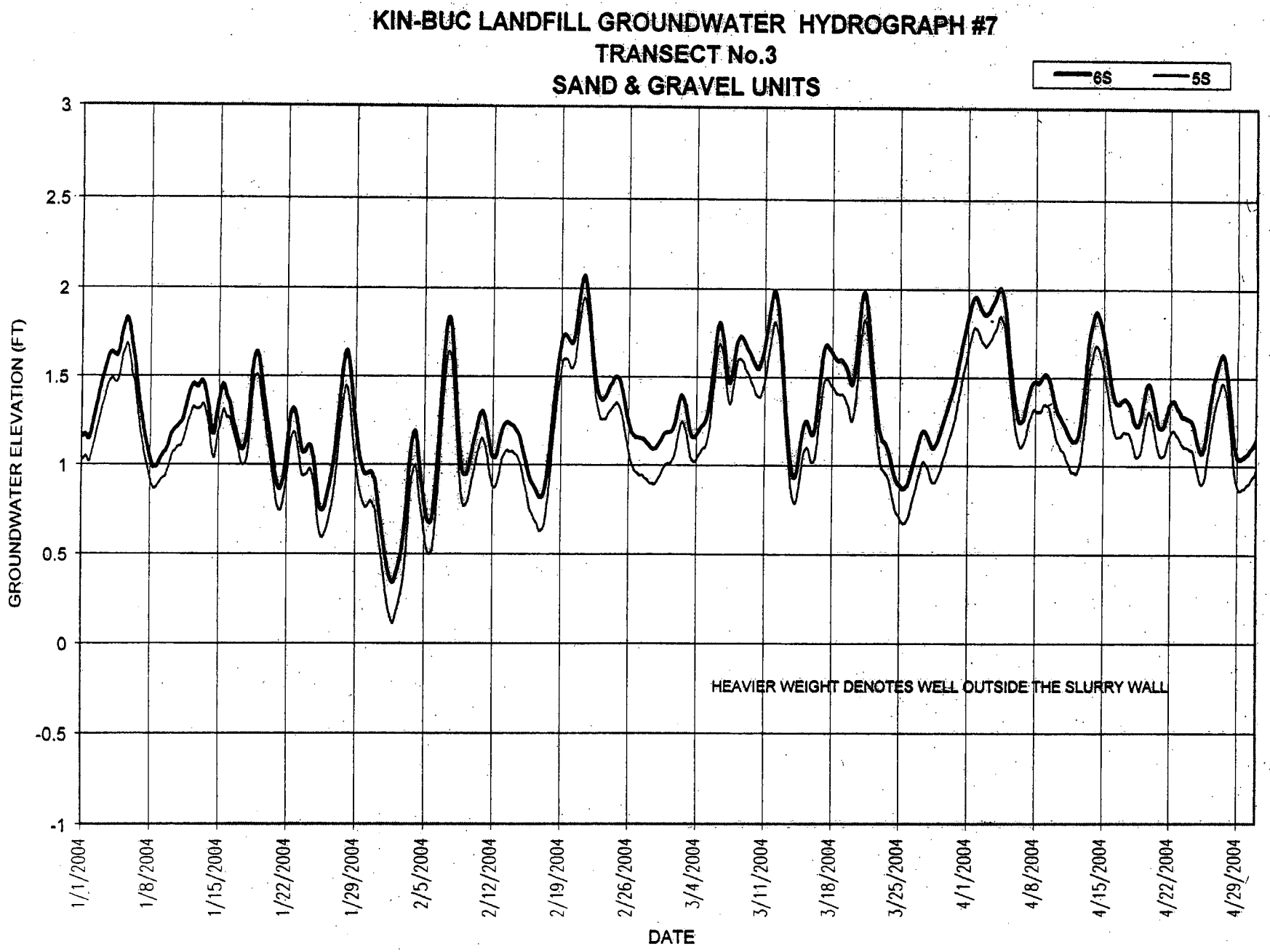

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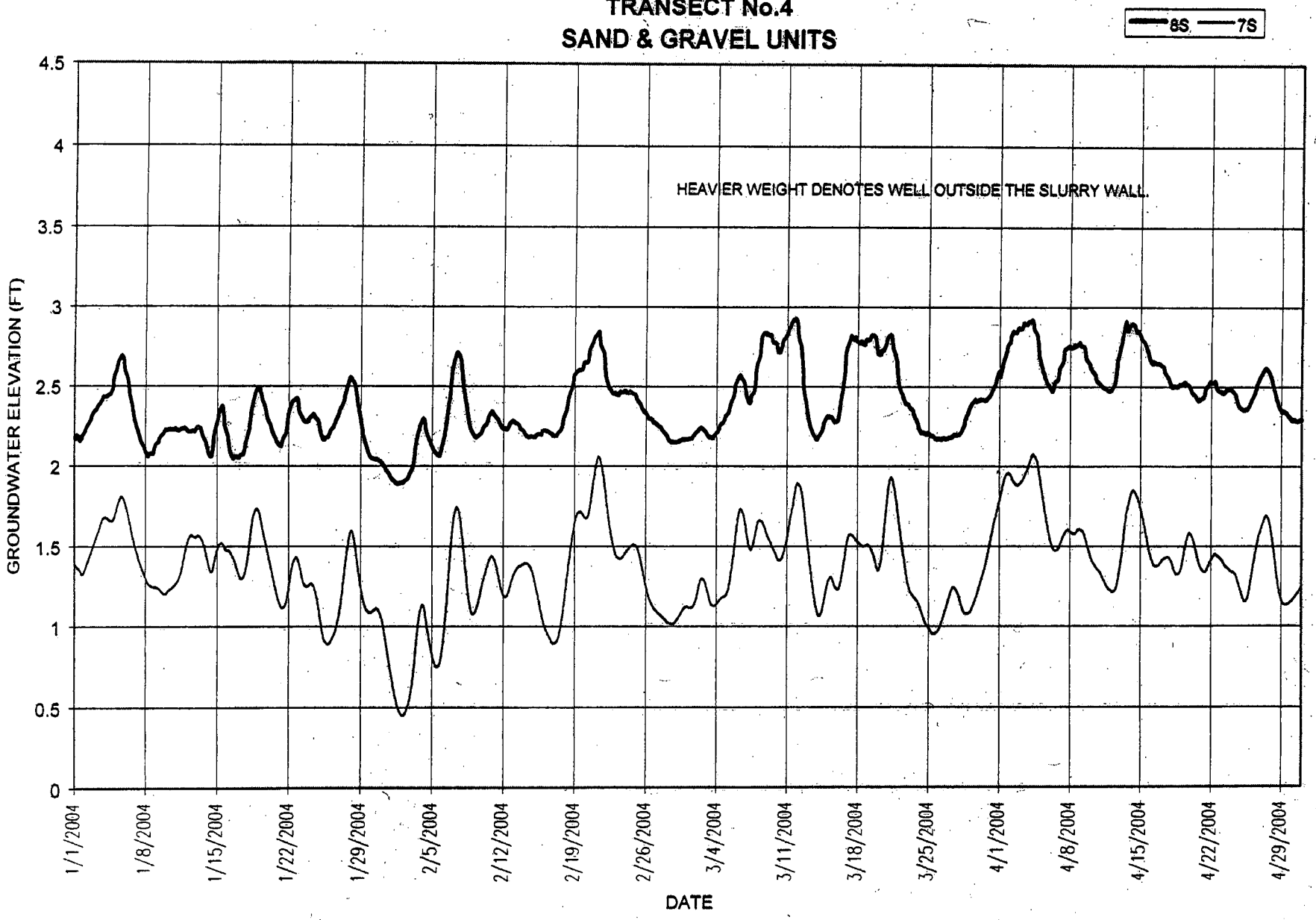
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
TRANSECT No.4
SAND & GRAVEL UNITS



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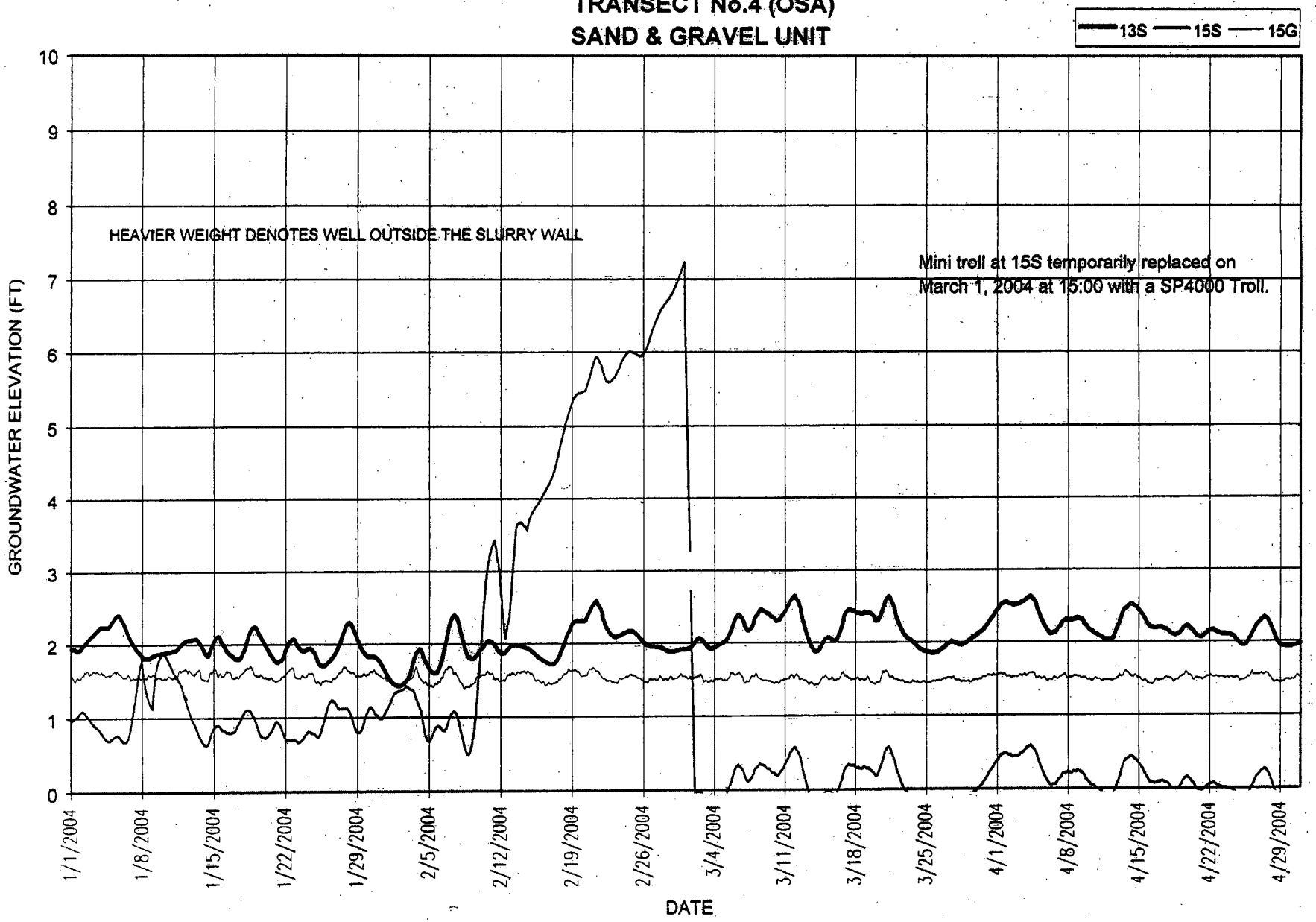
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #9
TRANSECT No.4 (OSA)
SAND & GRAVEL UNIT



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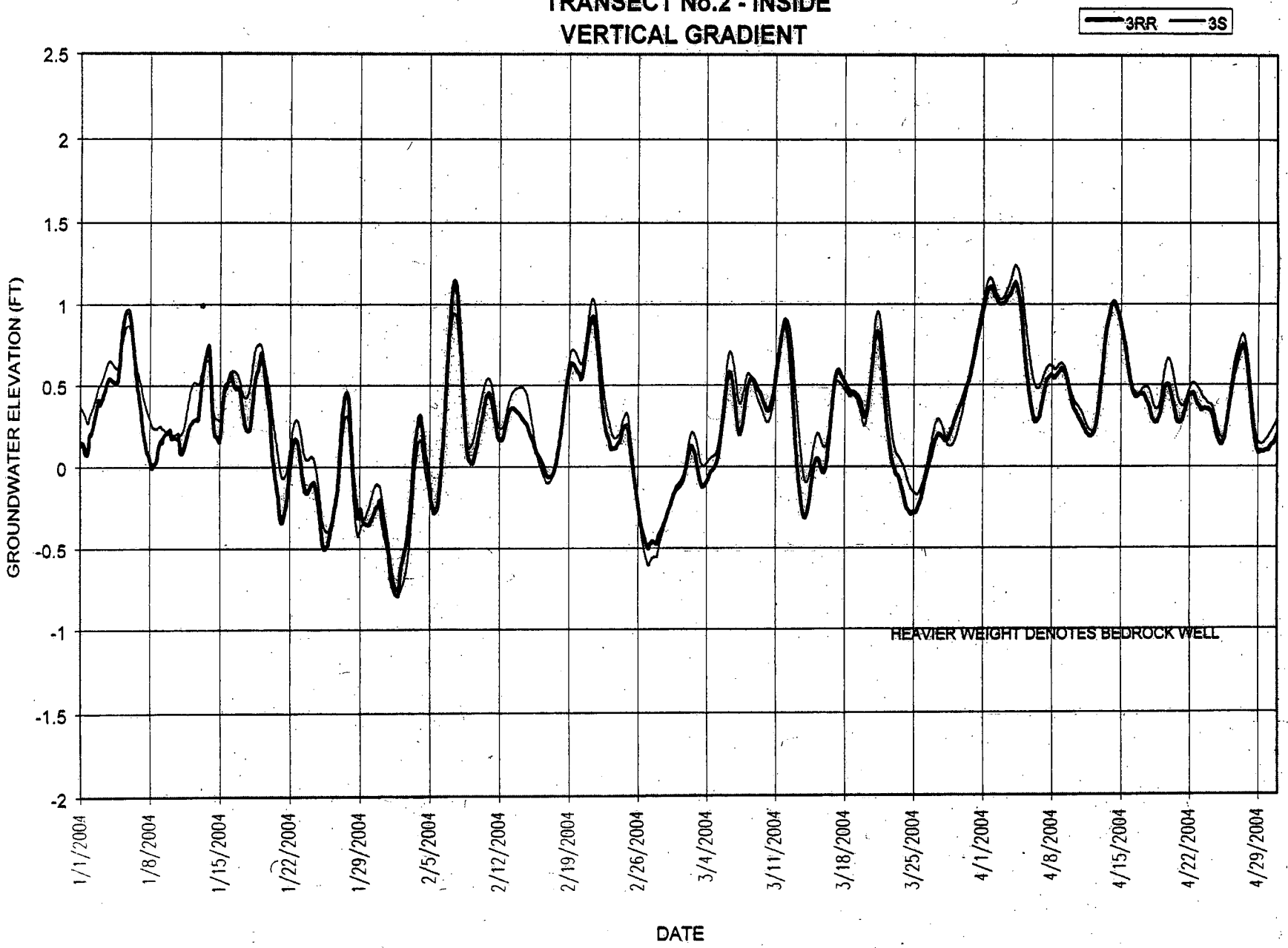
TRANSECT No.2 - INSIDE
VERTICAL GRADIENT



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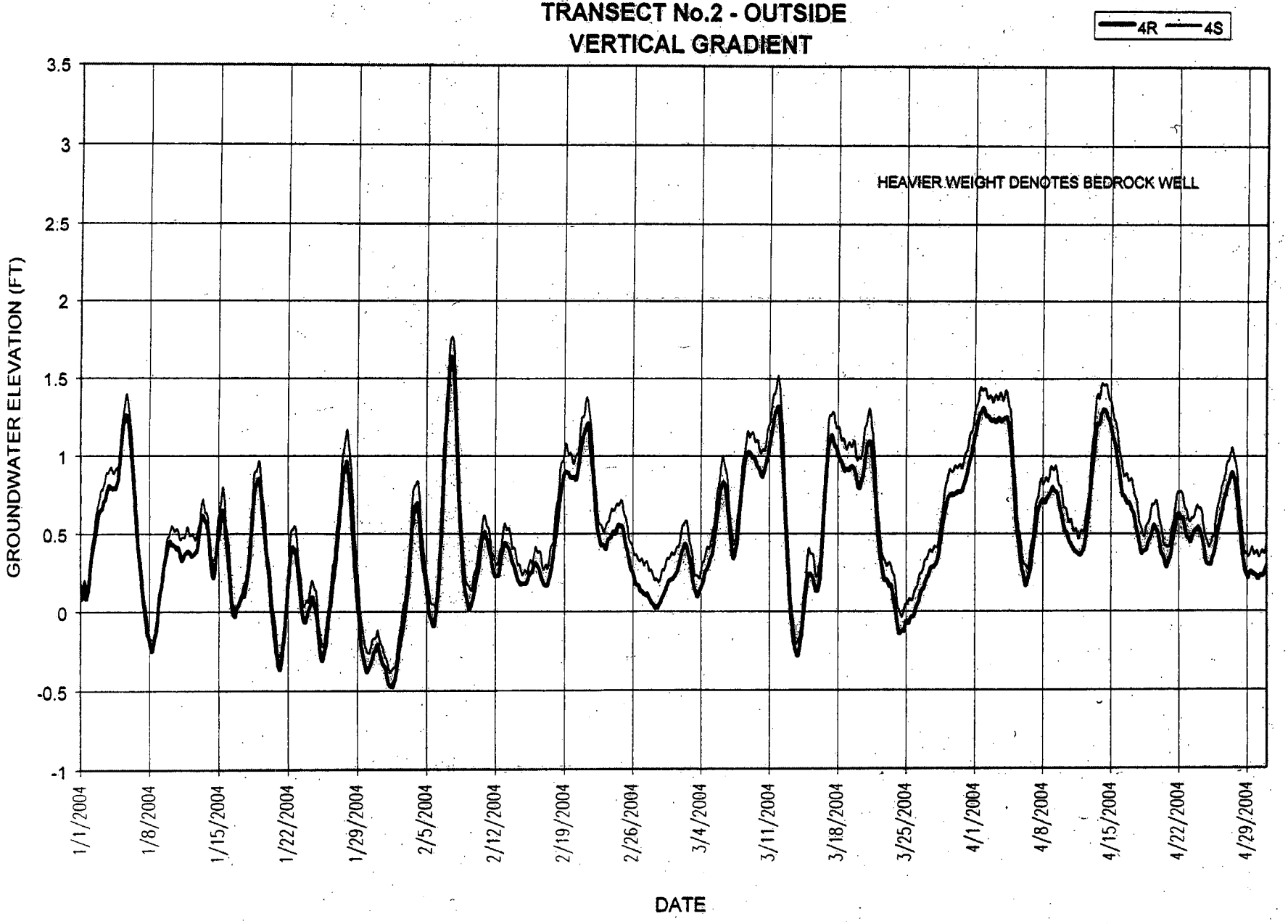
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #11
TRANSECT No.2 - OUTSIDE
VERTICAL GRADIENT



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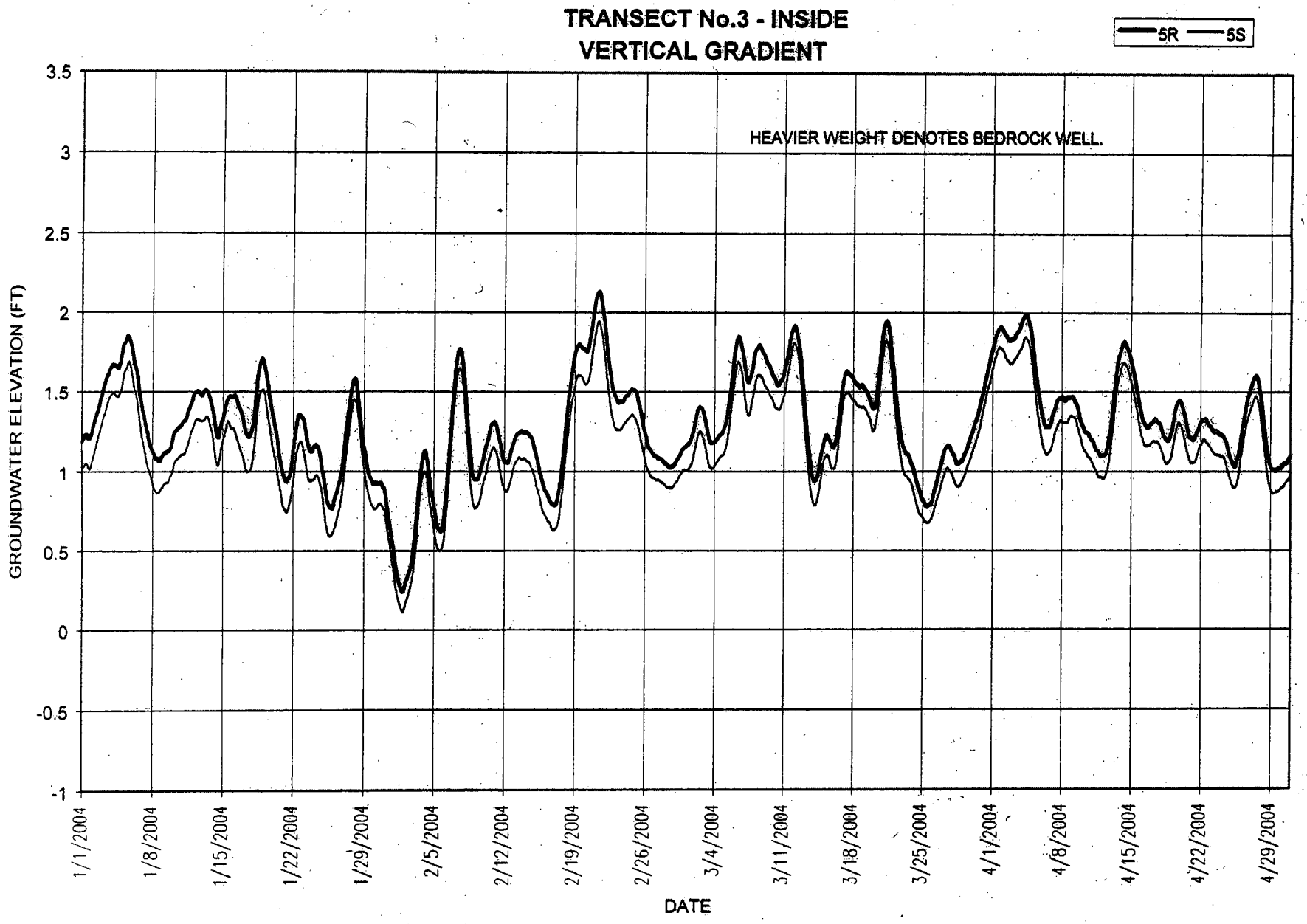
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



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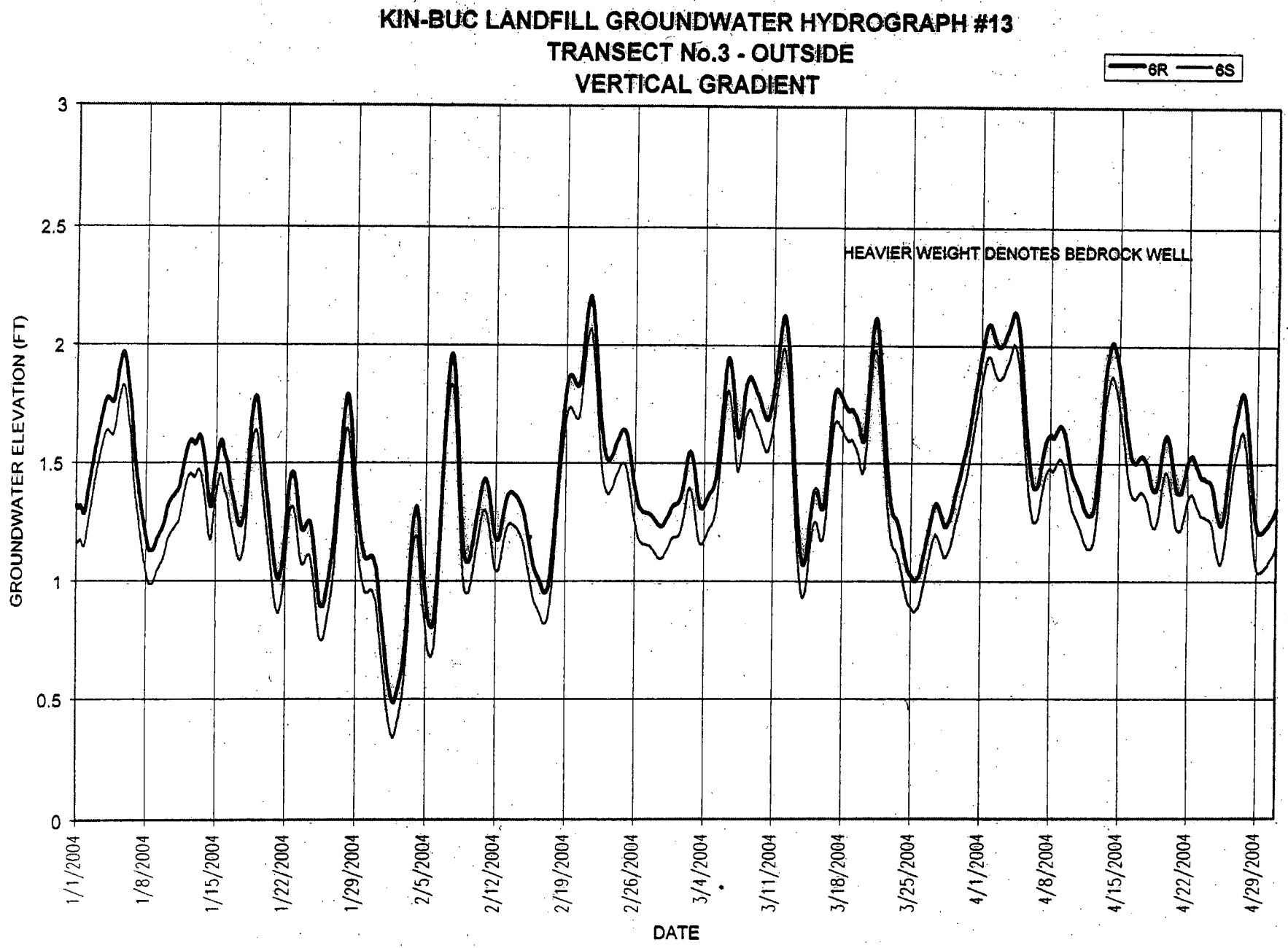

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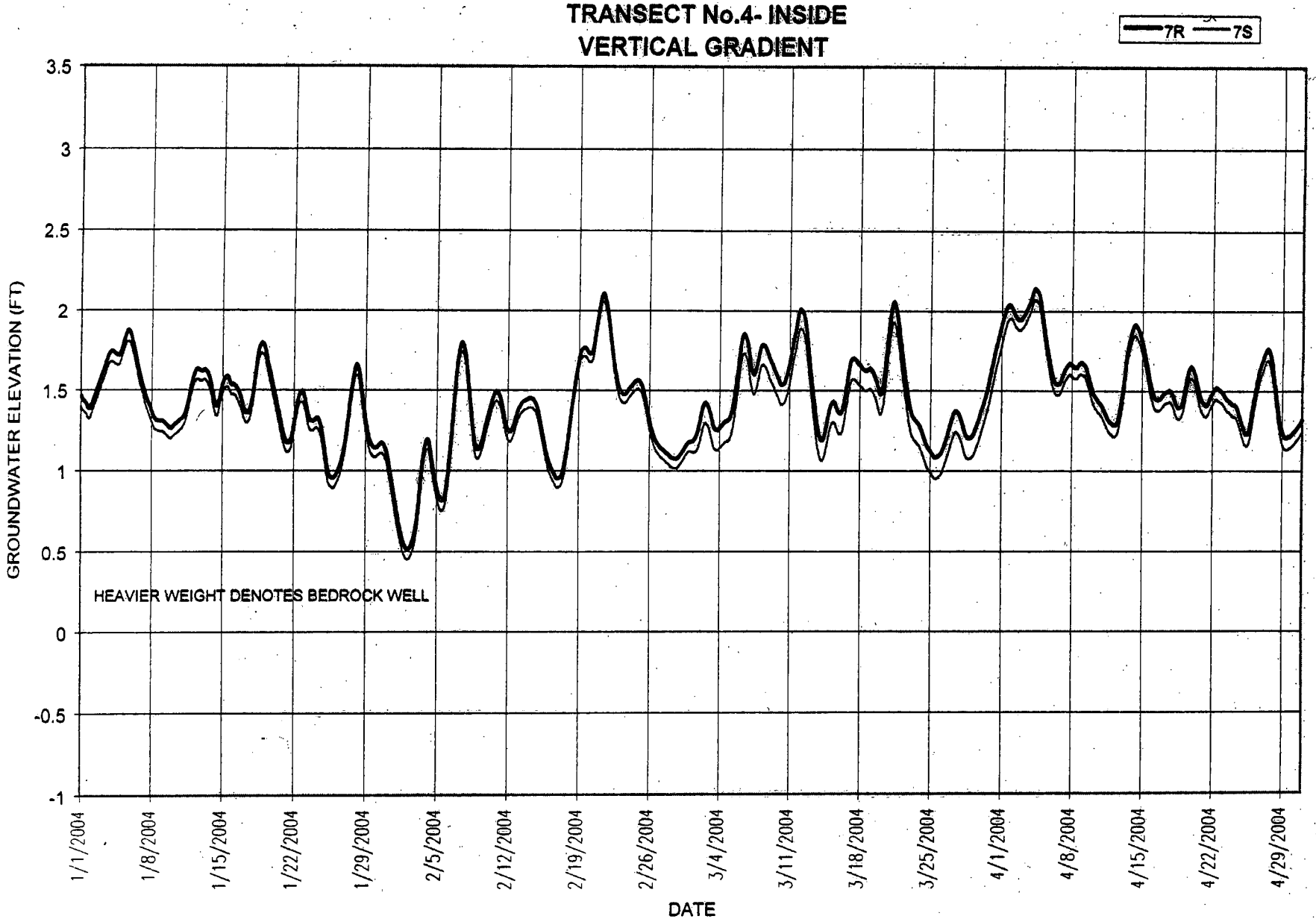
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #14
TRANSECT No.4- INSIDE
VERTICAL GRADIENT



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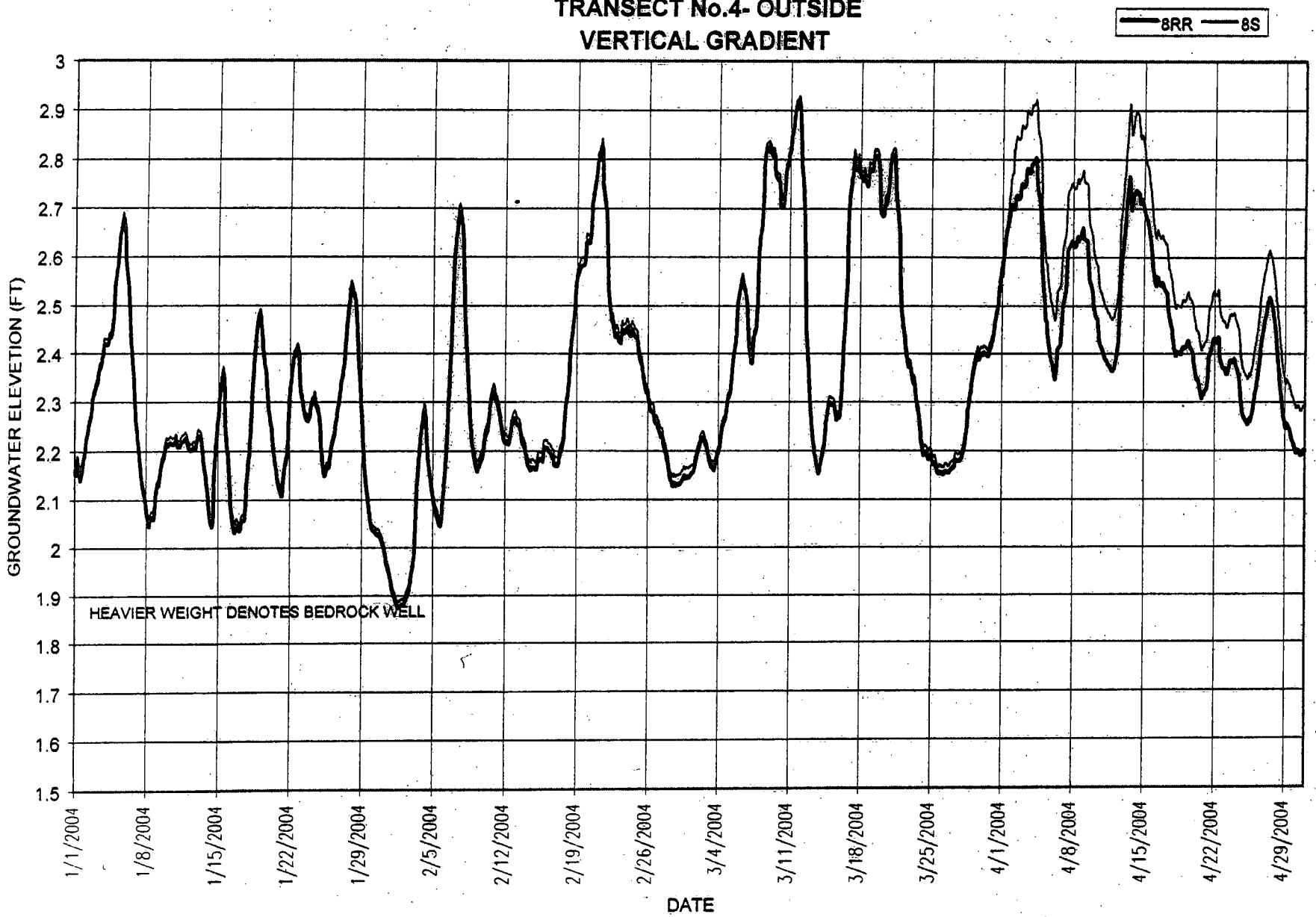
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #15
TRANSECT No.4- OUTSIDE
VERTICAL GRADIENT



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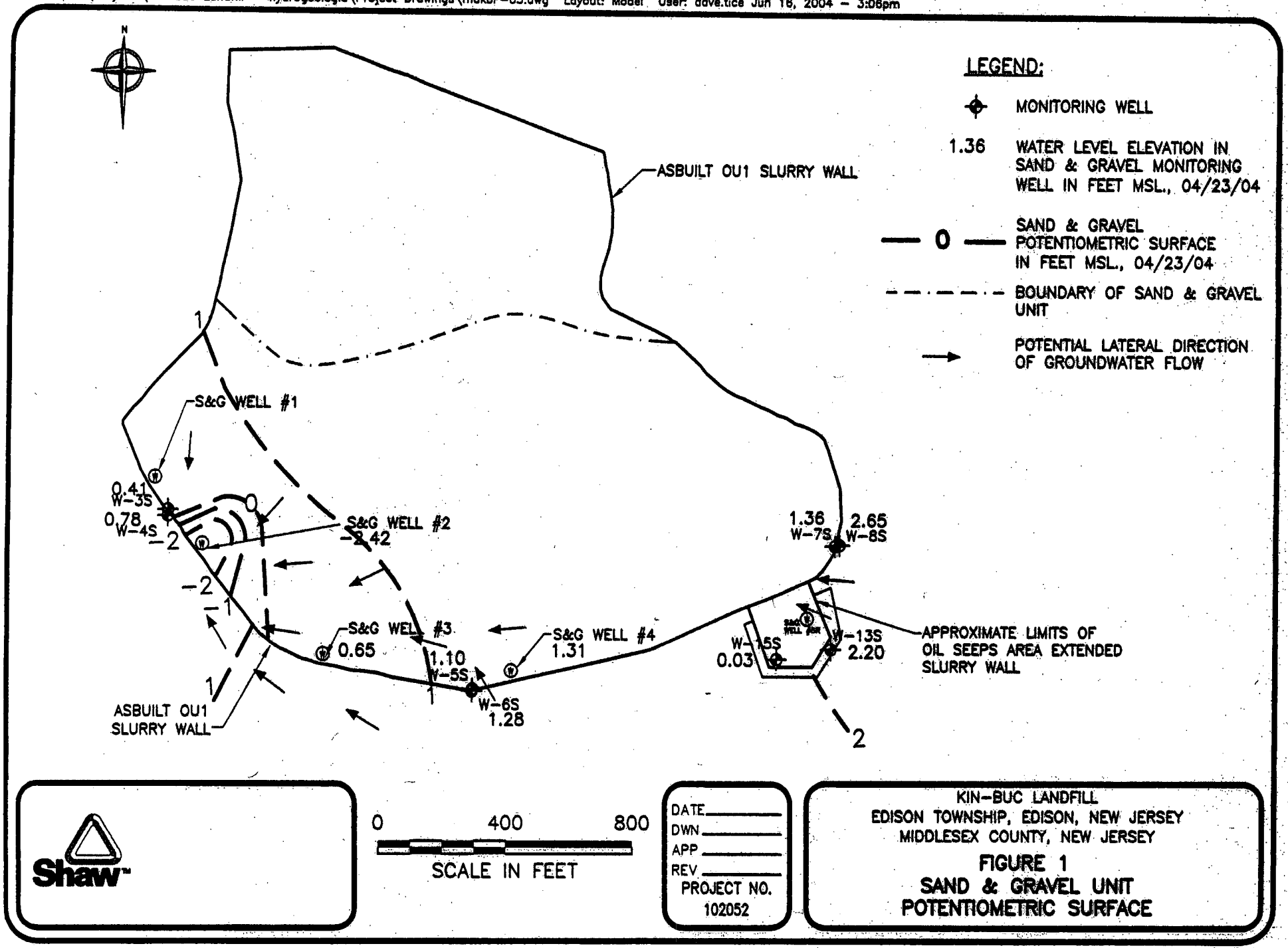

1" 1/2" 0" 1"

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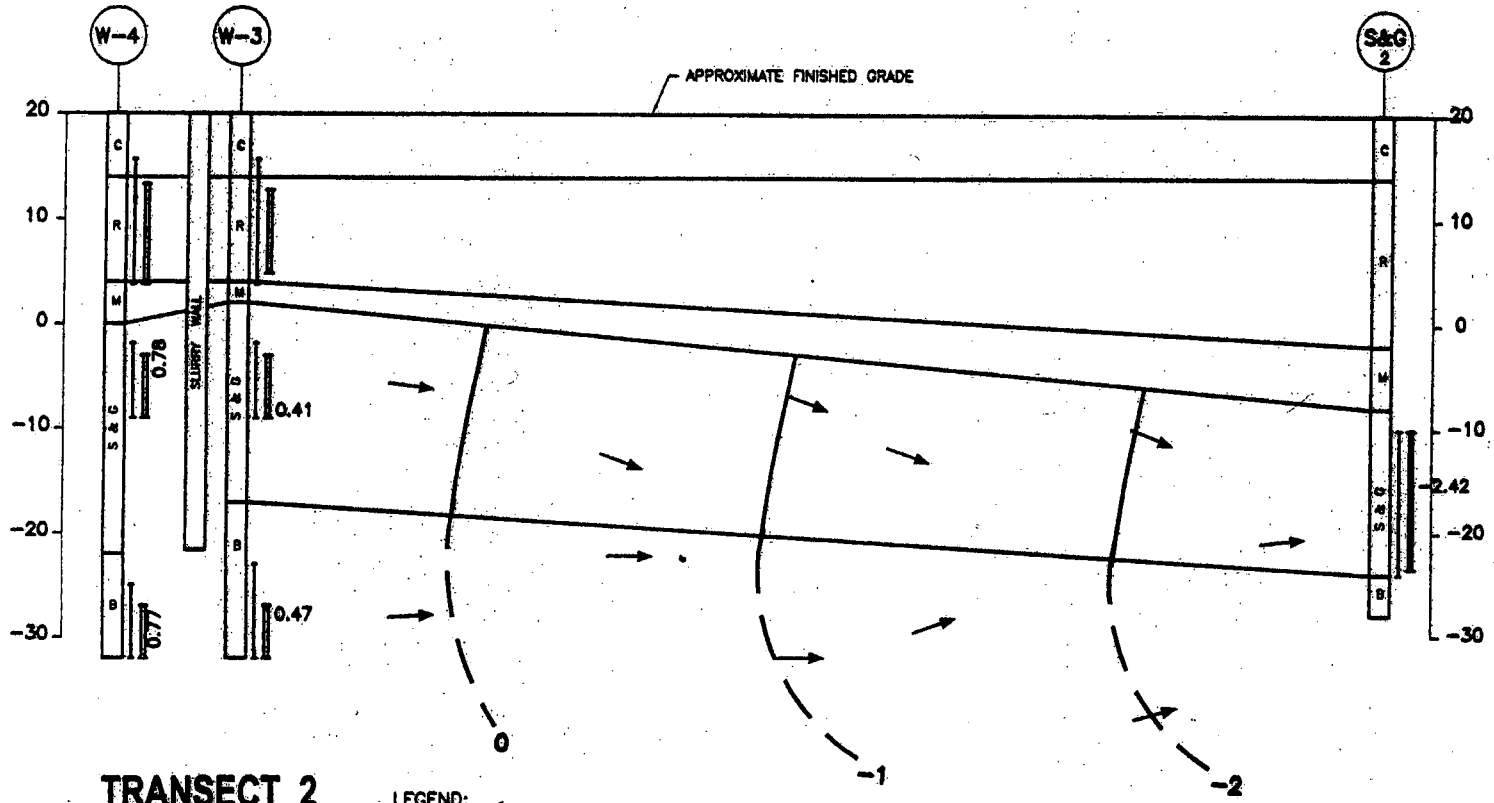

TRANSECT 2

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	0.41	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 04/23/04
C	- CAP	—— -1 ——	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 04/23/04
R	- REFUSE	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.
M	- MEADOW MAT		
S & G	- SAND & GRAVEL		

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw

DATE
DWN
APP
REV
PROJECT NO. 102052

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 2
TRANSECT 2
HYDROGEOLOGIC CROSS SECTION ANALYSIS

1" 1/2" 0" 1"

XREF Files: makbBDA1 IMAGE Files:
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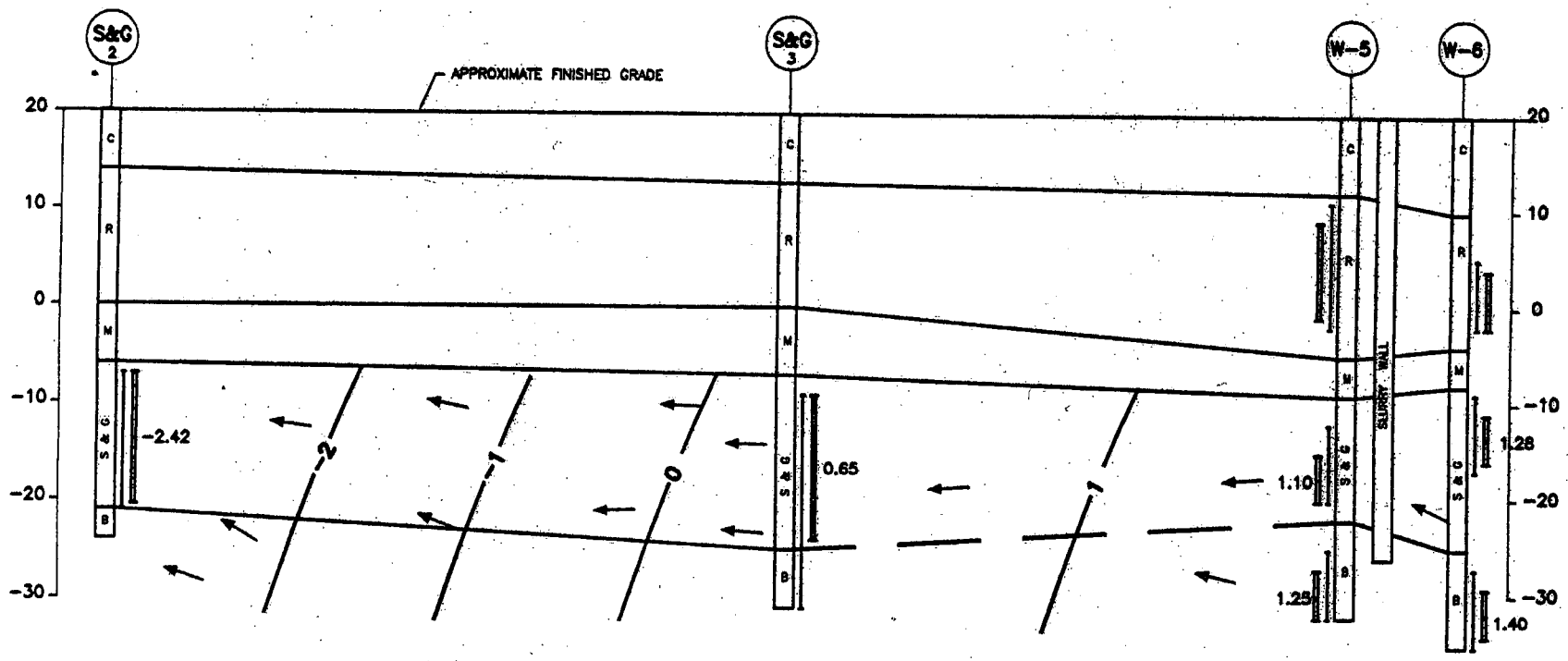

TRANSECT 3

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	1.10	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 04/23/04
C	- CAP	— 1 —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL, 04/23/04
R	- REFUSE	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.
M	- MEADOW MAT		
S & G	- SAND & GRAVEL		

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw

DATE
DWN
APP
REV
PROJECT NO.
102052

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY

FIGURE 3
TRANSECT 3
HYDROGEOLOGIC CROSS SECTION ANALYSIS

1" 1/2" 0" 1"

XREF Files: makbBDA1 IMAGE Files:
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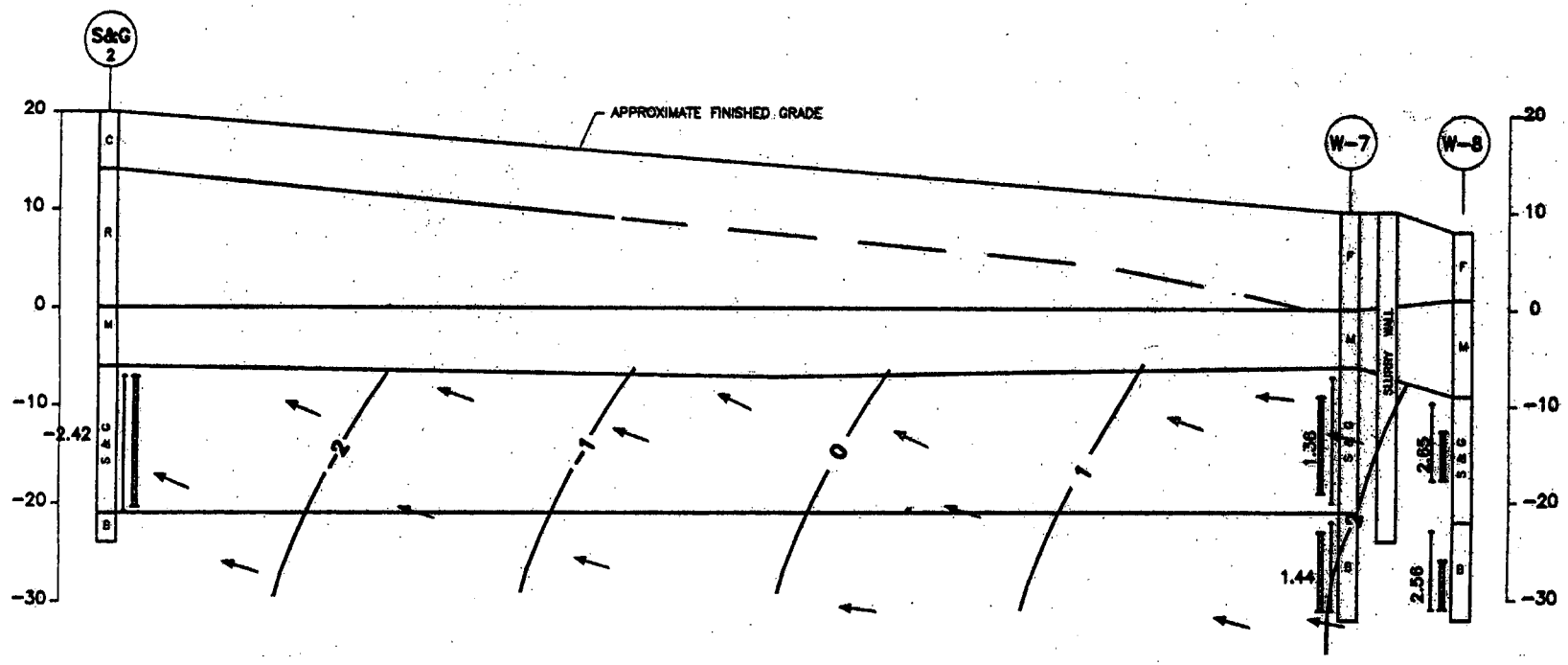


TRANSECT 4

SCALE: N.T.S.

LEGEND:

B	– BEDROCK	2.65	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 04/23/04
C	– CAP	— 0 —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 04/23/04
R	– REFUSE	←	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.
M	– MEADOW MAT		
S & G	– SAND & GRAVEL		

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw

DATE
DWN
APP
REV
PROJECT NO.
102052

KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON, NEW JERSEY
MIDDLESEX COUNTY, NEW JERSEY
FIGURE 4
TRANSECT 4
HYDROGEOLOGIC CROSS SECTION ANALYSIS

ATTACHMENT 1

DVR-134 M
1/94

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. 25 - 46505
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-HUC INC.
Address 200 CENTENIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address.
County MIDDLESEX Municipality EDISON TWP Owner's Well No. 1G
Address 383 Meadows Road, Edison, NJ Lot No. 400 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Case I.D. # NJD049800836
Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade
[ ] flush mounted
If finished above grade, casing height (stick up) above land surface ____ ft.
Was steel protective casing installed? [ ] Yes [X] No

	Depth to Top (ft.)	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
	[From land surface]			
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .020
Tail Piece				
Gravel Pack	3	15.6	8	#2 Ricci
Annular Seal/Grout	0	5	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling - ft.
Water level was measured using -
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid -
Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C (B) A
N.J. License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red gray dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

ATTACHMENT 2

MONITORING WELL RECORD

Well Permit No. 25 : 46506
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-TEX INC.
Address 203 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address. Owner's Well No. 2C
County MIDDLESEX Municipality EDISON TWP
Address 383 Meadow Road, Edison, NJ Lot No. 400 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Cert I.D. # NJD049860836
Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade
[ ] flush mounted
If finished above grade, casing height (stick up) above land surface 2 ft.
Was steel protective casing installed? [ ] Yes [X] No

	Depth to Top (ft) (from land surface)	Depth to Bottom (ft)	Diameter (inches)	Type and Material
Inner Casing	44	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .010
Tail Piece				
Gravel Pack	3	15.6	8	#00 Rlocl
Annular Seal/Grout	0	3	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling — ft.
Water level was measured using —
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid — Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C (B) A
N.J. License No. 0013753-001375
Name of Drilling Company HARDITH-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

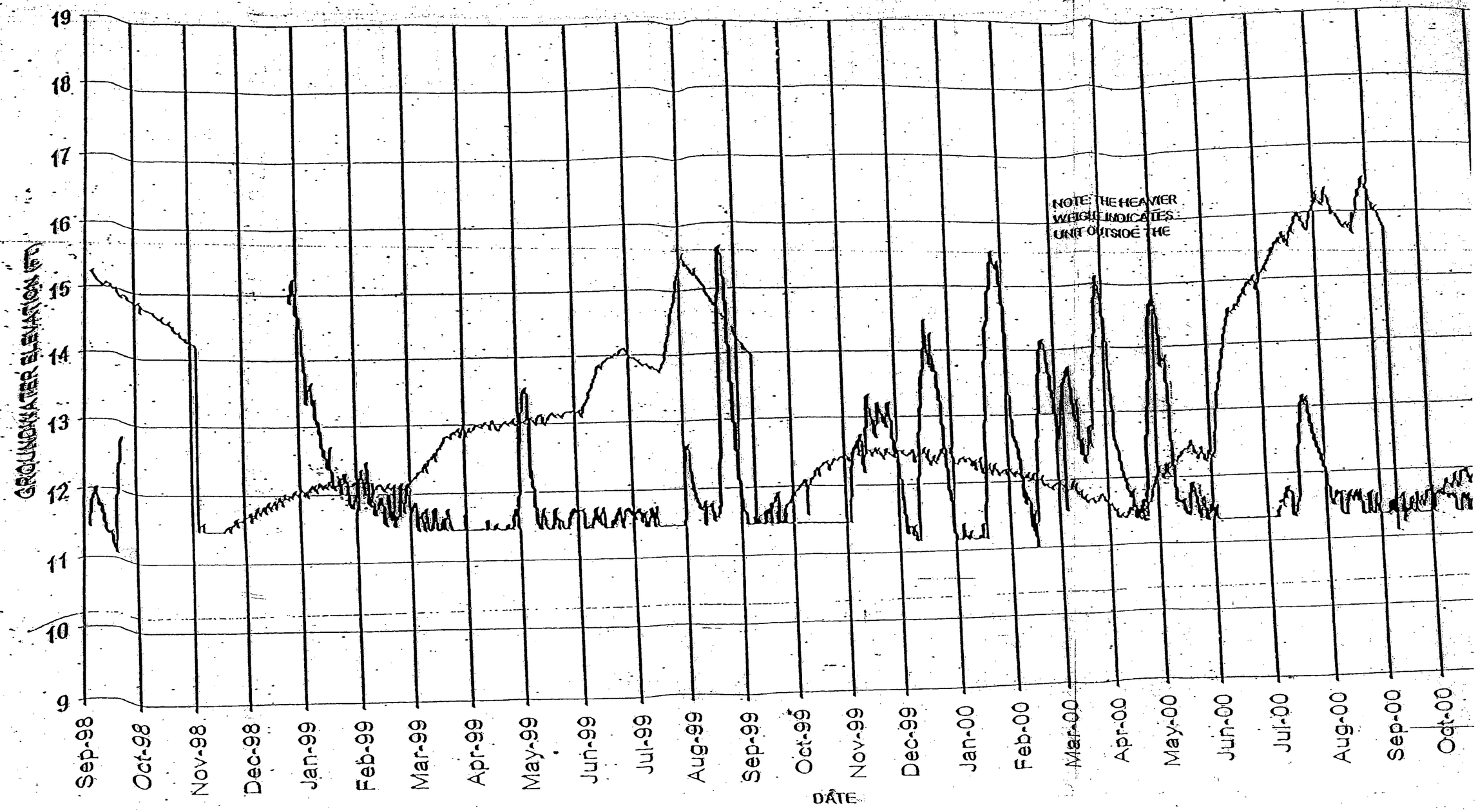
0 - 15.6	red dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

KIN-BUC LF GROUNDWATER ELEVATION HYDROGRAPH AT TRANSECT NO. 1



ATTACHMENT 2

the IT group

IT Corporation
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
Tel. 201.512.5700
Fax. 201.512.5786
A Member of The IT Group

June 27, 2001
Project 796201

Gad Januszkiewicz
Waste Management, Inc
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Evaluation of Head Levels at Transect 1

Dear Mr. Januszkiewicz:

We have completed an evaluation of the hydraulic characteristics at Transect 1 with specific focus on the lack of intragradient conditions associated with the high water levels in W-1G (inside of the slurry wall) relative to those levels in W-2G (outside of the wall).

While intragradient conditions were evident at the outset of the hydraulic monitoring program in April 1996, these conditions have generally not been maintained. Specifically, based on a review of historical hydrographs, intragradient conditions were evident initially from approximately April to July 1996, and April to June 1997. Thereafter, to more recent events, intragradient conditions have been observed intermittently and for shorter periods of time.

Attachment 1 presents a hydrograph at Transect 1 encompassing the period from September 1998 to December 2000. As seen on the hydrograph, there were periods of time when intragradient conditions were not being maintained.

As opposed to the other "G" series monitoring wells that are located in refuse, wells 1G and 2G at Transect 1 are actually located in a silt and clay deposit. Attachment 2 contains the boring logs for these 2 installations. In-situ hydraulic conductivity testing performed at Transect 1 indicated permeabilities of 10^{-7} cm/sec and 10^{-5} cm/sec in W-1G and W-2G, respectively. Accordingly, a source of recharge to the overburden soils in the area of W-1G would not readily drain away, and therefore, higher heads could result.

Well 1G sampling events (November 1998, October 1999, October 2000) can be seen on the hydrograph as sharp vertical drops in groundwater levels. Due to the low permeability of the surrounding materials, the groundwater levels required several months to recover. Since the final cover extends 10 feet past the slurry wall, the source of the groundwater that is recharging W-1G is unknown at present.

The hydraulic gradient between W-1G and W-1R is vertically downward which rules out the bedrock as being a source of groundwater recharge. Based on a recent visual inspection of the area around Transect 1, the cap appears to be good condition and there were no signs that the cap integrity has been compromised.

Figure 1 depicts the conceptual model of the hydraulic interrelationship across Transect 1 showing water level measurements that depict the lack of intragradient conditions across the

slurry wall. The head levels in W-2G (outside the slurry wall) are generally at elevation 12 to 13 feet msl with periodic and short term increases to about 15 feet msl. The water level in the well sometimes falls below the level of the transducer. This is characterized by a flat straight line on the hydrographs as shown on Attachment 1. Head levels in W-1G (inside the slurry wall), on the other hand, are often greater with elevations as high as 15 to 16 feet msl being recorded.

It is evident from a review of Figure 1 that the drop in topography outside of the slurry wall toward Mill Brook, coupled with the higher permeability of W-2G relative to W-1G, would promote a more rapid decrease of head levels in the latter. This suggests that intragradient conditions may not be consistently attainable at this transect in any event. This notwithstanding however, and as depicted on Figure 1, it is important to note that the leachate collection system represents a hydraulic sink within the containment system. As such, groundwater in the vicinity of W-1G would drain toward the sink mitigating concerns of outward flow.

The leachate collection line runs parallel to the slurry wall and at its closest point is only about 20 feet away from Transect 1. Several cleanouts are located along the collection line with the closest, Cleanout 16, only about 65 feet from Transect 1. Leachate level measurements obtained from the cleanouts during December 2000 and June 2001 indicate a leachate level of 10 to 11 feet msl along the collection line as shown in Table 1. The leachate levels observed suggest that the leachate collection system is presently operating effectively.

Recommendations

Based on the above, it is recommended that during subsequent monitoring events at the site, measurements of leachate levels in Cleanouts 14 through 16 be recorded to verify that the leachate collection system is operating effectively. If liquid levels in the cleanouts increase above 12 to 13 feet msl, then maintenance of the collection line is recommended. Subsequent reports to EPA should include a discussion of the leachate collection system and its role as serving as a hydraulic sink within the containment system.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

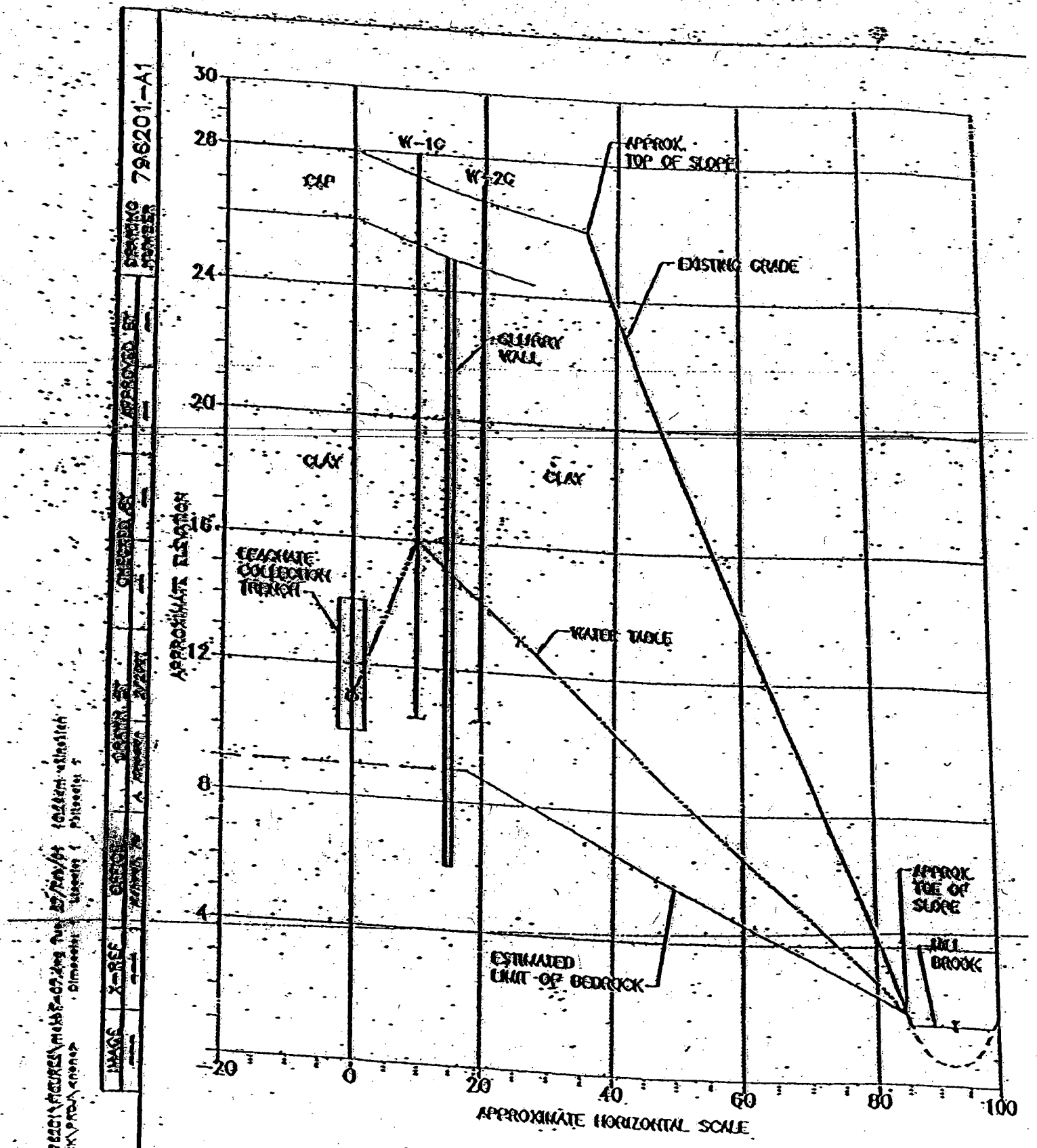
Sincerely,

IT Corporation

Steven Goldberg, PhD, CPG
Senior Hydrogeologist

Thomas M. Connors, P.E.
Project Manager

Attachments



0 20 40
HORIZONTAL SCALE IN FEET

0 4 8
VERTICAL SCALE IN FEET

IT CORPORATION

WASTE MANAGEMENT INC

FIGURE 1
CROSS SECTION
TRANSECT 1

79-6201-A1

Table 1
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.26		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.80		10.74		10.66		10.67				11.11
DATE												
6/7/01	11.98	10.89	12.02	10.75	15.86	10.65	15.87	10.64	dry	na	dry	na
5/16/01	12.25	10.62	12.23	10.64	15.95	10.56	15.96	10.55	dry	na	dry	na
4/26/01	12.36	10.51	12.35	10.42	15.99	10.52	16.01	10.50	dry	na	dry	na
3/21/01	11.80	11.07	11.75	11.02	15.62	10.89	15.59	10.92	dry	na	dry	na
2/26/01	12.03	10.84	11.94	10.83	15.95	10.66	15.92	10.69	dry	na	dry	na
1/29/01	12.08	10.79	11.98	10.79	15.85	10.66	15.83	10.68	dry	na	20.41	10.91
12/27/01	12.02	10.85	11.94	10.83	15.72	10.79	15.68	10.83	dry	na	20.01	11.31

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Shaw® EMCON/OWT, Inc.

July 1, 2004
Project 102052

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for May 2004

Dear Mr. Januszkiewicz:

A site visit was completed on June 3, 2004 to download the May 2004 water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of May 2004 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by mid-July 2004.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. Table 2 presents the troll water elevations versus the manual water elevations. The continuous water level elevation data when compared with manual readings indicated that the miniTrolls are functioning properly and are recording accurate data, except for the few instances discussed in the following sections, where recommendations are made regarding conditions at the well and transducer/mini-troll set-up.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference as Attachment 1. The water levels in wells on the outside of the slurry wall vary over the course of the day due to the tidal influence at the site. For clarity, Hydrographs 6 through 15 show the average water level in the wells over a 24-hour period (12 hours before, and 12 hours after).

Refuse

As defined in the Record of Decision (ROD) for Operable Unit 1 (OU-1), the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. Based on the hydrographs the following is presented.

Transect 1-Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were observed throughout the month of May. The average monthly water elevations for May at wells 1G (inside) and 2G (outside) were 11.77 and 12.11 feet msl, respectively. Water level

elevation measurements taken from Leachate Collection Cleanouts 14 through 16 are included in Table 3. As depicted in Table 3, the leachate collection system is functioning properly, suggesting significant capture of leachate. A previous evaluation of the hydraulic conditions in the refuse at Transect 1 is provided in Attachment 2, and indicates that despite the absence of intragradient conditions, leachate capture is significant.

Transect 2-Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month of May. The average monthly water elevations for the month of May at wells 3G (inside) and 4G (outside) were 7.50 and 11.47 feet msl, respectively. As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.537) for W-3G is relatively high and not typical. The transducer/mini troll in that location should be checked for proper operation. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Transect 3-Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month of May. The average monthly water elevations for the month of May at wells 5G (inside) and 6G (outside) were 9.63 and 13.20 feet msl, respectively. As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.469) for W-6G is relatively high and not typical. The transducer/mini troll in that location should be checked for proper operation. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Transect 4-Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month of May. The average monthly water elevations for the month of May at wells 15G (inside) and 13G (outside) were 1.52 and 6.76 feet msl, respectively.

Transect 5-Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month of May. The average monthly water elevations for the month of May at wells 9G (inside) and 10G (outside) were 7.31 and 8.16 feet msl, respectively. Past observations consistently showed intragradient conditions at this location.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.413) for W-10G is relatively high and not typical. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Sand and Gravel/Bedrock

For the sand and gravel unit, the performance objectives calls for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on visual observation of the hydrographs.

Horizontal Flow

Transect 2-Sand and Gravel (3S/4S)/Hydrograph No. 6 – Intragradient conditions were maintained through the month of May. Containment is being maintained by the pumping wells. The average monthly water elevations for the month of May at wells 3S (inside) and 4S (outside) were 0.54 and 0.80 feet msl, respectively.

Transect 3-Sand and Gravel (5S/6S)/Hydrograph No. 7 – Intragradient conditions were maintained throughout the month of May. The average monthly water elevations for wells 5S (inside) and 6S (outside) were 1.24 and 1.41 feet msl, respectively.

Transect 4-Sand and Gravel (7S/8S)/Hydrograph No. 8- As stated in the Troll Maintenance Letter dated March 24, 2004 the minitroll in well 8S required servicing by InSitu. The transducer/mini troll at well 8S was temporarily replaced on April 1, 2004 at 13:00 with a SP4000 (S/N 13608 and battery capacity of 88%). Intragradient conditions were maintained throughout the month of May. The average monthly water elevations for the month of May at wells 7S (inside) and 8S (outside) were 1.47 and 2.55 feet msl, respectively.

Transect 4 Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 – Intragradient conditions were maintained throughout the month of May. The average monthly water elevations for the month of May at wells 15S (inside) and 13S (outside) were 0.10 and 2.20 feet msl, respectively. Water levels from Well 15G in the refuse unit are included on the hydrograph for comparison.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings for well 15S is relatively high and not typical (2.088). The presence or absence of intragradient conditions between two wells is based on an analysis of average monthly water elevation readings obtained from designated trolls. It should therefore be noted that the discrepancy between manual and troll readings for well 15S may possibly negate the observed intragradient conditions as shown on hydrograph 9. Further investigation on this discrepancy will be conducted during the next scheduled site visit.

Vertical Flow-Inside Slurry Wall

Transect 2-Vertical Gradient (3S/3RR)-Inside/Hydrograph No.10 – Upward gradient conditions were not consistently observed between the bedrock and overlying sand & gravel units inside the slurry wall for most of the month of May. The average monthly water elevations for the month of May at wells 3S (sand & gravel) and 3RR (bedrock) were 0.54 and 0.50 feet msl, respectively.

Transect 3-Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall for most of the month of May. The average monthly water elevations for the month of May at wells 5S (sand & gravel) and 5R (bedrock) were 1.24 and 1.38 feet msl, respectively.

Transect 4-Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Slight upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month of May. The average monthly water elevations for the month of May at wells 7S (sand & gravel) and 7R (bedrock) were 1.47 and 1.55 feet msl, respectively.

Vertical Flow-Outside Slurry Wall

Transect 2-Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall for the entire month of May. The average monthly water elevations for the month of May at wells 4S (sand & gravel) and 4R (bedrock) were 0.80 and 0.66 feet msl, respectively.

Transect 3-Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of May. The average monthly water elevations for the month of May at wells 6S (sand & gravel) and 6R (bedrock) were 1.41 and 1.57 feet msl, respectively.

Transect 4-Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month of May. The average monthly water elevations for the month of May at wells 8S (sand & gravel) and 8RR (bedrock) were 2.55 and 2.48 feet msl, respectively.

An initial review of the hydrographs indicates that certain performance objectives associated with the sand and gravel and bedrock units may not be met, specifically

associated with the uniform achievement of upward gradients from the bedrock to the overlying sand and gravel inside the wall (e.g. Hydrograph 10). However previous investigations performed at the site would indicate that complete control of OU-1 groundwater can be achieved notwithstanding indications of downward flow from the sand and gravel to the bedrock, or outward flow across the slurry wall within the sand and gravel unit. This is based on the findings of the considerable pumping influence of the sand and gravel pumping wells, in particular S&G#2, in achieving hydraulic control at the site (see Groundwater Pumping Well Performance Evaluation Report, July 2000).

The influence of the pumping well can be demonstrated by review of a plan view groundwater contour map of the sand and gravel (Figure 1) and equipotential profiles and vector diagrams (Figures 1, 2, 3, and 4) that have been prepared for a period of time when the vertical gradient between the sand and gravel and the bedrock was downward at Transect 2. For this evaluation, a snapshot of groundwater elevations from the monitoring wells and pumping wells was obtained for May 12, 2004. At this time, S&G#2 was pumping at a rate of about 10.5 gallons per minute (gpm) or about 15,142 gallons per day, and S&G#3 was pumping at a rate of about 3.99 gallons per minute (gpm) or about 5,745 gallons per day. During May, there was a downward vertical gradient observed most of the time between the sand and gravel and the bedrock inside and outside the slurry wall at Transect No.2 as evidenced by higher heads in the sand and gravel wells relative to bedrock wells.

Figures 1 through 4 incorporate the heads induced by pumping and show the considerable pumping influence of S&G#2. Specifically, groundwater flowing downward from the sand and gravel into the bedrock subsequently flows toward the pumping well. This occurs both inside and outside of the slurry wall. Also, groundwater within the sand and gravel unit flows toward the pumping well. The considerable pumping influence demonstrated at S&G#2, in conjunction with the fact that natural groundwater gradients in both the sand & gravel and bedrock flow predominantly towards the area of S&G#2, result in the complete capture of OU-1 groundwater at these pumping rates.

Groundwater and Leachate Collection

Based on data provided by Veolia Water, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from May 1 to 31, 2004:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	458,590 gal.	176,698 gal.	0 gal.	63,513 gal.
0 gpd	14,793.23 gpd	5,699.94 gpd	0 gpd	2,048.81 gpd

For the month of May, a total of 635,288 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 20,493.16 gpd. The extraction rate from S&G No. 1 was 0 gpd; 14,793.23 gpd for S&G No. 2; 5,699.94 gpd for S&G No. 3; and 0 gpd for S&G No. 4. The leachate extraction rate was 2,048.81 gpd for the month of May.

CONCLUSIONS

Intragradient conditions were maintained in the refuse unit at Transects 1,2, 3, 4, and 5.

Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G#2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping wells (S&G#2 and also S&G#3) resulting in overall containment of groundwater in OU-1.

In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively. These pumping rates will continue to be evaluated to confirm continued hydraulic control of OU-1 groundwater.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

EMCON/OWT, Inc.

Timothy S. Pagano, CPG
Senior Hydrogeologist

Steven P. Goldberg, Ph.D
Senior Hydrogeologist

Attachments

cc: Glenn Grieb, US Filter
Jeff Shanks, WM, Inc.

KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2004
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	May	11.68	11.88	11.77	W-2G	May	11.70	12.52	12.11
W-3G	May	7.24	7.73	7.50	W-4G	May	11.27	11.86	11.47
W-3S	May	-0.01	1.20	0.54	W-4S	May	-0.28	2.24	0.80
W-5G	May	9.38	9.79	9.63	W-6G	May	12.77	13.66	13.20
W-5S	May	0.72	1.86	1.24	W-6S	May	0.89	2.04	1.41
W-7S	May	1.08	1.99	1.47	W-8S	May	2.04	4.13	2.55
W-15S	May	-0.25	0.80	0.10	W-13S	May	1.78	3.13	2.20
W-15G	May	1.32	1.78	1.52	W-13G	May	6.61	6.88	6.76
W-9G	May	7.15	7.55	7.31	W-10G	May	8.11	8.23	8.16
W-3RR	May	-0.27	1.43	0.50	W-4R	May	-0.51	2.18	0.66
W-5R	May	0.87	1.99	1.38	W-6R	May	1.07	2.19	1.57
W-7R	May	1.16	2.09	1.55	W-8RR	May	1.94	4.06	2.48

Table 2
KinBuc Landfill Operable Unit 1
May 2004
Troll Elevations vs. Manual Elevations

OU 1 Well ID	June 3, 2004		
	Troll	Manual	Difference
W-1G	11.889	10.53	1.359
W-2G	12.445	12.47	0.025
W-3G	7.387	6.85	0.537
W-3S	0.725	0.81	0.085
W-3RR	0.86	0.9	0.040
W-4G	11.222	11.24	0.018
W-4S	1.445	1.49	0.045
W-4R	1.374	1.46	0.086
W-5G	9.523	9.6	0.077
W-5S	1.414	1.49	0.076
W-5R	1.313	1.31	0.003
W-6G	13.221	12.78	0.441
W-6S	1.667	1.74	0.073
W-6R	1.827	0.84	0.987
W-7S	1.591	1.63	0.039
W-7R	1.714	1.77	0.056
W-8S	2.513	2.52	0.007
W-8RR	2.455	2.44	0.015
W-9G	7.481	7.53	0.049
W-10G	8.237	8.65	0.413
W-13G	6.671	6.67	0.001
W-13S	2.226	2.2	0.026
W-15G	1.489	N/A	N/A
W-15S	0.212	2.3	2.088

Table 2-1

Kin-Buc Landfill
Operable Unit 1
Continuous Hydraulic Monitoring Well Network/Transects

Transect Location No.	Screened Hydrogeologic Unit	Well Location Inside Slurry Wall	Well Location Outside Slurry Wall
1	Refuse/Fill	W-1G	W-2G
2	Refuse/Fill	W-3G	W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill	W-5G	W-6G
	Sand and Gravel	W-5S	W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill[1]	W-15G	W-13G
	Sand and Gravel[1]	W-15S	W-13S
	Sand and Gravel	W-7S	W-8S
	Bedrock	W-7R	W-8RR
5	Refuse/Fill	W-9G	W-10G

Notes: [1] Wells located across the extended slurry wall.

Table 2-2

Kin-Buc Landfill
Operable Unit 2
Hydraulic Monitoring Network

Well Location	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-10G	Fill/Refuse
WE-10S	Sand & Gravel
WE-10R	Bedrock
GEI-3G	Fill/Refuse
WE-3S	Sand & Gravel
WE-3R	Bedrock
Mound B	
GEI-5G	Fill/Refuse
WE-5S	Sand & Gravel
WE-5R	Bedrock
GEI-6G	Fill/Refuse
GEI-6S	Sand & Gravel
WE-6R	Bedrock
GEI-7G	Fill/Refuse
WE-7S	Sand & Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock

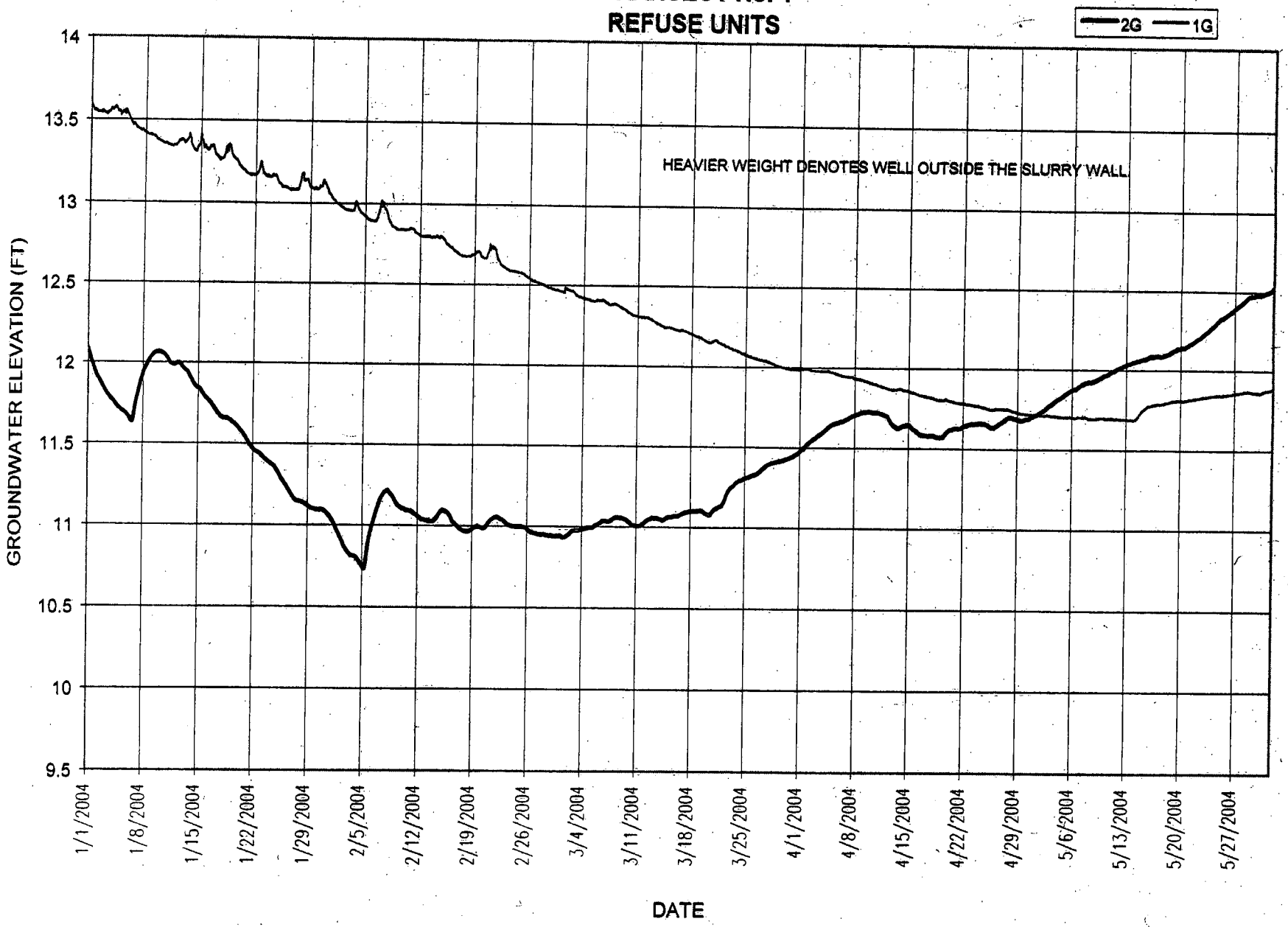
Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2004

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		9.98		9.91		9.70		9.76		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na
3/4/2003	13.21	9.66	13.15	9.62	17.22	9.29	17.20	9.31	dry	na	dry	na
4/1/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.79	9.72	dry	na	dry	na
5/8/2003	13.05	9.82	12.97	9.80	17.01	9.50	16.96	9.55	dry	na	dry	na
6/3/2003	13.11	9.76	13.14	9.63	17.09	9.42	17.04	9.47	dry	na	dry	na
6/30/2003	12.92	9.95	12.85	9.92	16.83	9.68	16.79	9.72	dry	na	dry	na
8/11/2003	12.91	9.96	12.84	9.93	16.82	9.69	16.78	9.73	dry	na	dry	na
9/5/2003	13.00	9.87	12.92	9.85	16.93	9.58	16.88	9.63	dry	na	dry	na
9/29/2003	12.99	9.88	12.91	9.86	16.93	9.58	16.90	9.61	dry	na	dry	na
11/3/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.78	9.73	dry	na	dry	na
12/2/2003	13.01	9.86	12.93	9.84	16.95	9.56	16.94	9.57	dry	na	dry	na
12/29/2003	12.8	10.07	12.74	10.03	16.7	9.81	16.67	9.84	dry	na	dry	na
2/2/2004	13.12	9.75	13.05	9.72	dry	na	dry	na	dry	na	dry	na
3/1/2004	13.08	9.79	13.03	9.74	dry	na	dry	na	dry	na	dry	na

Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2004

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
4/1/2004	12.89	9.98	12.825	9.95	dry	na	dry	na	dry	na	dry	na
5/6/2004	12.17	10.70	13.1	9.67	dry	na	dry	na	dry	na	dry	na
6/3/2004	13.21	9.66	13.14	9.67	dry	na	dry	na	dry	na	dry	na

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
TRANSECT No. 1
REFUSE UNITS



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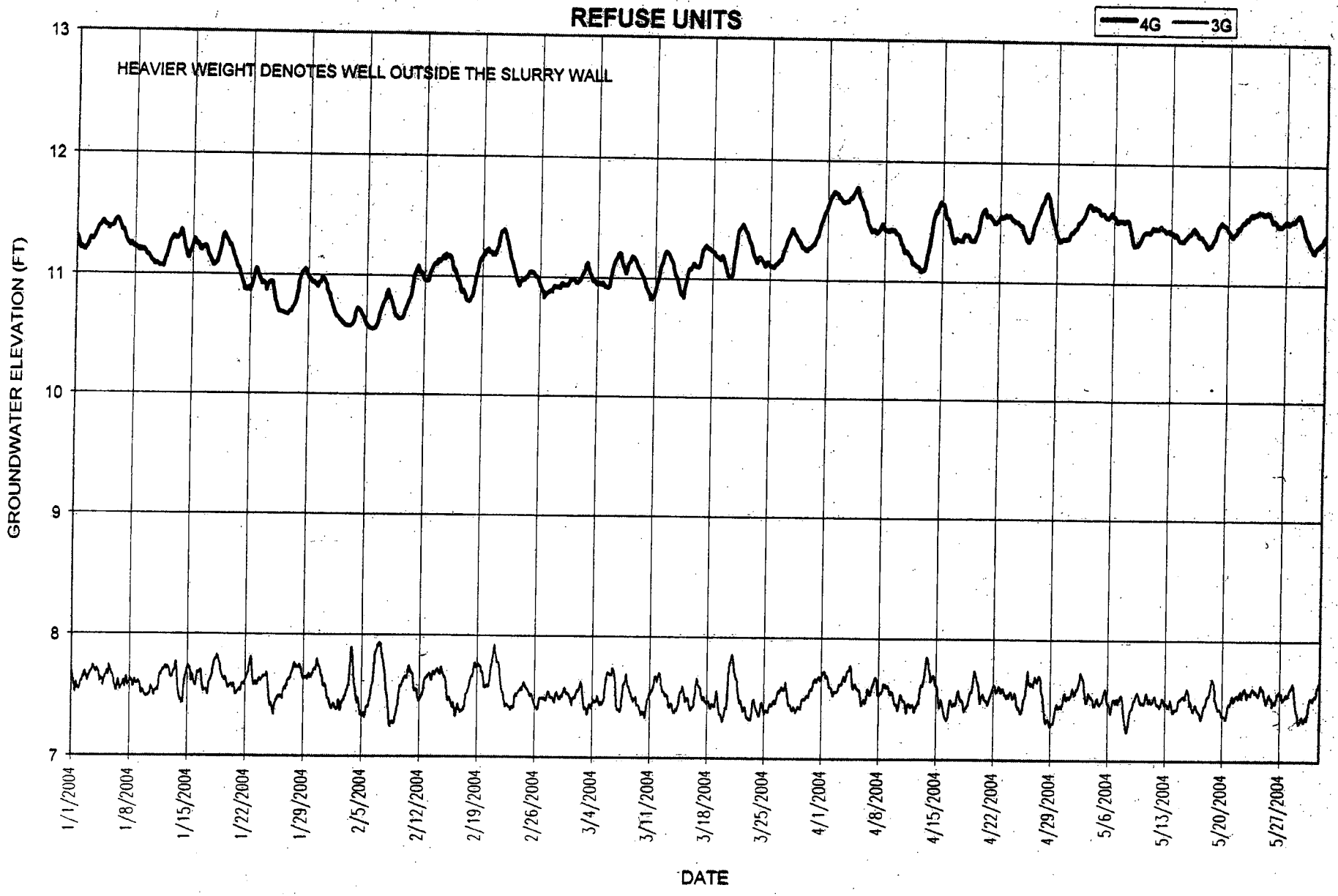
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #2
TRANSECT No.2
REFUSE UNITS



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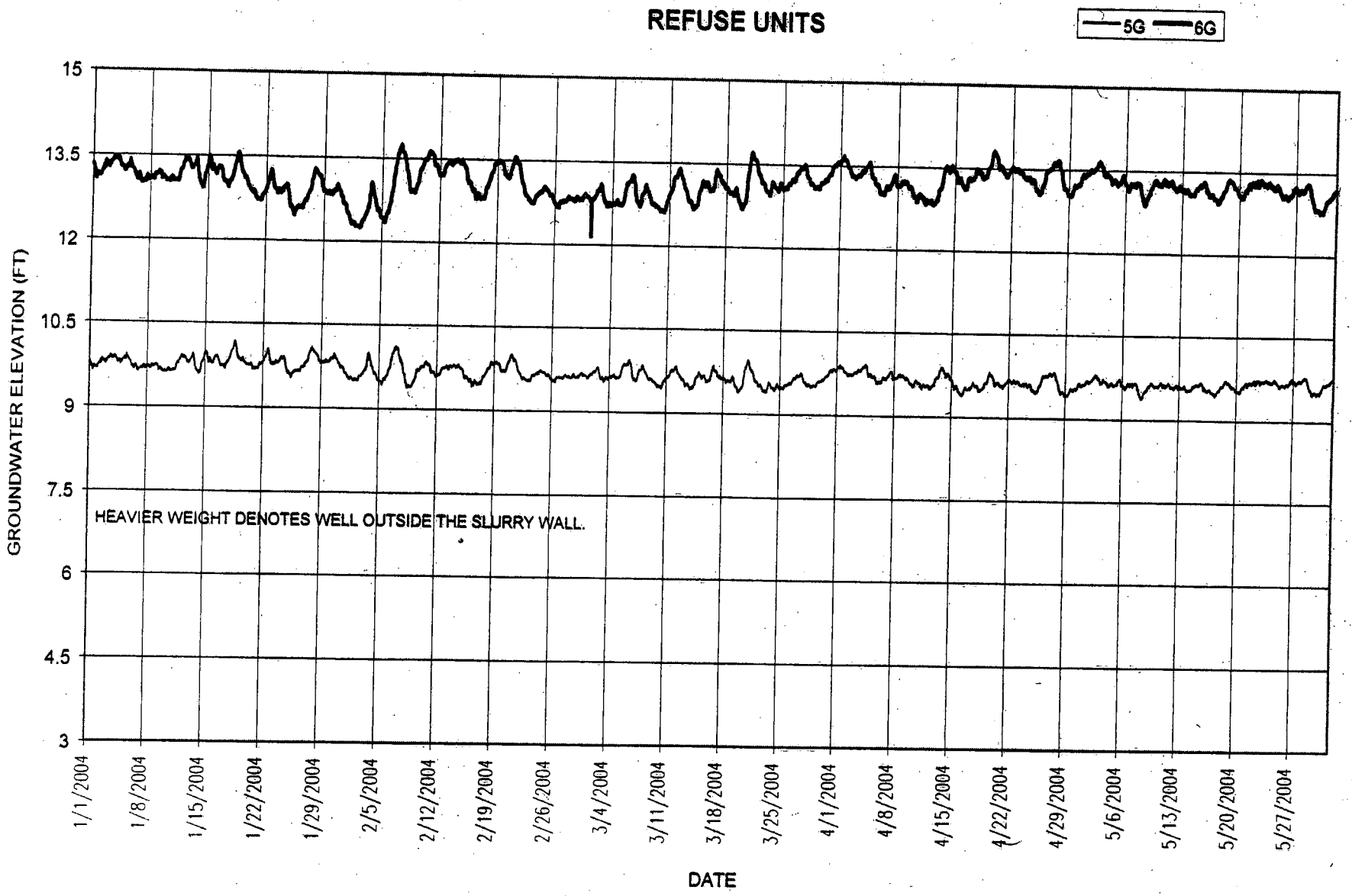
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH # 3
TRANSECT No.3
REFUSE UNITS



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KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #4
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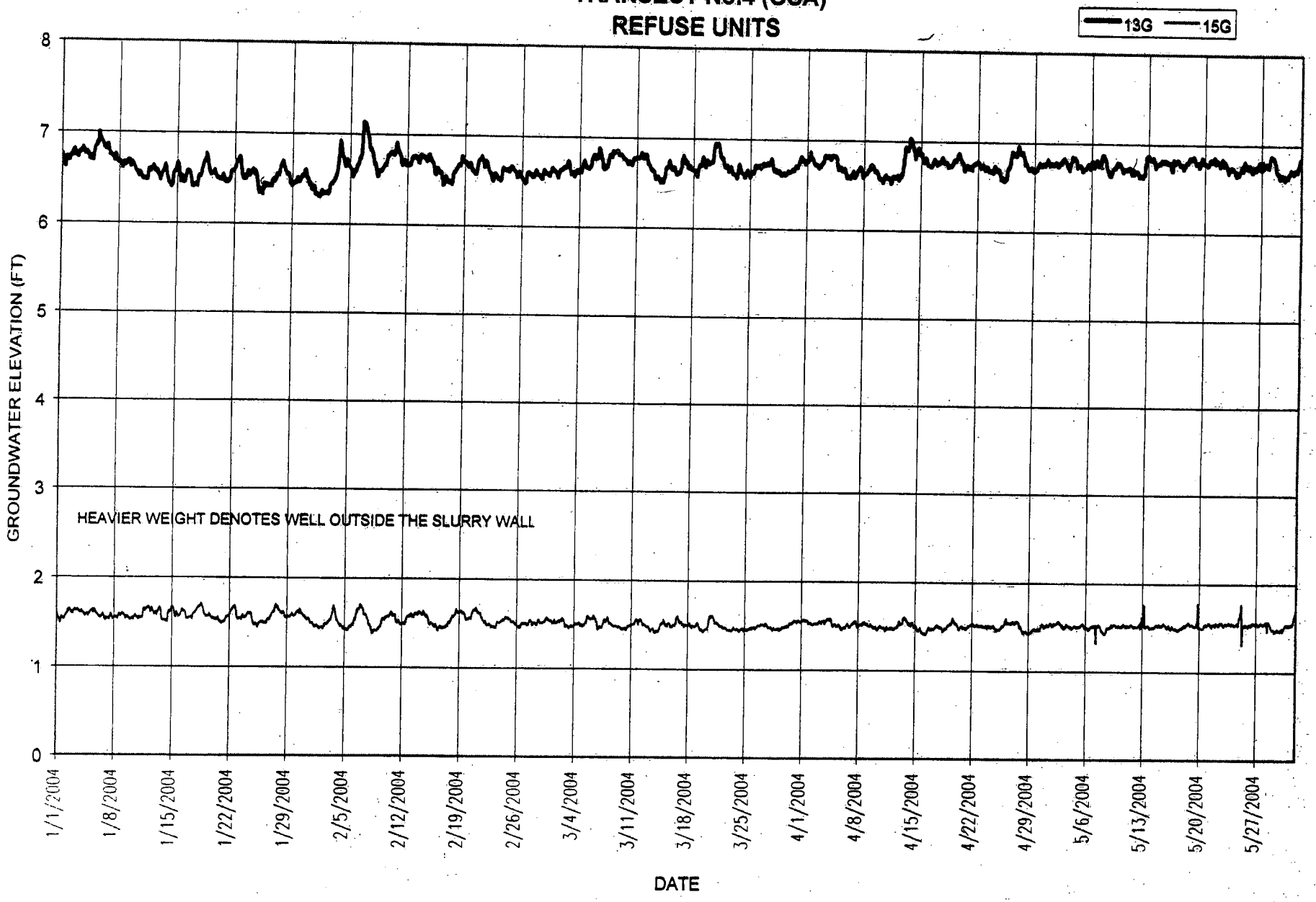

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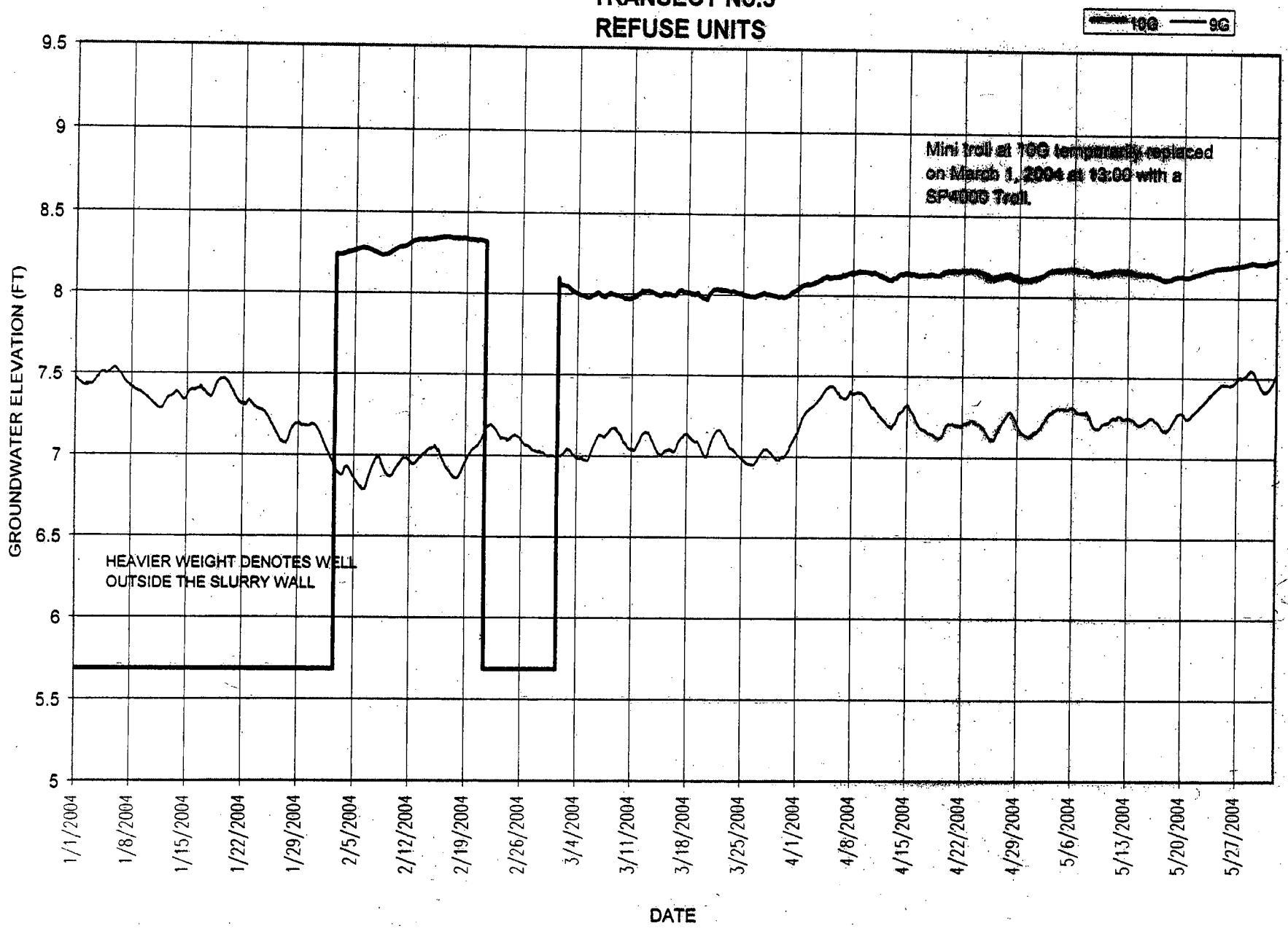
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #5
TRANSECT No.5
REFUSE UNITS



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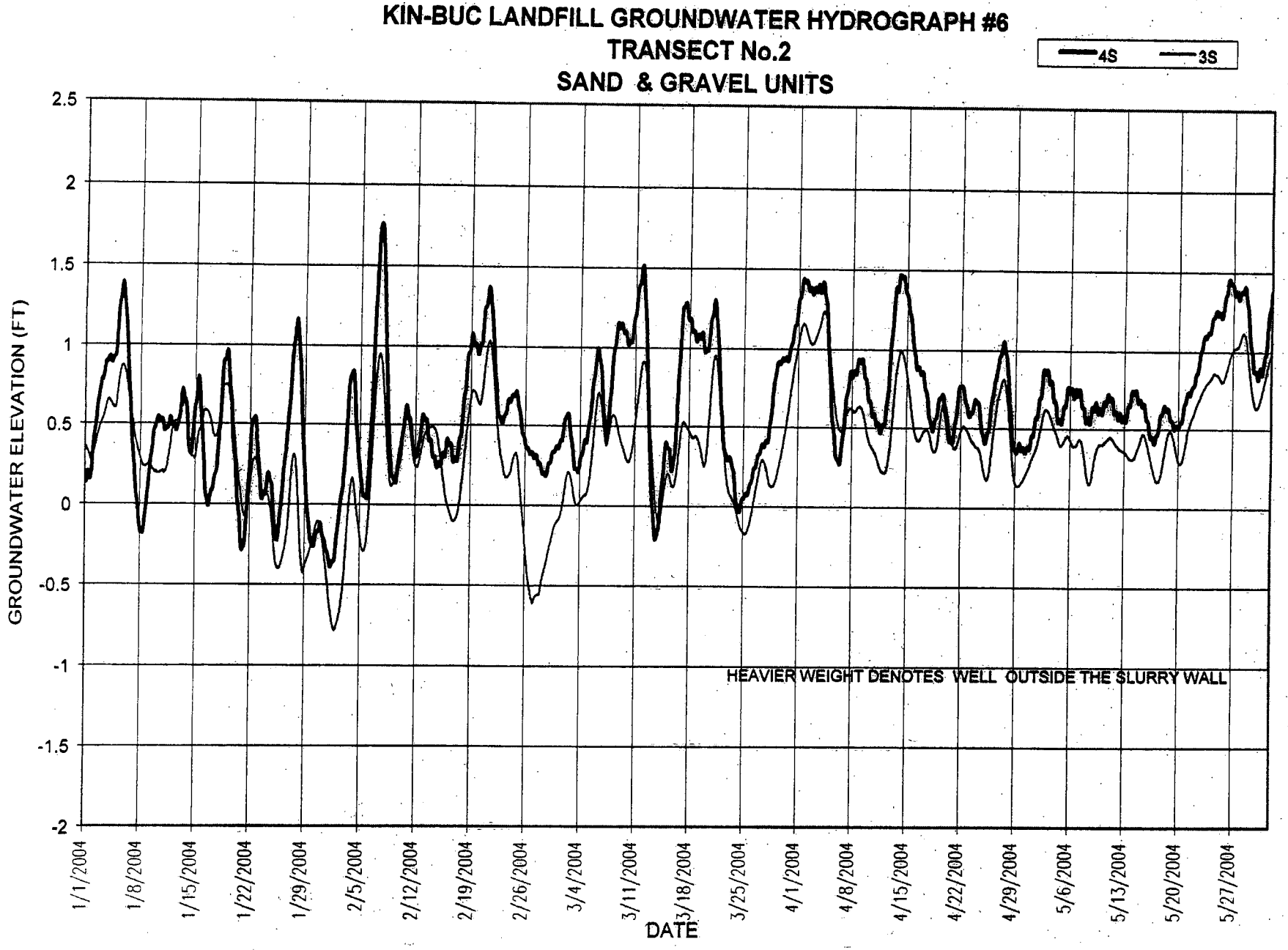

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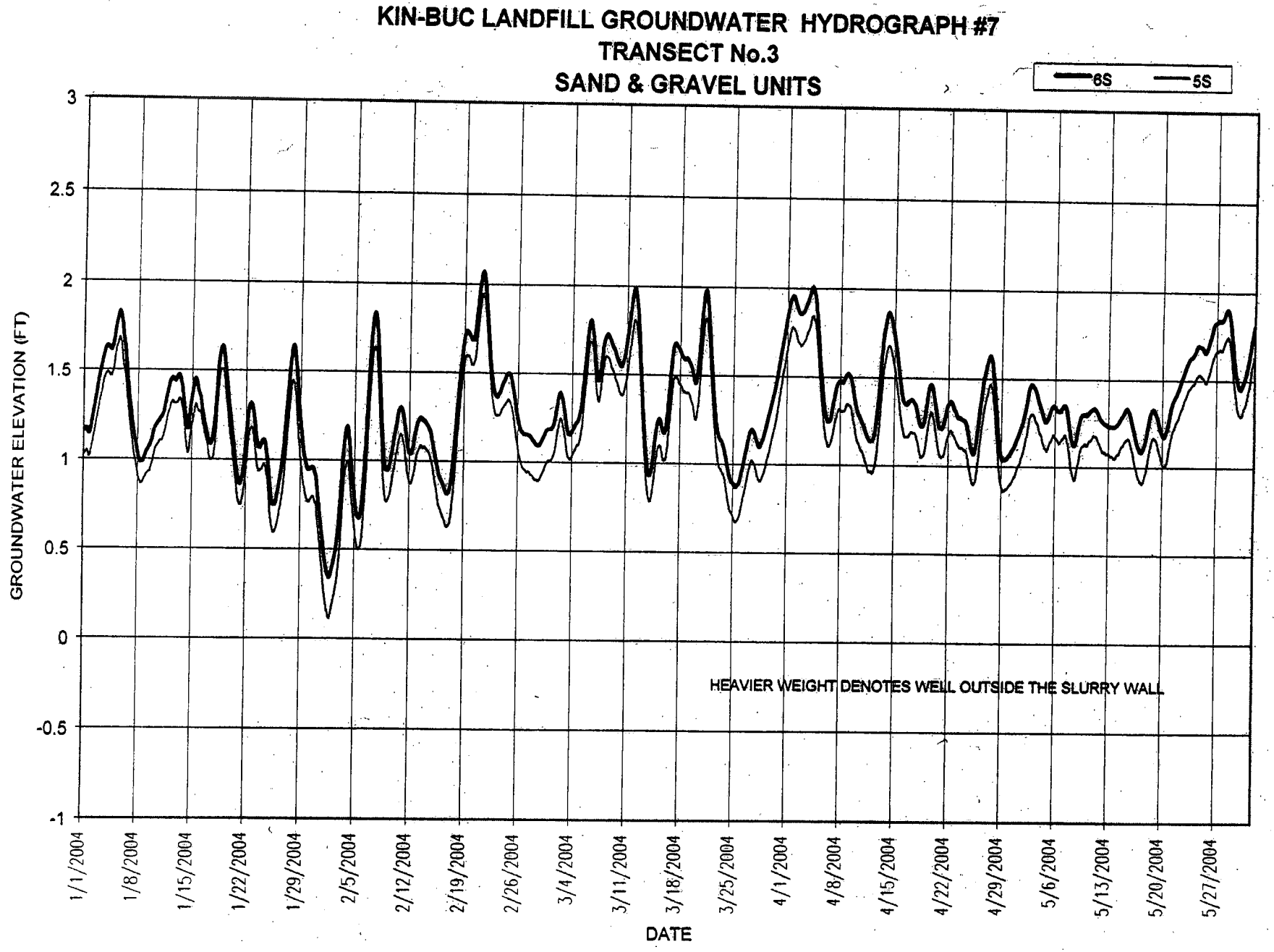

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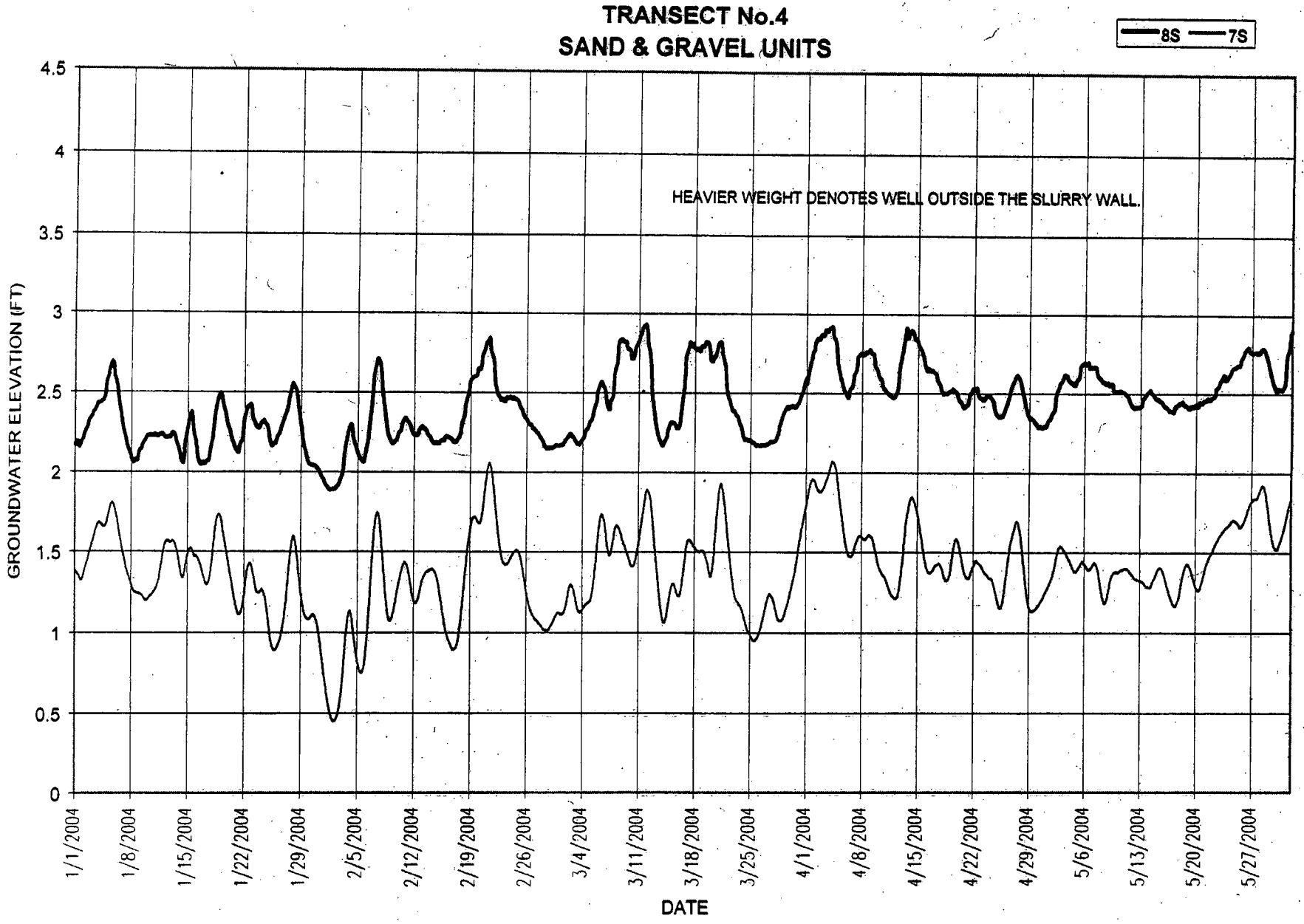
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
TRANSECT No.4
SAND & GRAVEL UNITS



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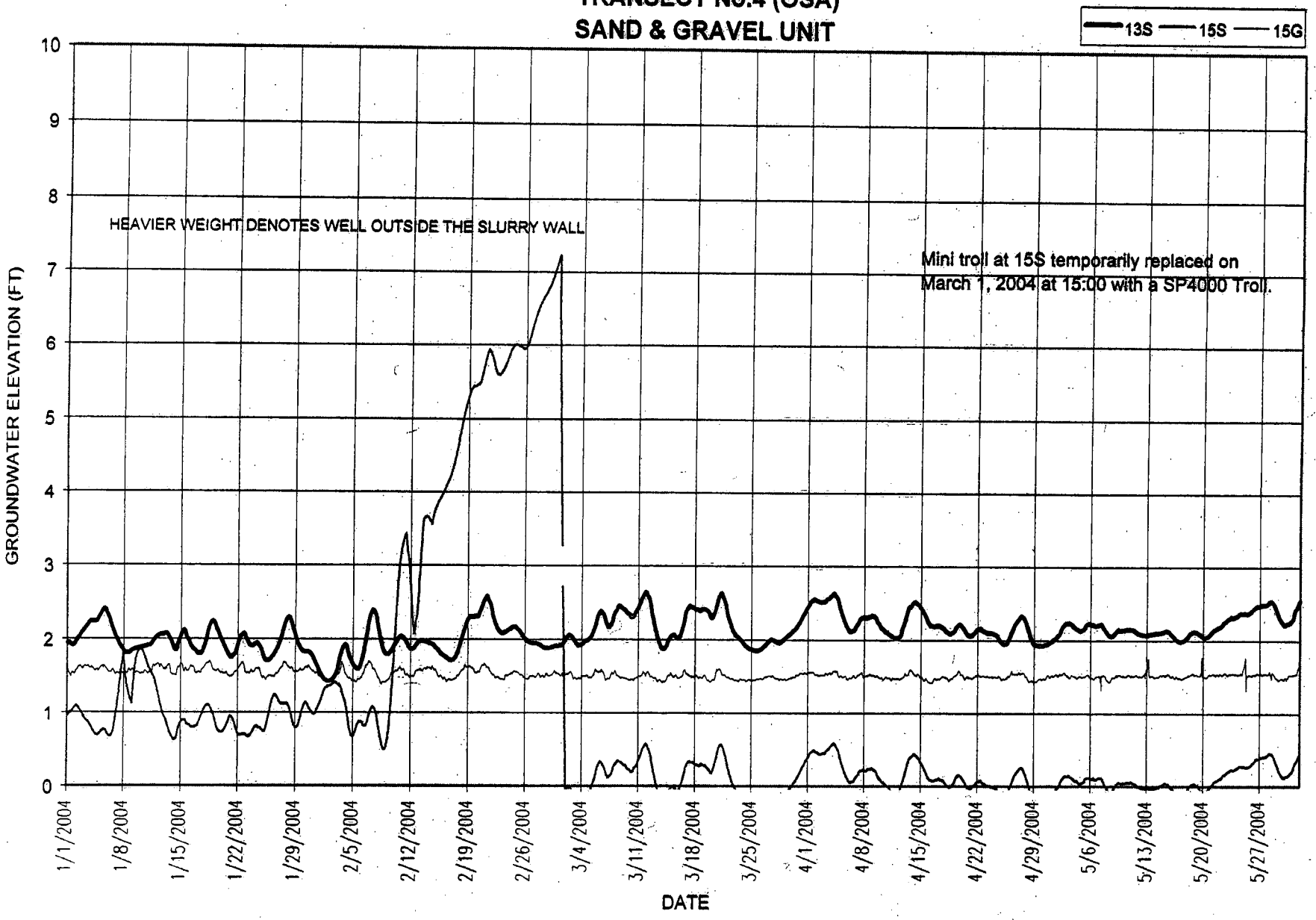
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #9
TRANSECT No.4 (OSA)
SAND & GRAVEL UNIT



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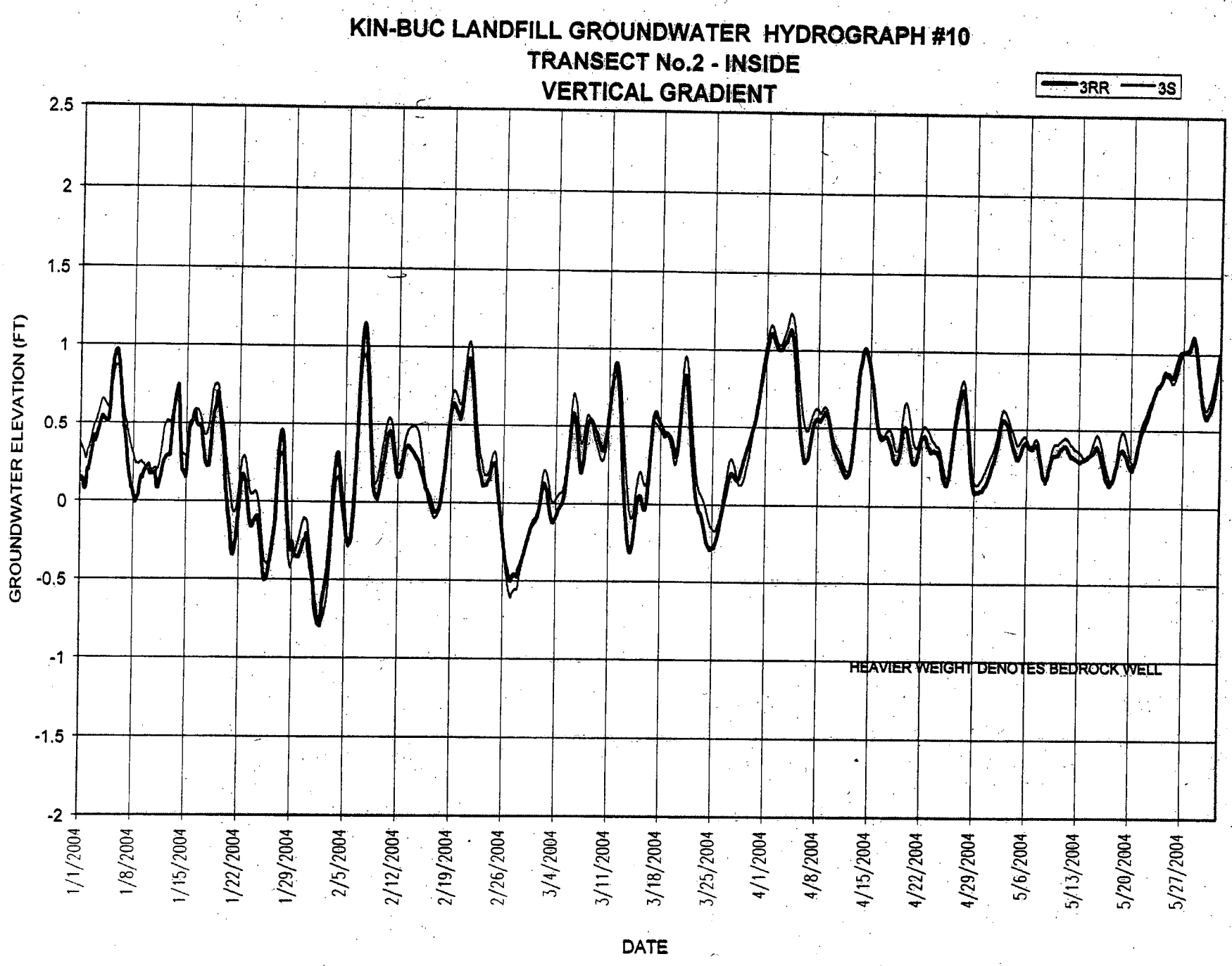

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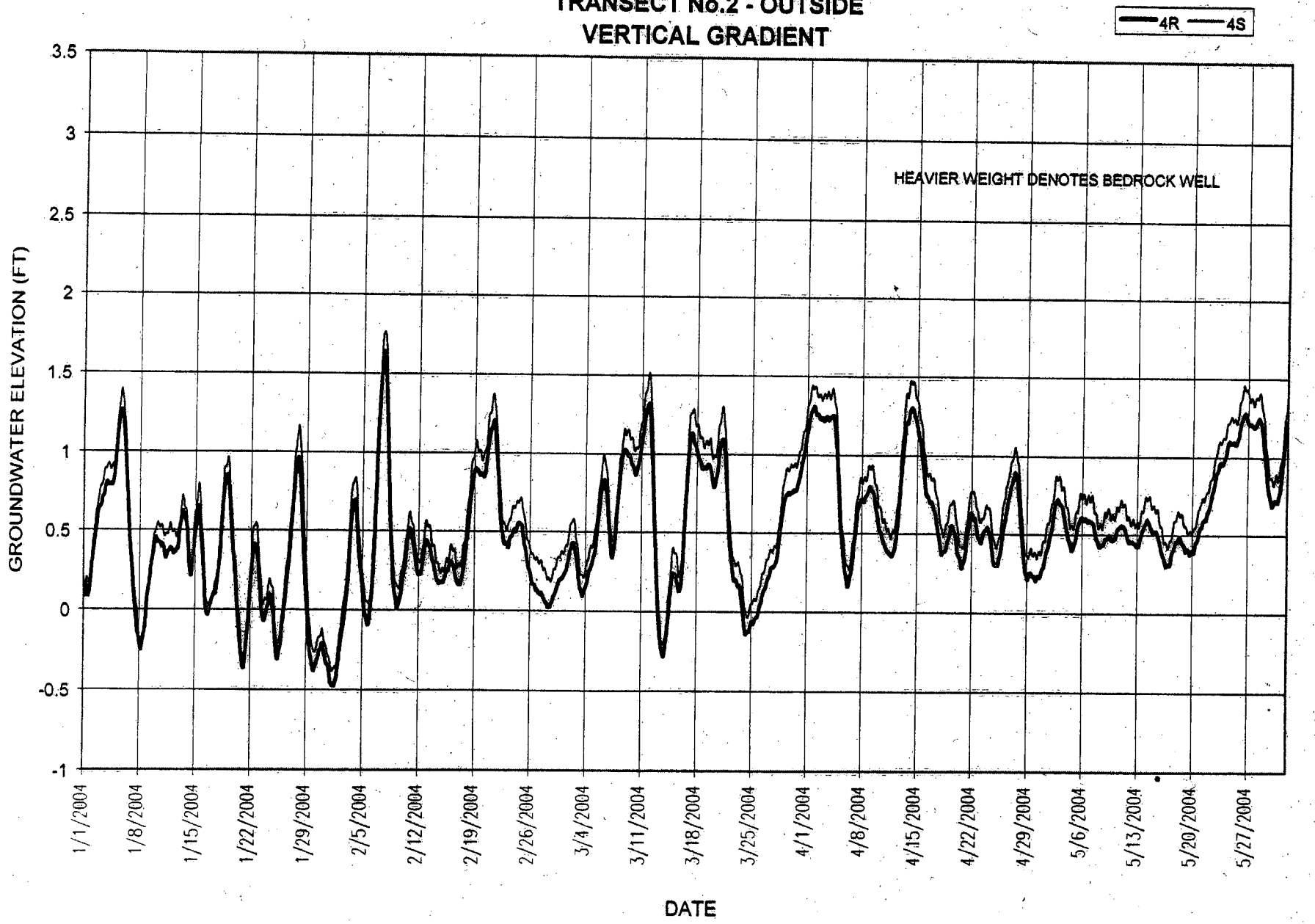
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #11
TRANSECT No.2 - OUTSIDE
VERTICAL GRADIENT



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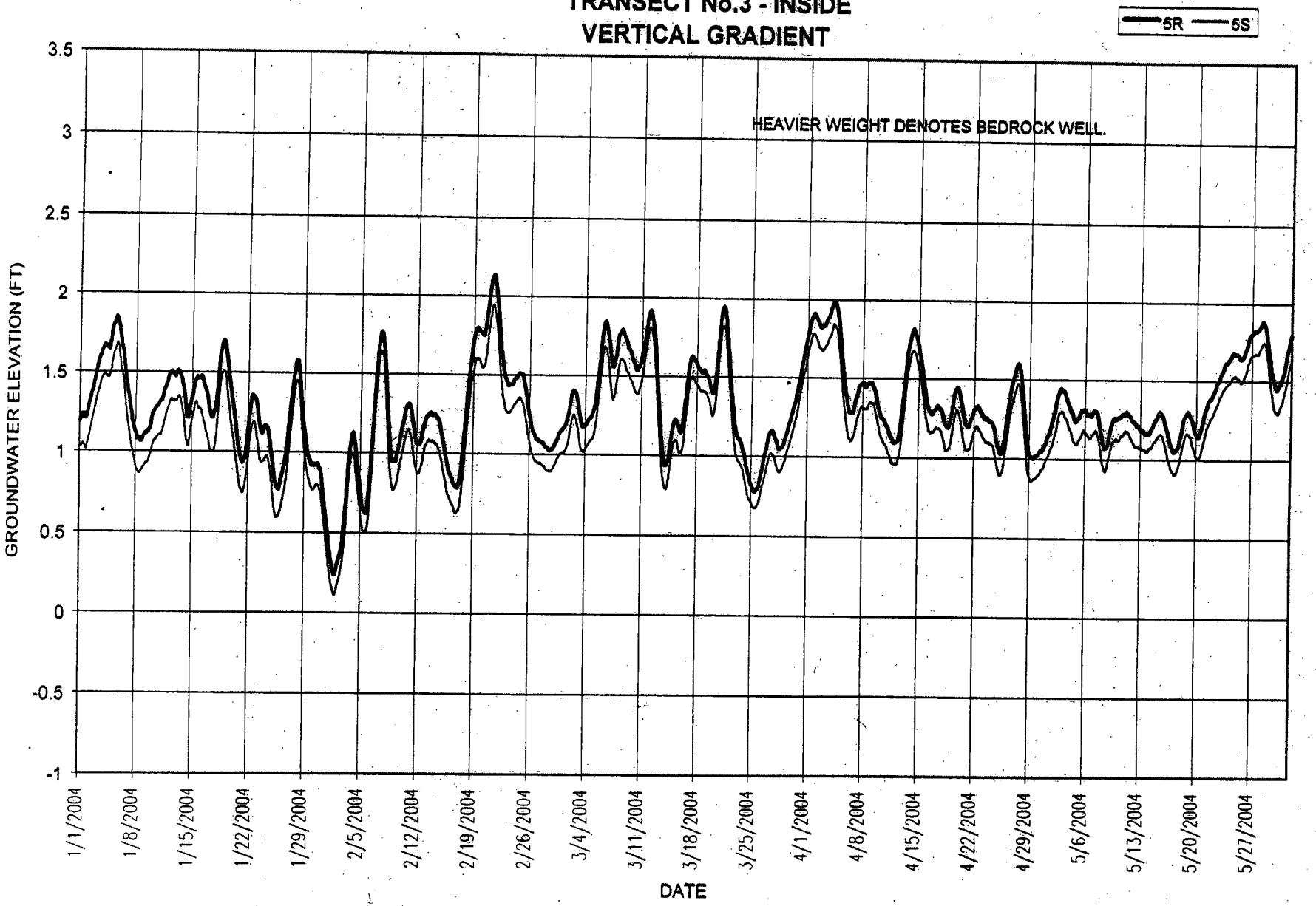
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



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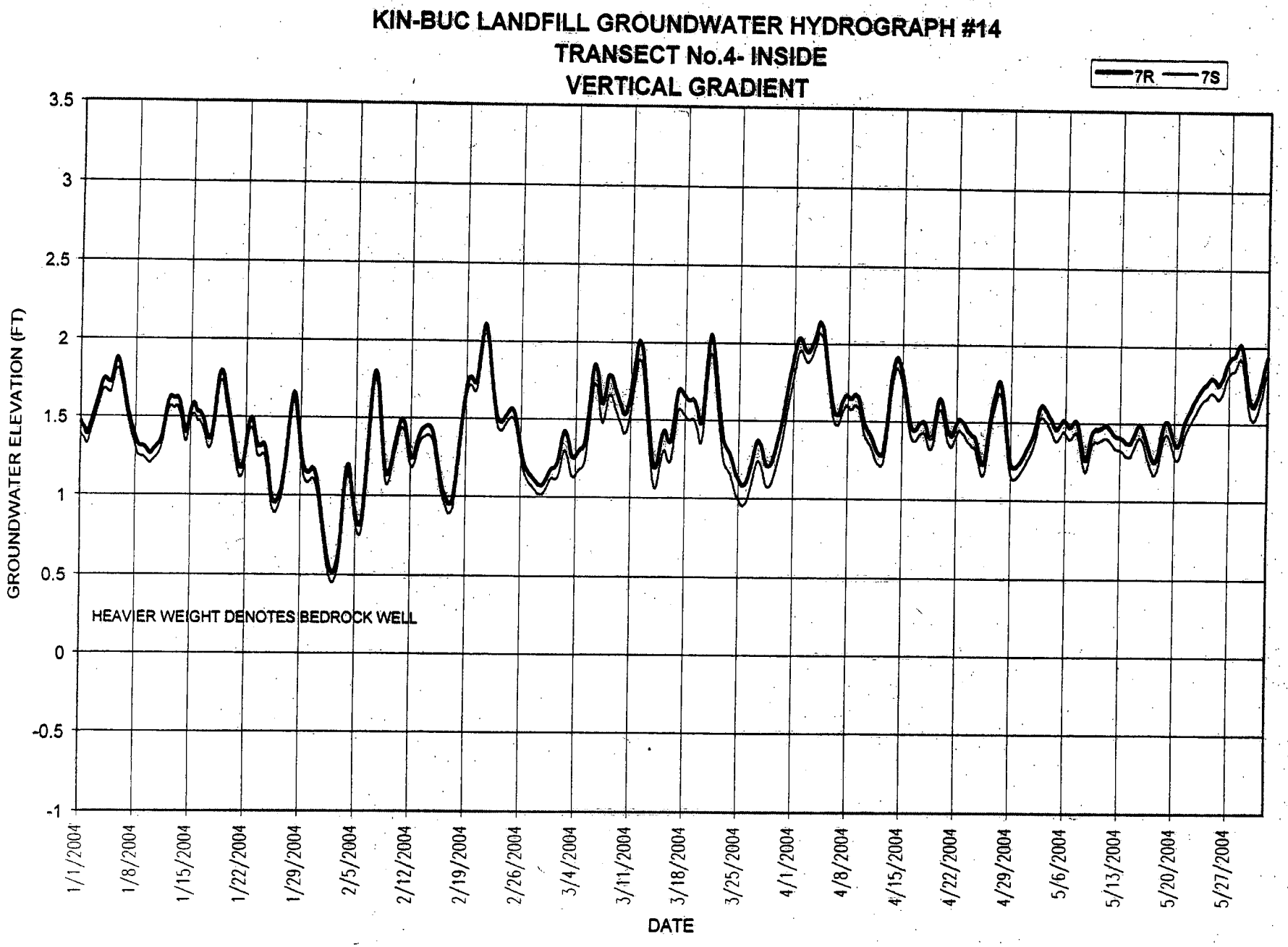

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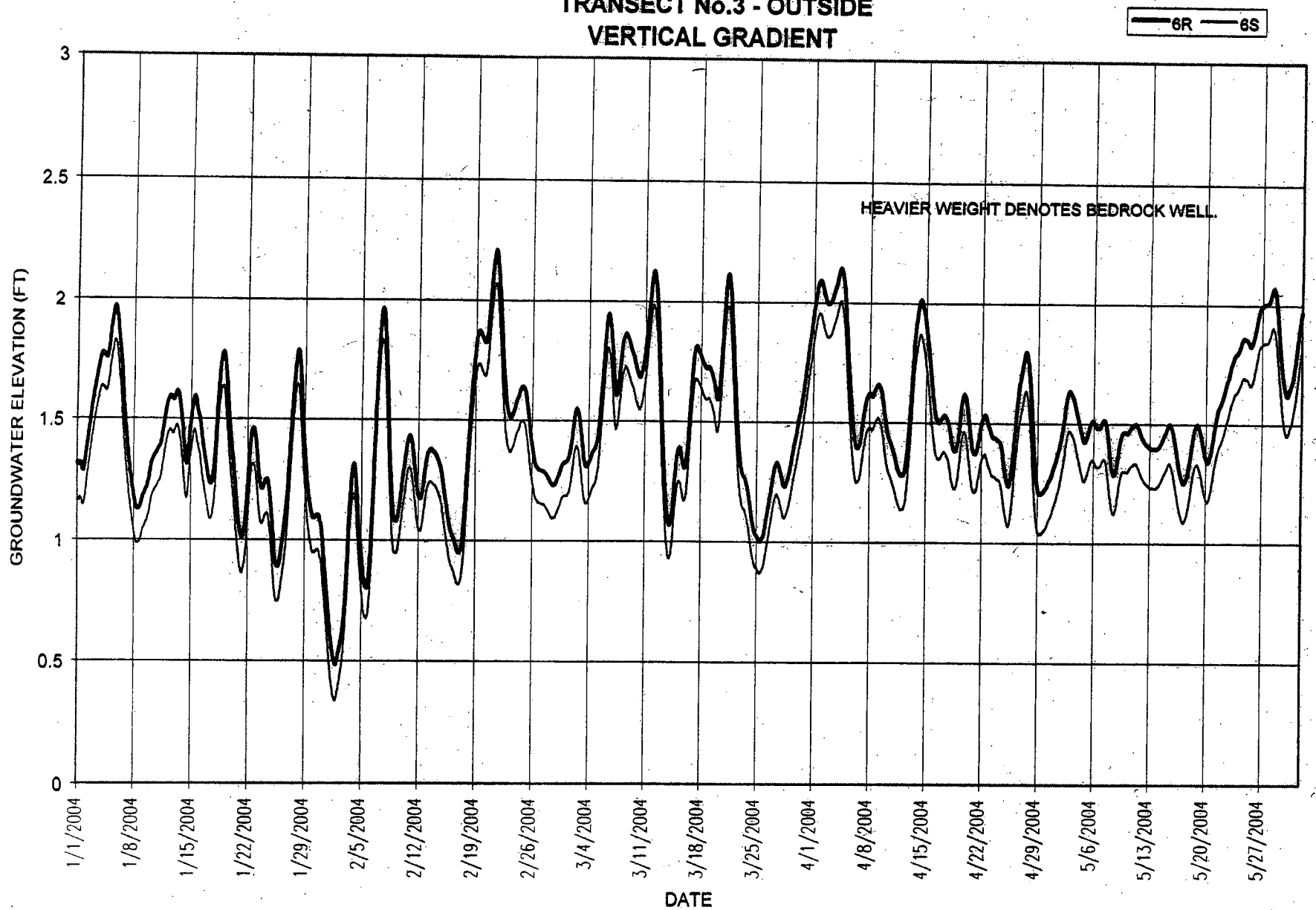
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #13
TRANSECT No.3 - OUTSIDE
VERTICAL GRADIENT



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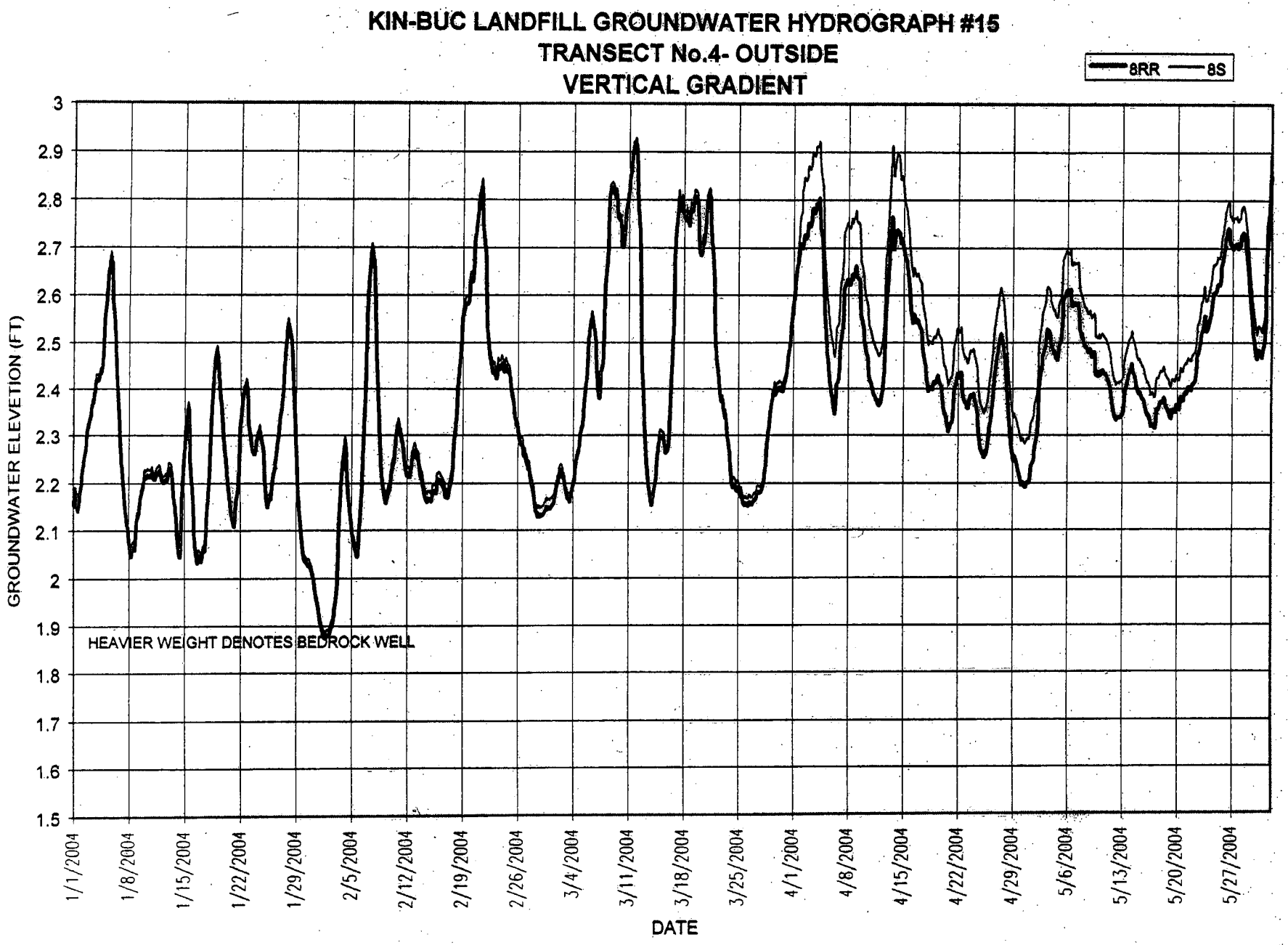

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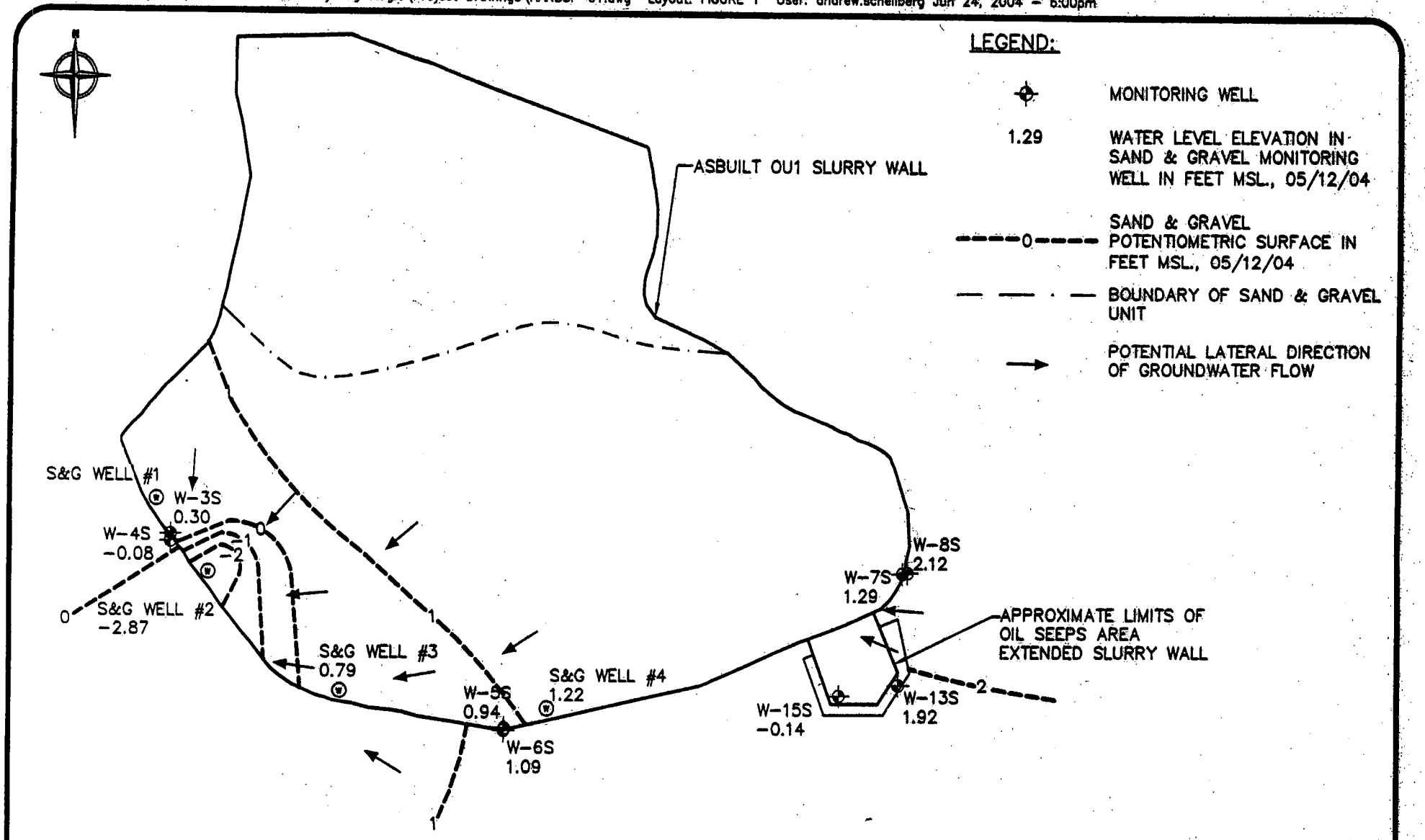
XREF Files: HAKBXBD01 HAKBXB-01 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-01.dwg Layout: FIGURE 1 User: andrew.schellberg Jun 24, 2004 - 6:00pm



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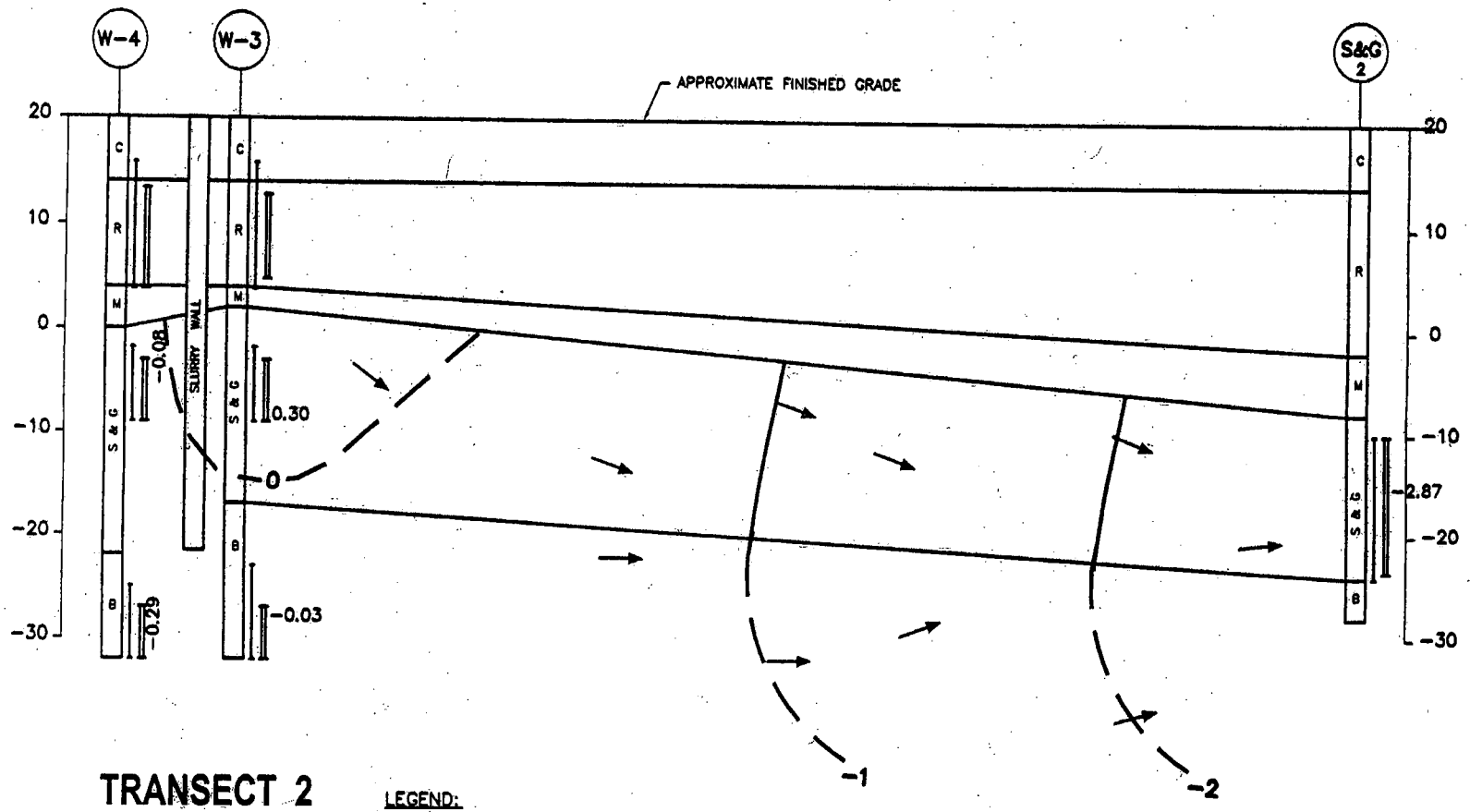
0 400 800
SCALE IN FEET

DATE 6/22/04
DWN ACS
APP ZL
REV
PROJECT NO. 102052

FIGURE 1
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
SAND & GRAVEL UNIT
POTENTIOMETRIC SURFACE

XREF Files: HAKBXBD01 HAKBXP-01 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-02.dwg Layout: FIGURE 2 User: andrew.schellberg Jun 24, 2004 - 1:58pm



TRANSECT 2

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	-0.03	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 05/12/04
C	- CAP		
R	- REFUSE	-1	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 05/12/04
M	- MEADOW MAT		
S & G	- SAND & GRAVEL	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

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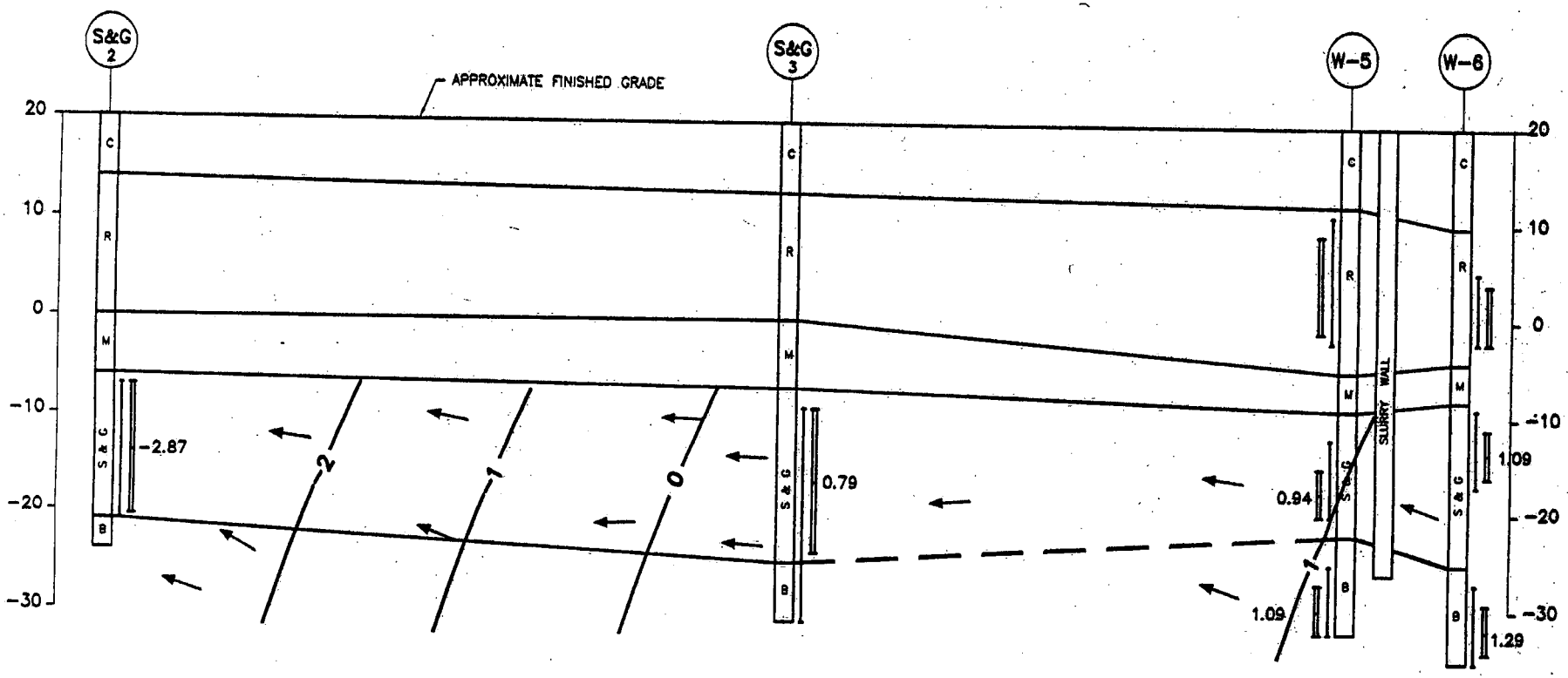
REV
PROJECT NO.
102052

FIGURE 2
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
TRANSECT 2
HYDROGEOLOGIC CROSS SECTION ANALYSIS

XREF Files: HAKBXBD01 HAKBXP-02 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-03.dwg Layout: FIGURE 3 User: andrew.schellberg Jun 24, 2004 - 2:13pm



TRANSECT 3

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	0.79	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 05/12/04
C	- CAP		
R	- REFUSE	— 1 —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 05/12/04
M	- MEADOW MAT		
S & G	- SAND & GRAVEL	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

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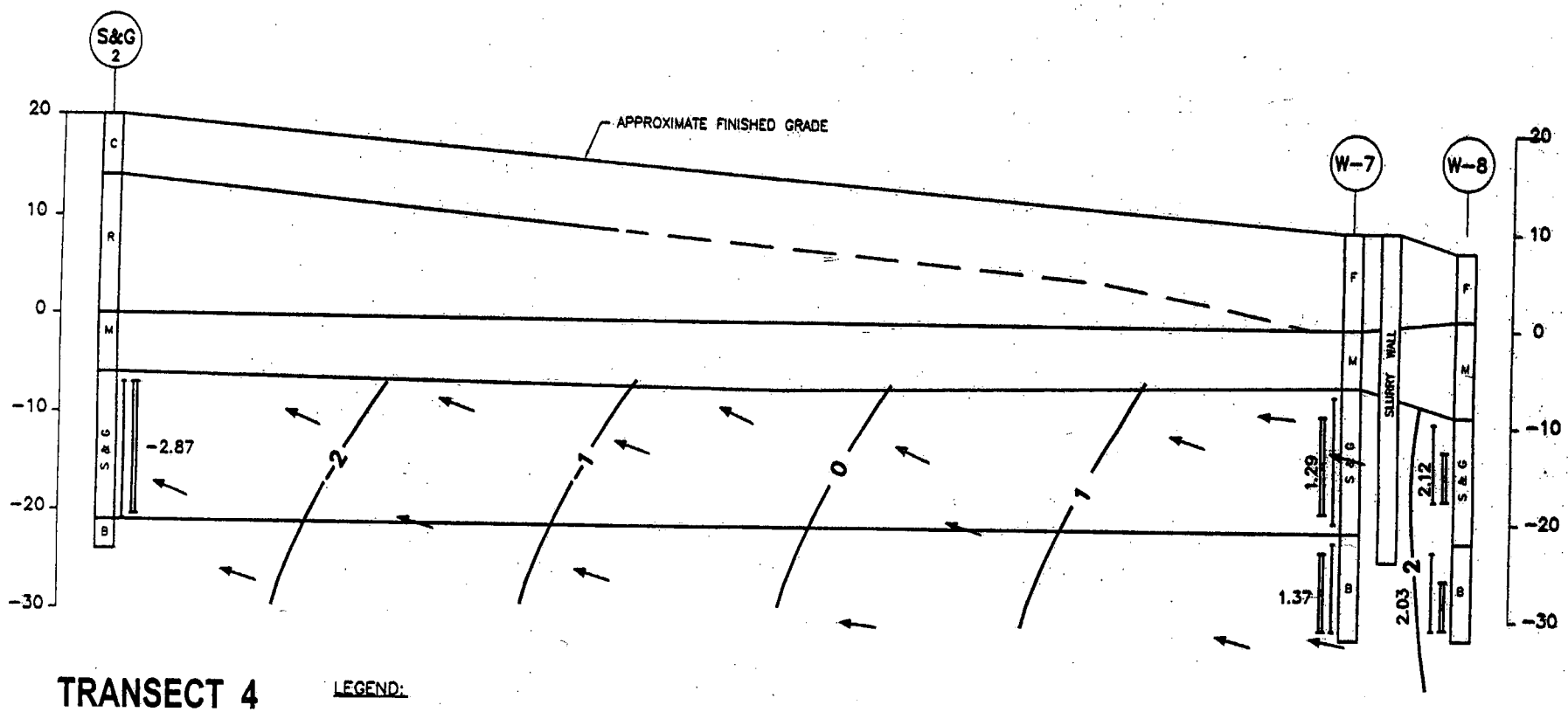
DATE 6/22/04
DWN ACS
APP ZL
REV
PROJECT NO.
102052

FIGURE 3
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
TRANSECT 3
HYDROGEOLOGIC CROSS SECTION ANALYSIS

XREF Files: HAKBXBD01 HAKBXP-03 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-04.dwg Layout: FIGURE 4 User: andrew.schellberg Jun 24, 2004 - 2:26pm



TRANSECT 4

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	1.29	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 05/12/04
C	- CAP		
R	- REFUSE	— 0 —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 05/12/04
M	- MEADOW MAT		
S & G	- SAND & GRAVEL	←	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

Shaw® EMCON/OWT, Inc.

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DATE 6/22/04
DWN ACS
APP ZL
REV
PROJECT NO.
102052

FIGURE 4
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
TRANSECT 4
HYDROGEOLOGIC CROSS SECTION ANALYSIS

ATTACHMENT 1

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. 25 - 46505
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KEN-TEC INC.
Address 203 CENTRAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address.
County MIDDLESEX Municipality EDISON TWP. Owner's Well No. 1G
Address 383 Meadow Road, Edison, NJ Lot No. 403 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Case I.D. # NJD981080036
Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade
[ ] flush mounted
If finished above grade, casing height (stick up) above land surface ft.
Was steel protective casing installed? [ ] Yes [X] No

	Depth to Top (ft.) [From land surface]	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	14	5	2	Sch 40 PVC
Outer Casing (for Protective Casing)				
Screen (Place slot size)	5	15	2	Sch 40 PVC .020
Tail Piece				
Gravel Pack	3	15.6	8	#2 Rlect.
Annular Seal/Grout	0	5	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling — ft.
Water level was measured using —
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid —
Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C (B) A
N.J. License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached)

0 - 15.6	red gray dry stiff clay, some silt

I certify that I have drilled the above referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Chad A. Chism Date 2/15/95

COPIES

ATTACHMENT 2

MONITORING WELL RECORD

Well Permit No. 25 : 46506
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-BOC INC.
Address 200 CENTENIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address.
County MIDDLESEX Municipality EDISON TWP Owner's Well No. 2C
Address 383 Meadow Road, Edison, NJ Lot No. 400 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Case I.D. # NJD049860836
Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade
[ ] flush mounted
If finished above grade, casing height (stick up) above land surface 4 ft.
Was steel protective casing installed? [ ] Yes [X] No

	Depth to Top (ft.)	Depth to Bottom (ft.) (From land surface)	Diameter (inches)	Type and Material
Inner Casing	+4	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .010
Tail Piece				
Gravel Pack	3	15.6	8	#00 Ricci
Annular Seal/Grout	0	3	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling — ft.
Water level was measured using —
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid —
Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C (B) A
N.J. License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable state rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

ATTACHMENT 2

the IT group

IT Corporation
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
Tel. 201.512.5700
Fax. 201.512.5786
A Member of The IT Group

June 27, 2001
Project 796201

Gad Januszkiewicz
Waste Management, Inc
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Evaluation of Head Levels at Transect 1

Dear Mr. Januszkiewicz:

We have completed an evaluation of the hydraulic characteristics at Transect 1 with specific focus on the lack of intragradient conditions associated with the high water levels in W-1G (inside of the slurry wall) relative to those levels in W-2G (outside of the wall).

While intragradient conditions were evident at the outset of the hydraulic monitoring program in April 1996, these conditions have generally not been maintained. Specifically, based on a review of historical hydrographs, intragradient conditions were evident initially from approximately April to July 1996, and April to June 1997. Thereafter, to more recent events, intragradient conditions have been observed intermittently and for shorter periods of time.

Attachment 1 presents a hydrograph at Transect 1 encompassing the period from September 1998 to December 2000. As seen on the hydrograph, there were periods of time when intragradient conditions were not being maintained.

As opposed to the other "G" series monitoring wells that are located in refuse, wells 1G and 2G at Transect 1 are actually located in a silt and clay deposit. Attachment 2 contains the boring logs for these 2 installations. In-situ hydraulic conductivity testing performed at Transect 1 indicated permeabilities of 10^{-7} cm/sec and 10^{-5} cm/sec in W-1G and W-2G, respectively. Accordingly, a source of recharge to the overburden soils in the area of W-1G would not readily drain away, and therefore, higher heads could result.

Well 1G sampling events (November 1998, October 1999, October 2000) can be seen on the hydrograph as sharp vertical drops in groundwater levels. Due to the low permeability of the surrounding materials, the groundwater levels required several months to recover. Since the final cover extends 10 feet past the slurry wall, the source of the groundwater that is recharging W-1G is unknown at present.

The hydraulic gradient between W-1G and W-1R is vertically downward which rules out the bedrock as being a source of groundwater recharge. Based on a recent visual inspection of the area around Transect 1, the cap appears to be good condition and there were no signs that the cap integrity has been compromised.

Figure 1 depicts the conceptual model of the hydraulic interrelationship across Transect 1 showing water level measurements that depict the lack of intragradient conditions across the

slurry wall. The head levels in W-2G (outside the slurry wall) are generally at elevation 12 to 13 feet msl with periodic and short term increases to about 15 feet msl. The water level in the well sometimes falls below the level of the transducer. This is characterized by a flat straight line on the hydrographs as shown on Attachment 1. Head levels in W-1G (inside the slurry wall), on the other hand, are often greater with elevations as high as 15 to 16 feet msl being recorded.

It is evident from a review of Figure 1 that the drop in topography outside of the slurry wall toward Mill Brook, coupled with the higher permeability of W-2G relative to W-1G, would promote a more rapid decrease of head levels in the latter. This suggests that intragradient conditions may not be consistently attainable at this transect in any event. This notwithstanding however, and as depicted on Figure 1, it is important to note that the leachate collection system represents a hydraulic sink within the containment system. As such, groundwater in the vicinity of W-1G would drain toward the sink mitigating concerns of outward flow.

The leachate collection line runs parallel to the slurry wall and at its closest point is only about 20 feet away from Transect 1. Several cleanouts are located along the collection line with the closest, Cleanout 16, only about 65 feet from Transect 1. Leachate level measurements obtained from the cleanouts during December 2000 and June 2001 indicate a leachate level of 10 to 11 feet msl along the collection line as shown in Table 1. The leachate levels observed suggest that the leachate collection system is presently operating effectively.

Recommendations

Based on the above, it is recommended that during subsequent monitoring events at the site, measurements of leachate levels in Cleanouts 14 through 16 be recorded to verify that the leachate collection system is operating effectively. If liquid levels in the cleanouts increase above 12 to 13 feet msl, then maintenance of the collection line is recommended. Subsequent reports to EPA should include a discussion of the leachate collection system and its role as serving as a hydraulic sink within the containment system.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

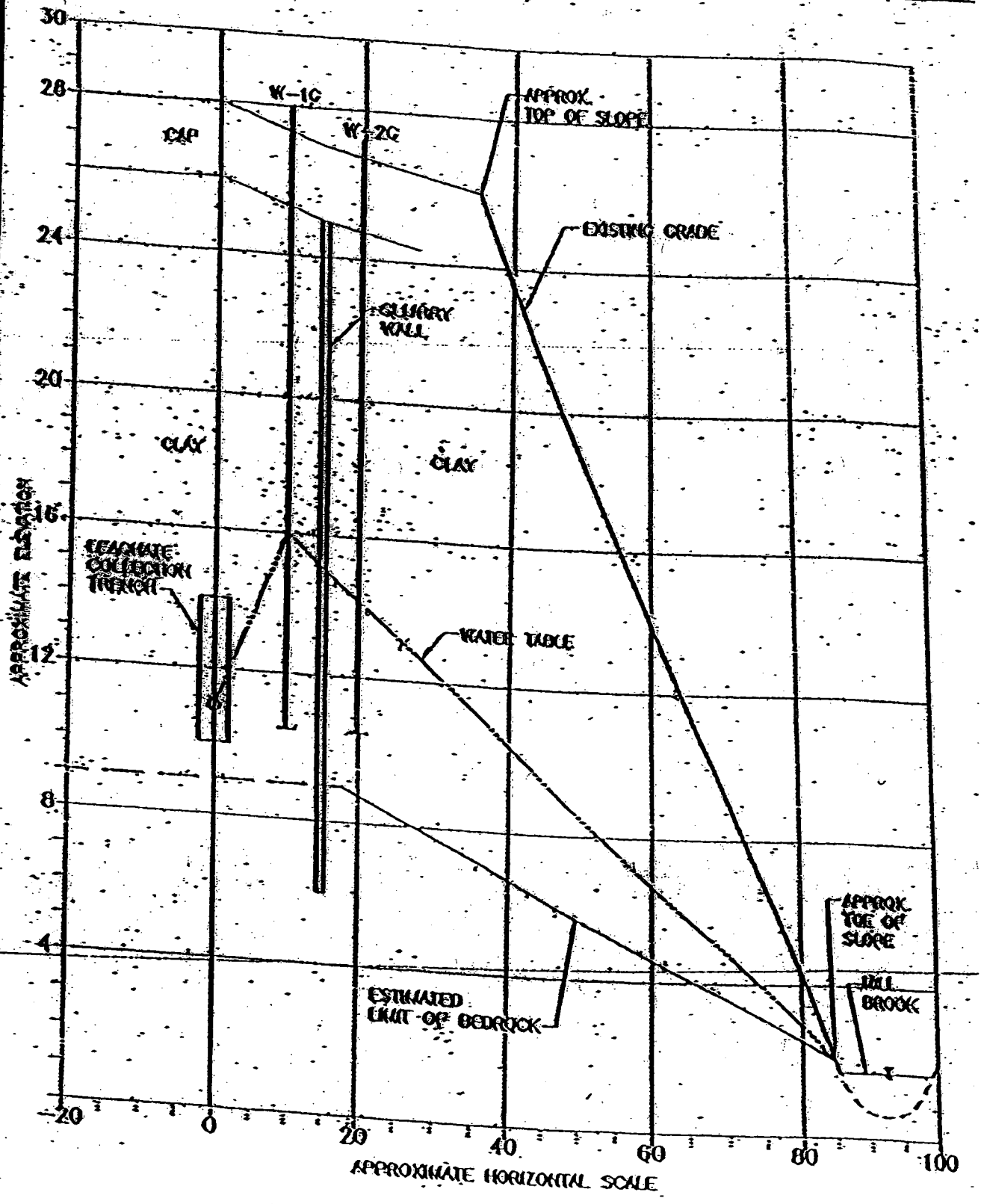
Sincerely,

IT Corporation

Steven Goldberg, PhD, CPG
Senior Hydrogeologist

Thomas M. Connors, P.E.
Project Manager

Attachments



0 20 40
HORIZONTAL SCALE IN FEET

0 4 8
VERTICAL SCALE IN FEET

IT CORPORATION

WASTE MANAGEMENT INC.

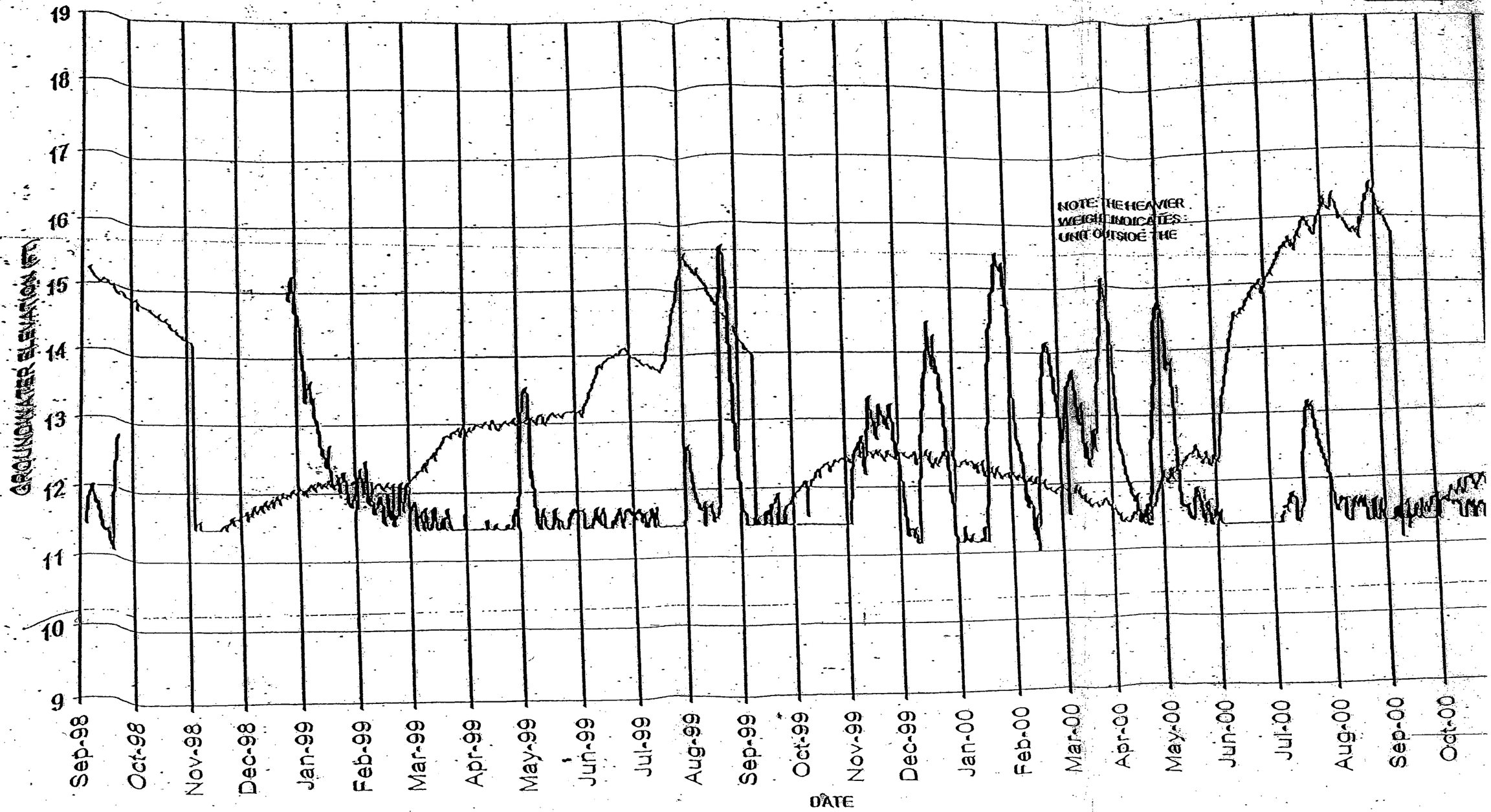
FIGURE 1
CROSS SECTION
TRANSECT 1

DRAWING NUMBER 79-6201-A1

Table 1
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.26		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.80		10.74		10.66		10.67				11.11
DATE												
6/7/01	11.98	10.89	12.02	10.75	15.86	10.65	15.87	10.64	dry	na	dry	na
5/16/01	12.26	10.62	12.23	10.64	15.96	10.55	15.95	10.55	dry	na	dry	na
4/26/01	12.36	10.51	12.35	10.42	15.99	10.52	16.01	10.50	dry	na	dry	na
3/21/01	11.80	11.07	11.75	11.02	15.62	10.89	15.59	10.92	dry	na	dry	na
2/26/01	12.03	10.84	11.94	10.83	15.95	10.66	15.92	10.69	dry	na	dry	na
1/29/01	12.08	10.79	11.98	10.79	15.85	10.66	15.83	10.68	dry	na	20.41	10.91
12/27/01	12.02	10.85	11.94	10.83	15.72	10.79	15.68	10.83	dry	na	20.01	11.31

N:proj\kinbuc\791186\monthly\waterlevels\cleanout levels.xls



1G
2G
NOTE: THE HEAVIER WEIGHT INDICATES UNIT OUTSIDE THE
GROUNDWATER ELEVATION (FT)
19
18
17
16
15
14
13
12
11
10
9
Sep-98
Oct-98
Nov-98
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
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Shaw® EMCON/OWT, Inc.

July 16, 2004
Project 102052

Mr. Carl Januszkiewicz
Waste Management, Inc.
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Hydraulic Monitoring for June 2004

Dear Mr. Januszkiewicz:

A site visit was completed on July 1, 2004 to download the June 2004 water level recorder data and obtain manual water level measurements. The following is an update of the hydraulic monitoring for the month of June 2004 at the Kin-Buc Landfill. This information is to be included in the quarterly report, which is to be submitted to the EPA by the end of July 2004.

The minimum, maximum, and average water elevations recorded at each well are included in Table 1. Table 2 presents the troll water elevations versus the manual water elevations. The continuous water level elevation data when compared with manual readings indicated that the minitrolls are functioning properly and are recording accurate data, except for the few instances discussed in the following sections, where recommendations are made regarding conditions at the well and transducer/mini-troll set-up.

Hydrographs have been prepared for each of the transect locations and are enclosed for your reference as Attachment 1. The water levels in wells on the outside of the slurry wall vary over the course of the day due to the tidal influence at the site. For clarity, Hydrographs 6 through 15 show the average water level in the wells over a 24-hour period (12 hours before, and 12 hours after).

In addition to hydraulic monitoring, EMCON/OWT personnel also re-installed the minitrolls which were sent to In-Situ for servicing. Serviced minitrolls were re-installed in wells 10G, 8S, and 15S. A detailed discussion is provided in the July 2004 Minitroll Maintenance and Status letter (dated July 8, 2004).

Refuse

As defined in the Record of Decision (ROD) for Operable Unit 1 (OU-1), the performance objective for the refuse unit calls for the pumping of leachate to establish inward gradients across the slurry wall with the additional benefit of reducing downward flow into the underlying sand and gravel unit. Based on the hydrographs the following is presented.

Transect 1-Refuse (1G/2G)/Hydrograph No. 1 - Intragradient conditions were observed throughout the month of June. The average monthly water elevations for June at wells 1G (inside) and 2G (outside) were 12.21 and 12.51 feet msl, respectively. Water level elevation measurements taken from Leachate Collection Cleanouts 14 through 16 are included in Table 3. As depicted in table 3, the leachate collection system is functioning properly, suggesting significant capture of leachate. The evaluation of the hydraulic conditions in the refuse at Transect 1 is provided in Attachment 2.

Transect 2-Refuse (3G/4G)/Hydrograph No. 2 – Intragradient conditions were maintained throughout the month of June. The average monthly water elevations for the month of June at wells 3G (inside) and 4G (outside) were 7.44 and 11.06 feet msl, respectively.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.546) for W-3G is relatively significant. Discrepancies in elevation readings at well 3G have been occurring since March 2004. Viscous black oil has always been observed in this well and may be a possible origin factor for misread elevations. A thorough cleaning and inspection of this minitroll will be conducted during the next scheduled site visit.

Transect 3-Refuse (5G/6G)/Hydrograph No. 3 – Intragradient conditions were maintained throughout the month of June. The average monthly water elevations for the month of June at wells 5G (inside) and 6G (outside) were 9.58 and 12.70 feet msl, respectively.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.438) for W-6G is relatively significant. Discrepancies in elevation readings at well 6G have been occurring since before January 2004. During the last site-wide minitroll inspection on March 1, 2004, inspection of the minitroll in 6S was impeded due to excess silt or a foreign object blocking troll removal. The transducer/mini troll in well 6G location will be checked utilizing a submersible camera in an attempt to retrieve the minitroll without damaging it. This work will be conducted during the first week of August 2004.

Transect 4-Refuse Oil Seeps Area (13G/15G)/Hydrograph No. 4 – Intragradient conditions were maintained throughout the month of June. The average monthly water elevations for the month of June at wells 15G (inside) and 13G (outside) were 1.52 and 6.57 feet msl, respectively.

Transect 5-Refuse (9G/10G)/Hydrograph No. 5 – Intragradient conditions were maintained throughout the month of June. The average monthly water elevations for the month of June at wells 9G (inside) and 10G (outside) were 7.41 and 8.20 feet msl,

respectively. Past observations consistently showed intragradient conditions at this location.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (0.454) for W-10G is relatively significant. On July 1, 2004, the In-Situ serviced minitroll was returned to this well along with a water barrier bag to protect it from external factors that may affect its functioning. A detailed discussion is provided in the July 2004 Minitroll Maintenance and Status letter (dated July 8, 2004).

Sand and Gravel/Bedrock

For the sand and gravel unit, the performance objectives calls for pumping of sand and gravel groundwater to prevent flow toward the slurry wall and to impose upward hydraulic gradients from the bedrock to the sand and gravel. An additional benefit would be the establishment of inward gradients across the slurry wall within the sand and gravel unit. The following is a description of the flow characteristics based on visual observation of the hydrographs.

Horizontal Flow

Transect 2-Sand and Gravel (3S/4S)/Hydrograph No. 6 – Intragradient conditions were maintained through the month of June. Containment is being maintained by the pumping wells. The average monthly water elevations for the month of June at wells 3S (inside) and 4S (outside) were 0.66 and 0.90 feet msl, respectively.

Transect 3-Sand and Gravel (5S/6S)/Hydrograph No. 7 – Intragradient conditions were maintained throughout the month of June. The average monthly water elevations for the month of June at wells 5S (inside) and 6S (outside) were 1.29 and 1.45 feet msl, respectively.

Transect 4-Sand and Gravel (7S/8S)/Hydrograph No. 8- Intragradient conditions were maintained throughout the month of June. The average monthly water elevations for the month of June at wells 7S (inside) and 8S (outside) were 1.52 and 2.50 feet msl, respectively. On July 1, 2004, the In-Situ serviced minitroll was returned to this well along with a water barrier bag to protect it from external factors that may affect its functioning. A detailed discussion is provided in the July 2004 Minitroll Maintenance and Status letter (dated July 8, 2004).

Transect 4 Sand and Gravel Oil Seeps Area (13S/15S)/Hydrograph No. 9 – Intragradient conditions were maintained throughout the month of June. The average monthly water elevations for the month of June at wells 15S (inside) and 13S (outside) were 0.09 and 2.18 feet msl, respectively. Water levels from Well 15G in the refuse unit are included on the hydrograph for comparison.

As indicated in Table 2 of this report, the difference in manual versus troll elevation readings (2.093) for W-15S is relatively significant. On July 1, 2004, the In-Situ serviced minitroll was returned to this well along with a water barrier bag to protect it from external factors that may affect its functioning. A detailed discussion is provided in the July 2004 Minitroll Maintenance and Status letter (dated July 8, 2004).

Vertical Flow-Inside Slurry Wall

Transect 2-Vertical Gradient (3S/3RR)-Inside/Hydrograph No.10 – Upward gradient conditions were not co nsistently observed between the bedrock and overlying sand & gravel units inside the slurry wall for most of the month of June. The average monthly water elevations for the month of June at wells 3S (sand & gravel) and 3RR (bedrock) were 0.66 and 0.62 feet msl, respectively.

Transect 3-Vertical Gradient (5R/5S)-Inside/Hydrograph No. 12 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall for most of the month of June. The average monthly water elevations for the month of June at wells 5S (sand & gravel) and 5R (bedrock) were 1.29 and 1.45 feet msl, respectively.

Transect 4-Vertical Gradient (7R/7S)-Inside/Hydrograph No. 14 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units inside the slurry wall throughout the month of June. The average monthly water elevations for the month of June at wells 7S (sand & gravel) and 7R (bedrock) were 1.52 and 1.62 feet msl, respectively.

Vertical Flow-Outside Slurry Wall

Transect 2-Vertical Gradient (4S/4R)-Outside/Hydrograph No. 11 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall for the entire month of June. The average monthly water elevations for the month of June at wells 4S (sand & gravel) and 4R (bedrock) were 0.90 and 0.75 feet msl, respectively.

Transect 3-Vertical Gradient (6R/6S)-Outside/Hydrograph No. 13 – Upward gradient conditions were observed between the bedrock and overlying sand & gravel units outside the slurry wall for the month of June. The average monthly water elevations for the month of June at wells 6S (sand & gravel) and 6R (bedrock) were 1.45 and 1.61 feet msl, respectively.

Transect 4-Vertical Gradient (8RR/8S)-Outside/Hydrograph No. 15 – Upward gradient conditions were not observed between the bedrock and overlying sand & gravel units outside the slurry wall throughout the month of June. The average monthly water elevations for the month of June at wells 8S (sand & gravel) and 8RR (bedrock) were 2.50 and 2.45 feet msl, respectively.

An initial review of the hydrographs indicates that certain performance objectives associated with the sand and gravel and bedrock units may not be met, specifically associated with the uniform achievement of upward gradients from the bedrock to the overlying sand and gravel inside the wall (e.g. Hydrograph 10). However previous

investigations performed at the site would indicate that complete control of OU-1 groundwater can be achieved notwithstanding indications of downward flow from the sand and gravel to the bedrock, or outward flow across the slurry wall within the sand and gravel unit. This is based on the findings of the considerable pumping influence of the sand and gravel pumping wells, in particular S&G#2, in achieving hydraulic control at the site (see Groundwater Pumping Well Performance Evaluation Report, July 2000).

The influence of the pumping well can be demonstrated by review of a plan view groundwater contour map of the sand and gravel (Figure 1) and equipotential profiles and vector diagrams (Figures 1, 2, 3, and 4) that have been prepared for a period of time when the vertical gradient between the sand and gravel and the bedrock was downward at Transect 2. For this evaluation, a snapshot of groundwater elevations from the monitoring wells and pumping wells was obtained for June 16, 2004. At this time, S&G#2 was pumping at a rate of about 9.09 gallons per minute (gpm) or about 13,087 gallons per day, and S&G#3 was pumping at a rate of about 3.90 gallons per minute (gpm) or about 5,620 gallons per day. During June, there was a downward vertical gradient observed most of the time between the sand and gravel and the bedrock inside and outside the slurry wall at Transect No.2 as evidenced by higher heads in the sand and gravel wells relative to bedrock wells.

Figures 1 through 4 incorporate the heads induced by pumping and show the considerable pumping influence of S&G#2. Specifically, groundwater flowing downward from the sand and gravel into the bedrock subsequently flows toward the pumping well. This occurs both inside and outside of the slurry wall. Also, groundwater within the sand and gravel unit flows toward the pumping well. The considerable pumping influence demonstrated at S&G#2, in conjunction with the fact that natural groundwater gradients in both the sand & gravel and bedrock flow predominantly towards the area of S&G#2, result in the complete capture of OU-1 groundwater at these pumping rates.

Groundwater and Leachate Collection

Based on data provided by Veolia Water, the following volumes of groundwater and leachate were extracted from the sand & gravel wells and leachate collection system for the period from June 1 to 30, 2004:

S&G No. 1 Groundwater	S&G No. 2 Groundwater	S&G No. 3 Groundwater	S&G No. 4 Groundwater	Leachate
0 gal.	391,877 gal.	170,442 gal.	0 gal.	60,643 gal.
0 gpd	13,062.57 gpd	5,681.40 gpd	0 gpd	2,021.43 gpd

For the month of June, a total of 562,319 gallons of groundwater was collected. The average daily groundwater extraction rate for all of the wells was 18,743.97 gpd. The

extraction rate from S&G No. 1 was 0 gpd; 13,062.57 gpd for S&G No. 2; 5,681.40 gpd for S&G No. 3; and 0 gpd for S&G No. 4. The leachate extraction rate was 2,021.43 gpd for the month of June.

CONCLUSIONS

Intragradient conditions were maintained in the refuse unit at Transects 1,2, 3, 4, and 5.

Hydraulic control was maintained within OU-1 based on the analysis of the significant influence of S&G#2 in acting as a hydraulic sink for sand and gravel and bedrock groundwater. Groundwater flow in the sand and gravel and bedrock is ultimately captured by the pumping wells (S&G#2 and also S&G#3) resulting in overall containment of groundwater in OU-1.

In view of the analysis presented herein, it is recommended that the combined groundwater pumping rates in the sand and gravel be maintained at 15,000 gpd with S&G#2 and S&G#3 pumping at 10,000 gpd and 5,000 gpd, respectively.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

EMCON/OWT, Inc.

Timothy S Pagano

Timothy S. Pagano, CPG
Senior Hydrogeologist

Steven P. Goldberg, Ph.D
Senior Hydrogeologist

Attachments

cc: Glenn Grieb, US Filter
Jeff Shanks, WM, Inc.

KinBuc Landfill Operable Units 1 and 2
Continuous Hydraulic Monitoring Results
2004
Minimum/Maximum/Average Water Elevations

Inside Slurry Wall					Outside Slurry Wall				
Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)	Well ID	Monitoring Period	Minimum Recorded Water Elevation (ft)	Maximum Recorded Water Elevation (ft)	Average Water Elevation (ft)
W-1G	April	11.72	11.99	11.85	W-2G	April	11.48	11.73	11.64
	May	11.68	11.88	11.77		May	11.70	12.52	12.11
	June	11.86	12.40	12.21		June	12.40	12.56	12.51
W-3G	April	7.28	7.85	7.54	W-4G	April	11.08	11.78	11.47
	May	7.24	7.73	7.50		May	11.27	11.66	11.47
	June	7.28	7.65	7.44		June	10.78	11.44	11.06
W-3S	April	0.07	1.37	0.58	W-4S	April	-0.43	2.10	0.80
	May	-0.01	1.20	0.54		May	-0.28	2.24	0.80
	June	0.33	1.05	0.66		June	-0.15	2.42	0.90
W-5G	April	9.46	9.93	9.65	W-6G	April	12.82	13.81	13.30
	May	9.38	9.79	9.63		May	12.77	13.66	13.20
	June	9.43	9.76	9.58		June	12.31	13.22	12.70
W-5S	April	0.78	2.02	1.26	W-6S	April	0.92	2.21	1.43
	May	0.72	1.86	1.24		May	0.89	2.04	1.41
	June	0.87	1.89	1.29		June	1.01	2.10	1.45
W-7S	April	1.08	2.17	1.51	W-8S	April	1.39	3.97	2.59
	May	1.08	1.99	1.47		May	2.04	4.13	2.55
	June	1.23	2.00	1.52		June	1.90	4.78	2.50
W-15S	April	-0.27	0.82	0.13	W-13S	April	1.78	3.05	2.22
	May	-0.25	0.80	0.10		May	1.78	3.13	2.20
	June	-0.30	0.98	0.09		June	1.71	3.51	2.18
W-15G	April	1.41	1.60	1.50	W-13G	April	6.54	7.64	6.74
	May	1.32	1.78	1.52		May	6.61	6.88	6.76
	June	1.31	1.62	1.52		June	6.32	6.85	6.57
W-9G	April	7.11	7.44	7.25	W-10G	April	8.04	8.18	8.12
	May	7.15	7.55	7.31		May	8.11	8.23	8.16
	June	7.33	7.56	7.41		June	8.12	8.25	8.20
W-3RR	April	-0.15	1.51	0.51	W-4R	April	-0.65	2.03	0.66
	May	-0.27	1.43	0.50		May	-0.51	2.18	0.66
	June	-0.03	1.49	0.62		June	-0.40	2.39	0.75
W-5R	April	0.90	2.17	1.40	W-6R	April	1.09	2.33	1.58
	May	0.87	1.99	1.38		May	1.07	2.19	1.57
	June	1.08	2.01	1.45		June	1.18	2.24	1.61
W-7R	April	1.15	2.24	1.58	W-8RR	April	1.94	3.86	2.48
	May	1.16	2.09	1.55		May	1.94	4.06	2.48
	June	1.34	2.10	1.62		June	1.84	4.73	2.45

Table 2
KinBuc Landfill Operable Unit 1
May 2004
Troll Elevations vs. Manual Elevations

OU 1	July 1, 2004		
Well ID	Troll	Manual	Difference
W-1G	12.409	12.45	0.041
W-2G	12.492	12.54	0.048
W-3G	7.336	6.79	0.546
W-3S	0.431	0.53	0.099
W-3RR	0.591	0.65	0.059
W-4G	10.739	10.78	0.041
W-4S	1.143	1.16	0.017
W-4R	1.071	1.18	0.109
W-5G	9.51	9.63	0.120
W-5S	1.082	1.17	0.088
W-5R	0.983	1.03	0.047
W-6G	12.858	12.42	0.438
W-6S	1.292	1.36	0.068
W-6R	1.41	1.43	0.020
W-7S	1.271	1.33	0.059
W-7R	1.402	1.46	0.058
W-8S	2.31	2.3	0.010
W-8RR	2.267	2.26	0.007
W-9G	7.381	7.44	0.059
W-10G	8.176	8.63	0.454
W-13G	6.467	6.45	0.017
W-13S	1.896	1.89	0.006
W-15G	1.515	N/A	N/A
W-15S	-0.113	1.98	2.093

Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2004

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		9.97		9.90		9.69		9.74		na		na
DATE												
12/10/2001	12.5	10.37	12.42	10.35	16.31	10.20	16.33	10.18	dry	na	dry	na
1/3/2002	12.37	10.50	12.31	10.46	16.21	10.30	16.22	10.29	dry	na	dry	na
2/13/2002	12.70	10.17	12.63	10.14	16.57	9.94	16.62	9.89	dry	na	dry	na
3/27/2002	12.61	10.26	12.55	10.22	16.52	9.99	16.47	10.04	dry	na	dry	na
4/19/2002	12.75	10.12	12.68	10.09	16.64	9.87	16.61	9.90	dry	na	dry	na
5/3/2002	13.03	9.84	12.96	9.81	16.97	9.54	16.94	9.57	dry	na	dry	na
6/5/2002	13.04	9.83	12.97	9.80	16.63	9.88	16.95	9.56	dry	na	dry	na
7/8/2002	12.86	10.01	12.79	9.98	16.77	9.74	16.72	9.79	dry	na	dry	na
8/2/2002	12.86	10.01	12.79	9.98	16.8	9.71	15.73	10.78	dry	na	dry	na
9/5/2002	12.86	10.01	12.78	9.99	16.77	9.74	16.75	9.76	dry	na	dry	na
9/26/2002	12.94	9.93	12.85	9.92	16.85	9.66	16.83	9.68	dry	na	dry	na
11/6/2002	12.64	10.23	12.58	10.19	16.59	9.92	16.48	10.03	dry	na	dry	na
12/6/2002	13.02	9.85	12.94	9.83	16.97	9.54	16.95	9.56	dry	na	dry	na
1/2/2003	13.07	9.80	13.00	9.77	17.03	9.48	17.01	9.50	dry	na	dry	na
2/12/2003	13.20	9.67	13.12	9.65	17.19	9.32	17.16	9.35	dry	na	dry	na
3/4/2003	13.21	9.66	13.15	9.62	17.22	9.29	17.20	9.31	dry	na	dry	na
4/1/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.79	9.72	dry	na	dry	na
5/8/2003	13.05	9.82	12.97	9.80	17.01	9.50	16.96	9.55	dry	na	dry	na
6/3/2003	13.11	9.76	13.14	9.63	17.09	9.42	17.04	9.47	dry	na	dry	na
6/30/2003	12.92	9.95	12.85	9.92	16.83	9.68	16.79	9.72	dry	na	dry	na
8/11/2003	12.91	9.96	12.84	9.93	16.82	9.69	16.78	9.73	dry	na	dry	na
9/5/2003	13.00	9.87	12.92	9.85	16.93	9.58	16.88	9.63	dry	na	dry	na
9/29/2003	12.99	9.88	12.91	9.86	16.93	9.58	16.90	9.61	dry	na	dry	na
11/3/2003	12.90	9.97	12.83	9.94	16.82	9.69	16.78	9.73	dry	na	dry	na
12/2/2003	13.01	9.86	12.93	9.84	16.95	9.56	16.94	9.57	dry	na	dry	na
12/29/2003	12.8	10.07	12.74	10.03	16.7	9.81	16.67	9.84	dry	na	dry	na
2/2/2004	13.12	9.75	13.05	9.72	dry	na	dry	na	dry	na	dry	na
3/1/2004	13.08	9.79	13.03	9.74	dry	na	dry	na	dry	na	dry	na

Table 3
Kin-Buc Landfill
Leachate Cleanout Monitoring
2004

Cleanout location	14N		14E		15N		15E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.36		31.32	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
4/1/2004	12.89	9.98	12.825	9.95	dry	na	dry	na	dry	na	dry	na
5/6/2004	12.17	10.70	13.1	9.67	dry	na	dry	na	dry	na	dry	na
6/3/2004	13.21	9.66	13.14	9.63	dry	na	dry	na	dry	na	dry	na
7/1/2004	13.23	9.64	13.18	9.59	17.25	9.26	17.22	9.29	dry	na	dry	na

Table 2-1

Kin-Buc Landfill
Operable Unit 1
Continuous Hydraulic Monitoring Well Network/Transects

Transect Location No.	Screened Hydrogeologic Unit	Well Location Inside Slurry Wall	Well Location Outside Slurry Wall
1	Refuse/Fill	W-1G	W-2G
2	Refuse/Fill	W-3G	W-4G
	Sand and Gravel	W-3S	W-4S
	Bedrock	W-3RR	W-4R
3	Refuse/Fill	W-5G	W-6G
	Sand and Gravel	W-5S	W-6S
	Bedrock	W-5R	W-6R
4	Refuse/Fill[1]	W-15G	W-13G
	Sand and Gravel[1]	W-15S	W-13S
	Sand and Gravel	W-7S	W-8S
	Bedrock	W-7R	W-8RR
5	Refuse/Fill	W-9G	W-10G

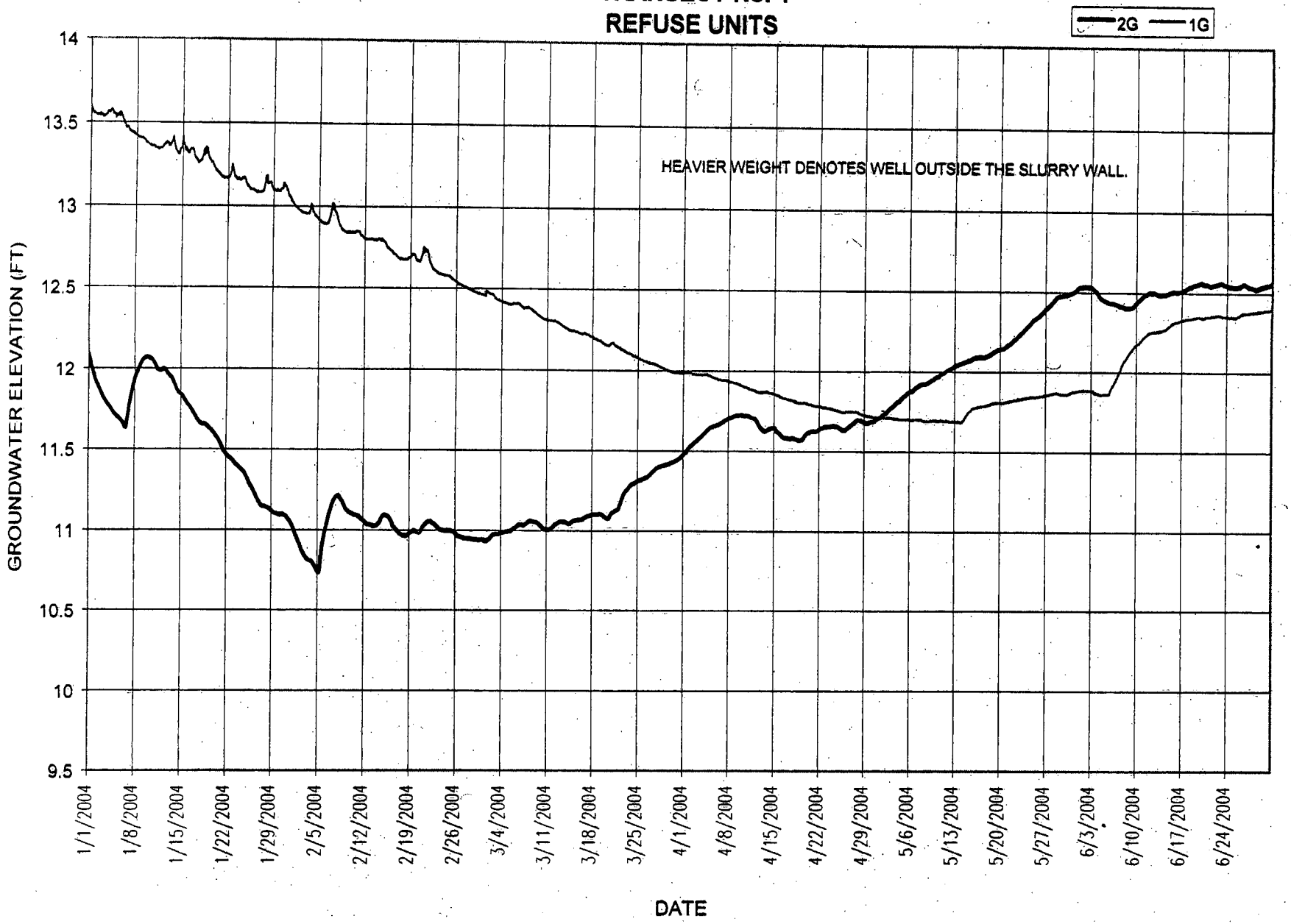
Notes: [1] Wells located across the extended slurry wall.

Table 2-2

Kin-Buc Landfill
Operable Unit 2
Hydraulic Monitoring Network

Well Location	Screened Hydrogeologic Unit
Low-Lying Area	
GEI-10G	Fill/Refuse
WE-10S	Sand & Gravel
WE-10R	Bedrock
GEI-3G	Fill/Refuse
WE-3S	Sand & Gravel
WE-3R	Bedrock
Mound B	
GEI-5G	Fill/Refuse
WE-5S	Sand & Gravel
WE-5R	Bedrock
GEI-6G	Fill/Refuse
GEI-6S	Sand & Gravel
WE-6R	Bedrock
GEI-7G	Fill/Refuse
WE-7S	Sand & Gravel
WE-7R	Bedrock
Upgradient	
WE-114DR	Bedrock

KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #1
TRANSECT No. 1
REFUSE UNITS



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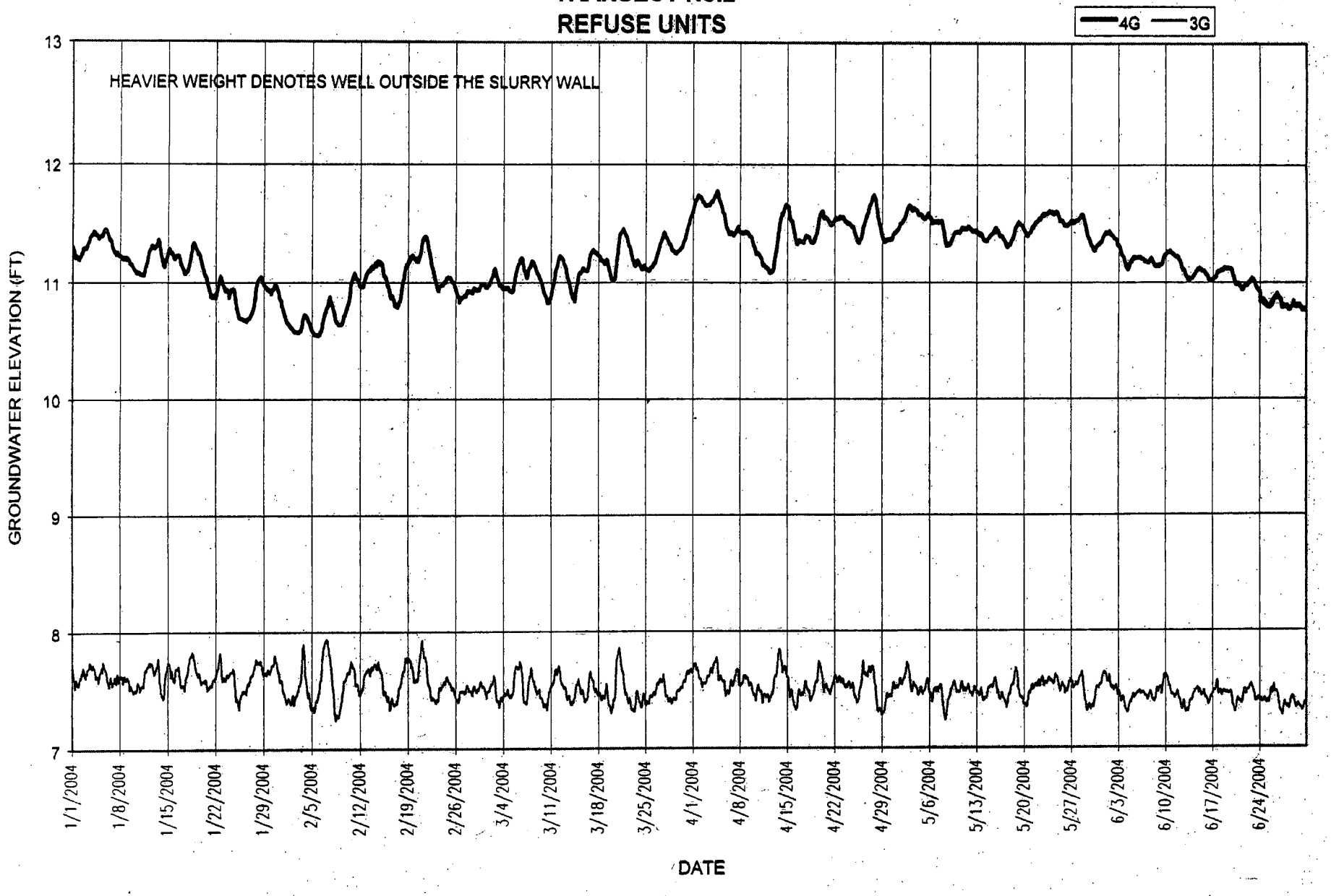
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #2
TRANSECT No.2
REFUSE UNITS



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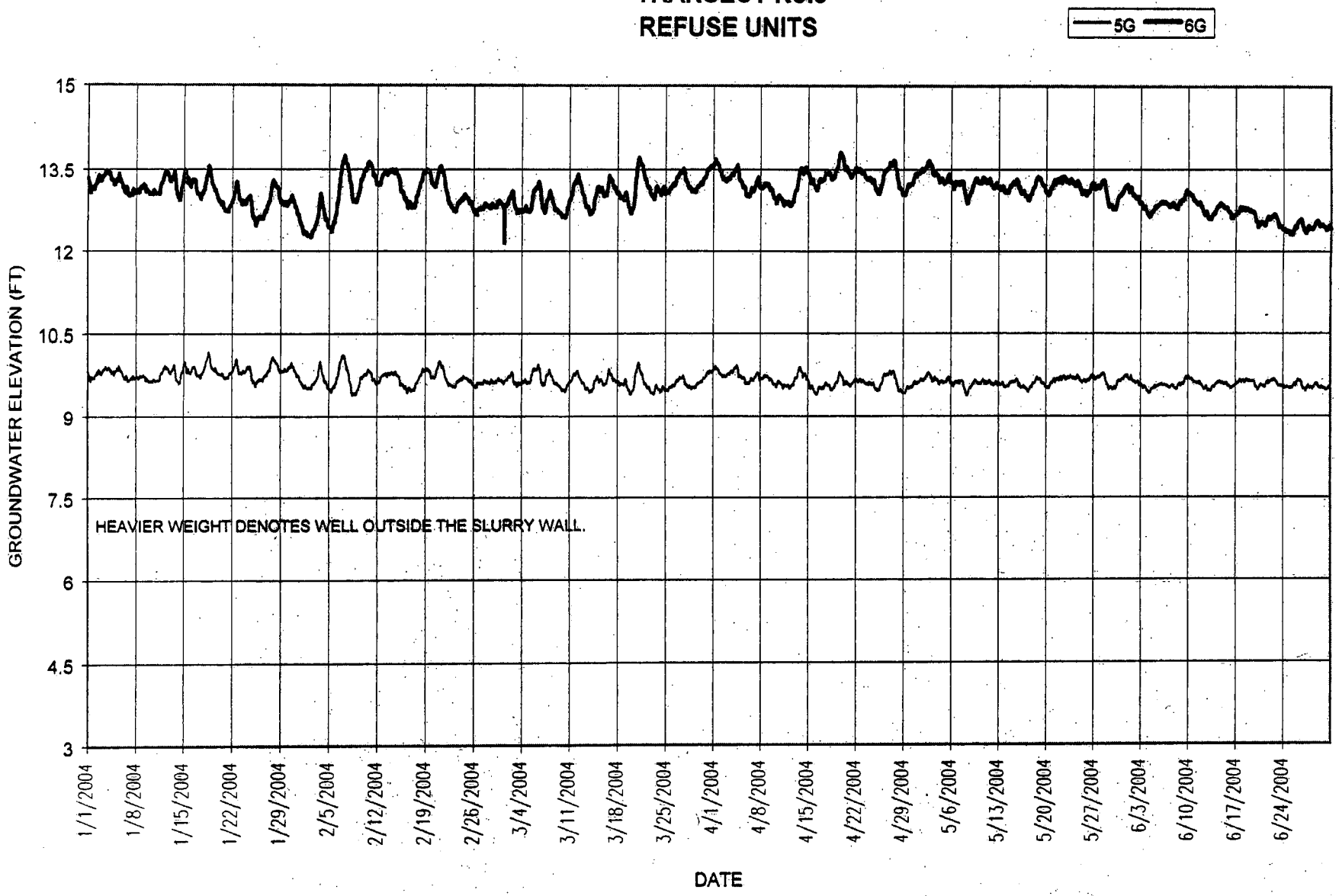
TRANSECT No.3
REFUSE UNITS



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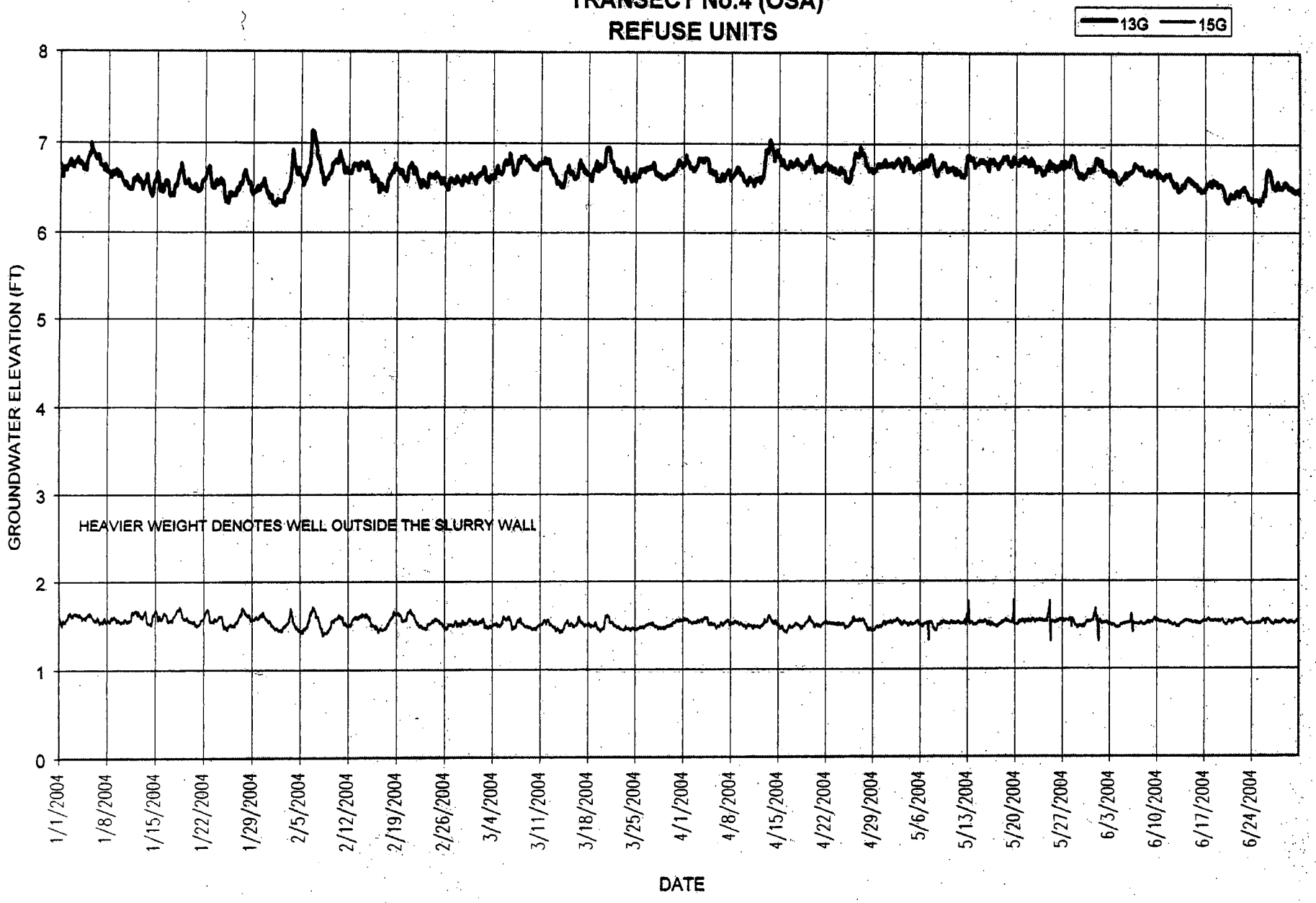
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #4
TRANSECT No.4 (OSA)
REFUSE UNITS



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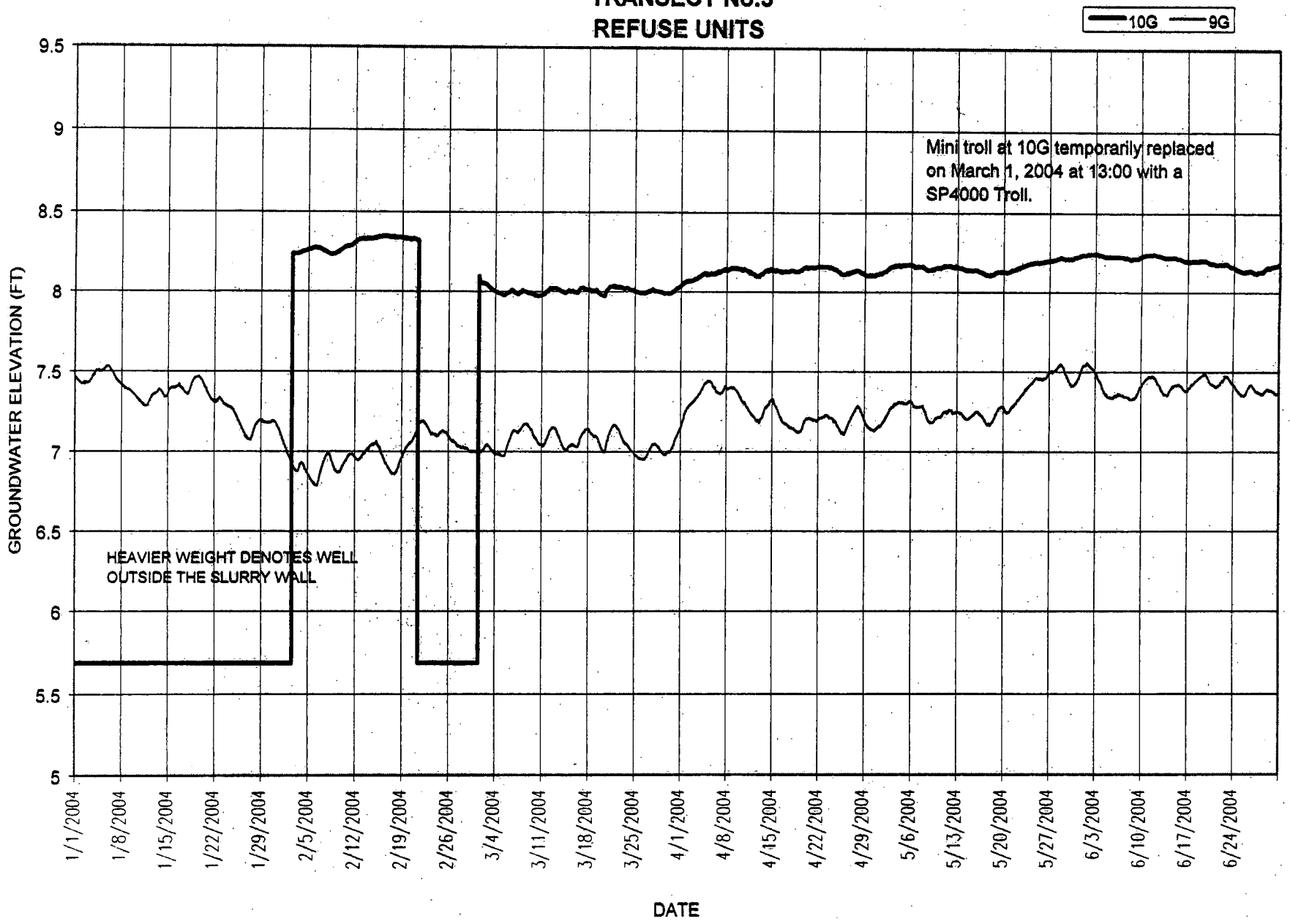
TRANSECT No.5
REFUSE UNITS



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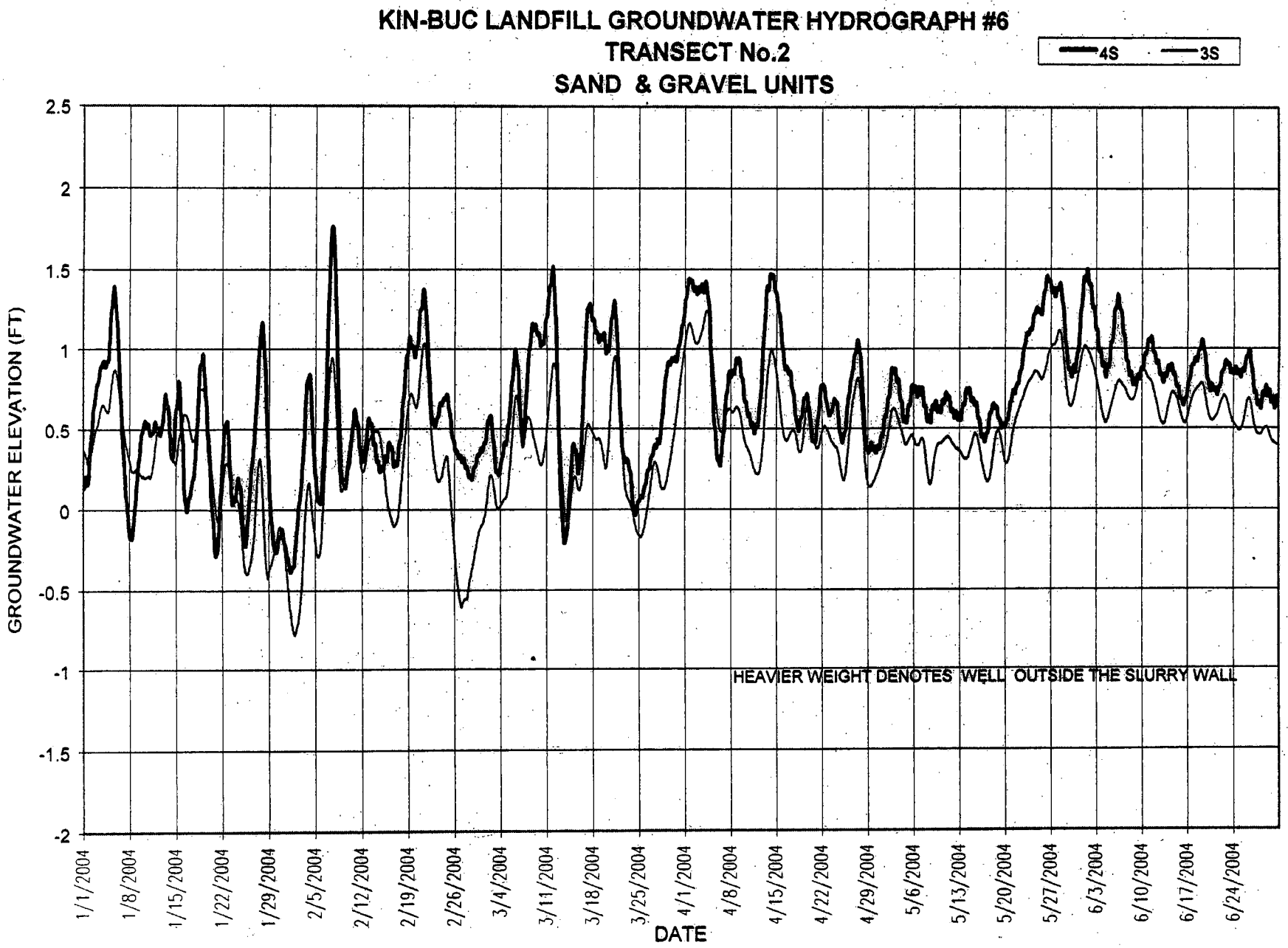

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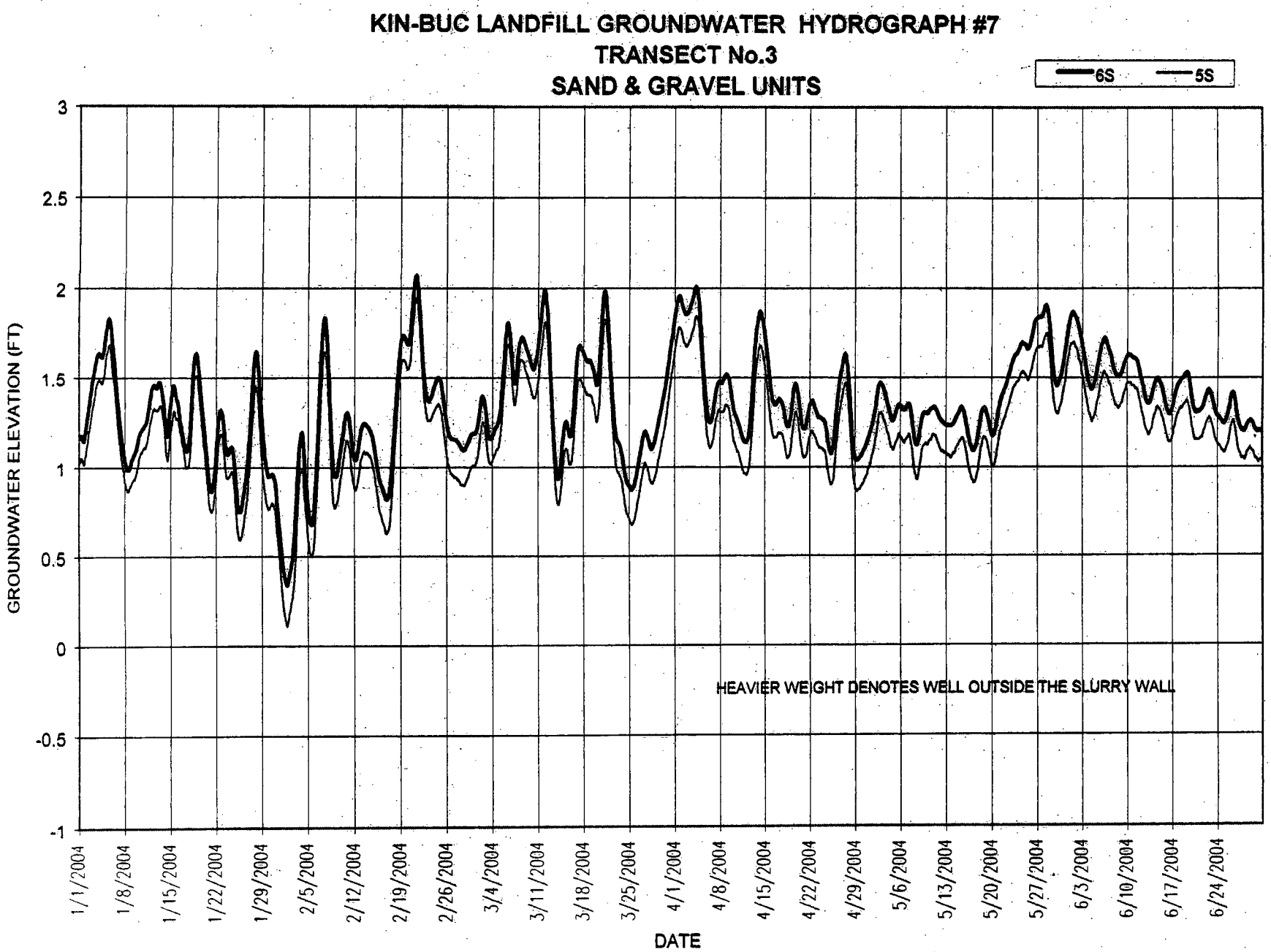

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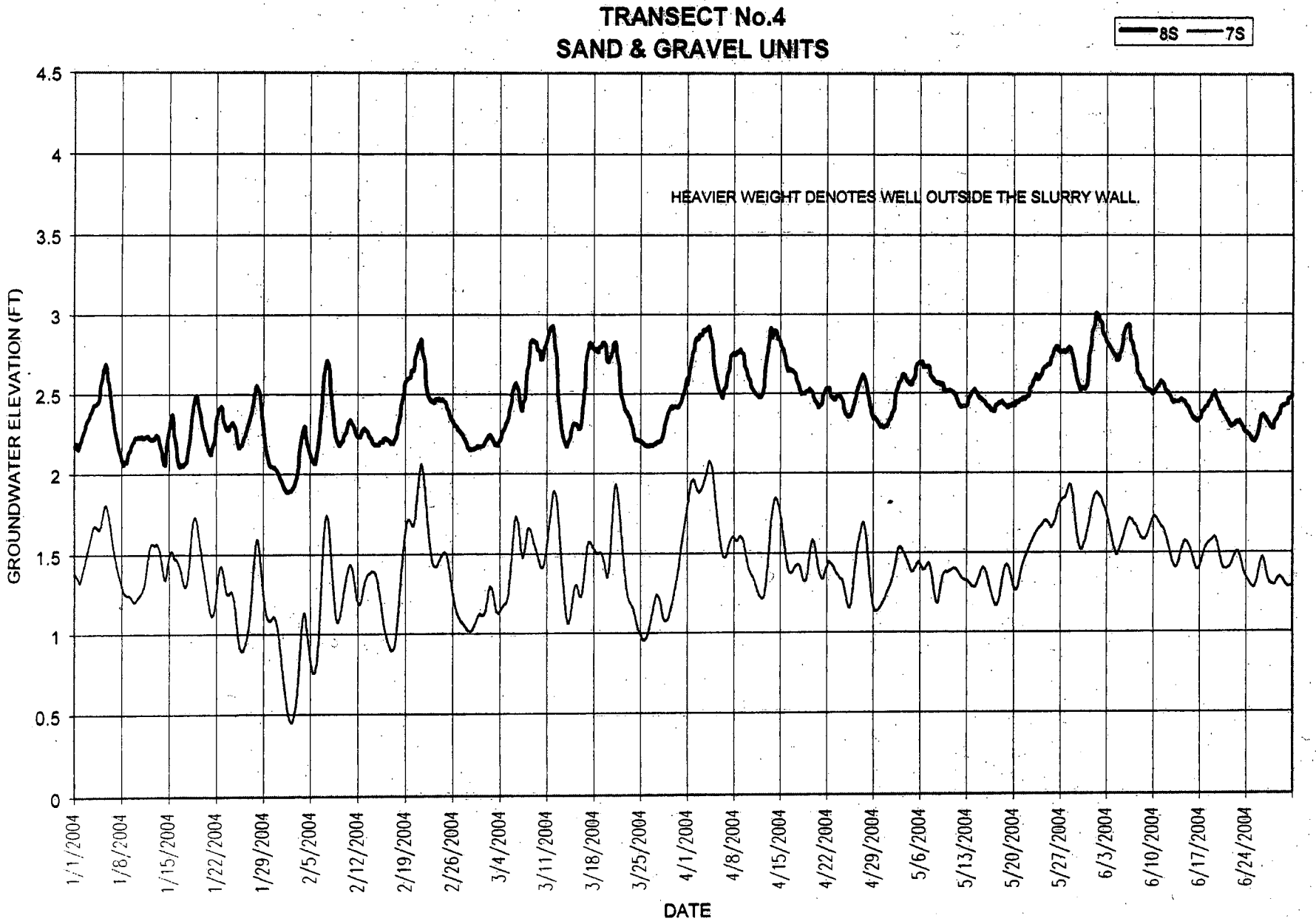
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #8
TRANSECT No.4
SAND & GRAVEL UNITS



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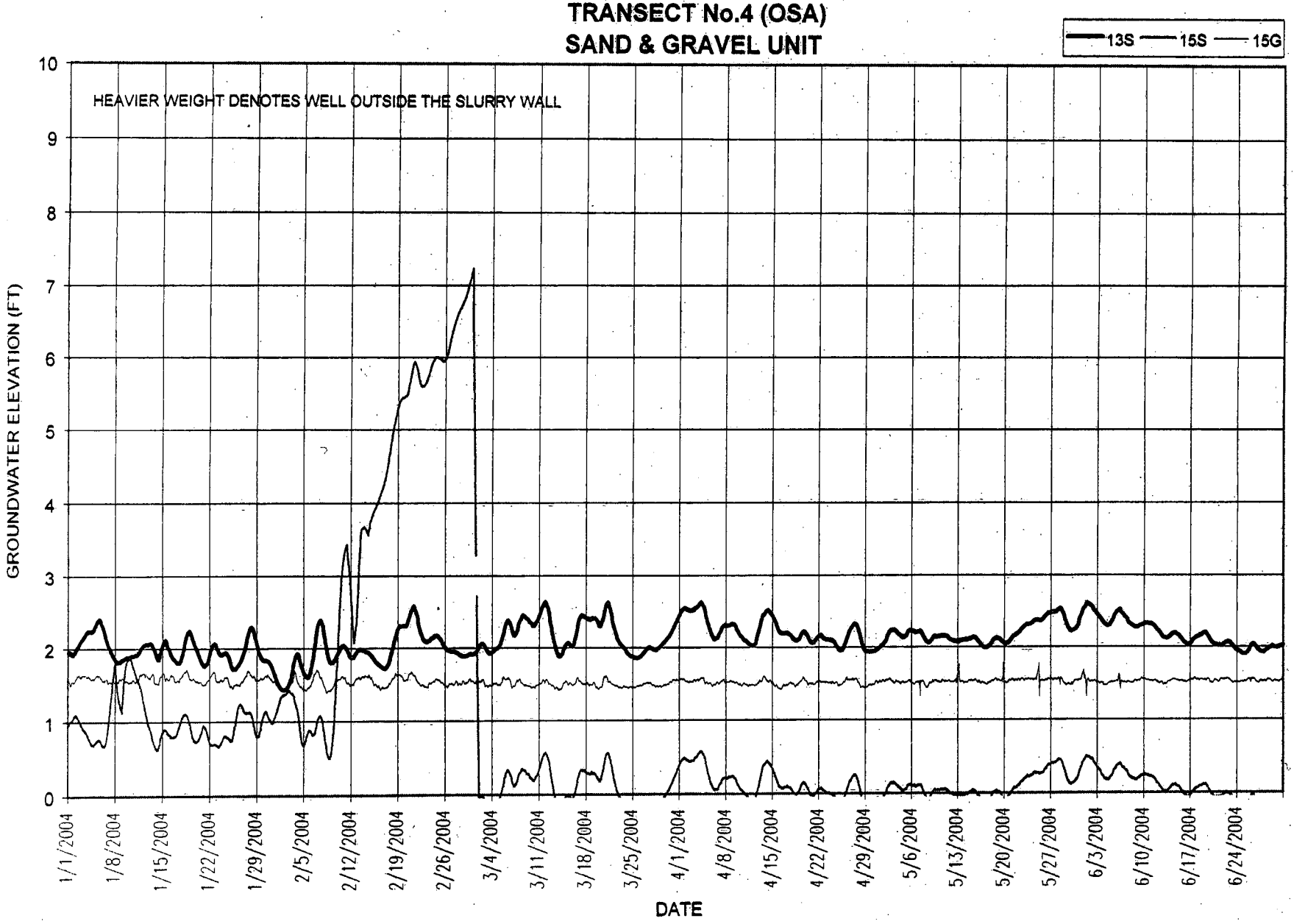
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #9
TRANSECT No.4 (OSA)
SAND & GRAVEL UNIT



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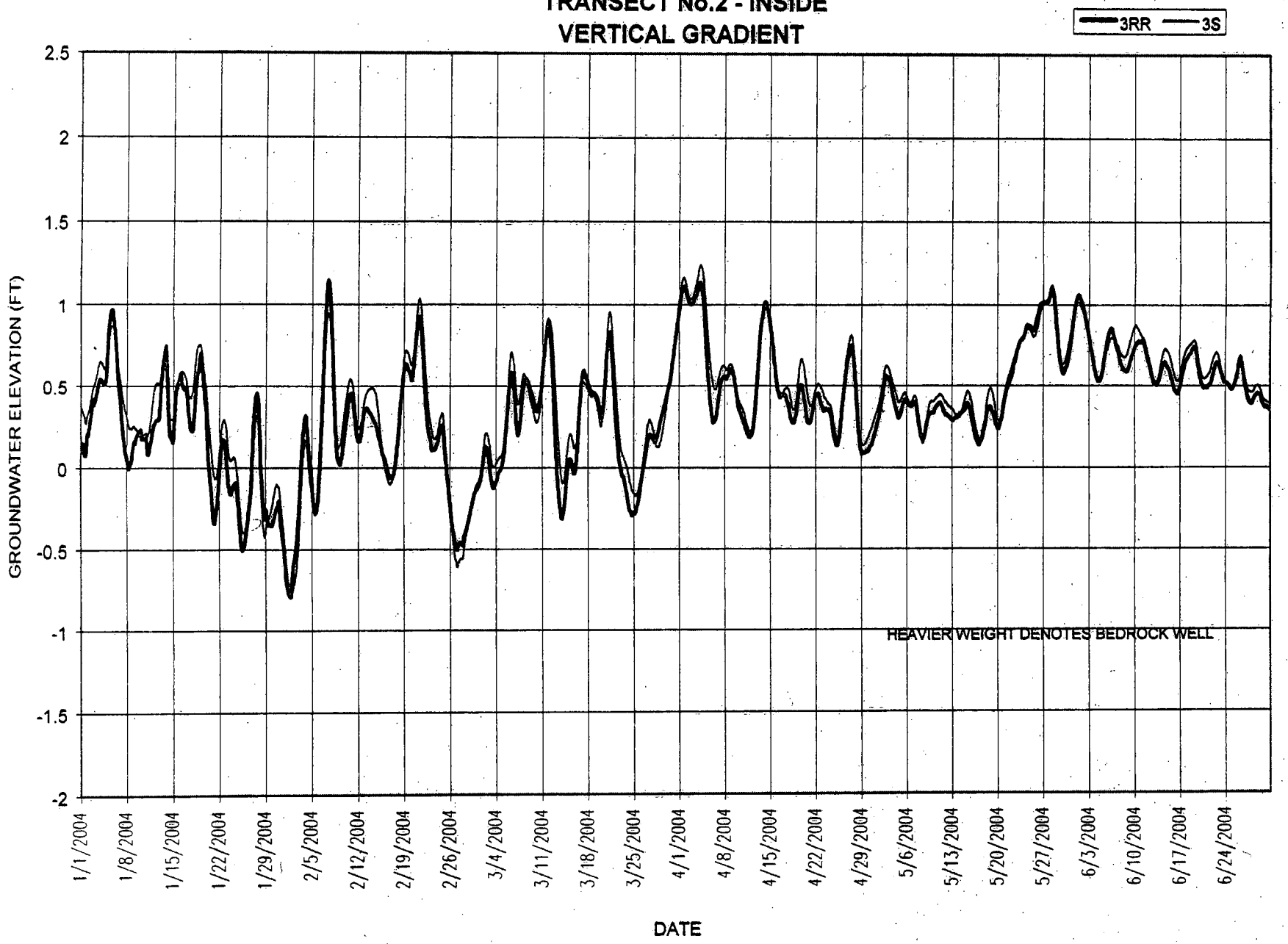
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #10
TRANSECT No.2 - INSIDE
VERTICAL GRADIENT



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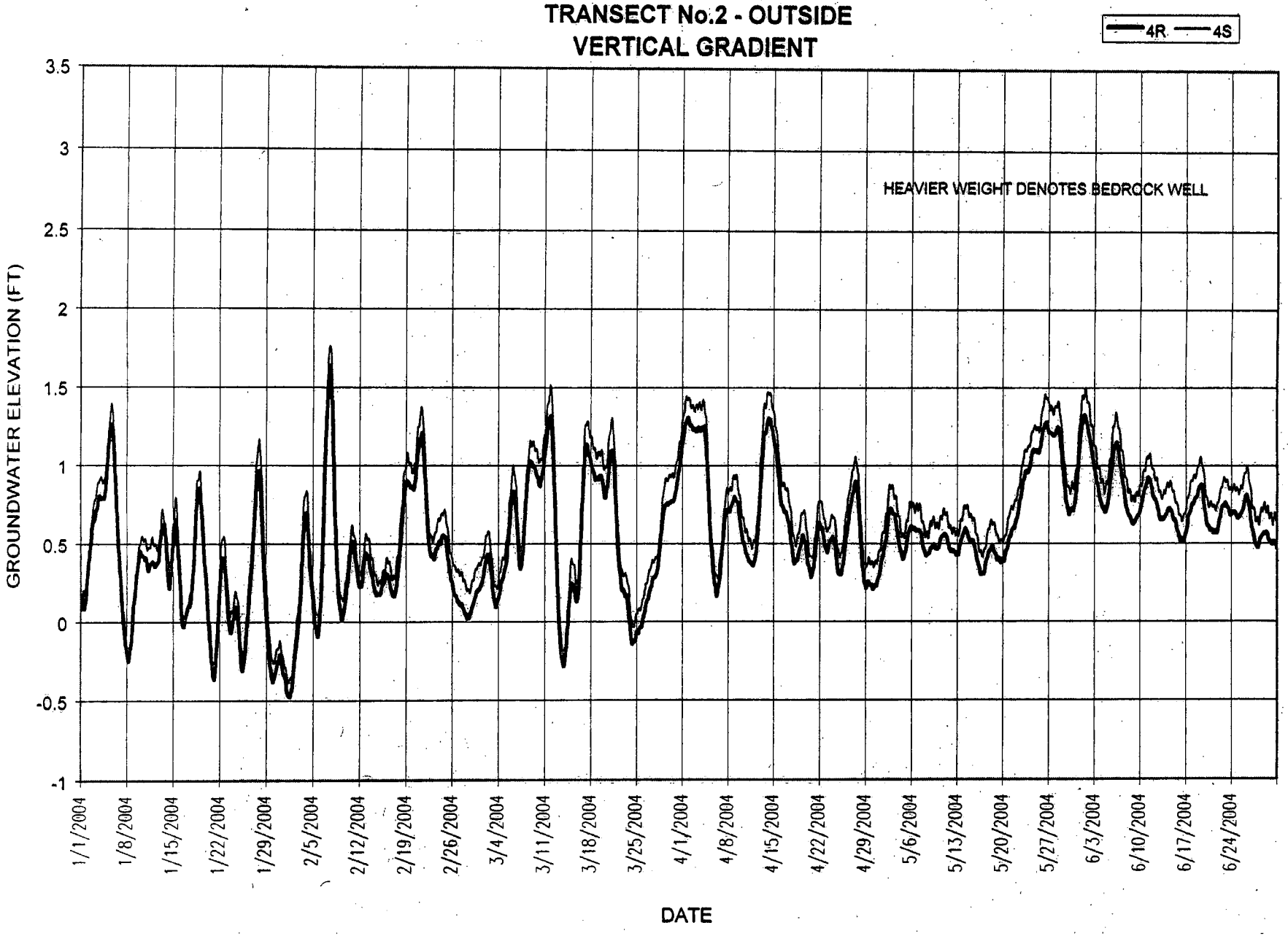
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #11
TRANSECT No.2 - OUTSIDE
VERTICAL GRADIENT



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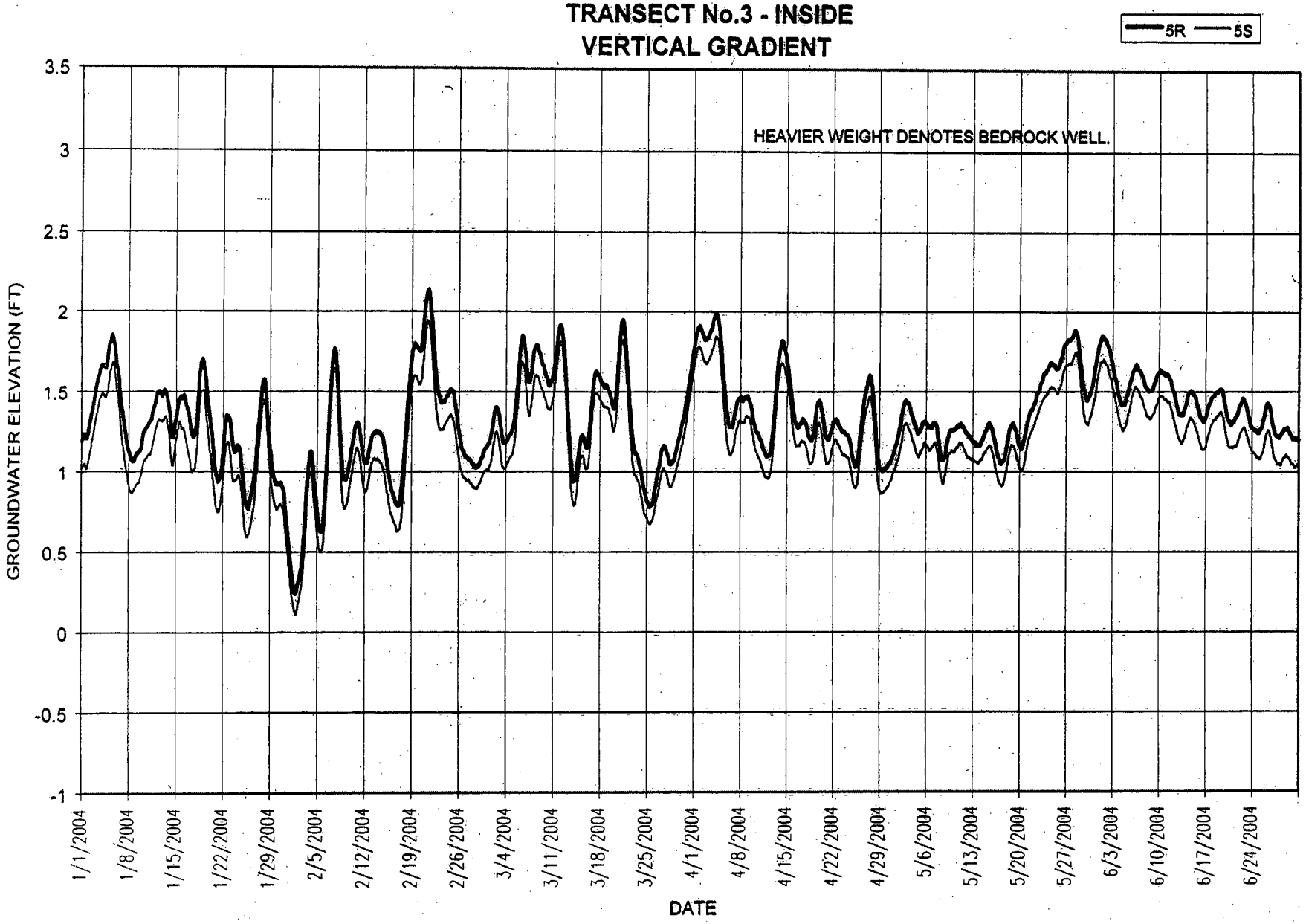
KIN-BUC LANDFILL GROUNDWATER HYDROGRAPH #12
TRANSECT No.3 - INSIDE
VERTICAL GRADIENT



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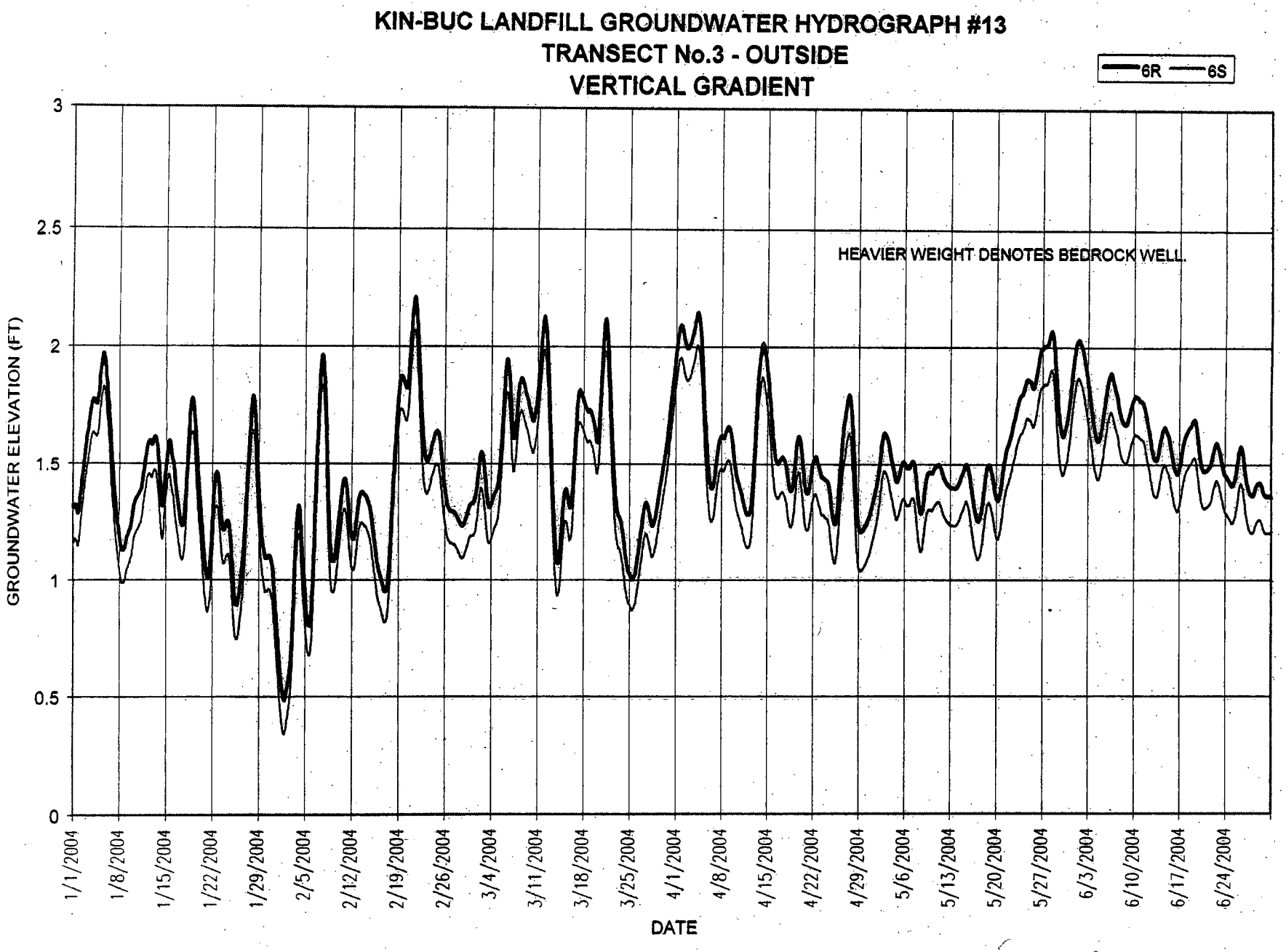

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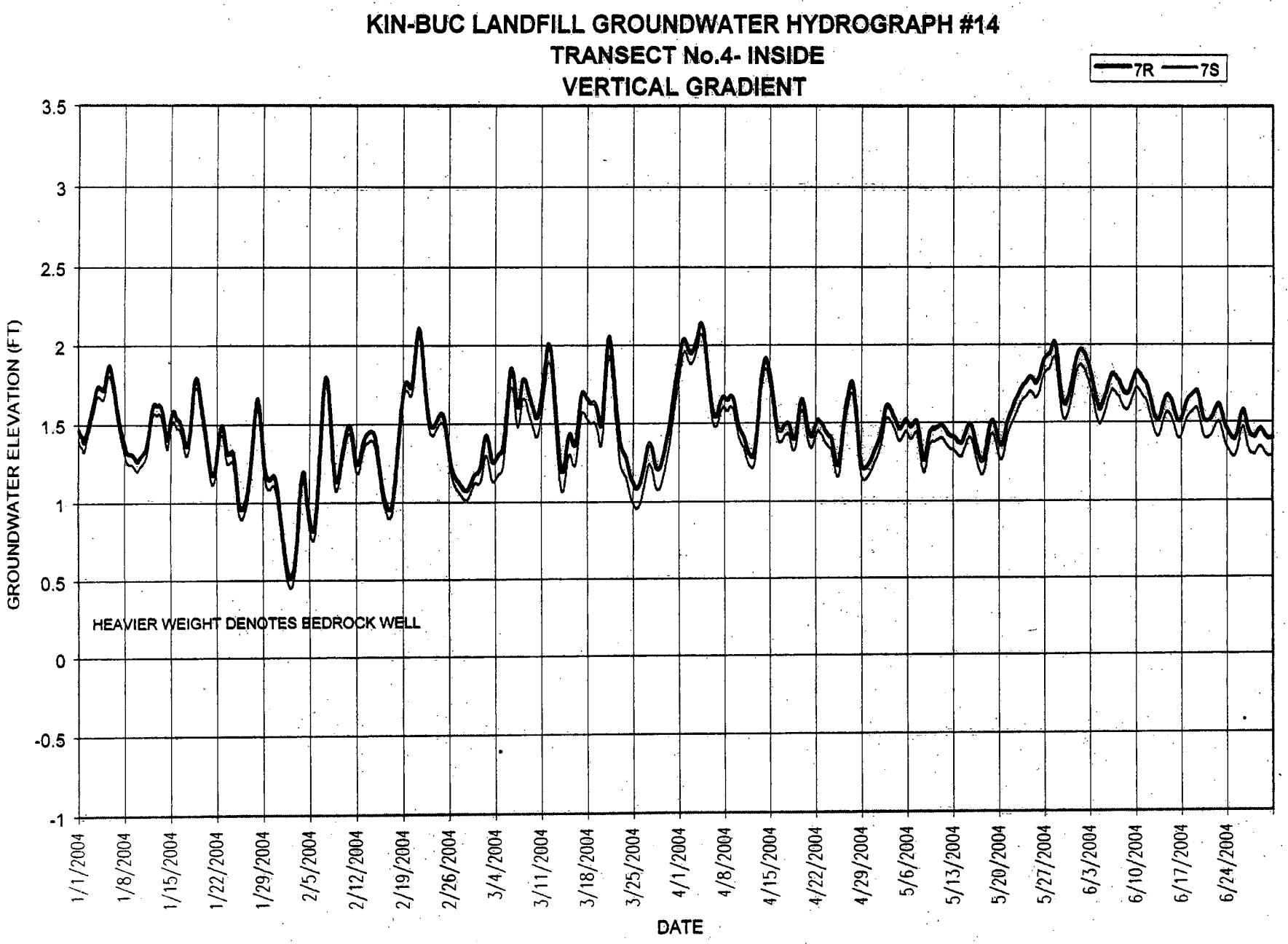

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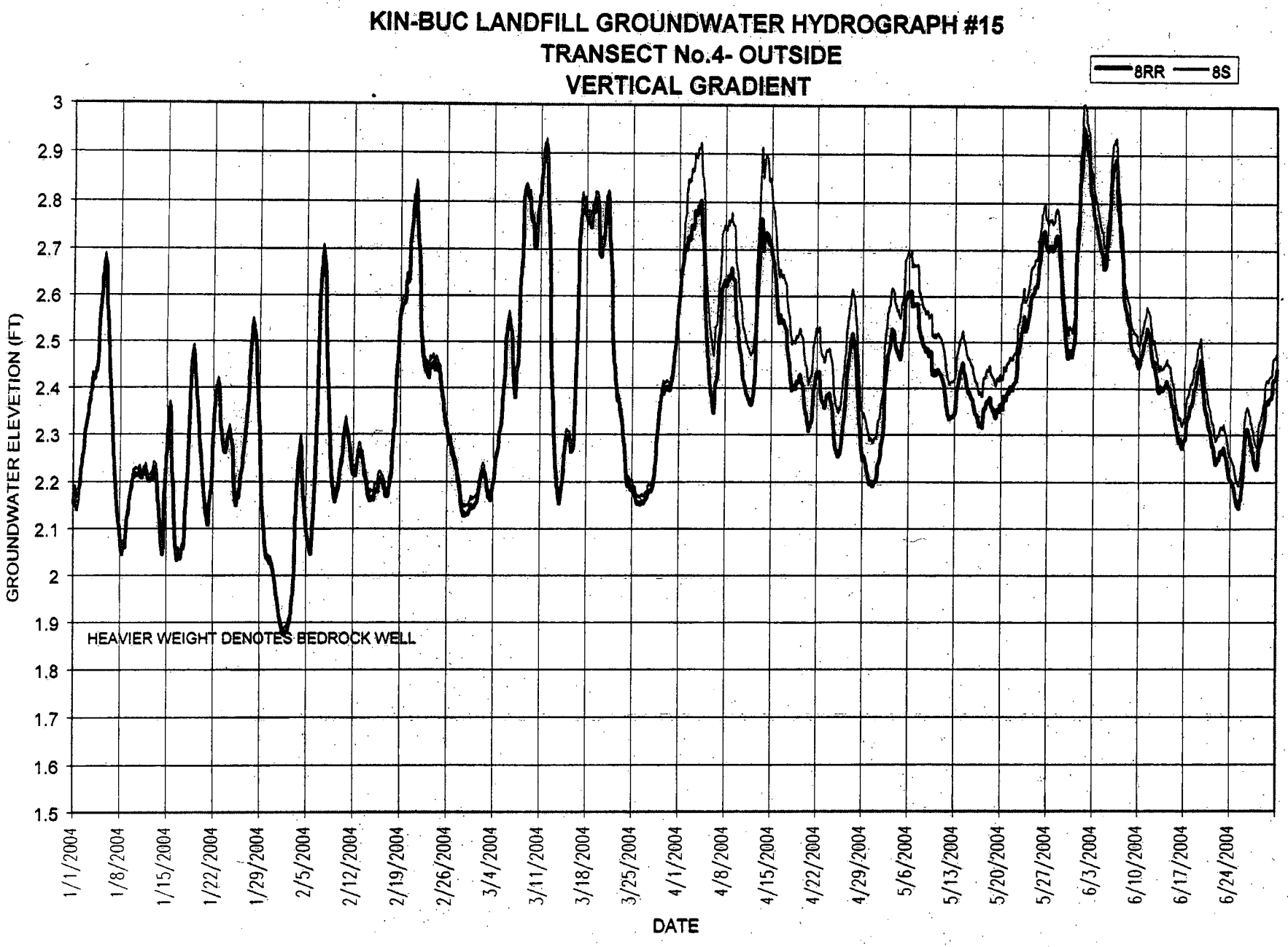

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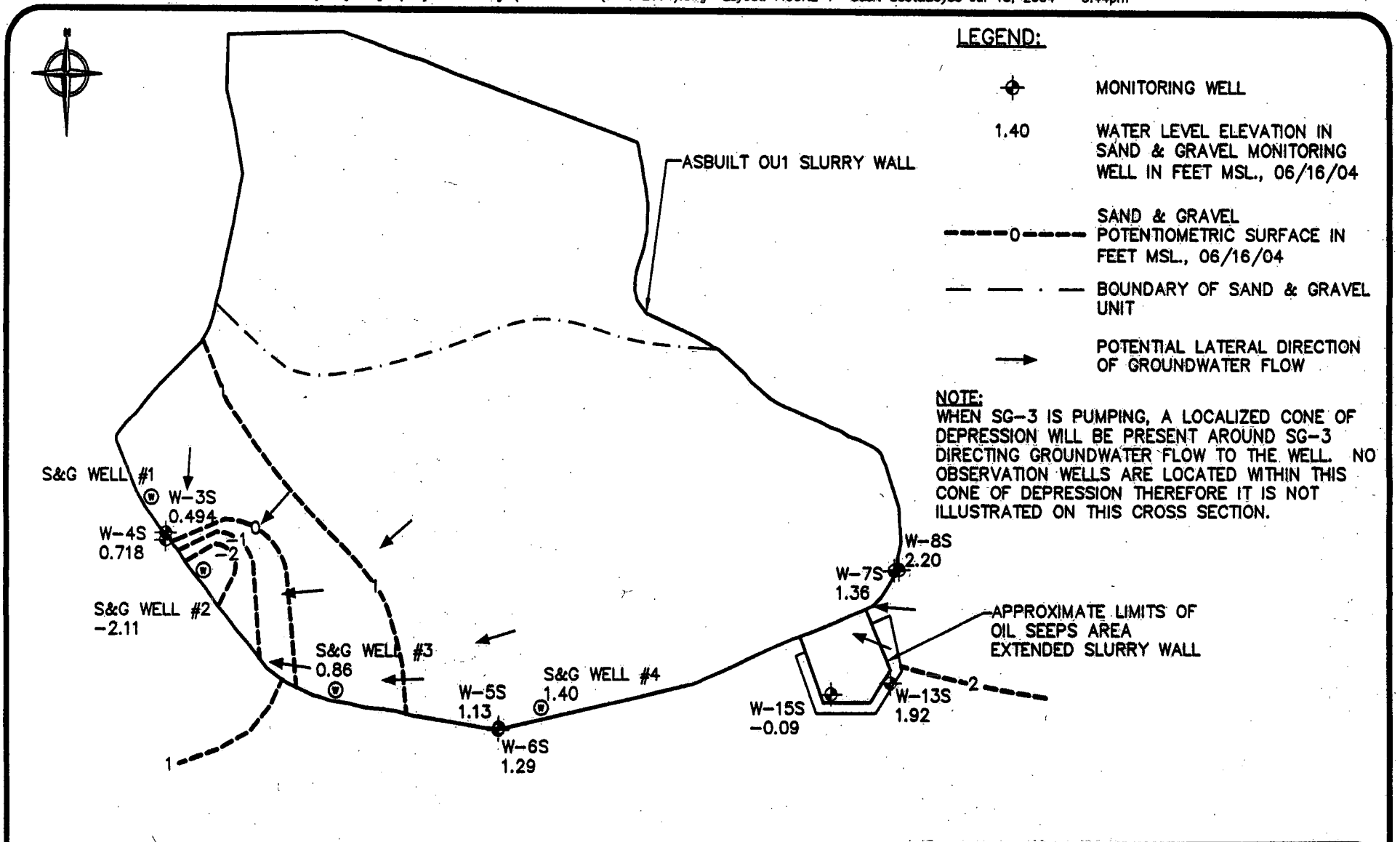
XREF Files: HAKBXBD01 HAKBXB-01 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-01 (June 2004).dwg Layout: FIGURE 1 User: Scott.Boyce Jul 15, 2004 - 3:44pm



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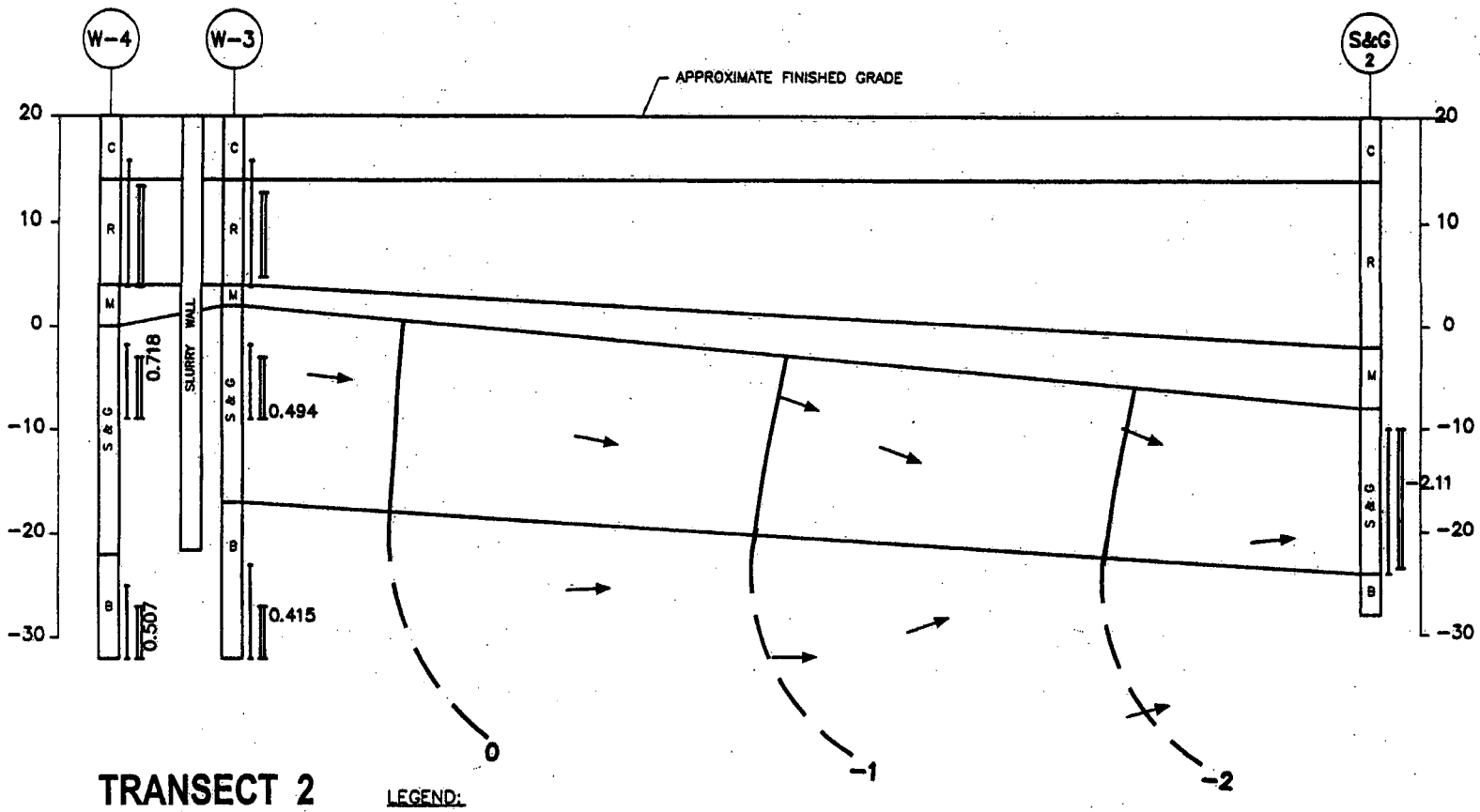
0 400 800
SCALE IN FEET

DATE 7/09/04
DWN ACS
APP ZL
REV
PROJECT NO. 102052

FIGURE 1
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
SAND & GRAVEL UNIT
POTENTIOMETRIC SURFACE

XREF Files: HAKBXBD01 HAKBXP-01 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-02 (June 2004).dwg Layout: FIGURE 2 User: andrew.schellberg Jul 09, 2004 - 2:46pm



TRANSECT 2

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	0.415	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 06/16/04
C	- CAP		
R	- REFUSE	—-1—	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 06/16/04
M	- MEADOW MAT		
S & G	- SAND & GRAVEL	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

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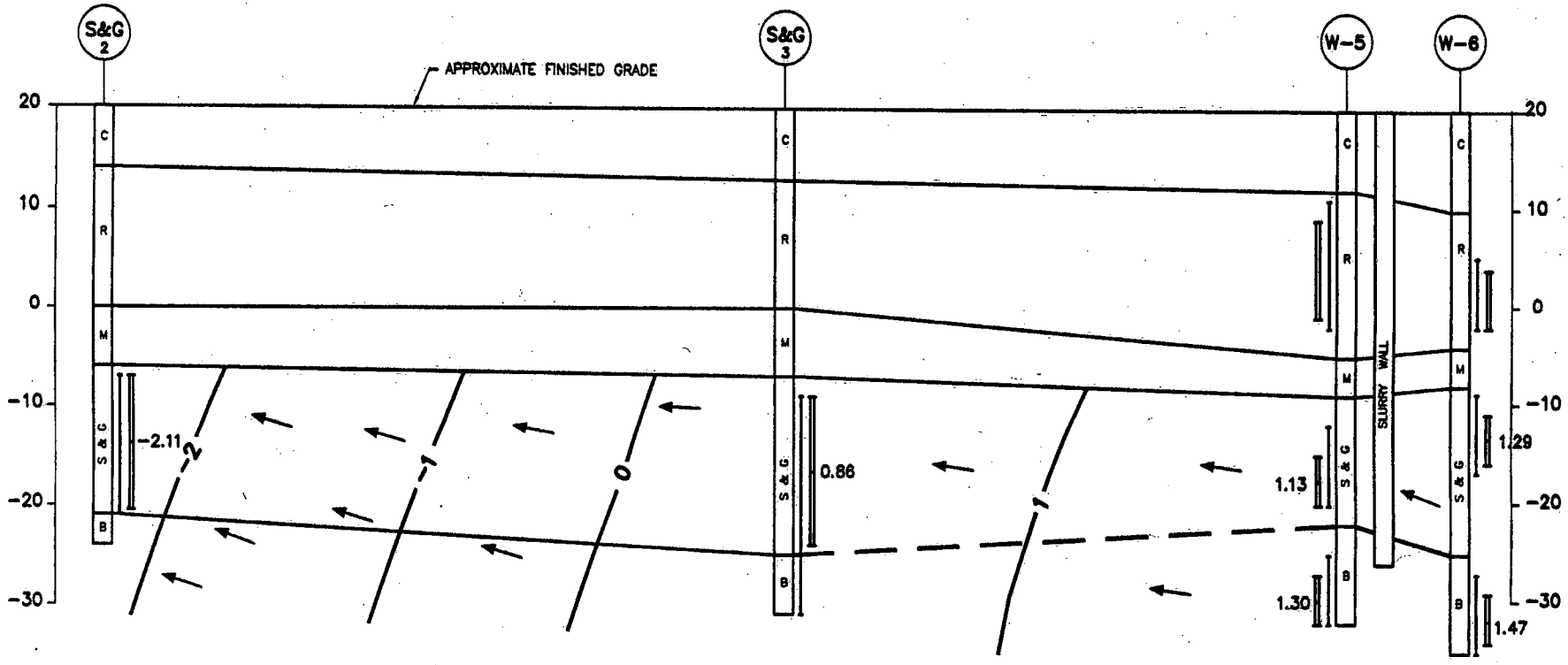
DATE 7/09/04
DWN ACS
APP ZL
REV
PROJECT NO. 102052

FIGURE 2
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
TRANSECT 2
HYDROGEOLOGIC CROSS SECTION ANALYSIS

XREF Files: HAKBXBD01 HAKBXP-02 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-03 (June 2004).dwg Layout: FIGURE 3 User: Scott.Boyce Jul 15, 2004 - 3:46pm



TRANSECT 3

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	0.86	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 06/16/04
C	- CAP	— 1 —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 06/16/04
R	- REFUSE		
M	- MEADOW MAT		
S & G	- SAND & GRAVEL	→	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.

SAND PACK INTERVAL

SCREENED INTERVAL

NOTE:
WHEN SG-3 IS PUMPING, A LOCALIZED CONE OF DEPRESSION WILL BE PRESENT AROUND SG-3 DIRECTING GROUNDWATER FLOW TO THE WELL. NO OBSERVATION WELLS ARE LOCATED WITHIN THIS CONE OF DEPRESSION THEREFORE IT IS NOT ILLUSTRATED ON THIS CROSS SECTION.

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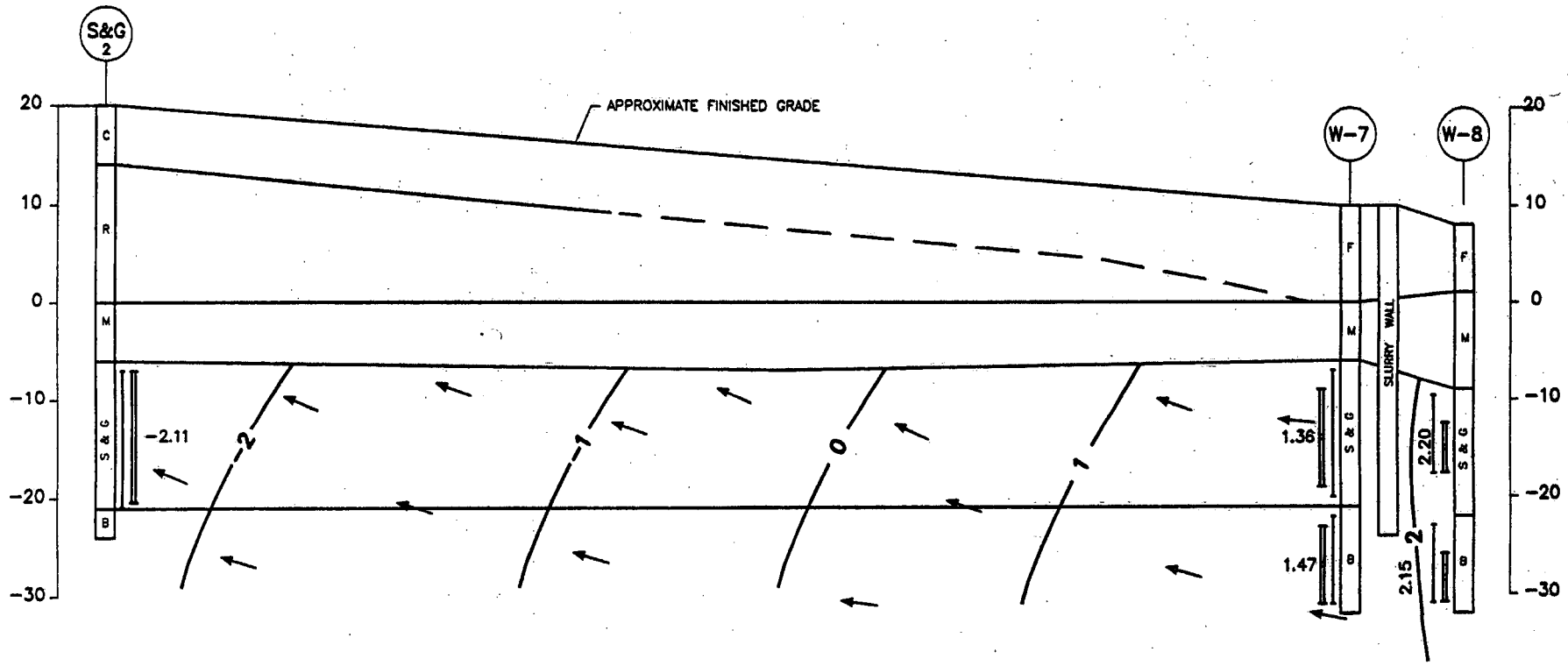
DATE 7/09/04
DWN ACS
APP ZL
REV
PROJECT NO.
102052

FIGURE 3
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
TRANSECT 3
HYDROGEOLOGIC CROSS SECTION ANALYSIS

XREF Files: HAKBXBD01 HAKBXP-03 IMAGE Files:
File: N:\Cad\Projects\Kin-buc Landfill - hydrogeologic\Project Drawings\HAKBSF-04 (June 2004).dwg Layout: FIGURE 4 User: andrew.schellberg Jul 09, 2004 - 3:05pm



TRANSECT 4

SCALE: N.T.S.

LEGEND:

B	- BEDROCK	1.47	ELEVATION OF WATER LEVEL IN MONITORING WELL, IN FEET MSL., 06/16/04
C	- CAP	— 0 —	GROUNDWATER EQUIPOTENTIAL IN BEDROCK AND SAND & GRAVEL, IN FEET MSL., 06/16/04
R	- REFUSE	←	POTENTIAL VERTICAL DIRECTION OF GROUNDWATER FLOW.
M	- MEADOW MAT		
S & G	- SAND & GRAVEL		

SAND PACK INTERVAL

SCREENED INTERVAL

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DATE 7/09/04
DWN ACS
APP ZL
REV
PROJECT NO.
102052

FIGURE 4
KIN-BUC LANDFILL
EDISON TOWNSHIP, EDISON
MIDDLESEX COUNTY, NEW JERSEY
TRANSECT 4
HYDROGEOLOGIC CROSS SECTION ANALYSIS

ATTACHMENT 1

OMB-1111-M
1154

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WATER ALLOCATION

MONITORING WELL RECORD

Well Permit No. 25 - 46505
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-TIC INC
Address 2222 CENTENNIAL AVE
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address.
County MIDDLESEX Municipality WILSON TWP Owner's Well No. 1G
Address 383 Hoffman Road, Edison, NJ Lot No. 483 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
CONSULTING FIELD SUPERVISOR (if applicable) Case I.D. # NJD981800036
Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade
[ ] flush mounted
If finished above grade, casing height (stick up) above land surface ft.
Was steel protective casing installed? [ ] Yes [X] No
Static water level after drilling – ft.
Water level was measured using –
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid –
Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C (B) A
N.J. License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

	Depth to Top (ft.) (From land surface)	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	14	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Mac slot size)	5	15	2	Sch 40 PVC .020
Tail Piece				
Gravel Pack	3	15.6	8	#2 Block
Annular Seal/Grout	0	5	8	Bentonite slurry
Method of Grouting	tremie			

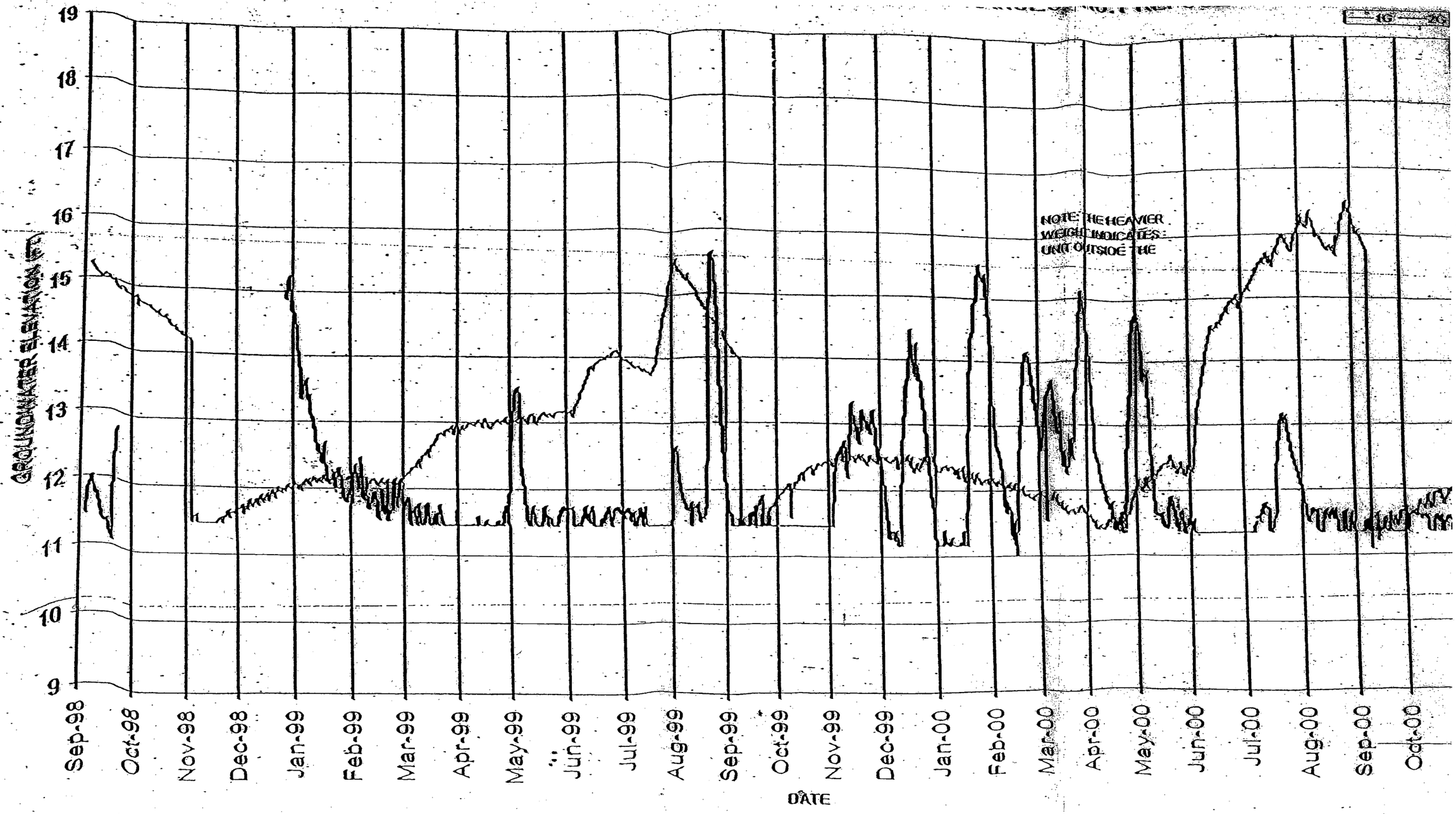
GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red gray dry stiff clay, some silt

I certify that I have drilled the above referenced well in accordance with all well permit requirements and all applicable State rules and regulations.

Driller's Signature Chad Chism

Date



1G
2G
NOTE: THE HEAVIER WEIGHT INDICATES UNIT OUTSIDE THE
GROUNDWATER ELEVATION (FT)
19
18
17
16
15
14
13
12
11
10
9
Sep-98
Oct-98
Nov-98
Dec-98
Jan-99
Feb-99
Mar-99
Apr-99
May-99
Jun-99
Jul-99
Aug-99
Sep-99
Oct-99
Nov-99
Dec-99
Jan-00
Feb-00
Mar-00
Apr-00
May-00
Jun-00
Jul-00
Aug-00
Sep-00
Oct-00
DATE

ATTACHMENT 2

MONITORING WELL RECORD

Well Permit No. 25 - 46506
Atlas Sheet Coordinates 25 : 45 : 428

OWNER IDENTIFICATION - Owner KIN-BOC INC.
Address 200 CENTENNIAL AVE.
City PISCATAWAY State NJ Zip Code

WELL LOCATION - If not the same as owner please give address.
County HIDDLESEX Municipality EDISON TWP Owner's Well No. 2C
Address 383 Meadows Road, Edison, NJ Lot No. 400 Block No. 3C

TYPE OF WELL (as per Well Permit Categories) MONITORING
Regulatory Program Requiring Well CERCLA Date well completed 2 / 15 / 95
CONSULTING FIRM/FIELD SUPERVISOR (if applicable) Case I.D. # NJD049860036
Tele. #

WELL CONSTRUCTION

Total depth drilled 15.6 ft.
Well finished to 15 ft.
Borehole diameter:
Top 8 in.
Bottom 8 in.
Well was finished: [X] above grade [ ] flush mounted
If finished above grade, casing height (stick up) above land surface 4 ft.
Was steel protective casing installed? [ ] Yes [X] No

	Depth to Top (ft.) (From land surface)	Depth to Bottom (ft.)	Diameter (inches)	Type and Material
Inner Casing	44	5	2	Sch 40 PVC
Outer Casing (Not Protective Casing)				
Screen (Note slot size)	5	15	2	Sch 40 PVC .010
Tail Piece				
Gravel Pack	3	15.6	8	#00 Ricci
Annular Seal/Grout	0	3	8	Bentonite slurry
Method of Grouting	tremie			

Static water level after drilling - ft.
Water level was measured using -
Well was developed for N/A hours at N/A gpm
Method of development N/A
Was permanent pumping equipment installed? [ ] Yes [X] No
Pump capacity N/A gpm
Pump type: N/A
Drilling Method HSA
Drilling Fluid - Type of Rig B-61
Name of Driller Chad Chism
Health and Safety Plan submitted? [ ] Yes [X] No
Level of Protection used on site (circle one) None D C (B) A
N.J. License No. 0013753-001375
Name of Drilling Company HARDIN-HUBER, INC.

GEOLOGIC LOG (Copies of other geologic logs and/or geophysical logs should be attached.)

0 - 15.6	red dry stiff clay, some silt

I certify that I have drilled the above-referenced well in accordance with all well permit requirements and all applicable state rules and regulations.

Driller's Signature Chad Chism Date 2/15/95

COPIES: White - DEP Canary - Driller Pink - Owner Goldenrod - Health Dept.

ATTACHMENT 2

the IT group

IT Corporation
Crossroads Corporate Center
One International Boulevard, Suite 700
Mahwah, NJ 07495-0086
Tel. 201.512.5700
Fax. 201.512.5786
A Member of The IT Group

June 27, 2001
Project 796201

Gad Januszkiewicz
Waste Management, Inc
Kin-Buc Landfill Treatment Plant
383 Meadow Road
Edison, NJ 08817

Re: Evaluation of Head Levels at Transect 1

Dear Mr. Januszkiewicz:

We have completed an evaluation of the hydraulic characteristics at Transect 1 with specific focus on the lack of intragradient conditions associated with the high water levels in W-1G (inside of the slurry wall) relative to those levels in W-2G (outside of the wall).

While intragradient conditions were evident at the outset of the hydraulic monitoring program in April 1996, these conditions have generally not been maintained. Specifically, based on a review of historical hydrographs, intragradient conditions were evident initially from approximately April to July 1996, and April to June 1997. Thereafter, to more recent events, intragradient conditions have been observed intermittently and for shorter periods of time.

Attachment 1 presents a hydrograph at Transect 1 encompassing the period from September 1998 to December 2000. As seen on the hydrograph, there were periods of time when intragradient conditions were not being maintained.

As opposed to the other "G" series monitoring wells that are located in refuse, wells 1G and 2G at Transect 1 are actually located in a silt and clay deposit. Attachment 2 contains the boring logs for these 2 installations. In-situ hydraulic conductivity testing performed at Transect 1 indicated permeabilities of 10^{-4} cm/sec and 10^{-5} cm/sec in W-1G and W-2G, respectively. Accordingly, a source of recharge to the overburden soils in the area of W-1G would not readily drain away, and therefore, higher heads could result.

Well 1G sampling events (November 1998, October 1999, October 2000) can be seen on the hydrograph as sharp vertical drops in groundwater levels. Due to the low permeability of the surrounding materials, the groundwater levels required several months to recover. Since the final cover extends 10 feet past the slurry wall, the source of the groundwater that is recharging W-1G is unknown at present.

The hydraulic gradient between W-1G and W-1R is vertically downward which rules out the bedrock as being a source of groundwater recharge. Based on a recent visual inspection of the area around Transect 1, the cap appears to be good condition and there were no signs that the cap integrity has been compromised.

Figure 1 depicts the conceptual model of the hydraulic interrelationship across Transect 1 showing water level measurements that depict the lack of intragradient conditions across the

slurry wall. The head levels in W-2G (outside the slurry wall) are generally at elevation 12 to 13 feet msl with periodic and short term increases to about 15 feet msl. The water level in the well sometimes falls below the level of the transducer. This is characterized by a flat straight line on the hydrographs as shown on Attachment 1. Head levels in W-1G (inside the slurry wall), on the other hand, are often greater with elevations as high as 15 to 16 feet msl being recorded.

It is evident from a review of Figure 1 that the drop in topography outside of the slurry wall toward Mill Brook, coupled with the higher permeability of W-2G relative to W-1G, would promote a more rapid decrease of head levels in the latter. This suggests that intragradient conditions may not be consistently attainable at this transect in any event. This notwithstanding however, and as depicted on Figure 1, it is important to note that the leachate collection system represents a hydraulic sink within the containment system. As such, groundwater in the vicinity of W-1G would drain toward the sink mitigating concerns of outward flow.

The leachate collection line runs parallel to the slurry wall and at its closest point is only about 20 feet away from Transect 1. Several cleanouts are located along the collection line with the closest, Cleanout 16, only about 65 feet from Transect 1. Leachate level measurements obtained from the cleanouts during December 2000 and June 2001 indicate a leachate level of 10 to 11 feet msl along the collection line as shown in Table 1. The leachate levels observed suggest that the leachate collection system is presently operating effectively.

Recommendations

Based on the above, it is recommended that during subsequent monitoring events at the site, measurements of leachate levels in Cleanouts 14 through 16 be recorded to verify that the leachate collection system is operating effectively. If liquid levels in the cleanouts increase above 12 to 13 feet msl, then maintenance of the collection line is recommended. Subsequent reports to EPA should include a discussion of the leachate collection system and its role as serving as a hydraulic sink within the containment system.

We trust you find this information useful. If you have any questions, please do not hesitate to contact us.

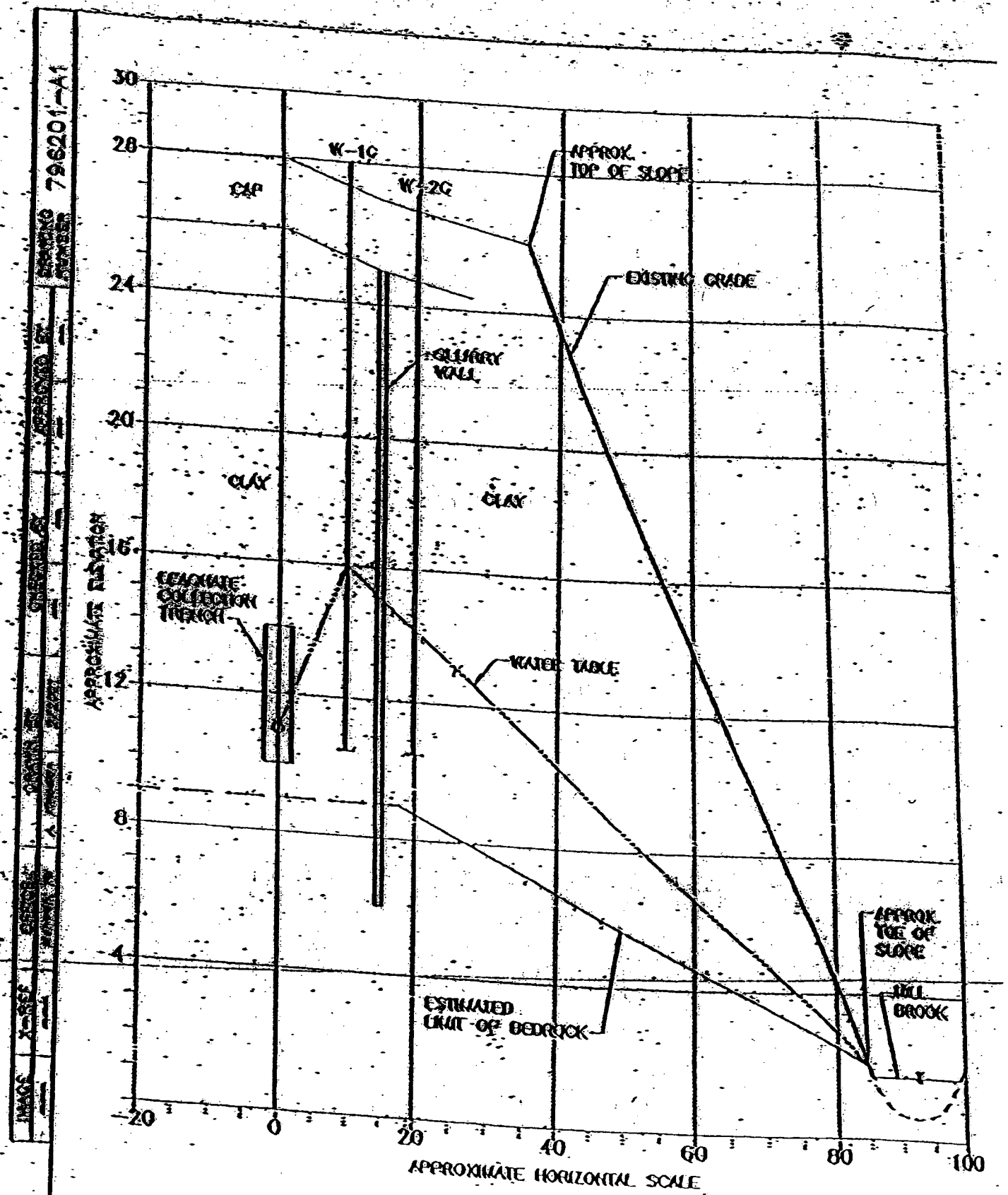
Sincerely,

IT Corporation

Steven Goldberg, Ph.D, CPG
Senior Hydrogeologist

Thomas M. Connors, P.E.
Project Manager

Attachments



0 20 40
HORIZONTAL SCALE IN FEET

0 4 8
VERTICAL SCALE IN FEET

IT CORPORATION

WASTE MANAGEMENT INC.

FIGURE 1
CROSS SECTION
TRANSECT 1

Table 1
Kin-Buc Landfill
Leachate Cleanout Monitoring
2001

Cleanout location	14N		14E		15N		16E		16N		16E	
Elevation @ Sea Level	22.87		22.77		26.51		26.51		31.26		31.22	
	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation	depth to water	elevation
Elevation Average		10.80		10.74		10.68		10.67				11.11
DATE												
6/7/01	11.98	10.89	12.02	10.75	15.88	10.66	15.87	10.64	dry	na	dry	na
5/16/01	12.26	10.62	12.23	10.64	15.96	10.55	15.95	10.55	dry	na	dry	na
4/26/01	12.36	10.61	12.25	10.42	15.99	10.52	16.01	10.50	dry	na	dry	na
3/21/01	11.80	11.07	11.76	11.02	15.62	10.89	15.59	10.92	dry	na	dry	na
2/26/01	12.03	10.84	11.94	10.83	15.95	10.56	15.92	10.59	dry	na	dry	na
1/29/01	12.08	10.79	11.98	10.79	15.85	10.66	15.83	10.68	dry	na	20.41	10.91
12/27/01	12.02	10.85	11.94	10.83	15.72	10.79	15.68	10.83	dry	na	20.01	11.31

Process Variables - Hourly Average Report

Date: 6/16/2004

Time	Pump 203 Speed	SG Well #1 Level	SG Well #2 Level	SG Well #3 Level	SG Well #4 Level	PS1 Leachate Well Level	PS3 Drawdn Well Level	PS4 Drawdn Well Level	PS5 Leachate Well Level	PS3 Oil Storage Level	PS4 Oil Storage Tank Level	PS2 Leachate Well Level	GndWater Coll. Flow Rate	P1101 Pressure	Effluent Chem. Flow Rate	Pump 105 Speed	Pump 105 Speed
12:00:00 AM	13.68	0.29	-2.09	1.04	1.53	3.61	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	17.28	32.44	0.63
1:00:00 AM	13.87	0.29	-2.22	0.93	1.48	3.07	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.01	20.38	32.88	0.64
2:00:00 AM	13.88	0.15	-2.35	0.83	1.44	3.90	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	23.99	32.49	0.62
3:00:00 AM	14.13	-0.08	-2.43	0.76	1.40	3.78	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.01	23.24	32.44	0.65
4:00:00 AM	13.91	0.01	-2.43	0.73	1.36	4.08	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.01	21.38	32.68	0.67
5:00:00 AM	13.54	-0.13	-2.35	0.76	1.35	3.57	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	21.58	32.73	0.72
6:00:00 AM	13.66	-0.34	-2.22	0.78	1.35	3.79	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	22.79	32.80	0.72
7:00:00 AM	13.93	-0.10	-2.12	0.82	1.36	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	21.32	32.66	0.69
8:00:00 AM	13.65	-0.02	-2.04	0.86	1.38	3.94	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.59	3.09	32.70	0.65
9:00:00 AM	13.71	-0.01	-2.01	0.92	1.40	3.83	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.81	0.88	33.05	0.68
10:00:00 AM	13.96	-0.17	-2.03	0.90	1.41	3.96	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	15.85	33.04	0.68
11:00:00 AM	13.83	-0.31	-2.11	0.85	1.40	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	57.00	19.61	32.81	0.70
12:00:00 PM	13.93	-0.39	-2.22	0.79	1.37	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	22.67	32.36	0.66
1:00:00 PM	13.98	-0.44	-2.35	0.72	1.34	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.26	10.80	32.80	0.72
2:00:00 PM	14.15	-0.47	-2.43	0.66	1.31	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	22.72	32.64	0.76
3:00:00 PM	13.87	-0.42	-2.48	0.62	1.29	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	57.88	21.68	32.85	0.82
4:00:00 PM	13.99	-0.24	-2.44	0.64	1.26	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	57.99	22.24	32.89	0.79
5:00:00 PM	13.86	-0.30	-2.33	0.72	1.30	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	22.57	32.52	0.83
6:00:00 PM	13.81	-0.19	-2.16	0.86	1.34	3.97	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	22.77	32.61	0.82
7:00:00 PM	13.84	-0.02	-2.01	1.01	1.40	3.88	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	12.92	32.55	0.86
8:00:00 PM	13.75	0.35	-1.91	1.11	1.46	3.94	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	23.14	32.58	0.84
9:00:00 PM	13.73	0.34	-1.85	1.17	1.49	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	22.67	32.43	0.73
10:00:00 PM	13.88	0.26	-1.89	1.18	1.51	4.00	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.01	22.90	32.59	0.73
11:00:00 PM	13.77	0.25	-1.97	1.15	1.53	3.90	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.00	22.84	32.69	0.70
Average:	13.85	-0.07	-2.19	0.87	1.40	3.88	0.00	0.00	0.00	0.00	0.00	14.00	13.00	57.82	18.23	32.64	0.72
Low:	13.54	-0.47	-2.48	0.62	1.28	3.07	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.26	0.88	32.35	0.62
High:	14.15	0.35	-1.85	1.18	1.53	4.08	0.00	0.00	0.00	0.00	0.00	14.00	13.00	56.01	23.99	33.05	0.85

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12:02:04 AM