TECHNICAL REPORT

# BELMONT TERMINAL SVE REMEDIATION SYSTEM EVALUATION REPORT 3144 PASSYUNK AVENUE PHILADELPHIA, PENNSYLVANIA

*Prepared For*

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**JANUARY 2000**

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*PRESENTS*

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*TO*

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# 1 INTRODUCTION

The SUNOCO Belmont Marketing Terminal is an over the road truck refined petroleum distribution facility located adjacent to the SUNOCO Philadelphia refinery. The Belmont Terminal is located on the south side of Passyunk Avenue at the intersection of 26th Street in South Philadelphia. The location of the terminal is shown on the USGS 7.5-minute quadrangle in Figure 1. A site map showing the location of site wells and physical features on the site is presented as Figure 2.

The Belmont Terminal has been used to store and distribute a variety of refined petroleum products for many years. One of its major subsurface features is a large brick combined sewer. A City of Philadelphia combined storm and sanitary sewer line, the Shunk Street sewer, crosses the Terminal property in an approximately east-west direction and crosses under Passyunk Avenue in the vicinity of the terminal main gate. In late 1997 the City of Philadelphia Water Department detected hydrocarbon odors and observed phase separated hydrocarbon (PSH) staining in the sewer. PSH is defined as liquid phase hydrocarbons derived from a petroleum source such as gasoline or fuel oil. Sunoco responded to the City's findings by initiating a subsurface investigation. Results of the investigation showed that PSH was floating on the water table adjacent to but outside the sewer. These findings prompted Sunoco to conduct PSH recoverability tests, aquifer characterization tests, and SVE pilot tests. Results of these were used to develop a remediation plan for this aspect of the Terminal. Hydraulic control and PSH recovery were addressed in the plan through installation of a series of water table depression and PSH skimming wells. An SVE system was installed to preclude hydrocarbon vapor migration into the sewer and to also assist in removal of hydrocarbon mass. The original goal of the remediation system was to mitigate hydrocarbon impacts to the Shunk Street Sewer through liquid and vapor phase remediation efforts. This Report reviews and evaluates the applicability and efficiency of the SVE system as part of the Belmont Terminal remediation.

# 2 SITE GEOLOGY AND HYDROGEOLOGY

The following discussion presents the site setting and the relative subsurface environment for PSH recovery, SVE, and the sewer.

## 2.1 SITE GEOLOGY

The study area is located in the lowland and intermediate section of the Atlantic Coastal plain Physiographic Province. This Province is characterized by a flat upper terrace surface cut by narrow steep-sided valleys, including the Delaware River floodplain. The underlying deposits are fluvial in origin including glacial meltwater and consist of unconsolidated to poorly consolidated sand and gravel.

Based on drilling logs, the immediate area surrounding the Shunk Street sewer is characterized by anthropogenic fill at depths up to 20-ft. In addition, it is assumed that construction of the sewer required excavation and backfill in the area of installation. Generally, in addition to the fill material, sand and gravel was encountered as the predominant unit. Varying amounts of silt and clay were also observed in selected borings. The entire area is probably comprised of undifferentiated native sediments utilized as fill. A generalized cross section of the site is presented in Figure 3.

## 2.2 SITE HYDROGEOLOGY

Ground water at the study area is encountered at approximately twenty six to thirty feet. below grade. Results of ground water monitoring activities conducted at the site are summarized in Table 1. Based on ground-water elevation data collected since the installation of the wells in the study area, the ground-water flow is generally to the west at a gradient of 0.03 ft./ft. to 0.04 ft./ft. Ground-water elevations are consistently higher in the northeast corner of the site including wells TW-5, TW-9, and OW-2. A static ground water elevation (no pumping) map is presented as Figure 4. In addition, OW-14 has consistently exhibited anomalously low readings. The aquifer is not utilized for drinking water purposes.

## 2.3 PSH OCCURRENCE

Table 1 presents a summary of the depths to ground water and PSH in the site monitoring wells. Historically, no PSH has been measured in wells TW 5, 8, 9, 11, and OW-14. Wells TW 5, 8, and 9 are on the north side of the Shunk Street Sewer. The other two wells, OW-14 and TW-11 are located at the eastern end of the study area.

The PSH thickness in wells exhibiting PSH generally increased during the pumping tests conducted as part of the "Free Product Delineation Along Shunk Street Sewer" (Mulry and Cresswell Environmental, Inc.), in November and December 1997. Several bailing and recovery tests were conducted on the wells in an attempt to quantify the rate of accumulation. PSH accumulation rates in wells ranged from approximately 6.5 gpd (TW-10) to 0.5 gpd (OW-12). Wells in the eastern portion of the site exhibited slightly lower accumulation rates (~ 1.5 gpd) relative to TW-10 but exhibited a more consistent PSH thickness throughout the local area.

Based on the most recent gauging, PSH is present in all of the site wells west of OW-14 and south of the sewer. No PSH has been measured in wells north of the sewer. Under static conditions, the apparent PSH thickness ranges from approximately 2 feet in the western most wells to less than 0.5-ft. in the eastern most well (RW-6) with PSH. Under pumping conditions (RW-1, RW-4, and RW-6), the PSH thickness increases to several feet in the pumping wells. A minimal change in PSH thickness has been observed in non-pumping wells during recent (past 3 months) gauging events. RW-4 has been excluded from the discussion of PSH thickness due to its anomalously high PSH levels. PSH levels in excess of 10-ft. have consistently been measured in RW-4. In addition, the water level in RW-4 is also anomalously high. Although no boring log was available; it is assumed based on construction of similar wells installed during the study that the ground-water and/or PSH levels are above the screened interval. Plots of the depth to ground water and PSH and corrected ground water elevation are included in Appendix A.

## 2.4 HYDROCARBON VAPOR SOURCE

Based on the boring logs of wells installed during the remedial investigation and the gauging history of the site, PSH is present on the water table along much of the Shunk Street Sewer in the project area. However, residual hydrocarbons are not reportedly present in the vadose zone soils except for those in the capillary fringe directly above the PSH. An additional consideration is that the hydrocarbons trapped in the capillary fringe as residual phase will be a regenerating source until PSH is removed. Therefore, the primary source of hydrocarbons in the vadose is volatilization from phase separated hydrocarbons on the water table and in the smear zone. Volatilization of residual hydrocarbons from secondary sources in the vadose is substantially less than from PSH.

# 3 REMEDIATION SYSTEM CONFIGURATION AND OPERATION

The following section details the history of the remedial investigation, and system design, installation, and start-up. Information for both the ground water depression and PSH recovery and the SVE systems is presented.

## 3.1 REMEDIATION SYSTEM HISTORY

In response to the presence of liquid and vapor phase hydrocarbons that may potentially impact the Shunk Street Sewer, a remedial investigation was conducted and a Remediation Work Plan was prepared in January 1998. As detailed in the "Shunk Street Sewer Remediation Work Plan", a remediation system consisting of combined ground-water depression and PSH recovery and soil vapor extraction system was recommended for the site.

As part of a site investigation focused on the Shunk Street Sewer, fourteen borings were installed on the Terminal property, along the sewer line, between 13 and 19 November 1997. The Shunk Street Sewer is thirteen feet in diameter and extends from approximately twenty to thirty three feet below the grade of the terminal property. The borings were completed to a depth of 35 feet and converted to 2-inch (temporary) monitoring wells, and to 50 feet and converted to 4-inch and 6-inch (observation and recovery) wells. Initially, all borings were completed to a depth of 35 feet. In areas where PSH was encountered, borings were drilled to fifty feet below grade and completed with 4-inch or 6-inch well screen. Of the total fourteen wells, six were completed as 2-inch wells (TW's 3, 5, 8, 9, 10, and 11), six as 4-inch wells (OW's 2, 12, 13, 14, 16, and 17), and two as 6-inch wells (RW-6 and RW-15). A site map showing the locations of the site wells is presented in Figure 2.

## 3.2 TESTING AND SYSTEM DESIGN

As part of the "Free Product Delineation Along Shunk Street Sewer" study in November and December 1997, Mulry and Cresswell Environmental Inc., conducted a remedial investigation and completed aquifer characterization and pilot testing. The remedial investigation and testing consisted of the installation of ground-water recovery and monitoring wells in November 1997.

Upon completion of the wells, several ground-water and PSH recoverability tests were conducted during the end of November and the month of December. An SVE pilot test was conducted on 25 November, 1997.

### 3.2.1 Ground Water Depression and PSH Recovery

In order to evaluate the effectiveness and potential for ground-water depression and PSH recovery, pumping tests were performed on three wells, RW-6, RW-15, and OW-17 in November and December 1998. A two-hour pump test was conducted on RW-15, at an approximate rate of 10 gallons per minute. During pumping, the well exhibited 7.47-ft. of drawdown and the PSH layer increased to as much as 5.1-ft. A forty hour pumping test was performed on RW-6, which was pumped at approximately 6 gallons per minute. Drawdown was measured in the closest (~ 40-ft.) observation well (OW-17) at 0.17-ft. Minimal (< 0.03-ft.) or no drawdown was measured in the other observation wells. A pumping test was also conducted on OW-17, at a rate of approximately 6 gallons per minute. However, during this test the pump was observed to be cycling and the flow rate was reduced to 4 gpm. Observed drawdown ranged from a maximum in RW-15 of 0.88-ft. to 0.13-ft. in OW-2, located more than 260-ft. to the east of the pumping well. A ground-water elevation map showing the drawdown and effects of ground-water pumping in the recovery wells is presented in Figure 5. A plot of the depths to ground water and PSH during periods of non-pumping and pumping is presented in Figure 6.

### 3.2.2 SVE Pilot Test

Determination of the efficacy of SVE was evaluated through a review of the soil boring logs to gain an initial estimate of intrinsic permeability followed by two pilot tests that were performed in November 1998. The objectives of the pilot tests were to gather the data needed to design an SVE system including achievable air flow, vacuum required to move air and hydrocarbon vapors, and the radii of influence and remediation that could be achieved. One of the pilot tests was carried out using a truck-mounted vacuum system applied to RW-6 and the other used an internal combustion engine-based system applied to OW-17. Results of these tests were interpreted to show that SVE could be successfully applied at the site in the area of interest (i.e. along the west side of the Shunk Street sewer). This interpretation was based on the test results which indicated that a design wellhead vacuum of 75 inches of water would effect a 0.5-inch subsurface vacuum over a 50-ft. radius of influence. Based on the testing results, soil vapor extraction was recommended as a means of removing vapor phase hydrocarbons that could potentially impact the sewer and to remove residual hydrocarbons absorbed in soils above the water table.

### 3.3 SYSTEM INSTALLATION

The current remediation system consists of five ground-water recovery wells (RW-1, RW-4, RW-6, RW-7, and RW-15). Three of the recovery wells (RW-1, RW-4, and RW-15) are equipped with PSH recovery pumps; eight soil vapor extraction wells (TW-3, TW-10, OW-12, OW-13, OW-16, OW-18, OW-19, and OW-20); and eight ground-water monitoring wells (OW-2, TW-5, TW-8, TW-9, TW-11, OW-14, OW-17, and TW 5-73).

The ground-water system is comprised of five ground water depression and recovery wells. Three of the wells include dual phase ground water and PSH recovery pumps. Recovered ground water is pumped, via a common subsurface transfer line, from the wells to the remediation system building. The ground water is passed through an oil water separator system inside the building. Treated ground water is discharged to the City of Philadelphia sewer. Recovered PSH is pumped into an adjacent PSH storage tank.

The SVE system is comprised of a line of vapor extraction points that are oriented parallel to the Shunk Street sewer proximate to the ground-water and PSH extraction points. The points are manifolded and terminate at a treatment facility where they discharge to two internal combustion engine extractors. By design, the extractors were to provide vacuum (as manifold vacuum) to evacuate vadose zone air and hydrocarbon vapors. The extracted fluid was then thermally oxidized in the internal combustion engine, which used a combination of extracted hydrocarbon vapor and propane supplemental fuel along with ambient air to sustain operation. The engines were equipped with computerized control systems that were to regulate the proportions of soil vapor, propane, and air such that efficient operation was attained. However, after some effort, one combustor was brought on line, but the other was never rendered operational. It appears that the major problem was the high level of hydrocarbon vapor in the extracted vadose zone fluid that exceeded the capacity of the controller.

## 3.4 START-UP AND OPERATION

The system was started-up in September 1998. During the next three months the ground-water recovery and SVE systems were operated in start-up mode and were closely monitored. In late December 1998, the SVE system was taken off-line. The ground-water and PSH recovery systems are still in operation. Since the start-up both systems have experienced a variety of shut downs due to equipment failures. These failures have resulted in less than optimal operation of both the ground-water/PSH recovery and SVE systems.

## 3.5 SYSTEM OPERATING DATA

A summary of the hydrocarbon recovery data collected during operation of the system is presented in Table 2. As shown in the table, during the initial three months of ground-water/PSH recovery and SVE operation (September 1998 to December 1998) approximately 27,586 gallons of total hydrocarbons were recovered. Of the total 27,586 gallons, approximately 21,649 were recovered through ground-water pumping/PSH recovery and 5,937 gallon equivalents were recovered through SVE. A plot of the cumulative hydrocarbons recovered during this period is presented as Figure 7. As mentioned previously, both systems experienced problems and periodic shut-downs during this time. However, during optimal operation of each system, the maximum hydrocarbon recovery through ground-water/PSH recovery was approximately 1,998 gallons/day compared to approximately 72 gallons/day through SVE. Since the SVE system was shut down in December 1998 an additional 21,004 gallons of PSH have been recovered via ground-water/PSH recovery through September 1998. A plot of the cumulative hydrocarbon recovery to date is shown in Figure 8.

# 4 UNDERSTANDING OF THE PROBLEM

## 4.1 BACKGROUND

Given the much larger volume of PSH removed through the ground-water depression and skimming system and the low efficiency and operational problems with the SVE system, Sunoco discontinued SVE system operation in December 1998. Sunoco reported this operational change to DEP and indicated that they would explore alternatives for vapor extraction. In a letter to Sunoco dated 24 November 1999 DEP requested that Sunoco complete its evaluation and either re-activate the SVE system or present a selected alternative.

The original intent of the remediation system at the Sunoco Belmont Terminal was to mitigate hydrocarbon impacts to the Shunk Street Sewer through liquid and vapor phase remediation efforts. Typically, if PSH is present, the initial focus of the remedial effort is liquid PSH recovery and if required, attainment of hydraulic control. After hydrocarbon recovery has been carried to its technological limit, phase recovery is utilized to address residual hydrocarbons in the soil. Sunoco plans to implement the selected remedial strategies in phases as the site cleanup progresses and the target hydrocarbon source moves from PSH to residual mass. DEP noted in the referenced letter that recovery of vapors from the sewer as an alternative to SVE is not acceptable and that vapor recovery from within the sewer will not enhance PSH recovery rates. Sunoco's understanding is that vapor recovery in the sewer is required to address hydrocarbon vapors resulting from PSH and is not intended to replace SVE or PSH recovery. In addition Sunoco agrees with DEP's position that SVE may be an important part of the Belmont Terminal area remediation effort. However, due to the presence of PSH on the water table, SVE is not an appropriate or efficient method of hydrocarbon recovery as long as PSH is present on the water table. ?

## 4.2 SVE TECHNOLOGY

SVE is a proven *in situ* technology used to remove volatile organic compounds (VOC's) and selected residual hydrocarbons from vadose zone soils. Figure 9 presents a conceptual schematic of the SVE process and technology. The application and effectiveness of an SVE system are dependent upon various soil characteristics such as air permeability, soil heterogeneity, water content, etc., and, contaminant characteristics such as vapor pressure, Henry's Law constant, solubility, soil sorption coefficient, and chemical composition. The behavior of hydrocarbon contaminants in the vadose zone is determined by the quantity of contaminant released, the time since the release occurred, the physical and chemical properties of the contaminant, and the characteristics of the soils through which these contaminants migrate.

One of the most critical aspects of SVE is the ability to achieve adequate gaseous fluid flow through the contaminated soil. The radius of influence defines the area farthest from a vapor extraction well at which air pressure effects can be measured. The radius of influence is usually estimated as the distance from a vapor extraction well where the air pressure or vacuum is 1.0 inches of water (Johnson, 1990). The radius is determined by a site-specific pilot test or is estimated based on intrinsic permeability. The radius depends mainly on the permeability of the soil (i.e., vapor movement from less permeable to more permeable material is a diffusion limited process) and it's homogeneity.

## 4.3 RECOVERY OF HYDROCARBON VAPORS VIA SVE IN THE VICINITY OF THE SHUNK STREET SEWER

One of the design parameters of the original SVE system was to recover hydrocarbon vapors prior to their migration to the Shunk Street Sewer. The DEP has stated that recovery of the vapors from within the sewer is not a replacement for an SVE system outside the sewer. This original objective however, appears to be premature and ignore the fact that the primary route of entry for the observed vapors in the sewer is the PSH and not vapor phase hydrocarbon. Once PSH enters the sewer, volatilization from the separate phase either along the wall of the sewer as a film or as a film on the water in the sewer, provides a much more efficient transport mechanism. This inefficiency in SVE is best demonstrated by considering the vapor migration process that is primarily diffusion limited in soil-water porosity where the Effective Diffusion Coefficient in Soil ($D_s$) is calculated by the following algorithm:

$$D_s\ (cm^2/s) = D_{air} \cdot \frac{\theta_a^{3.33}}{n^2} + D_{wat} \cdot \frac{1}{H} \cdot \frac{\theta_w^{3.33}}{n^2}$$

where:

| Parameter | Value | Description (units) |
|---|---|---|
| $D_{air}$ | Constituent-specific | Diffusion coefficient in air ($cm^2/s$) |
| $\theta_a$ | 0.12 | air-filled soil porosity ($L_{air}/L_{soil}$) |
| N | 0.32 | total soil porosity ($L_{pore}/L_{total}$) |
| $\rho_b$ | 1.8 | dry soil bulk density ($g/cm^3$) |
| $\rho_s$ | 2.65 | soil particle density ($g/cm^3$) |
| $D_{wat}$ | Constituent-specific | Diffusion coefficient in water ($cm^2/s$) |
| $\theta_w$ | 0.2 | water-filled soil porosity ($L_{water}/L_{total}$) |
| H | Constituent-specific | Henry's Law constant (unitless) |

Even assuming the diffusion contribution in the vadose zone from water is minimal; the vapor phase diffusion reduces the concentration two orders of magnitude less than the concentration directly above the PSH. The vapor diffusion coefficient for benzene, for example, is 0.088 where if the PSH migrates into the sewer the diffusion coefficient is essentially equivalent to 1. Based on the site investigation and the site monitoring, PSH is present on the water table along the majority of the sewer length in the project area. Phase separated hydrocarbons have been observed seeping through cracks in the sewer walls and accumulating as a sheen on water within the sewer. The volatilization of this PSH inside the sewer (by seeps and stains along cracks) is therefore expected to be the primary source of hydrocarbon vapors within the sewer.

A further evaluation of the contribution of the vapors into an enclosed space, which in this instance is the sewer, can also be made. For this scenario the assumption that PSH resides adjacent to the outside wall of the sewer has been made to provide a conservative estimate of the vapor movement into the sewer. An estimate of PSH volatilization can be calculated using the following algorithm (Johnson, Kemblowski, and Johnson, 1998):

$$VF_{PSH}\ (kg/m^3) = \frac{\left[\frac{MW_{PSH}\cdot P_v^i}{R\cdot T}\left(\frac{D_{eff}/L_{PSH}}{ER\cdot L_B}\right)\right]}{\left[1+\left(\frac{D_{eff}/L_{PSH}}{ER\cdot L_B}\right)+\left(\frac{D_{eff}/L_{PSH}}{(D_{crack}/L_{crack})\cdot FC}\right)\right]}\cdot 10^3\left(\frac{cm^3\cdot kg}{m^3\cdot g}\right)$$

where:

| **Parameter** | **Value** | **Description (units)** |
|---|---|---|
| $MW_{PSH}$ | 610 | PSH molecular weight (g/mol) |
| $P_v^i$ | Constituent-specific | Vapor pressure of constituent i in PSH (atm) |
| R | 83 | gas constant ($cm^3 \cdot atm$ / mol·K) |
| T | 292 | Absolute temperature (K) |
| $D_{eff}$ | Constituent-specific | Effective diffusion coefficient ($cm^2/s$) |
| $L_{PSH}$ | 853 | Depth to PSH (cm) |
| $L_B$ | 300 | Enclosed-structure volume/infiltration area ratio (cm) |
| ER | 0.0025 | Enclosed-structure air exchange rate (1/s) |
| $D_{crack}$ | Constituent-specific | Effective diffusion coefficient through foundation cracks ($cm^2/s$) |
| $L_{crack}$ | 15 | Enclosed-structure foundation or wall thickness (cm) |
| FC | 0.01 | areal fraction of cracks in foundation/walls ($cm^2$ cracks/$cm^2$ total area) |

This is based on the mechanics of air movement in the subsurface. The volume of air contained in the 600-foot length of sewer in the project area is approximately 79,599 $ft^3$. The rate of diffusive transport into a sewer is similar to that into an enclosed space with a low air exchange rate and can be estimated based on the pure component molecular diffusivity in air, total soil porosity, and vapor filled porosity (Johnson, et. al., 1998). It is further justified to use such a transport model since the vacuum applied to the sewer (which has a substantial volume of air) does not result in a measurable vacuum but rather approaches atmospheric conditions such as that provided in the Johnson and Ettinger model. The diffusion transport equation can be applied to the project site using benzene as a representative compound for total PSH vapor transport. The model assumes complete saturation and calculates the concentration of air in the vadose outside the sewer. As discussed above, Johnson, et al. have also developed models for vapor transport into enclosed spaces. The model estimates the concentration of the saturated vapors that will move into an enclosed space assuming the presence of cracks in the structure. Based on the model, and assuming a moderate airflow of 20 cfm in the sewer, a concentration of approximately 0.02 mg/L is estimated to migrate into the sewer through diffusion. This concentration is approximately five orders of magnitude less than the saturated concentration above the PSH. Therefore, the contribution of hydrocarbons to the sewer due to diffusion from the vadose is insignificant.

## 4.4 PSH RECOVERY THROUGH SVE

For the purposes of this report, the applicability of SVE as a remedial technology is based on the effectiveness of vapor phase hydrocarbon mass removal, in gallon equivalents, as compared to liquid PSH removal. Both methodologies obviously assume the presence of PSH on the water table. The calculation and estimate of vapor phase hydrocarbon recovery will be based on the theoretical maximum vapor concentration in the SVE wells. Because PSH is present in the SVE wells, the source of the hydrocarbon vapors extracted during SVE is volatilized PSH from within the well, and to a lesser extent soil vapor from the vadose or unsaturated zone. This point is important to note because the target hydrocarbon source for SVE technology is the vadose and unsaturated zone. SVE is not designed or intended as an efficient recovery technology for PSH.

The maximum vapor concentration of any compound (mixture) in extracted vapors is its equilibrium or "saturated" vapor concentration.. This concentration can be calculated using the compound's molecular weight, vapor pressure at the soil temperature, residual soil contaminant composition, and the ideal gas law:

$$C_{est} = \text{Sum}\ ((\chi_i\ P_i\ MW_i)/RT)$$

where:

$C_{est}$ = estimate of contaminant vapor concentration (mg/L)

$\chi_I$ = mole fraction of component i in liquid-phase residual ($\chi_I$ = 1 for single compound)

$P_I$ = pure component vapor pressure at temperature T (atm)

$MW_I$ = molecular weight of component i (mg/mole)

R = gas constant = 0.0821 l-atm/mole-K

T = absolute temperature of residual (K)

Based on calculations by Johnson et al. 1990, the estimated maximum vapor concentration for fresh gasoline is approximately 1300 mg/L and 220 mg/L for weathered gasoline. At the average flow rate of 75 cfm observed at the project site, these concentrations translate into approximately 1403 gallons/day and 237 gallons/day of fresh and weathered gasoline, respectively. However, these calculations assume that all of the extracted air in the well is saturated. At a 75 cfm flow rate, the volume of air in a 4-inch, 30 foot well is exchanged approximately every 2 seconds. This exchange rate does not allow the entire well volume to become saturated and reach equilibrium. It is realistic to assume that no more than 2-ft. of the air above the PSH surface reaches equilibrium. This represents approximately 7 percent of the total volume. Applying this to the theoretical maximum recovery volumes, a range of 17 gallons/day to 98 gallons day would be expected from the project site. A review of the SVE operating data indicates that the maximum daily recovery rate during the three-month operating period was 72 gallons/ day.

The recovery of hydrocarbons through SVE while PSH is present is not efficient. While 72 gallons / day can be potentially recovered, the source of these hydrocarbons is the PSH, which is designed to be recovered by the ground-water depression and PSH pumping system. By contrast, the PSH recovery system was able to recover almost 2,000 gallons per day. By operating the SVE system while PSH is present, the SVE system is removing PSH that can be more effectively and efficiently removed by the PSH recovery system designed for that purpose.

## 4.5 TECHNICAL APPLICATION OF SVE

The application of SVE as a remedial technology is based on the assumption that the target source is residual hydrocarbons in the soil. As discussed above, in the presence of PSH, SVE is an inefficient method of hydrocarbon recovery relative to liquid phase recovery. Based on the historical results at the site, the maximum rate of liquid phase recovery is much higher (> 28x) than vapor phase recovery (1,998 gallons/day vs. 72 gallons/day). As reported in Section 3, approximately 21,647 gallons of liquid phase hydrocarbon were recovered during the initial three months of system operation. This is compared to approximately 5,937 gallons of equivalent vapor phase hydrocarbons. On average, liquid phase recovery is 3.5 times greater than vapor recovery.

In the presence of PSH, the mass of hydrocarbons removed is not increased through operation of the SVE system. The SVE and PSH systems both extract hydrocarbons from PSH in the well and the total volume removed is not increased, but distributed between the two systems. PSH skimming is a much more efficient removal method as compared to SVE. In addition, hydrocarbons recovered through PSH skimming are recycled back into facility operations. Hydrocarbons recovered via SVE are destroyed during the treatment process and are unavailable for re-use. Therefore, there is no net benefit to operating the SVE system when recoverable PSH is present. Once recoverable PSH has been removed and hydrocarbon is present as a residual in vadose soils, operation of an SVE system is warranted. At this point, when no recoverable PSH is present, SVE will provide a net benefit by removing hydrocarbon.

In addition, based on the SVE testing conducted in November 1997, the design vacuum at the well head, required to effect a 0.5-inch radius of subsurface influence, was 75 inches of water. The average vacuum of the SVE system during the three-month operating period was approximately 19 inches of water. Therefore, minimal, if any, radius of influence was achieved in the subsurface. The recovered vapor phase hydrocarbons in the SVE were a result of volatilization of PSH in the well which could have been removed via pumping. Because the SVE system extracted saturated vapors solely from the PSH in the well, the extracted vapor concentrations were extremely high throughout the operating period. Several technologies were evaluated to treat of the hydrocarbon saturated vapors (concentrations > 100,000 ppm$_v$). Because the off-gas vapor concentrations were so high which would have resulted in rapid breakthrough, vapor phase activated carbon adsorption was deemed technically infeasible and not cost-effective. Therefore, the option was not considered further. Again, as a result of the high off-gas vapor phase hydrocarbon concentrations and a concomitant low oxygen concentration, thermal/catalytic oxidation destruction efficiency could only be achieved through dilution of approximately one order of magnitude. At this dilution level, the vacuum applied to an extraction point would be appreciably diminished and thus the already small radius of remediation would be virtually non-existent. Therefore, SUNOCO's consultant selected internal combustion engine treatment for this site. However, as discussed above for the thermal/catalytic oxidation, internal combustion engine treatment would require appreciable dilution and a similar efficiency reduction.

# 5 PSH RECOVERY

## 5.1 PSH RECOVERY AND REMEDIAL SYSTEM OPTIMIZATION

Based on the gauging and PSH recovery data to date, significant source removal is most definitely occurring. Recovery of PSH is being conducted in RW-1 and RW-4. However, the gauging data indicates that PSH is present in significant quantities in all five recovery wells. In addition, the current pumping program is not designed to optimize recovery of PSH. An additional program can be implemented to evaluate the site data and perform a system optimization and thereby enhance PSH recovery. Based on the historical operation presented in Figures 6 and 7, optimal recovery could (during appropriate water table conditions) approach 2,000 gpd of recovered product. The program to optimize recovery would include balancing the amount of in-well drawdown and the expected ground-water cone of depression to prevent localized PSH being pulled below the water table interface. A brief discussion of the pumping and recovery optimization methodology is included in the following section.

## 5.2 OPTIMIZATION OF GROUND WATER PUMPING AND PSH RECOVERY RATES AND REMEDIAL SYSTEM OPTIMIZATION

Optimization of hydrocarbon recovery at the Belmont Facility can be accomplished through a evaluation and study of the recovery well construction, operating data, and application of the following model. The purpose of the study will be to determine if the hydrocarbon/water production ratio can be increased through an analysis of each individual recovery well's construction, lithology, hydrocarbon thickness, pump position and pumping rate. This will be accomplished by reviewing the operational history of each well for pumping rates (both water and PSH) and water and PSH levels. This data can be compiled into spreadsheets for analysis and possible later inclusion into a GIS database.

Analytical calculations to evaluate hydrocarbon thickness and optimum pumping rates can be based on the methods of Charbeneau and Chiang (1995). The method utilizes the Brooks-Corey retention model in the calculations. For a detailed description of the calculations, the reader is referred to Charbeneau and Chiang (1995) and Chiang et al. (1990).

In general, the PSH thickness within the formation can be first determined. Then, the optimal pumping rates for both water and hydrocarbon can be calculated for the recovery wells. It is assumed that all of the recovery wells will have dual pump systems installed. The following equations and assumptions form the basis for the calculations.

The PSH thickness for each well will be calculated for each gauging based on the following equation:

$$D_o = \alpha + \beta\ (b_o)\ b_o$$

where

$D_o$ = PSH thickness

$$\alpha = \frac{\left[\lambda\ (n - \theta_{wr}) - \theta_{ors}\right]\varphi_{ow} - \left[\lambda\ (n - \theta_{wr} - \theta_{orv})\right]\ \varphi_{ao}}{1 - \lambda}$$

and

$$\beta\ (b_o) = (n - \theta_{wr}) + \frac{\chi}{1 - \chi}\theta_{orv} - \frac{(n - \theta_{wr} - \theta_{ors})}{(1 - \lambda)}\left(\frac{(1 - \chi)\varphi_{ow}}{b_o}\right)^{\lambda}$$

with

$$\chi = \left(\frac{n - \theta_{wr} - \theta_{orv}}{n - \theta_{wr} - \theta_{ors}}\right)^{1/\lambda}\frac{\sigma_{ao}}{\sigma_{ow}}\left(\frac{\rho_w - \rho_o}{\rho_o}\right)$$

where

$\sigma_{ao}$ = air-oil interfacial tension (dynes/cm)

$\sigma_{ow}$ = oil-water interfacial tension (dynes/cm)

$\theta_{wr}$ = residual volumetric water content

$\theta_{ors}$ = residual volumetric hydrocarbon content (saturated zone)

$\theta_{orv}$ = residual volumetric hydrocarbon content (saturated zone)

$\psi_{ao}$ = air-oil capillary rise parameter (ft.)

$\psi_{ow}$ = oil-water capillary rise parameter (ft.)

$\rho_w$ = water density (gm/cm$^3$)

$\rho_o$ = hydrocarbon density (gm/cm$^3$)

$\lambda$ = pore size distribution index.

This equation appears to be valid for apparent hydrocarbon thickness greater than two feet in coarse-grained soils to greater than five feet for fine-grained soils.

To determine the optimum pumping rate for the dual pump systems, the following equation will be used:

$$Q_o = \frac{b_o \overline{k}_{ro} \mu_w \rho_o}{b_w \mu_o \rho_w} Q_w$$

where

$Q_o$ = hydrocarbon production rate (ft$^3$/day)

$$Q_w = \text{water production rate (ft}^3\text{/day)} = \frac{\left(b_w^2 - h_w^2\right)\pi k_w}{\ln\left(R/r_w\right)}$$

$b_o$ = initial hydrocarbon layer thickness (ft.)

$b_w$ = initial water layer thickness (ft.), assumed to be at the boundary of the simulation

$$\bar{k}_{ro} = \left(\frac{D_o}{n b_o}\right)^2$$

$n$ = porosity

$\mu_w$ = dynamic viscosity of water (centipoise) = 1.0 cp

$\mu_o$ = dynamic viscosity of oil (centipoise)

$h_w$ = water layer thickness at the recovery well (ft.)

$k_w$ = saturated water hydraulic conductivity (ft/day)

R = radius of influence of the water production well (ft.)

$r_w$ = radius of the production well

# 6 COST ANALYSIS

In addition to evaluating the technical efficacy and applicability of SVE, a cost analysis of the remedial technologies was performed. The estimated capital, start-up, and operation and maintenance (O&M) costs of both ground water depression and PSH recovery (liquid phase) and SVE (vapor phase) were tabulated. The costs assume operation of the SVE system requires a full-time O&M technician. A summary of the costs is presented in Table 3. As shown in the table, the overall cost of liquid phase recovery is substantially less than that for vapor phase. A comparison of the average cost per gallon of PSH recovered was also conducted. The costs were based on the total gallons of PSH recovered during the initial 103 day system start-up period from September 17, 1998 to December 29, 1998. As shown in the table, the average cost per gallon of PSH recovered is $2.07 for liquid phase and $16.89 for vapor phase. The initial capital cost was amoratized over three years. The cost analysis further confirms the greater efficiency and efficacy of liquid phase recovery vs. vapor phase recovery when PSH is present. Based on this cost analysis, vapor phase recovery (SVE) is not a cost-effective or appropriate remedial technology during the current phase of remediation.

# 7 SUMMARY AND CONCLUSIONS

Given the presence of PSH's in the Shunk Street sewer and the generation of vapors via volatilization, continuing operation of the sewer blower system is necessary. In order to eliminate or reduce the concentration of vapors in the sewer, the goal is to remove the PSH source. Based on a review of the gauging and PSH recovery data to date, source removal is generally very productive. Additional removal can be significantly enhanced through optimization of the PSH and ground water pumping rates as discussed in Section 5. Optimizing the pumping rates will maximize the recovery of the PSH source and mitigate migration into the sewer.

Based on the vadose zone vapor phase calculations presented in Section 4, the contribution of hydrocarbon vapors from the vadose zone is much less than operation of the SVE. SVE was not developed or designed for PSH recovery and is not an efficient or recommended removal method. In addition, based on the cost analysis presented in Section 6, vapor phase recovery (SVE) is not a cost-effective or appropriate remedial technology during the current phase of remediation. The objectives of the ongoing remediation effort are to optimize PSH recovery. Once the PSH has been removed, operation of the SVE can be reevaluated to address residual vadose hydrocarbons.

# 8 REFERENCES

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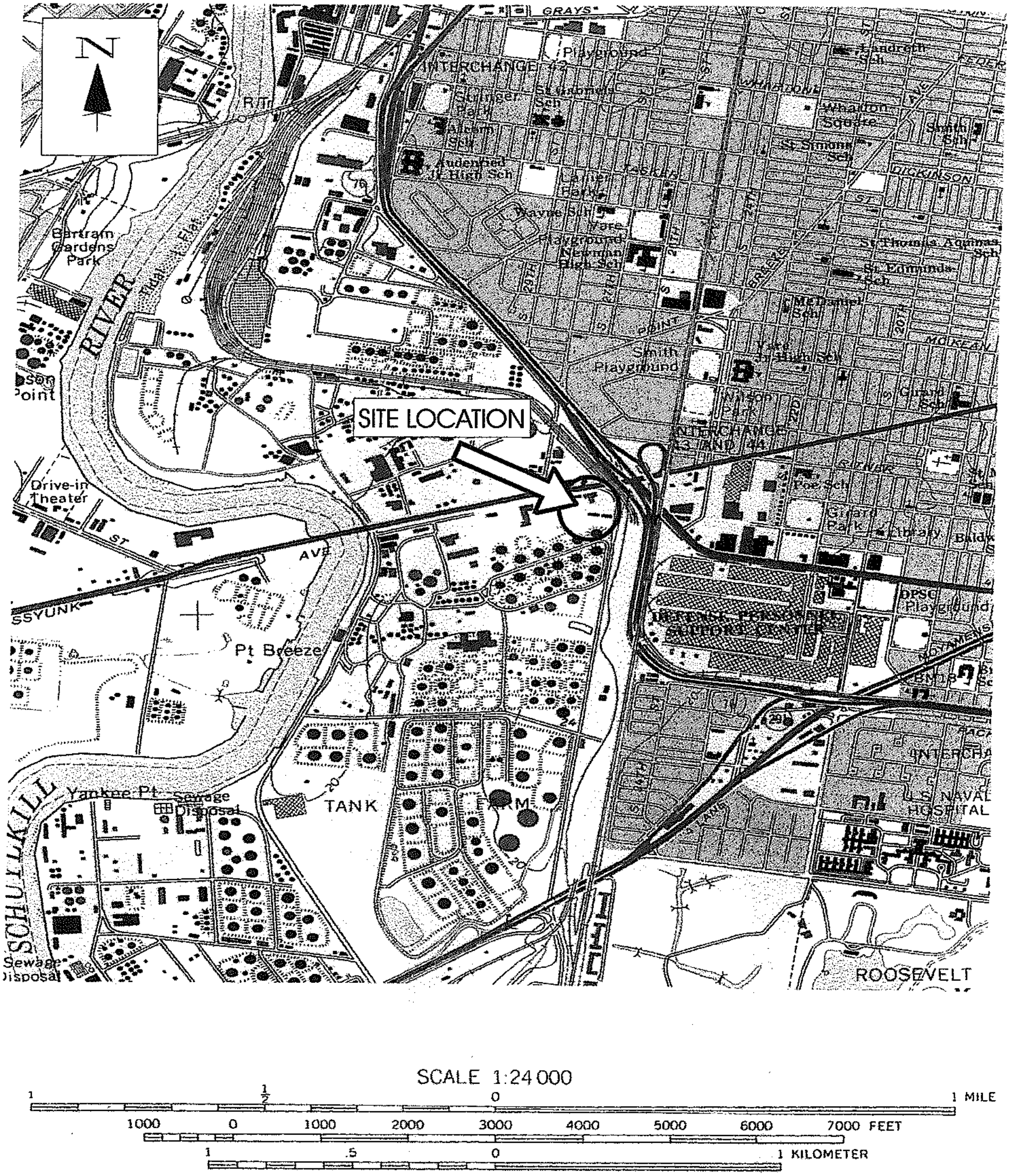
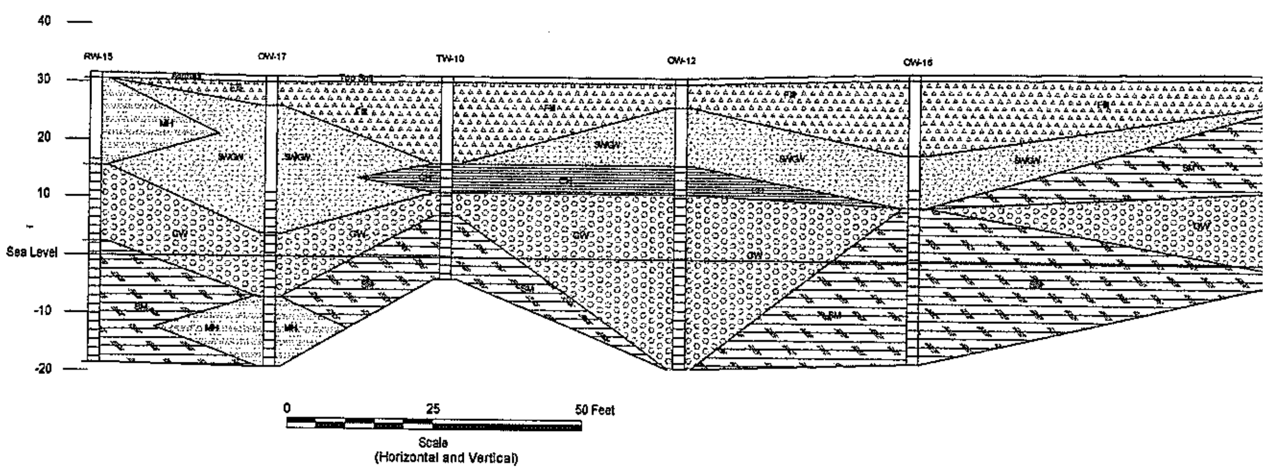
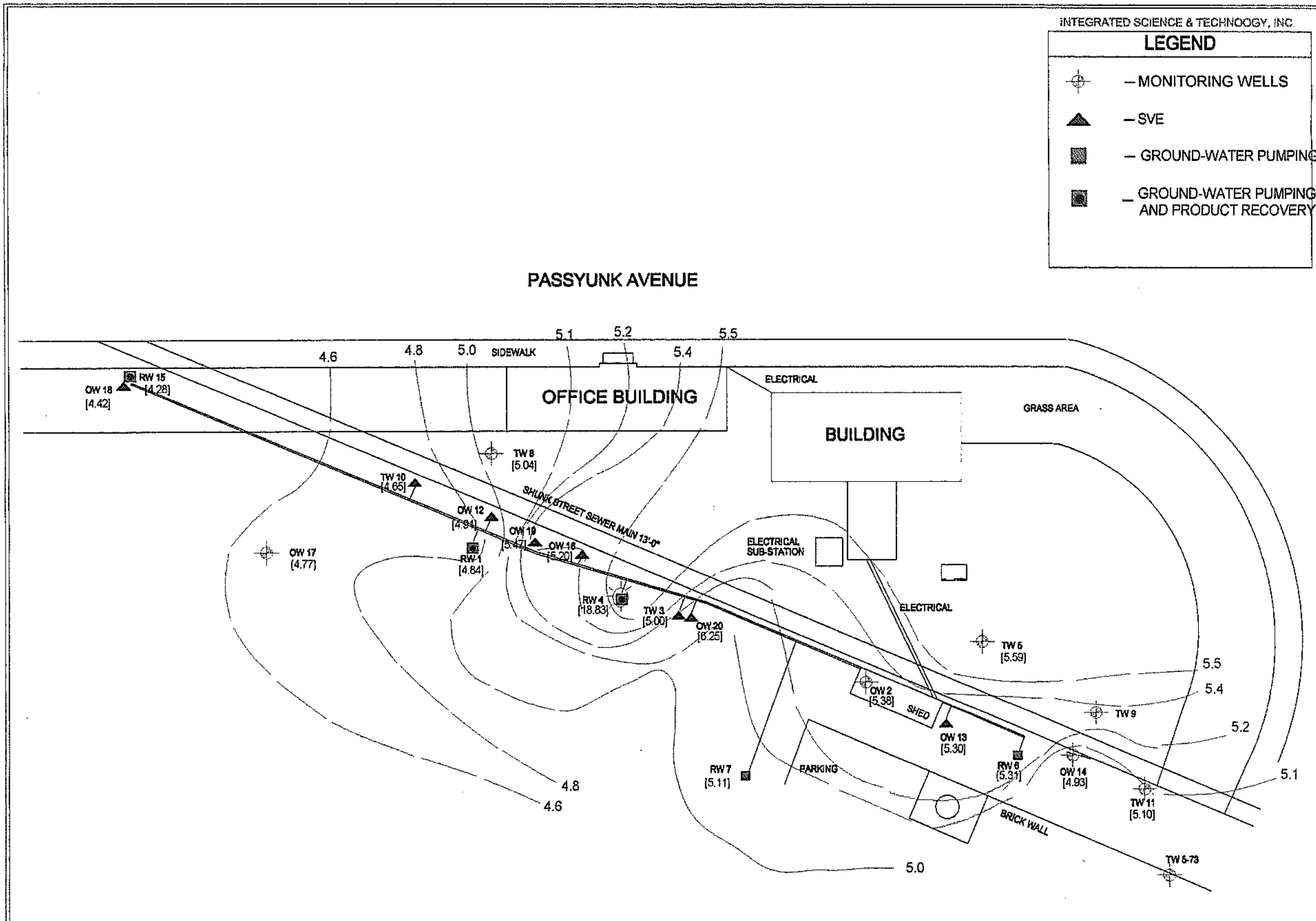


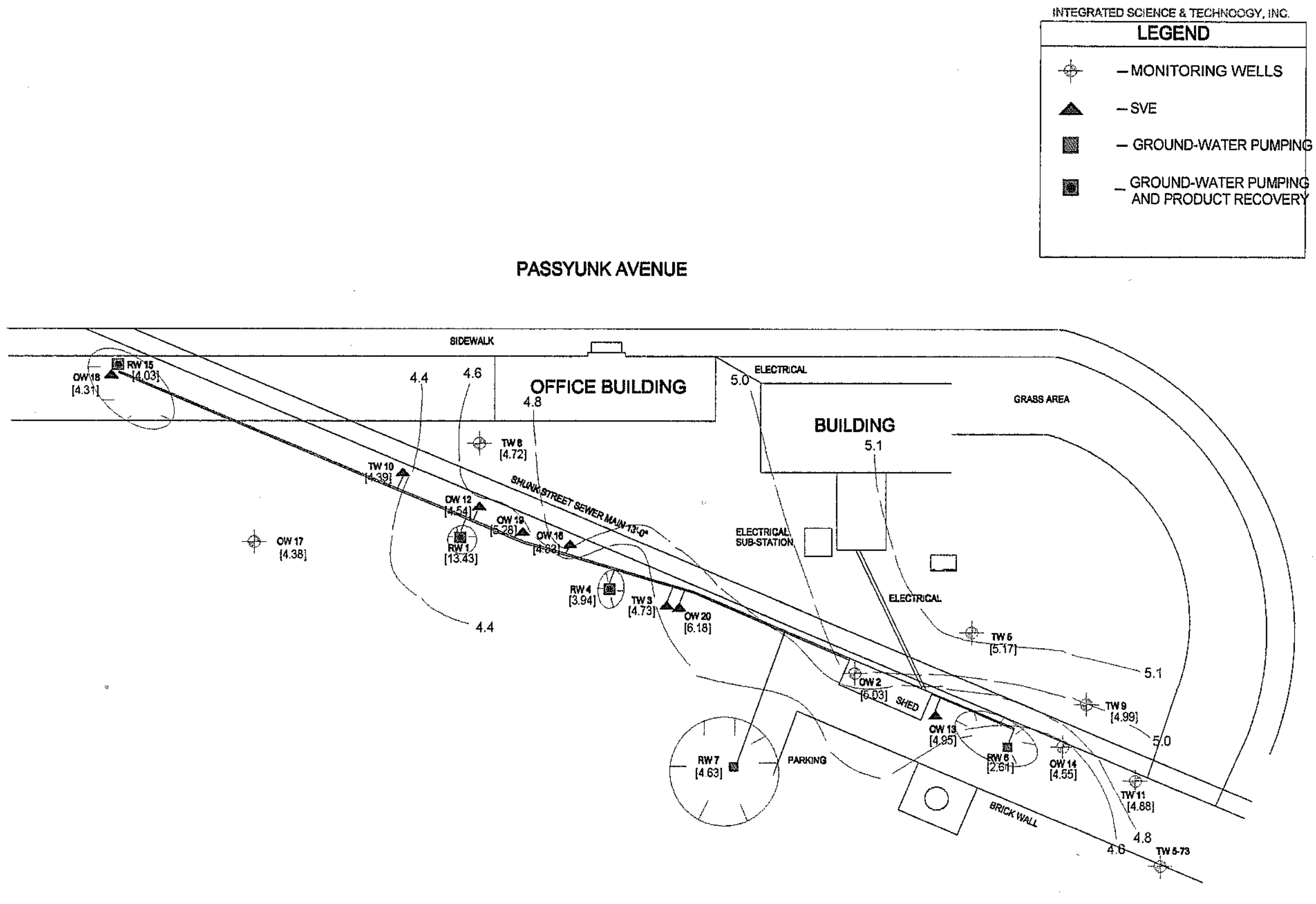

| | | | | |
|---|---|---|---|---|
| INTEGRATED SCIENCE & TECHNOLOGY, INC. | DRAWN BY: ----- | DATE: 01/17/00 | STUDY AREA WITHIN THE BELMONT TERMINAL | FIGURE |
| | REVIEWED BY: GDM | PROJECT NO SUN07A | | 1 |
| | APPROVED BY: HJR | DWG NO. ----- | 3144 PASSYUNK AVENUE PHILADELPHIA, PENNSYLVANIA | |



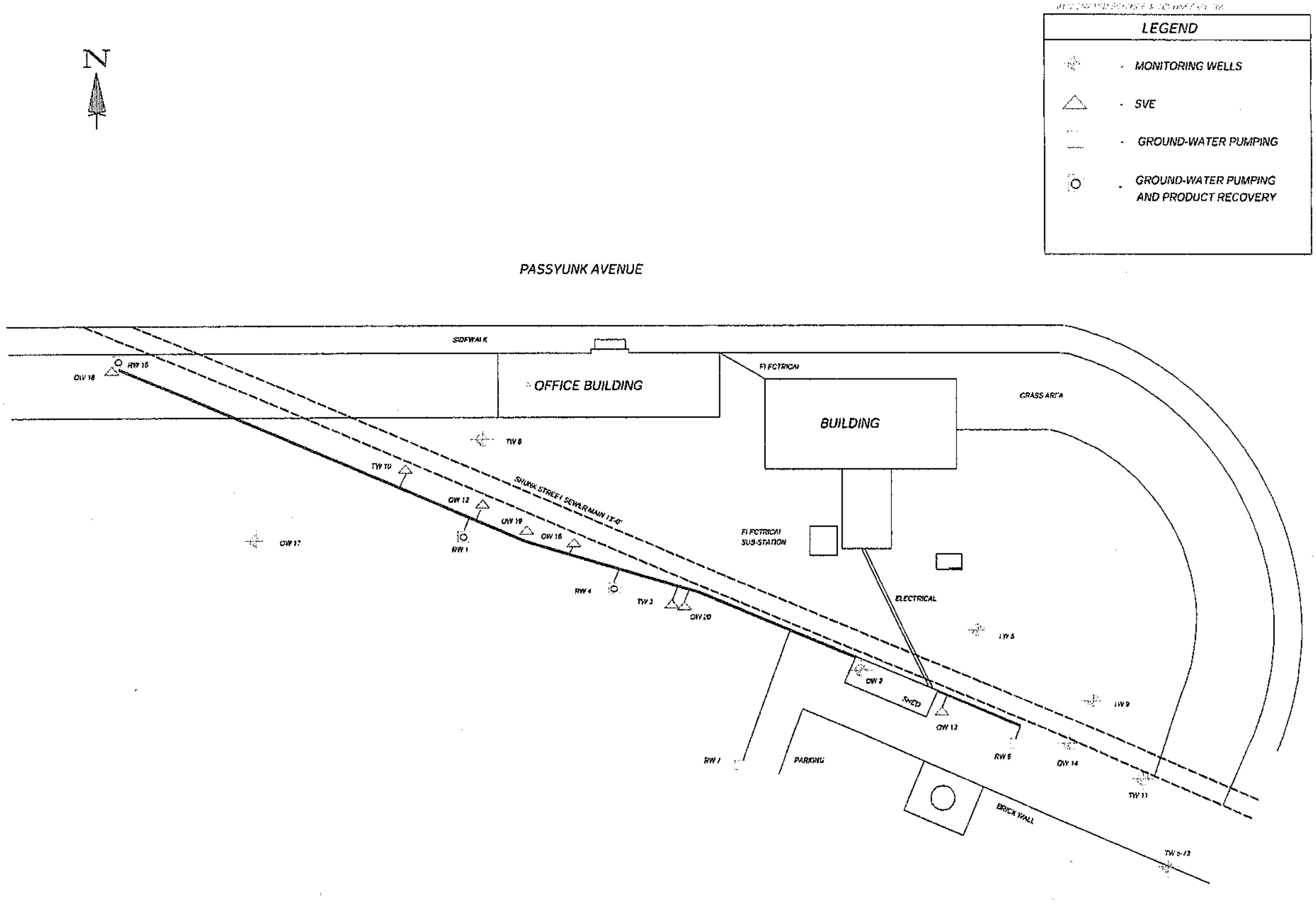

| INTEGRATED SCIENCE & TECHNOLOGY, INC. | | |
|---|---|---|
| | DRAWN BY: P. HILDEBRANDT | DATE: 1/17/00 |
| | REVIEWED BY: G. McCLEARY | PROJECT NO. : SUN07A |
| | APPROVED BY: J. REISINGER | DRAWING NO. : 07-04 |



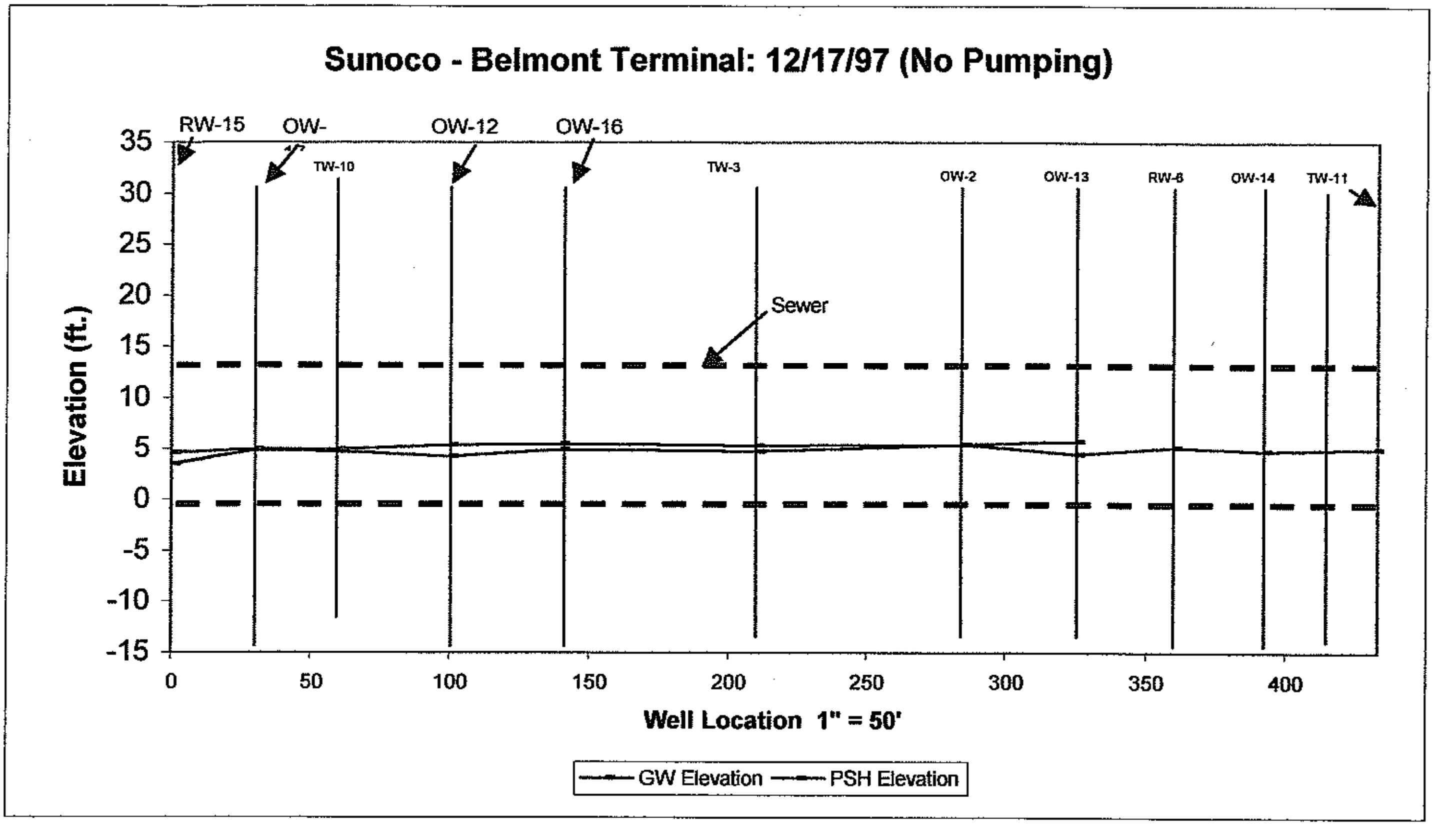

| INTEGRATED SCIENCE & TECHNOLOGY, INC. | DRAWN BY: T. HILL | DATE: 1/16/00 | GROUND WATER ELEVATIONS DURING STATIC (NON-PUMPING) CONDITIONS<br>21 AUGUST 1998 | FIGURE |
|---|---|---|---|---|
| | REVIEWED BY: G. McCLEARY | PROJECT NO.: SUN07A | BELMONT TERMINAL<br>3144 PASSYUNK AVENUE<br>PHILADELPHIA, PENNSYLVANIA | 4 |
| | APPROVED BY: J. REISINGER | DRAWING NO.: 07-02 | | |

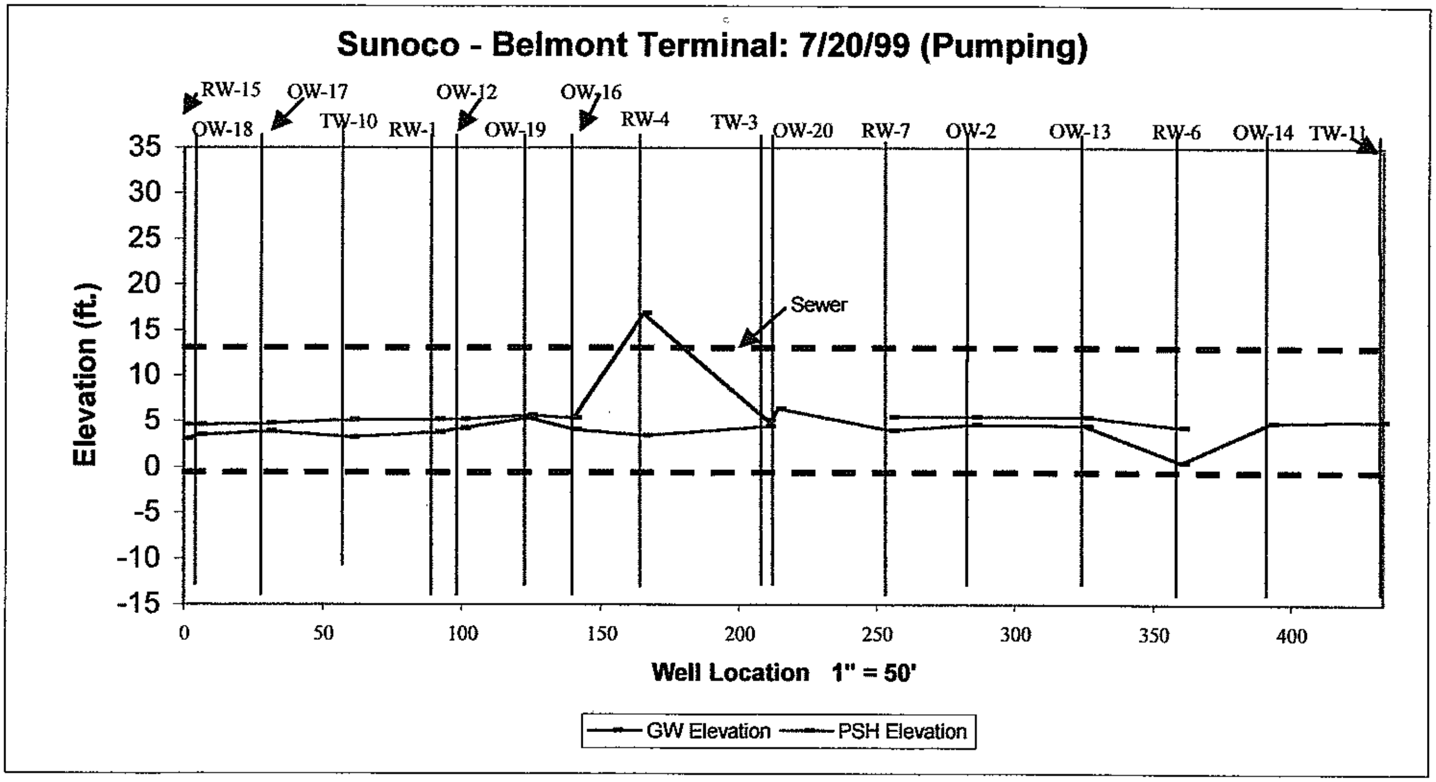



| | | | | |
|---|---|---|---|---|
| INTEGRATED SCIENCE & TECHNOLOGY, INC. | DRAWN BY: T. HILL | DATE: 1/16/00 | GROUND WATER ELEVATION DURING PUMPING OF THE RECOVERY WELLS<br>23 SEPTEMBER 1998 | FIGURE |
| | REVIEWED BY: G. McCLEARY | PROJECT NO. : SUN07A | BELMONT TERMINAL<br>3144 PASSYUNK AVENUE<br>PHILADELPHIA, PENNSYLVANIA | 5 |
| | APPROVED BY: J. REISINGER | DRAWING NO. : 07-03 | | |

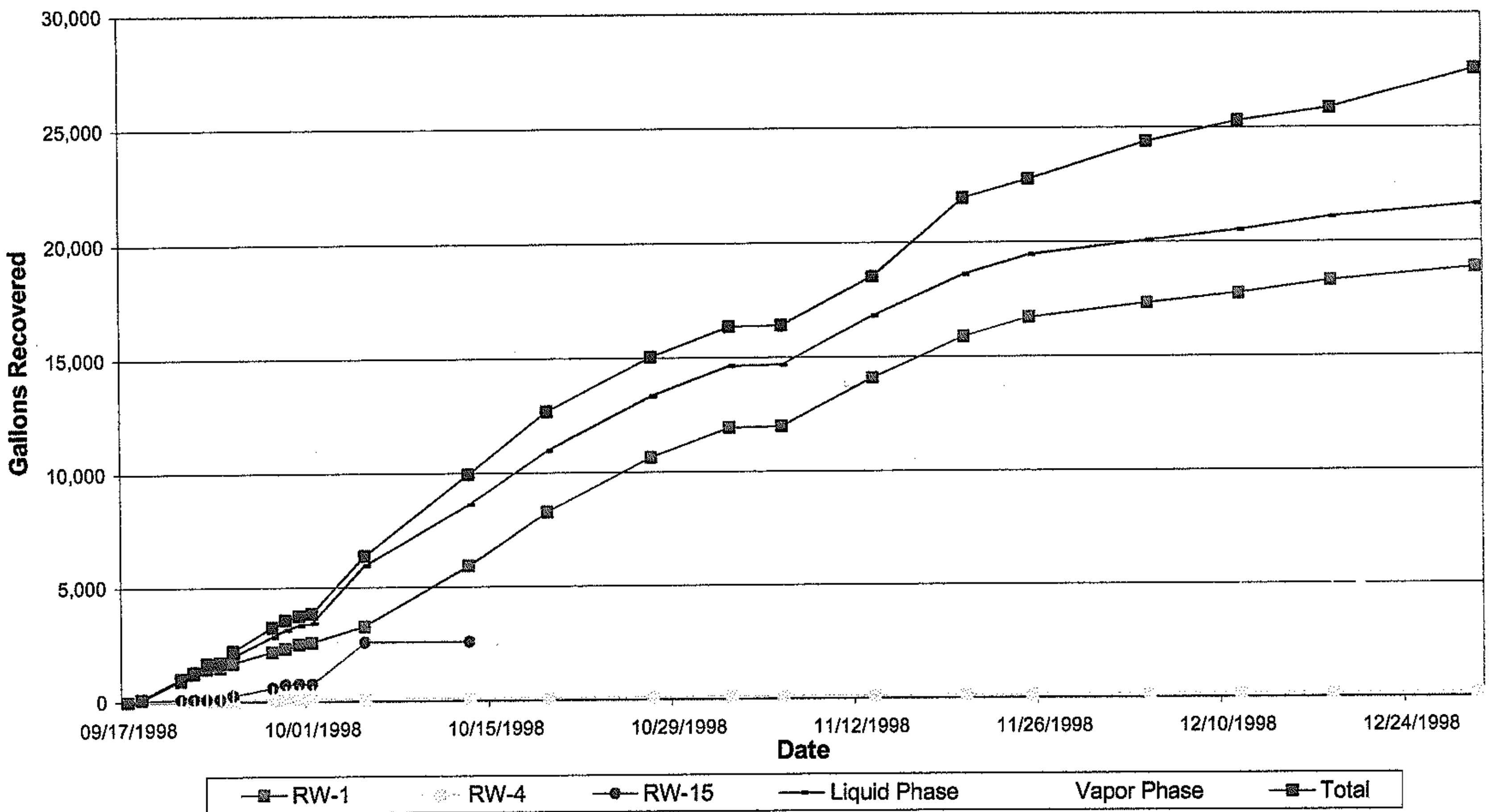



| INTEGRATED SCIENCE & TECHNOLOGY, INC | DRAWN BY: H. LASPINO | DATE: 1/13/00 | SITE LOCATION | FIGURE |
|---|---|---|---|---|
| | REVIEWED BY: G. McCLEARY | PROJECT NO.: SUN07A | BELMONT TERMINAL<br>3144 PASSYUNK AVENUE<br>PHILADELPHIA, PENNSYLVANIA | 2 |
| | APPROVED BY: J. REISINGER | DRAWING NO.: 07-01 | | |

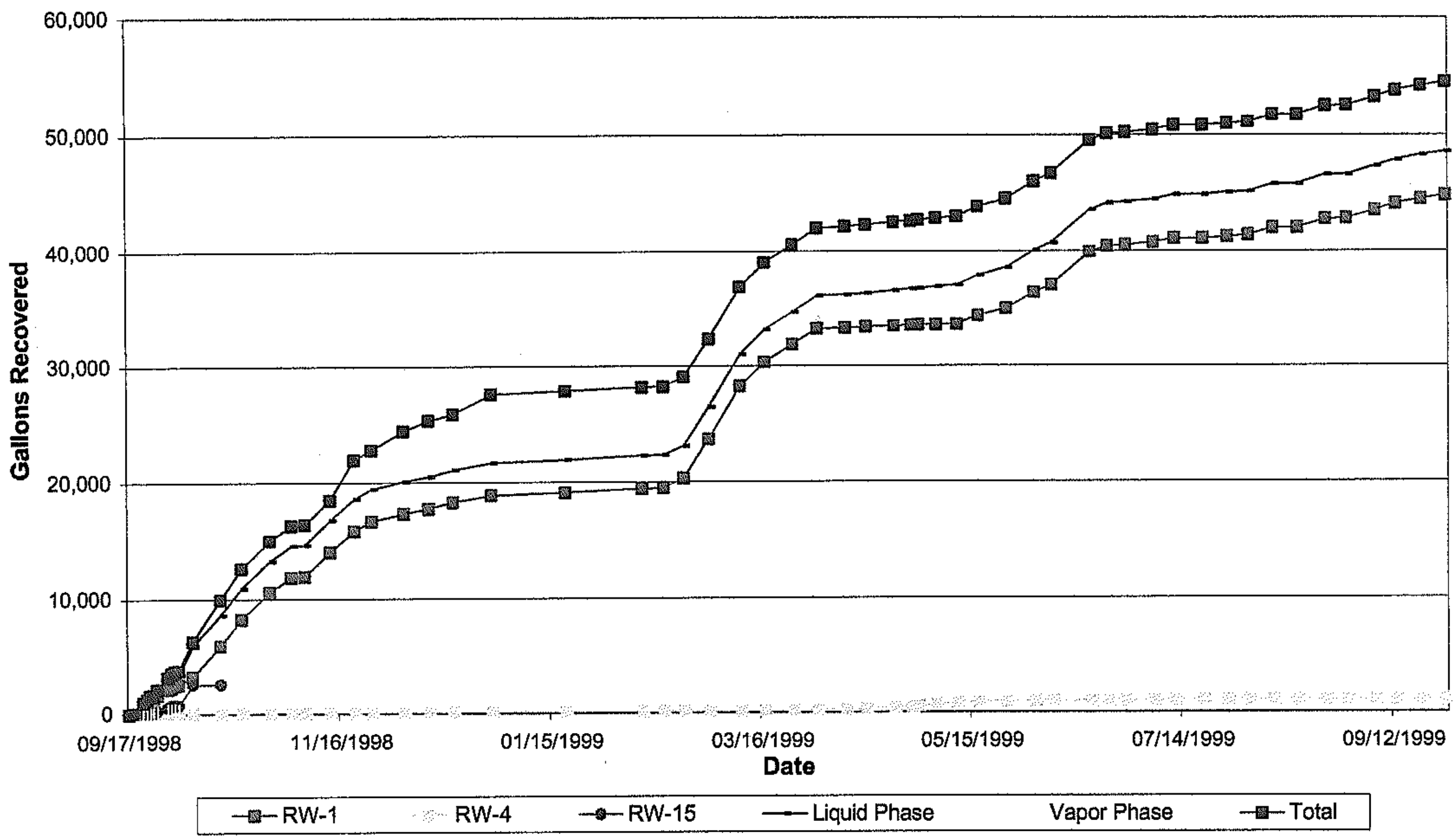



| INTEGRATED SCIENCE & TECHNOLOGY, INC. | DRAWN BY: S. SWANSON | DATE: 01/16/2000 | DEPTH TO GROUND WATER AND PSH DURING NON-PUMPING AND PUMPING | FIGURE |
|---|---|---|---|---|
| | REVIEWED: G. MCCLEARY | PROJECT NO. SUN07A | BELMONT TERMINAL | 6 |
| | APPROVED: H. J. Reisinger | DWG NO. — | 3144 PASSYUNK AVENUE PHILADELPHIA, PENNSYLVANIA | |




| INTEGRATED SCIENCE & TECHNOLOGY, INC. | DRAWN BY: S. SWANSON | DATE: 1/16/00 | CUMULATIVE PSH RECOVERY DURING THE THREE MONTH INITIAL START-UP PERIOD (SEPTEMBER 1998 TO DECEMBER 1998) BELMONT TERMINAL 3144 PASSYUNK AVENUE PHILADELPHIA, PENNSYLVANIA | FIGURE 7 |
|---|---|---|---|---|
| | REVIEWED: G. MCCLEARY | PROJECT NO. SUN07A | | |
| | APPROVED: G. MCCLEARY | DWG NO. --- | | |

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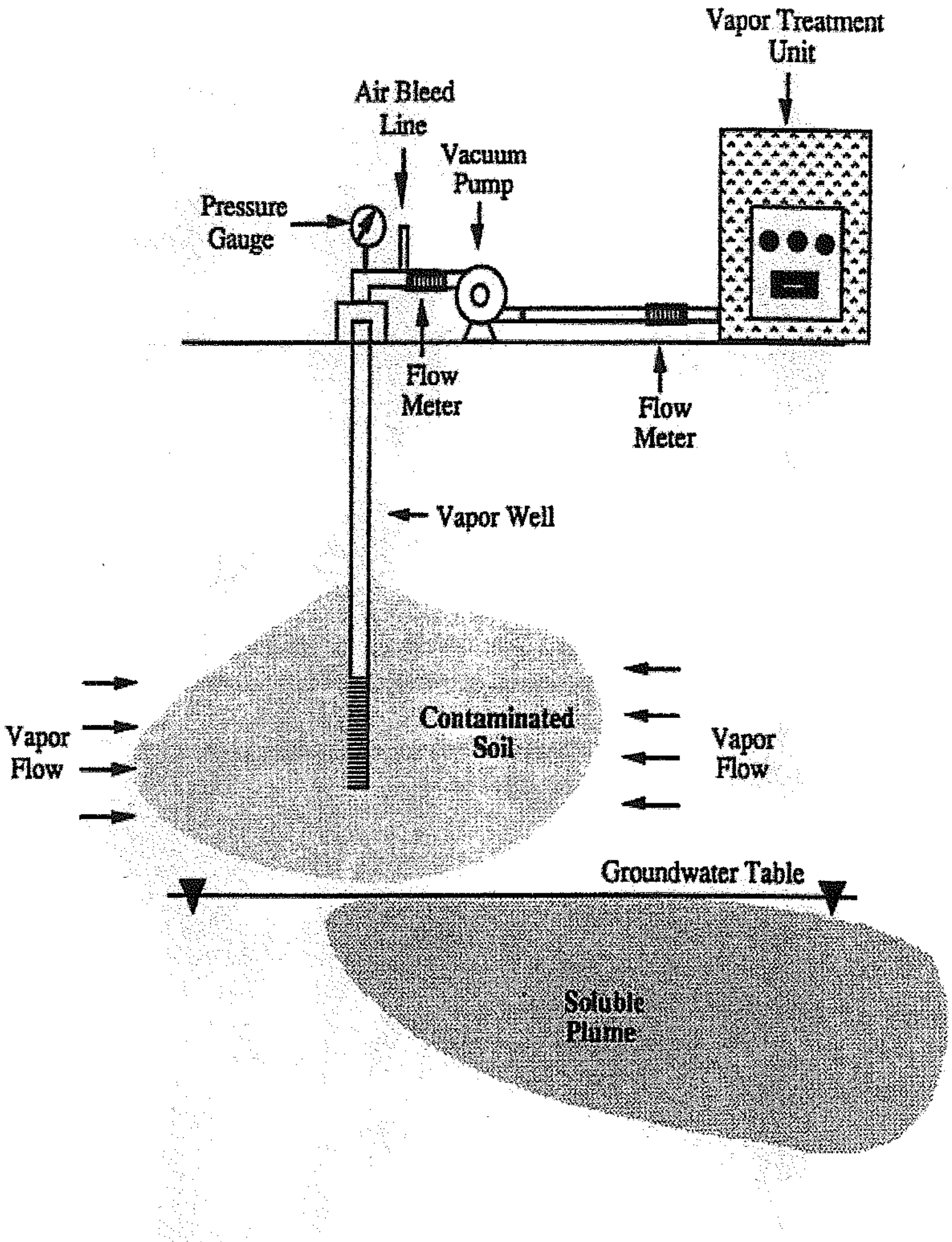
|---|---|---|---|---|
| INTEGRATED SCIENCE & TECHNOLOGY, INC. | DRAWN BY: S. SWANSON | DATE: 01/16/2000 | CUMULATIVE PSH RECOVERY THROUGH THIRD QUARTER 1999 OPERATIONS (SEPTEMBER 1998 TO SEPTEMBER 1999) BELMONT TERMINAL 3144 PASSYUNK AVENUE PHILADELPHIA, PENNSYLVANIA | FIGURE 8 |
| | REVIEWED: G. MCCLEARY | PROJECT NO. SUN07A | | |
| | APPROVED: G. MCCLEARY | DWG NO. — | | |

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|---|---|---|---|---|
| INTEGRATED SCIENCE & TECHNOLOGY, INC. | DRAWN BY: | DATE: 01/16/2000 | SCHEMATIC OF A TYPICAL VAPOR EXTRACTION OPERATION | FIGURE |
| | REVIEWED: GDM | PROJECT NO. SUN07A | BELMONT TERMINAL<br>3144 PASSYUNK AVENUE<br>PHILADELPHIA, PENNSYLVANIA | 9 |
| | APPROVED: GDM | DWG NO. — | | |

# TABLES

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| TW 3 | 11/25/97 | 32.86 | 28.56 | 28.40 | 0.16 | 4.46 | 4.30 | 4.42 |
| TW 3 | 12/17/97 | 32.86 | 28.14 | 27.54 | 0.60 | 5.32 | 4.72 | 5.17 |
| TW 3 | 8/21/98 | 32.86 | 28.60 | 27.51 | 1.09 | 5.35 | 4.26 | 5.08 |
| TW 3 | 9/18/98 | 32.86 | 28.70 | 27.66 | 1.04 | 5.20 | 4.16 | 4.94 |
| TW 3 | 9/21/98 | 32.86 | 28.80 | 27.64 | 1.16 | 5.22 | 4.06 | 4.93 |
| TW 3 | 9/22/98 | 32.86 | 28.83 | 27.64 | 1.19 | 5.22 | 4.03 | 4.92 |
| TW 3 | 9/23/98 | 32.86 | 28.91 | 27.77 | 1.14 | 5.09 | 3.95 | 4.81 |
| TW 3 | 9/25/98 | 32.86 | 28.92 | 27.78 | 1.14 | 5.08 | 3.94 | 4.80 |
| TW 3 | 9/28/98 | 32.86 | 28.90 | 27.71 | 1.19 | 5.15 | 3.96 | 4.85 |
| TW 3 | 9/29/98 | 32.86 | 29.06 | 27.85 | 1.21 | 5.01 | 3.80 | 4.71 |
| TW 3 | 9/30/98 | 32.86 | 29.05 | 27.83 | 1.22 | 5.03 | 3.81 | 4.73 |
| TW 3 | 10/1/98 | 32.86 | 29.03 | 27.83 | 1.20 | 5.03 | 3.83 | 4.73 |
| TW 3 | 10/5/98 | 32.86 | 28.92 | 27.77 | 1.15 | 5.09 | 3.94 | 4.80 |
| TW 3 | 10/13/98 | 32.86 | 29.06 | 27.88 | 1.18 | 4.98 | 3.80 | 4.69 |
| TW 3 | 10/19/98 | 32.86 | 29.01 | 27.83 | 1.18 | 5.03 | 3.85 | 4.74 |
| TW 3 | 11/20/98 | 32.86 | 29.46 | 28.08 | 1.38 | 4.78 | 3.40 | 4.44 |
| TW 3 | 11/25/98 | 32.86 | 29.76 | 28.15 | 1.61 | 4.71 | 3.10 | 4.31 |
| TW 3 | 12/4/98 | 32.86 | 29.55 | 28.08 | 1.47 | 4.78 | 3.31 | 4.41 |
| TW 3 | 12/11/98 | 32.86 | 29.61 | 28.15 | 1.46 | 4.71 | 3.25 | 4.35 |
| TW 3 | 12/18/98 | 32.86 | 29.73 | 28.25 | 1.48 | 4.61 | 3.13 | 4.24 |
| TW 3 | 12/29/98 | 32.86 | 29.69 | 28.16 | 1.53 | 4.70 | 3.17 | 4.32 |
| TW 3 | 4/30/99 | 32.86 | 28.90 | 28.01 | 0.89 | 4.85 | 3.96 | 4.63 |
| TW 3 | 5/17/99 | 32.86 | 28.84 | 27.90 | 0.94 | 4.96 | 4.02 | 4.73 |
| TW 3 | 7/20/99 | 32.86 | 28.45 | 27.75 | 0.70 | 5.11 | 4.41 | 4.94 |
| TW 5 | 11/25/97 | 33.13 | 31.13 | - | - | - | 2.00 | 2.00 |
| TW 5 | 12/17/97 | 33.13 | 27.72 | - | - | - | 5.41 | 5.41 |
| TW 5 | 8/21/98 | 33.13 | 27.54 | - | - | - | 5.59 | 5.59 |
| TW 5 | 9/18/98 | 33.13 | 27.87 | - | - | - | 5.26 | 5.26 |
| TW 5 | 9/21/98 | 33.13 | 27.80 | - | - | - | 5.33 | 5.33 |
| TW 5 | 9/22/98 | 33.13 | 27.80 | - | - | - | 5.33 | 5.33 |
| TW 5 | 9/25/98 | 33.13 | 27.96 | - | - | - | 5.17 | 5.17 |
| TW 5 | 9/28/98 | 33.13 | 27.88 | - | - | - | 5.25 | 5.25 |
| TW 5 | 9/29/98 | 33.13 | 28.05 | - | - | - | 5.08 | 5.08 |
| TW 5 | 9/30/98 | 33.13 | 28.03 | - | - | - | 5.10 | 5.10 |
| TW 5 | 10/1/98 | 33.13 | 28.04 | - | - | - | 5.09 | 5.09 |
| TW 5 | 10/5/98 | 33.13 | 27.93 | - | - | - | 5.20 | 5.20 |
| TW 5 | 10/13/98 | 33.13 | 28.09 | - | - | - | 5.04 | 5.04 |
| TW 5 | 10/19/98 | 33.13 | 27.98 | - | - | - | 5.15 | 5.15 |
| TW 5 | 11/20/98 | 33.13 | 28.28 | - | - | - | 4.85 | 4.85 |
| TW 5 | 11/25/98 | 33.13 | 28.35 | - | - | - | 4.78 | 4.78 |
| TW 5 | 12/4/98 | 33.13 | 28.26 | - | - | - | 4.87 | 4.87 |
| TW 5 | 12/11/98 | 33.13 | 28.34 | - | - | - | 4.79 | 4.79 |
| TW 5 | 12/18/98 | 33.13 | 28.45 | - | - | - | 4.68 | 4.68 |
| TW 5 | 12/29/98 | 33.13 | 28.38 | - | - | - | 4.75 | 4.75 |
| TW 5 | 4/30/99 | 33.13 | 27.85 | - | - | - | 5.28 | 5.28 |
| TW 5 | 5/17/99 | 33.13 | 27.73 | - | - | - | 5.40 | 5.40 |
| TW 5 | 7/20/99 | 33.13 | 27.76 | - | - | - | 5.37 | 5.37 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| TW 8 | 11/25/97 | 31.12 | 26.95 | - | - | - | 4.17 | 4.17 |
| TW 8 | 12/17/97 | 31.12 | 26.00 | - | - | - | 5.12 | 5.12 |
| TW 8 | 8/21/98 | 31.12 | 26.08 | - | - | - | 5.04 | 5.04 |
| TW 8 | 9/18/98 | 31.12 | 26.26 | - | - | - | 4.86 | 4.86 |
| TW 8 | 9/21/98 | 31.12 | 26.24 | - | - | - | 4.88 | 4.88 |
| TW 8 | 9/22/98 | 31.12 | 26.28 | - | - | - | 4.84 | 4.84 |
| TW 8 | 9/23/98 | 31.12 | 26.40 | - | - | - | 4.72 | 4.72 |
| TW 8 | 9/25/98 | 31.12 | 26.43 | - | - | - | 4.69 | 4.69 |
| TW 8 | 9/28/98 | 31.12 | 26.43 | - | - | - | 4.69 | 4.69 |
| TW 8 | 9/29/98 | 31.12 | 26.49 | - | - | - | 4.63 | 4.63 |
| TW 8 | 9/30/98 | 31.12 | 26.45 | - | - | - | 4.67 | 4.67 |
| TW 8 | 10/1/98 | 31.12 | 26.49 | - | - | - | 4.63 | 4.63 |
| TW 8 | 10/5/98 | 31.12 | 26.40 | - | - | - | 4.72 | 4.72 |
| TW 8 | 10/13/98 | 31.12 | 26.40 | - | - | - | 4.72 | 4.72 |
| TW 8 | 10/19/98 | 31.12 | 26.40 | - | - | - | 4.72 | 4.72 |
| TW 8 | 11/20/98 | 31.12 | 26.75 | - | - | - | 4.37 | 4.37 |
| TW 8 | 11/25/98 | 31.12 | 26.78 | - | - | - | 4.34 | 4.34 |
| TW 8 | 12/4/98 | 31.12 | 26.75 | - | - | - | 4.37 | 4.37 |
| TW 8 | 12/11/98 | 31.12 | 26.80 | - | - | - | 4.32 | 4.32 |
| TW 8 | 12/18/98 | 31.12 | 26.92 | - | - | - | 4.20 | 4.20 |
| TW 8 | 12/29/98 | 31.12 | 26.81 | - | - | - | 4.31 | 4.31 |
| TW 8 | 4/30/99 | 31.12 | 26.52 | - | - | - | 4.60 | 4.60 |
| TW 8 | 5/17/99 | 31.12 | 26.47 | - | - | - | 4.65 | 4.65 |
| TW 8 | 7/20/99 | 31.12 | 26.29 | - | - | - | 4.83 | 4.83 |
| TW 9 | 11/25/97 | 33.14 | 28.69 | - | - | - | 4.45 | 4.45 |
| TW 9 | 12/17/97 | 33.14 | 27.75 | - | - | - | 5.39 | 5.39 |
| TW 9 | 9/18/98 | 33.14 | 28.06 | - | - | - | 5.08 | 5.08 |
| TW 9 | 9/21/98 | 33.14 | 27.97 | - | - | - | 5.17 | 5.17 |
| TW 9 | 9/22/98 | 33.14 | 27.97 | - | - | - | 5.17 | 5.17 |
| TW 9 | 9/23/98 | 33.14 | 28.15 | - | - | - | 4.99 | 4.99 |
| TW 9 | 9/25/98 | 33.14 | 28.14 | - | - | - | 5.00 | 5.00 |
| TW 9 | 9/28/98 | 33.14 | 28.05 | - | - | - | 5.09 | 5.09 |
| TW 9 | 9/29/98 | 33.14 | 28.18 | - | - | - | 4.96 | 4.96 |
| TW 9 | 9/30/98 | 33.14 | 28.19 | - | - | - | 4.95 | 4.95 |
| TW 9 | 10/1/98 | 33.14 | 28.17 | - | - | - | 4.97 | 4.97 |
| TW 9 | 10/5/98 | 33.14 | 28.11 | - | - | - | 5.03 | 5.03 |
| TW 9 | 10/13/98 | 33.14 | 28.28 | - | - | - | 4.86 | 4.86 |
| TW 9 | 10/19/98 | 33.14 | 29.40 | - | - | - | 3.74 | 3.74 |
| TW 9 | 11/20/98 | 33.14 | 28.43 | - | - | - | 4.71 | 4.71 |
| TW 9 | 11/25/98 | 33.14 | 28.57 | - | - | - | 4.57 | 4.57 |
| TW 9 | 12/4/98 | 33.14 | 28.43 | - | - | - | 4.71 | 4.71 |
| TW 9 | 12/11/98 | 33.14 | 28.45 | - | - | - | 4.69 | 4.69 |
| TW 9 | 12/18/98 | 33.14 | 28.58 | - | - | - | 4.56 | 4.56 |
| TW 9 | 12/29/98 | 33.14 | 28.52 | - | - | - | 4.62 | 4.62 |
| TW 9 | 4/30/99 | 33.14 | 28.41 | - | - | - | 4.73 | 4.73 |
| TW 9 | 5/17/99 | 33.14 | 28.20 | - | - | - | 4.94 | 4.94 |
| TW 9 | 7/20/99 | 33.14 | 27.92 | - | - | - | 5.22 | 5.22 |

**TABLE 1**
**Historical Well Gauging Summary**
**Sun Belmont Terminal**
**Passyunk Avenue, Philadelphia Pennsylvania**

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| TW 10 | 11/25/97 | 31.19 | 26.97 | 26.89 | 0.08 | 4.30 | 4.22 | 4.28 |
| TW 10 | 12/17/97 | 31.19 | 26.48 | 26.29 | 0.19 | 4.90 | 4.71 | 4.85 |
| TW 10 | 8/21/98 | 31.19 | 27.88 | 25.91 | 1.97 | 5.28 | 3.31 | 4.79 |
| TW 10 | 9/18/98 | 31.19 | 28.08 | 26.04 | 2.04 | 5.15 | 3.11 | 4.64 |
| TW 10 | 9/21/98 | 31.19 | 27.91 | 26.05 | 1.86 | 5.14 | 3.28 | 4.68 |
| TW 10 | 9/22/98 | 31.19 | 27.97 | 26.10 | 1.87 | 5.09 | 3.22 | 4.62 |
| TW 10 | 9/23/98 | 31.19 | 28.12 | 26.18 | 1.94 | 5.01 | 3.07 | 4.53 |
| TW 10 | 9/25/98 | 31.19 | 28.17 | 26.23 | 1.94 | 4.96 | 3.02 | 4.48 |
| TW 10 | 9/28/98 | 31.19 | 28.10 | 26.22 | 1.88 | 4.97 | 3.09 | 4.50 |
| TW 10 | 9/29/98 | 31.19 | 28.24 | 26.28 | 1.96 | 4.91 | 2.95 | 4.42 |
| TW 10 | 9/30/98 | 31.19 | 28.16 | 26.25 | 1.91 | 4.94 | 3.03 | 4.46 |
| TW 10 | 10/1/98 | 31.19 | 28.21 | 26.28 | 1.93 | 4.91 | 2.98 | 4.43 |
| TW 10 | 10/5/98 | 31.19 | 27.95 | 26.20 | 1.75 | 4.99 | 3.24 | 4.55 |
| TW 10 | 10/19/98 | 31.19 | 27.95 | 26.20 | 1.75 | 4.99 | 3.24 | 4.55 |
| TW 10 | 11/20/98 | 31.19 | 28.43 | 26.51 | 1.92 | 4.68 | 2.76 | 4.20 |
| TW 10 | 11/25/98 | 31.19 | 28.52 | 26.53 | 1.99 | 4.66 | 2.67 | 4.16 |
| TW 10 | 12/4/98 | 31.19 | 28.58 | 26.47 | 2.11 | 4.72 | 2.61 | 4.19 |
| TW 10 | 12/29/98 | 31.19 | 28.65 | 26.51 | 2.14 | 4.68 | 2.54 | 4.15 |
| TW 10 | 4/30/99 | 31.19 | 28.00 | 26.39 | 1.61 | 4.80 | 3.19 | 4.40 |
| TW 10 | 5/17/99 | 31.19 | 27.95 | 26.34 | 1.61 | 4.85 | 3.24 | 4.45 |
| TW 10 | 7/20/99 | 31.19 | 27.95 | 26.11 | 1.84 | 5.08 | 3.24 | 4.62 |
| TW 11 | 11/25/97 | 33.43 | 28.36 | - | - | - | 5.07 | 5.07 |
| TW 11 | 12/17/97 | 33.43 | 28.40 | - | - | - | 5.03 | 5.03 |
| TW 11 | 8/21/98 | 33.43 | 28.33 | - | - | - | 5.10 | 5.10 |
| TW 11 | 9/18/98 | 33.43 | 28.45 | - | - | - | 4.98 | 4.98 |
| TW 11 | 9/21/98 | 33.43 | 28.42 | - | - | - | 5.01 | 5.01 |
| TW 11 | 9/22/98 | 33.43 | 28.41 | - | - | - | 5.02 | 5.02 |
| TW 11 | 9/23/98 | 33.43 | 28.55 | - | - | - | 4.88 | 4.88 |
| TW 11 | 9/25/98 | 33.43 | 28.53 | - | - | - | 4.90 | 4.90 |
| TW 11 | 9/28/98 | 33.43 | 28.49 | - | - | - | 4.94 | 4.94 |
| TW 11 | 9/29/98 | 33.43 | 28.59 | - | - | - | 4.84 | 4.84 |
| TW 11 | 9/30/98 | 33.43 | 28.59 | - | - | - | 4.84 | 4.84 |
| TW 11 | 10/1/98 | 33.43 | 28.59 | - | - | - | 4.84 | 4.84 |
| TW 11 | 10/5/98 | 33.43 | 28.55 | - | - | - | 4.88 | 4.88 |
| TW 11 | 10/13/98 | 33.43 | 28.64 | - | - | - | 4.79 | 4.79 |
| TW 11 | 10/19/98 | 33.43 | 28.59 | - | - | - | 4.84 | 4.84 |
| TW 11 | 11/20/98 | 33.43 | 28.81 | - | - | - | 4.62 | 4.62 |
| TW 11 | 11/25/98 | 33.43 | 28.87 | - | - | - | 4.56 | 4.56 |
| TW 11 | 12/4/98 | 33.43 | 28.82 | - | - | - | 4.61 | 4.61 |
| TW 11 | 12/11/98 | 33.43 | 28.87 | - | - | - | 4.56 | 4.56 |
| TW 11 | 12/18/98 | 33.43 | 28.97 | - | - | - | 4.46 | 4.46 |
| TW 11 | 12/29/98 | 33.43 | 28.91 | - | - | - | 4.52 | 4.52 |
| TW 11 | 4/30/99 | 33.43 | 28.66 | - | - | - | 4.77 | 4.77 |
| TW 11 | 5/17/99 | 33.43 | 28.61 | - | - | - | 4.82 | 4.82 |
| TW 11 | 7/20/99 | 33.43 | 28.43 | - | - | - | 5.00 | 5.00 |
| OW 2 | 11/25/97 | 32.70 | 27.37 | 27.30 | 0.07 | 5.40 | 5.33 | 5.38 |
| OW 2 | 12/17/97 | 32.70 | 27.31 | 27.30 | 0.01 | 5.40 | 5.39 | 5.40 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| OW 2 | 8/21/98 | 32.70 | 27.88 | 27.06 | 0.82 | 5.64 | 4.82 | 5.44 |
| OW 2 | 9/18/98 | 32.70 | 28.15 | 27.30 | 0.85 | 5.40 | 4.55 | 5.19 |
| OW 2 | 9/21/98 | 32.70 | 28.04 | 27.22 | 0.82 | 5.48 | 4.66 | 5.28 |
| OW 2 | 9/22/98 | 32.70 | 28.16 | 27.22 | 0.94 | 5.48 | 4.54 | 5.25 |
| OW 2 | 9/23/98 | 32.70 | 28.30 | 27.38 | 0.92 | 5.32 | 4.40 | 5.09 |
| OW 2 | 9/25/98 | 32.70 | 28.39 | 27.29 | 1.10 | 5.41 | 4.31 | 5.14 |
| OW 2 | 9/28/98 | 32.70 | 28.28 | 27.85 | 0.43 | 4.85 | 4.42 | 4.74 |
| OW 2 | 9/29/98 | 32.70 | 28.42 | 27.46 | 0.96 | 5.24 | 4.28 | 5.00 |
| OW 2 | 9/30/98 | 32.70 | 28.39 | 27.43 | 0.96 | 5.27 | 4.31 | 5.03 |
| OW 2 | 10/1/98 | 32.70 | 28.44 | 27.43 | 1.01 | 5.27 | 4.26 | 5.02 |
| OW 2 | 10/5/98 | 32.70 | 28.36 | 27.33 | 1.03 | 5.37 | 4.34 | 5.11 |
| OW 2 | 10/13/98 | 32.70 | 28.59 | 27.44 | 1.15 | 5.26 | 4.11 | 4.97 |
| OW 2 | 10/19/98 | 32.70 | 28.53 | 27.37 | 1.16 | 5.33 | 4.17 | 5.04 |
| OW 2 | 11/20/98 | 32.70 | 28.92 | 27.64 | 1.28 | 5.06 | 3.78 | 4.74 |
| OW 2 | 11/25/98 | 32.70 | 28.97 | 27.70 | 1.27 | 5.00 | 3.73 | 4.68 |
| OW 2 | 12/4/98 | 32.70 | 28.96 | 27.62 | 1.34 | 5.08 | 3.74 | 4.75 |
| OW 2 | 12/11/98 | 32.70 | 28.98 | 27.68 | 1.30 | 5.02 | 3.72 | 4.70 |
| OW 2 | 12/18/98 | 32.70 | 29.10 | 27.82 | 1.28 | 4.88 | 3.60 | 4.56 |
| OW 2 | 12/29/98 | 32.70 | 29.08 | 27.70 | 1.38 | 5.00 | 3.62 | 4.66 |
| OW 2 | 4/30/99 | 32.70 | 28.47 | 27.54 | 0.93 | 5.16 | 4.23 | 4.93 |
| OW 2 | 5/17/99 | 32.70 | 28.35 | 27.44 | 0.91 | 5.26 | 4.35 | 5.03 |
| OW 2 | 7/20/99 | 32.70 | 28.11 | 27.25 | 0.86 | 5.45 | 4.59 | 5.24 |
| OW 12 | 11/25/97 | 31.18 | 26.86 | 25.81 | 1.05 | 5.37 | 4.32 | 5.11 |
| OW 12 | 12/17/97 | 31.18 | 26.94 | 25.84 | 1.10 | 5.34 | 4.24 | 5.07 |
| OW 12 | 8/21/98 | 31.18 | 27.22 | 25.83 | 1.39 | 5.35 | 3.96 | 5.00 |
| OW 12 | 9/18/98 | 31.18 | 27.65 | 25.99 | 1.66 | 5.19 | 3.53 | 4.78 |
| OW 12 | 9/21/98 | 31.18 | 27.32 | 25.98 | 1.34 | 5.20 | 3.86 | 4.87 |
| OW 12 | 9/22/98 | 31.18 | 27.46 | 26.10 | 1.36 | 5.08 | 3.72 | 4.74 |
| OW 12 | 9/23/98 | 31.18 | 27.58 | 26.20 | 1.38 | 4.98 | 3.60 | 4.64 |
| OW 12 | 9/25/98 | 31.18 | 27.70 | 26.20 | 1.50 | 4.98 | 3.48 | 4.61 |
| OW 12 | 9/28/98 | 31.18 | 27.72 | 26.13 | 1.59 | 5.05 | 3.46 | 4.65 |
| OW 12 | 9/29/98 | 31.18 | 27.78 | 26.24 | 1.54 | 4.94 | 3.40 | 4.56 |
| OW 12 | 9/30/98 | 31.18 | 27.78 | 26.21 | 1.57 | 4.97 | 3.40 | 4.58 |
| OW 12 | 10/1/98 | 31.18 | 28.01 | 26.29 | 1.72 | 4.89 | 3.17 | 4.46 |
| OW 12 | 10/5/98 | 31.18 | 27.44 | 26.13 | 1.31 | 5.05 | 3.74 | 4.72 |
| OW 12 | 10/13/98 | 31.18 | 27.44 | 26.13 | 1.31 | 5.05 | 3.74 | 4.72 |
| OW 12 | 10/19/98 | 31.18 | 27.37 | 26.60 | 0.77 | 4.58 | 3.81 | 4.39 |
| OW 12 | 11/20/98 | 31.18 | 28.16 | 26.49 | 1.67 | 4.69 | 3.02 | 4.27 |
| OW 12 | 11/25/98 | 31.18 | 28.38 | 26.38 | 2.00 | 4.80 | 2.80 | 4.30 |
| OW 12 | 12/4/98 | 31.18 | 28.48 | 26.42 | 2.06 | 4.76 | 2.70 | 4.25 |
| OW 12 | 12/11/98 | 31.18 | 28.25 | 26.46 | 1.79 | 4.72 | 2.93 | 4.27 |
| OW 12 | 12/18/98 | 31.18 | 28.64 | 26.50 | 2.14 | 4.68 | 2.54 | 4.15 |
| OW 12 | 12/29/98 | 31.18 | 28.35 | 26.47 | 1.88 | 4.71 | 2.83 | 4.24 |
| OW 12 | 4/30/99 | 31.18 | 27.25 | 26.31 | 0.94 | 4.87 | 3.93 | 4.64 |
| OW 12 | 5/17/99 | 31.18 | 27.28 | 26.25 | 1.03 | 4.93 | 3.90 | 4.67 |
| OW 12 | 7/20/99 | 31.18 | 27.01 | 26.03 | 0.98 | 5.15 | 4.17 | 4.91 |
| OW 13 | 11/25/97 | 33.26 | 27.93 | 27.74 | 0.19 | 5.52 | 5.33 | 5.47 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| OW 13 | 12/17/97 | 33.26 | 28.80 | 27.52 | 1.28 | 5.74 | 4.46 | 5.42 |
| OW 13 | 8/21/98 | 33.26 | 28.70 | 27.61 | 1.09 | 5.65 | 4.56 | 5.38 |
| OW 13 | 9/18/98 | 33.26 | 29.07 | 27.84 | 1.23 | 5.42 | 4.19 | 5.11 |
| OW 13 | 9/21/98 | 33.26 | 28.90 | 27.74 | 1.16 | 5.52 | 4.36 | 5.23 |
| OW 13 | 9/22/98 | 33.26 | 28.96 | 27.76 | 1.20 | 5.50 | 4.30 | 5.20 |
| OW 13 | 9/23/98 | 33.26 | 29.08 | 27.95 | 1.13 | 5.31 | 4.18 | 5.03 |
| OW 13 | 9/25/98 | 33.26 | 29.09 | 27.96 | 1.13 | 5.30 | 4.17 | 5.02 |
| OW 13 | 9/28/98 | 33.26 | 29.12 | 27.85 | 1.27 | 5.41 | 4.14 | 5.09 |
| OW 13 | 9/29/98 | 33.26 | 29.18 | 28.04 | 1.14 | 5.22 | 4.08 | 4.94 |
| OW 13 | 9/30/98 | 33.26 | 29.21 | 28.01 | 1.20 | 5.25 | 4.05 | 4.95 |
| OW 13 | 10/1/98 | 33.26 | 29.25 | 28.01 | 1.24 | 5.25 | 4.01 | 4.94 |
| OW 13 | 10/5/98 | 33.26 | 29.20 | 27.84 | 1.36 | 5.42 | 4.06 | 5.08 |
| OW 13 | 10/13/98 | 33.26 | 29.38 | 28.04 | 1.34 | 5.22 | 3.88 | 4.89 |
| OW 13 | 10/19/98 | 33.26 | 29.40 | 27.92 | 1.48 | 5.34 | 3.86 | 4.97 |
| OW 13 | 11/20/98 | 33.26 | 29.65 | 28.17 | 1.48 | 5.09 | 3.61 | 4.72 |
| OW 13 | 11/25/98 | 33.26 | 29.69 | 28.22 | 1.47 | 5.04 | 3.57 | 4.67 |
| OW 13 | 12/4/98 | 33.26 | 29.62 | 28.13 | 1.49 | 5.13 | 3.64 | 4.76 |
| OW 13 | 12/11/98 | 33.26 | 29.64 | 28.22 | 1.42 | 5.04 | 3.62 | 4.69 |
| OW 13 | 12/18/98 | 33.26 | 29.78 | 28.35 | 1.43 | 4.91 | 3.48 | 4.55 |
| OW 13 | 12/29/98 | 33.26 | 29.75 | 28.24 | 1.51 | 5.02 | 3.51 | 4.64 |
| OW 13 | 4/30/99 | 33.26 | 29.17 | 28.06 | 1.11 | 5.20 | 4.09 | 4.92 |
| OW 13 | 5/17/99 | 33.26 | 29.10 | 27.95 | 1.15 | 5.31 | 4.16 | 5.02 |
| OW 13 | 7/20/99 | 33.26 | 28.78 | 27.80 | 0.98 | 5.46 | 4.48 | 5.22 |
| OW 14 | 11/25/97 | 33.26 | 28.35 | - | - | - | 4.91 | 4.91 |
| OW 14 | 12/17/97 | 33.26 | 28.45 | - | - | - | 4.81 | 4.81 |
| OW 14 | 8/21/98 | 33.26 | 28.33 | - | - | - | 4.93 | 4.93 |
| OW 14 | 9/18/98 | 33.26 | 28.67 | - | - | - | 4.59 | 4.59 |
| OW 14 | 9/21/98 | 33.26 | 28.43 | - | - | - | 4.83 | 4.83 |
| OW 14 | 9/22/98 | 33.26 | 28.42 | - | - | - | 4.84 | 4.84 |
| OW 14 | 9/23/98 | 33.26 | 28.71 | - | - | - | 4.55 | 4.55 |
| OW 14 | 9/25/98 | 33.26 | 28.67 | - | - | - | 4.59 | 4.59 |
| OW 14 | 9/28/98 | 33.26 | 28.46 | - | - | - | 4.80 | 4.80 |
| OW 14 | 9/29/98 | 33.26 | 28.83 | - | - | - | 4.43 | 4.43 |
| OW 14 | 9/30/98 | 33.26 | 28.80 | - | - | - | 4.46 | 4.46 |
| OW 14 | 10/1/98 | 33.26 | 28.82 | - | - | - | 4.44 | 4.44 |
| OW 14 | 10/5/98 | 33.26 | 28.82 | - | - | - | 4.44 | 4.44 |
| OW 14 | 10/13/98 | 33.26 | 28.88 | - | - | - | 4.38 | 4.38 |
| OW 14 | 10/19/98 | 33.26 | 28.58 | - | - | - | 4.68 | 4.68 |
| OW 14 | 11/20/98 | 33.26 | 28.89 | - | - | - | 4.37 | 4.37 |
| OW 14 | 11/25/98 | 33.26 | 28.96 | - | - | - | 4.30 | 4.30 |
| OW 14 | 12/4/98 | 33.26 | 28.84 | - | - | - | 4.42 | 4.42 |
| OW 14 | 12/11/98 | 33.26 | 28.90 | - | - | - | 4.36 | 4.36 |
| OW 14 | 12/18/98 | 33.26 | 29.04 | - | - | - | 4.22 | 4.22 |
| OW 14 | 12/29/98 | 33.26 | 28.94 | - | - | - | 4.32 | 4.32 |
| OW 14 | 4/30/99 | 33.26 | 28.65 | - | - | - | 4.61 | 4.61 |
| OW 14 | 5/17/99 | 33.26 | 28.59 | - | - | - | 4.67 | 4.67 |
| OW 14 | 7/20/99 | 33.26 | 28.41 | - | - | - | 4.85 | 4.85 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| OW 16 | 12/17/97 | 32.37 | 27.43 | 26.90 | 0.53 | 5.47 | 4.94 | 5.34 |
| OW 16 | 8/21/98 | 32.37 | 27.82 | 26.86 | 0.96 | 5.51 | 4.55 | 5.27 |
| OW 16 | 9/18/98 | 32.37 | 28.15 | 26.98 | 1.17 | 5.39 | 4.22 | 5.10 |
| OW 16 | 9/21/98 | 32.37 | 28.03 | 27.01 | 1.02 | 5.36 | 4.34 | 5.11 |
| OW 16 | 9/22/98 | 32.37 | 28.11 | 27.02 | 1.09 | 5.35 | 4.26 | 5.08 |
| OW 16 | 9/23/98 | 32.37 | 28.40 | 27.14 | 1.26 | 5.23 | 3.97 | 4.92 |
| OW 16 | 9/25/98 | 32.37 | 28.52 | 27.15 | 1.37 | 5.22 | 3.85 | 4.88 |
| OW 16 | 9/28/98 | 32.37 | 28.35 | 27.09 | 1.26 | 5.28 | 4.02 | 4.97 |
| OW 16 | 9/29/98 | 32.37 | 28.30 | 27.19 | 1.11 | 5.18 | 4.07 | 4.90 |
| OW 16 | 9/30/98 | 32.37 | 28.25 | 27.18 | 1.07 | 5.19 | 4.12 | 4.92 |
| OW 16 | 10/1/98 | 32.37 | 28.34 | 27.21 | 1.13 | 5.16 | 4.03 | 4.88 |
| OW 16 | 10/5/98 | 32.37 | 28.14 | 27.15 | 0.99 | 5.22 | 4.23 | 4.97 |
| OW 16 | 10/13/98 | 32.37 | 28.32 | 27.32 | 1.00 | 5.05 | 4.05 | 4.80 |
| OW 16 | 10/19/98 | 32.37 | 28.17 | 27.22 | 0.95 | 5.15 | 4.20 | 4.91 |
| OW 16 | 11/20/98 | 32.37 | 28.50 | 27.47 | 1.03 | 4.90 | 3.87 | 4.64 |
| OW 16 | 11/25/98 | 32.37 | 28.75 | 27.51 | 1.24 | 4.86 | 3.62 | 4.55 |
| OW 16 | 12/4/98 | 32.37 | 28.71 | 27.44 | 1.27 | 4.93 | 3.66 | 4.61 |
| OW 16 | 12/18/98 | 32.37 | 28.91 | 27.59 | 1.32 | 4.78 | 3.46 | 4.45 |
| OW 16 | 12/29/98 | 32.37 | 28.80 | 27.49 | 1.31 | 4.88 | 3.57 | 4.55 |
| OW 16 | 4/30/99 | 32.37 | 29.15 | 27.31 | 1.84 | 5.06 | 3.22 | 4.60 |
| OW 16 | 5/17/99 | 32.37 | 27.80 | 27.25 | 0.55 | 5.12 | 4.57 | 4.98 |
| OW 16 | 7/20/99 | 32.37 | 28.30 | 27.08 | 1.22 | 5.29 | 4.07 | 4.99 |
| OW 17 | 12/17/97 | 30.99 | 26.13 | 26.10 | 0.03 | 4.89 | 4.86 | 4.88 |
| OW 17 | 8/21/98 | 30.99 | 26.42 | 26.13 | 0.29 | 4.86 | 4.57 | 4.79 |
| OW 17 | 9/18/98 | 30.99 | 27.06 | 26.21 | 0.85 | 4.78 | 3.93 | 4.57 |
| OW 17 | 9/21/98 | 30.99 | 26.95 | 26.18 | 0.77 | 4.81 | 4.04 | 4.62 |
| OW 17 | 9/22/98 | 30.99 | 26.95 | 26.19 | 0.76 | 4.80 | 4.04 | 4.61 |
| OW 17 | 9/23/98 | 30.99 | 27.38 | 26.25 | 1.13 | 4.74 | 3.61 | 4.46 |
| OW 17 | 9/25/98 | 30.99 | 27.73 | 26.25 | 1.48 | 4.74 | 3.26 | 4.37 |
| OW 17 | 9/28/98 | 30.99 | 27.51 | 26.34 | 1.17 | 4.65 | 3.48 | 4.36 |
| OW 17 | 9/29/98 | 30.99 | 27.55 | 26.28 | 1.27 | 4.71 | 3.44 | 4.39 |
| OW 17 | 9/30/98 | 30.99 | 27.45 | 26.26 | 1.19 | 4.73 | 3.54 | 4.43 |
| OW 17 | 10/1/98 | 30.99 | 27.59 | 26.30 | 1.29 | 4.69 | 3.40 | 4.37 |
| OW 17 | 10/5/98 | 30.99 | 27.44 | 26.30 | 1.14 | 4.69 | 3.55 | 4.41 |
| OW 17 | 10/13/98 | 30.99 | 27.73 | 26.35 | 1.38 | 4.64 | 3.26 | 4.30 |
| OW 17 | 10/19/98 | 30.99 | 27.55 | 26.33 | 1.22 | 4.66 | 3.44 | 4.36 |
| OW 17 | 11/20/98 | 30.99 | 28.05 | 26.48 | 1.57 | 4.51 | 2.94 | 4.12 |
| OW 17 | 11/25/98 | 30.99 | 28.25 | 26.55 | 1.70 | 4.44 | 2.74 | 4.02 |
| OW 17 | 12/4/98 | 30.99 | 28.13 | 26.54 | 1.59 | 4.45 | 2.86 | 4.05 |
| OW 17 | 12/11/98 | 30.99 | 28.15 | 26.59 | 1.56 | 4.40 | 2.84 | 4.01 |
| OW 17 | 12/18/98 | 30.99 | 28.28 | 26.72 | 1.56 | 4.27 | 2.71 | 3.88 |
| OW 17 | 12/29/98 | 30.99 | 28.17 | 26.53 | 1.64 | 4.46 | 2.82 | 4.05 |
| OW 17 | 4/30/99 | 30.99 | 27.59 | 26.40 | 1.19 | 4.59 | 3.40 | 4.29 |
| OW 17 | 5/17/99 | 30.99 | 27.51 | 26.33 | 1.18 | 4.66 | 3.48 | 4.37 |
| OW 17 | 7/20/99 | 30.99 | 27.13 | 26.31 | 0.82 | 4.68 | 3.86 | 4.48 |
| OW 18 | 8/21/98 | 31.79 | 27.44 | 27.34 | 0.10 | 4.45 | 4.35 | 4.43 |
| OW 18 | 9/18/98 | 31.79 | 27.54 | 27.51 | 0.03 | 4.28 | 4.25 | 4.27 |

**TABLE 1**
**Historical Well Gauging Summary**
**Sun Belmont Terminal**
**Passyunk Avenue, Philadelphia Pennsylvania**

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| OW 18 | 9/21/98 | 31.79 | 27.50 | 27.42 | 0.08 | 4.37 | 4.29 | 4.35 |
| OW 18 | 9/22/98 | 31.79 | 27.52 | 27.40 | 0.12 | 4.39 | 4.27 | 4.36 |
| OW 18 | 9/23/98 | 31.79 | 27.58 | 27.44 | 0.14 | 4.35 | 4.21 | 4.32 |
| OW 18 | 9/25/98 | 31.79 | 27.82 | 27.62 | 0.20 | 4.17 | 3.97 | 4.12 |
| OW 18 | 9/28/98 | 31.79 | 27.98 | 27.59 | 0.39 | 4.20 | 3.81 | 4.10 |
| OW 18 | 9/29/98 | 31.79 | 27.94 | 27.48 | 0.46 | 4.31 | 3.85 | 4.20 |
| OW 18 | 9/30/98 | 31.79 | 27.93 | 27.41 | 0.52 | 4.38 | 3.86 | 4.25 |
| OW 18 | 10/1/98 | 31.79 | 28.08 | 27.40 | 0.68 | 4.39 | 3.71 | 4.22 |
| OW 18 | 10/5/98 | 31.79 | 28.06 | 27.42 | 0.64 | 4.37 | 3.73 | 4.21 |
| OW 18 | 10/13/98 | 31.79 | 28.24 | 27.41 | 0.83 | 4.38 | 3.55 | 4.17 |
| OW 18 | 10/19/98 | 31.79 | 28.31 | 27.41 | 0.90 | 4.38 | 3.48 | 4.16 |
| OW 18 | 11/20/98 | 31.79 | 28.76 | 27.50 | 1.26 | 4.29 | 3.03 | 3.98 |
| OW 18 | 11/25/98 | 31.79 | 28.89 | 27.55 | 1.34 | 4.24 | 2.90 | 3.91 |
| OW 18 | 12/4/98 | 31.79 | 28.06 | 27.48 | 0.58 | 4.31 | 3.73 | 4.17 |
| OW 18 | 12/11/98 | 31.79 | 29.06 | 27.56 | 1.50 | 4.23 | 2.73 | 3.86 |
| OW 18 | 12/18/98 | 31.79 | 29.08 | 27.61 | 1.47 | 4.18 | 2.71 | 3.81 |
| OW 18 | 12/29/98 | 31.79 | 29.08 | 27.57 | 1.51 | 4.22 | 2.71 | 3.84 |
| OW 18 | 4/30/99 | 31.79 | 28.71 | 27.45 | 1.26 | 4.34 | 3.08 | 4.03 |
| OW 18 | 7/20/99 | 31.79 | 28.39 | 27.28 | 1.11 | 4.51 | 3.40 | 4.23 |
| OW 19 | 8/21/98 | 31.95 | 27.02 | 26.23 | 0.79 | 5.72 | 4.93 | 5.52 |
| OW 19 | 9/18/98 | 31.95 | 26.52 | 26.35 | 0.17 | 5.60 | 5.43 | 5.56 |
| OW 19 | 9/25/98 | 31.95 | 27.68 | 26.19 | 1.49 | 5.76 | 4.27 | 5.39 |
| OW 19 | 9/28/98 | 31.95 | 26.70 | 26.41 | 0.29 | 5.54 | 5.25 | 5.47 |
| OW 19 | 9/29/98 | 31.95 | 26.79 | 26.57 | 0.22 | 5.38 | 5.16 | 5.33 |
| OW 19 | 9/30/98 | 31.95 | 26.78 | 26.59 | 0.19 | 5.36 | 5.17 | 5.31 |
| OW 19 | 10/1/98 | 31.95 | 26.78 | 26.54 | 0.24 | 5.41 | 5.17 | 5.35 |
| OW 19 | 10/5/98 | 31.95 | 26.74 | 26.49 | 0.25 | 5.46 | 5.21 | 5.40 |
| OW 19 | 10/13/98 | 31.95 | 26.93 | 26.78 | 0.15 | 5.17 | 5.02 | 5.13 |
| OW 19 | 10/19/98 | 31.95 | 26.82 | 26.65 | 0.17 | 5.30 | 5.13 | 5.26 |
| OW 19 | 11/20/98 | 31.95 | 26.40 | 26.39 | 0.01 | 5.56 | 5.55 | 5.56 |
| OW 19 | 11/25/98 | 31.95 | 26.15 | 26.06 | 0.09 | 5.89 | 5.80 | 5.87 |
| OW 19 | 12/4/98 | 31.95 | 26.38 | 26.35 | 0.03 | 5.60 | 5.57 | 5.59 |
| OW 19 | 12/11/98 | 31.95 | 26.13 | 25.99 | 0.14 | 5.96 | 5.82 | 5.93 |
| OW 19 | 12/18/98 | 31.95 | 26.17 | 26.14 | 0.03 | 5.81 | 5.78 | 5.80 |
| OW 19 | 12/29/98 | 31.95 | 26.08 | 26.06 | 0.02 | 5.89 | 5.87 | 5.89 |
| OW 19 | 4/30/99 | 31.95 | 25.80 | 25.71 | 0.09 | 6.24 | 6.15 | 6.22 |
| OW 19 | 7/20/99 | 31.95 | 26.62 | 26.38 | 0.24 | 5.57 | 5.33 | 5.51 |
| OW 20 | 8/21/98 | 32.86 | 26.88 | 26.48 | 0.40 | 6.38 | 5.98 | 6.28 |
| OW 20 | 9/18/98 | 32.86 | 26.63 | 26.54 | 0.09 | 6.32 | 6.23 | 6.30 |
| OW 20 | 9/21/98 | 32.86 | 26.67 | 26.50 | 0.17 | 6.36 | 6.19 | 6.32 |
| OW 20 | 9/22/98 | 32.86 | 26.67 | 26.58 | 0.09 | 6.28 | 6.19 | 6.26 |
| OW 20 | 9/23/98 | 32.86 | 26.79 | 26.63 | 0.16 | 6.23 | 6.07 | 6.19 |
| OW 20 | 9/25/98 | 32.86 | 26.91 | 26.63 | 0.28 | 6.23 | 5.95 | 6.16 |
| OW 20 | 9/28/98 | 32.86 | 26.87 | 26.61 | 0.26 | 6.25 | 5.99 | 6.19 |
| OW 20 | 9/29/98 | 32.86 | 27.08 | 26.71 | 0.37 | 6.15 | 5.78 | 6.06 |
| OW 20 | 9/30/98 | 32.86 | 27.16 | 26.71 | 0.45 | 6.15 | 5.70 | 6.04 |
| OW 20 | 10/1/98 | 32.86 | 27.15 | 26.69 | 0.46 | 6.17 | 5.71 | 6.06 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| OW 20 | 10/5/98 | 32.86 | 27.20 | 26.67 | 0.53 | 6.19 | 5.66 | 6.06 |
| OW 20 | 10/13/98 | 32.86 | 27.29 | 26.73 | 0.56 | 6.13 | 5.57 | 5.99 |
| OW 20 | 10/19/98 | 32.86 | 27.17 | 26.68 | 0.49 | 6.18 | 5.69 | 6.06 |
| OW 20 | 11/20/98 | 32.86 | 28.23 | 27.16 | 1.07 | 5.70 | 4.63 | 5.43 |
| OW 20 | 11/25/98 | 32.86 | 28.23 | 27.17 | 1.06 | 5.69 | 4.63 | 5.43 |
| OW 20 | 12/4/98 | 32.86 | 28.22 | 27.18 | 1.04 | 5.68 | 4.64 | 5.42 |
| OW 20 | 12/11/98 | 32.86 | 28.23 | 27.33 | 0.90 | 5.53 | 4.63 | 5.31 |
| OW 20 | 12/18/98 | 32.86 | 28.22 | 27.44 | 0.78 | 5.42 | 4.64 | 5.23 |
| OW 20 | 12/29/98 | 32.86 | 28.24 | 27.43 | 0.81 | 5.43 | 4.62 | 5.23 |
| OW 20 | 4/30/99 | 32.86 | 26.51 | 26.51 | 0.00 | 6.35 | 6.35 | 6.35 |
| OW 20 | 7/20/99 | 32.86 | 26.49 | - | - | - | 6.37 | 6.37 |
| RW 1 | 8/21/98 | 30.50 | 26.72 | 25.16 | 1.56 | 5.34 | 3.78 | 4.95 |
| RW 1 | 9/18/98 | 30.50 | 29.40 | 26.56 | 2.84 | 3.94 | 1.10 | 3.23 |
| RW 1 | 9/21/98 | 30.50 | 26.89 | 25.30 | 1.59 | 5.20 | 3.61 | 4.80 |
| RW 1 | 9/22/98 | 30.50 | 30.80 | 26.05 | 4.75 | 4.45 | -0.30 | 3.26 |
| RW 1 | 9/23/98 | 30.50 | 29.45 | 25.95 | 3.50 | 4.55 | 1.05 | 3.68 |
| RW 1 | 9/25/98 | 30.50 | 29.30 | 25.55 | 3.75 | 4.95 | 1.20 | 4.01 |
| RW 1 | 9/28/98 | 30.50 | 29.50 | 25.70 | 3.80 | 4.80 | 1.00 | 3.85 |
| RW 1 | 9/29/98 | 30.50 | 29.30 | 25.90 | 3.40 | 4.60 | 1.20 | 3.75 |
| RW 1 | 9/30/98 | 30.50 | 29.60 | 25.60 | 4.00 | 4.90 | 0.90 | 3.90 |
| RW 1 | 10/1/98 | 30.50 | 29.60 | 25.60 | 4.00 | 4.90 | 0.90 | 3.90 |
| RW 1 | 10/5/98 | 30.50 | 30.95 | 26.65 | 4.30 | 3.85 | -0.45 | 2.78 |
| RW 1 | 10/13/98 | 30.50 | 30.10 | 27.10 | 3.00 | 3.40 | 0.40 | 2.65 |
| RW 1 | 10/19/98 | 30.50 | 30.15 | 26.65 | 3.50 | 3.85 | 0.35 | 2.98 |
| RW 1 | 11/20/98 | 30.50 | 29.85 | 26.05 | 3.80 | 4.45 | 0.65 | 3.50 |
| RW 1 | 11/25/98 | 30.50 | 28.25 | 25.70 | 2.55 | 4.80 | 2.25 | 4.16 |
| RW 1 | 12/4/98 | 30.50 | 29.91 | 26.03 | 3.88 | 4.47 | 0.59 | 3.50 |
| RW 1 | 12/11/98 | 30.50 | 28.10 | 25.68 | 2.42 | 4.82 | 2.40 | 4.22 |
| RW 1 | 12/18/98 | 30.50 | 28.95 | 25.75 | 3.20 | 4.75 | 1.55 | 3.95 |
| RW 1 | 12/29/98 | 30.50 | 29.70 | 25.70 | 4.00 | 4.80 | 0.80 | 3.80 |
| RW 1 | 4/1/99 | 30.50 | 32.64 | 25.97 | 6.67 | 4.53 | -2.14 | 2.86 |
| RW 1 | 4/9/99 | 30.50 | 26.73 | 25.70 | 1.03 | 4.80 | 3.77 | 4.54 |
| RW 1 | 4/15/99 | 30.50 | 26.69 | 25.60 | 1.09 | 4.90 | 3.81 | 4.63 |
| RW 1 | 4/23/99 | 30.50 | 26.37 | 25.58 | 0.79 | 4.92 | 4.13 | 4.72 |
| RW 1 | 4/28/99 | 30.50 | 26.21 | 25.77 | 0.44 | 4.73 | 4.29 | 4.62 |
| RW 1 | 4/30/99 | 30.50 | 26.70 | 25.68 | 1.02 | 4.82 | 3.80 | 4.57 |
| RW 1 | 5/5/99 | 30.50 | 26.62 | 25.59 | 1.03 | 4.91 | 3.88 | 4.65 |
| RW 1 | 5/11/99 | 30.50 | 26.70 | 25.68 | 1.02 | 4.82 | 3.80 | 4.57 |
| RW 1 | 5/17/99 | 30.50 | 26.88 | 25.97 | 0.91 | 4.53 | 3.62 | 4.30 |
| RW 1 | 5/25/99 | 30.50 | 27.48 | 26.54 | 0.94 | 3.96 | 3.02 | 3.73 |
| RW 1 | 6/2/99 | 30.50 | 27.30 | 26.65 | 0.65 | 3.85 | 3.20 | 3.69 |
| RW 1 | 6/7/99 | 30.50 | 27.37 | 26.42 | 0.95 | 4.08 | 3.13 | 3.84 |
| RW 1 | 6/18/99 | 30.50 | 27.07 | 26.03 | 1.04 | 4.47 | 3.43 | 4.21 |
| RW 1 | 6/23/99 | 30.50 | 27.46 | 26.21 | 1.25 | 4.29 | 3.04 | 3.98 |
| RW 1 | 6/28/99 | 30.50 | 26.97 | 25.41 | 1.56 | 5.09 | 3.53 | 4.70 |
| RW 1 | 7/6/99 | 30.50 | 27.65 | 25.60 | 2.05 | 4.90 | 2.85 | 4.39 |
| RW 1 | 7/12/99 | 30.50 | 26.80 | 25.93 | 0.87 | 4.57 | 3.70 | 4.35 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| RW 1 | 7/20/99 | 30.50 | 26.75 | 25.36 | 1.39 | 5.14 | 3.75 | 4.79 |
| RW 1 | 7/27/99 | 30.50 | 26.73 | 25.36 | 1.37 | 5.14 | 3.77 | 4.80 |
| RW 1 | 8/2/99 | 30.50 | 26.04 | 25.63 | 0.41 | 4.87 | 4.46 | 4.77 |
| RW 1 | 8/9/99 | 30.50 | 26.08 | 25.60 | 0.48 | 4.90 | 4.42 | 4.78 |
| RW 1 | 8/16/99 | 30.50 | 26.70 | 25.42 | 1.28 | 5.08 | 3.80 | 4.76 |
| RW 1 | 8/24/99 | 30.50 | 26.19 | 25.51 | 0.68 | 4.99 | 4.31 | 4.82 |
| RW 1 | 8/30/99 | 30.50 | 26.21 | 25.57 | 0.64 | 4.93 | 4.29 | 4.77 |
| RW 1 | 9/7/99 | 30.50 | 26.21 | 25.39 | 0.82 | 5.11 | 4.29 | 4.91 |
| RW 1 | 9/13/99 | 30.50 | 26.25 | 25.42 | 0.83 | 5.08 | 4.25 | 4.87 |
| RW 1 | 9/20/99 | 30.50 | 26.20 | 25.17 | 1.03 | 5.33 | 4.30 | 5.07 |
| RW 1 | 9/27/99 | 30.50 | 26.25 | 25.21 | 1.04 | 5.29 | 4.25 | 5.03 |
| RW 4 | 8/21/98 | 31.42 | 12.60 | 12.58 | 0.02 | 18.84 | 18.82 | 18.84 |
| RW 4 | 9/18/98 | 31.42 | 25.10 | 24.90 | 0.20 | 6.52 | 6.32 | 6.47 |
| RW 4 | 9/21/98 | 31.42 | 29.50 | 11.05 | 18.45 | 20.37 | 1.92 | 15.76 |
| RW 4 | 9/22/98 | 31.42 | 27.56 | 27.04 | 0.52 | 4.38 | 3.86 | 4.25 |
| RW 4 | 9/23/98 | 31.42 | 28.08 | 27.20 | 0.88 | 4.22 | 3.34 | 4.00 |
| RW 4 | 9/25/98 | 31.42 | 26:00 | 25.15 | 0.85 | 6.27 | 5.42 | 6.06 |
| RW 4 | 9/28/98 | 31.42 | 25.40 | 24.10 | 1.30 | 7.32 | 6.02 | 7.00 |
| RW 4 | 9/29/98 | 31.42 | 25.33 | 24.82 | 0.51 | 6.60 | 6.09 | 6.47 |
| RW 4 | 9/30/98 | 31.42 | 25.50 | 25.00 | 0.50 | 6.42 | 5.92 | 6.30 |
| RW 4 | 10/1/98 | 31.42 | 26.90 | 26.20 | 0.70 | 5.22 | 4.52 | 5.05 |
| RW 4 | 10/5/98 | 31.42 | 16.23 | 13.70 | 2.53 | 17.72 | 15.19 | 17.09 |
| RW 4 | 10/13/98 | 31.42 | 26.98 | 26.33 | 0.65 | 5.09 | 4.44 | 4.93 |
| RW 4 | 10/19/98 | 31.42 | 26.84 | 26.24 | 0.60 | 5.18 | 4.58 | 5.03 |
| RW 4 | 11/20/98 | 31.42 | 27.87 | 27.30 | 0.57 | 4.12 | 3.55 | 3.98 |
| RW 4 | 11/25/98 | 31.42 | 27.50 | 26.95 | 0.55 | 4.47 | 3.92 | 4.33 |
| RW 4 | 12/4/98 | 31.42 | 28.15 | 27.61 | 0.54 | 3.81 | 3.27 | 3.68 |
| RW 4 | 12/11/98 | 31.42 | 28.10 | 27.60 | 0.50 | 3.82 | 3.32 | 3.70 |
| RW 4 | 12/18/98 | 31.42 | 26.85 | 26.18 | 0.67 | 5.24 | 4.57 | 5.07 |
| RW 4 | 12/29/98 | 31.42 | 27.52 | 27.07 | 0.45 | 4.35 | 3.90 | 4.24 |
| RW 4 | 4/1/99 | 31.42 | 26.75 | 26.15 | 0.60 | 5.27 | 4.67 | 5.12 |
| RW 4 | 4/9/99 | 31.42 | 25.52 | 16.69 | 8.83 | 14.73 | 5.90 | 12.52 |
| RW 4 | 4/15/99 | 31.42 | 25.18 | 20.69 | 4.49 | 10.73 | 6.24 | 9.61 |
| RW 4 | 4/23/99 | 31.42 | 25.10 | 23.77 | 1.33 | 7.65 | 6.32 | 7.32 |
| RW 4 | 4/28/99 | 31.42 | 25.34 | 18.41 | 6.93 | 13.01 | 6.08 | 11.28 |
| RW 4 | 4/30/99 | 31.42 | 25.20 | 17.46 | 7.74 | 13.96 | 6.22 | 12.03 |
| RW 4 | 5/5/99 | 31.42 | 25.56 | 21.03 | 4.53 | 10.39 | 5.86 | 9.26 |
| RW 4 | 5/11/99 | 31.42 | 25.15 | 21.20 | 3.95 | 10.22 | 6.27 | 9.23 |
| RW 4 | 5/17/99 | 31.42 | 25.30 | 17.21 | 8.09 | 14.21 | 6.12 | 12.19 |
| RW 4 | 5/25/99 | 31.42 | 25.15 | 23.89 | 1.26 | 7.53 | 6.27 | 7.22 |
| RW 4 | 6/2/99 | 31.42 | 25.45 | 24.71 | 0.74 | 6.71 | 5.97 | 6.53 |
| RW 4 | 6/7/99 | 31.42 | 28.71 | 13.81 | 14.90 | 17.61 | 2.71 | 13.89 |
| RW 4 | 6/18/99 | 31.42 | 28.81 | 13.30 | 15.51 | 18.12 | 2.61 | 14.24 |
| RW 4 | 6/23/99 | 31.42 | 29.11 | 12.92 | 16.19 | 18.50 | 2.31 | 14.45 |
| RW 4 | 6/28/99 | 31.42 | 26.40 | 25.92 | 0.48 | 5.50 | 5.02 | 5.38 |
| RW 4 | 7/6/99 | 31.42 | 28.65 | 13.42 | 15.23 | 18.00 | 2.77 | 14.19 |
| RW 4 | 7/12/99 | 31.42 | 25.40 | 24.10 | 1.30 | 7.32 | 6.02 | 7.00 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| RW 4 | 7/20/99 | 31.42 | 28.01 | 14.60 | 13.41 | 16.82 | 3.41 | 13.47 |
| RW 4 | 7/27/99 | 31.42 | 31.02 | 13.22 | 17.80 | 18.20 | 0.40 | 13.75 |
| RW 4 | 8/2/99 | 31.42 | 26.77 | 21.25 | 5.52 | 10.17 | 4.65 | 8.79 |
| RW 4 | 8/9/99 | 31.42 | 26.10 | 22.47 | 3.63 | 8.95 | 5.32 | 8.04 |
| RW 4 | 8/16/99 | 31.42 | 31.62 | 15.15 | 16.47 | 16.27 | -0.20 | 12.15 |
| RW 4 | 8/24/99 | 31.42 | 25.20 | 22.65 | 2.55 | 8.77 | 6.22 | 8.13 |
| RW 4 | 8/30/99 | 31.42 | 30.89 | 15.28 | 15.61 | 16.14 | 0.53 | 12.24 |
| RW 4 | 9/7/99 | 31.42 | 30.30 | 13.20 | 17.10 | 18.22 | 1.12 | 13.95 |
| RW 4 | 9/13/99 | 31.42 | 26.10 | 25.54 | 0.56 | 5.88 | 5.32 | 5.74 |
| RW 4 | 9/20/99 | 31.42 | 24.50 | 11.22 | 13.28 | 20.20 | 6.92 | 16.88 |
| RW 4 | 9/27/99 | 31.42 | 25.43 | 18.27 | 7.16 | 13.15 | 5.99 | 11.36 |
| RW 6 | 11/25/97 | 32.11 | 26.88 | - | - | - | 5.23 | 5.23 |
| RW 6 | 12/17/97 | 32.11 | 26.92 | - | - | - | 5.19 | 5.19 |
| RW 6 | 8/21/98 | 32.11 | 26.80 | - | - | - | 5.31 | 5.31 |
| RW 6 | 9/18/98 | 32.11 | 29.85 | - | - | - | 2.26 | 2.26 |
| RW 6 | 9/21/98 | 32.11 | 26.98 | - | - | - | 5.13 | 5.13 |
| RW 6 | 9/22/98 | 32.11 | 27.75 | - | - | - | 4.36 | 4.36 |
| RW 6 | 9/23/98 | 32.11 | 29.50 | - | - | - | 2.61 | 2.61 |
| RW 6 | 9/25/98 | 32.11 | 29.32 | - | - | - | 2.79 | 2.79 |
| RW 6 | 9/28/98 | 32.11 | 30.65 | - | - | - | 1.46 | 1.46 |
| RW 6 | 9/29/98 | 32.11 | 30.80 | - | - | - | 1.31 | 1.31 |
| RW 6 | 9/30/98 | 32.11 | 30.70 | - | - | - | 1.41 | 1.41 |
| RW 6 | 10/1/98 | 32.11 | 30.50 | - | - | - | 1.61 | 1.61 |
| RW 6 | 10/5/98 | 32.11 | 27.13 | - | - | - | 4.98 | 4.98 |
| RW 6 | 10/13/98 | 32.11 | 30.95 | - | - | - | 1.16 | 1.16 |
| RW 6 | 10/19/98 | 32.11 | 31.00 | - | - | - | 1.11 | 1.11 |
| RW 6 | 11/20/98 | 32.11 | 31.17 | 28.52 | 2.65 | 3.59 | 0.94 | 2.93 |
| RW 6 | 11/25/98 | 32.11 | 29.68 | 26.90 | 2.78 | 5.21 | 2.43 | 4.52 |
| RW 6 | 12/4/98 | 32.11 | 27.22 | - | - | - | 4.89 | 4.89 |
| RW 6 | 12/11/98 | 32.11 | 27.30 | - | - | - | 4.81 | 4.81 |
| RW 6 | 12/18/98 | 32.11 | 30.98 | 27.98 | 3.00 | 4.13 | 1.13 | 3.38 |
| RW 6 | 12/29/98 | 32.11 | 30.68 | 27.53 | 3.15 | 4.58 | 1.43 | 3.79 |
| RW 6 | 4/1/99 | 32.11 | 29.92 | 27.35 | 2.57 | 4.76 | 2.19 | 4.12 |
| RW 6 | 4/9/99 | 32.11 | 30.68 | 27.03 | 3.65 | 5.08 | 1.43 | 4.17 |
| RW 6 | 4/15/99 | 32.11 | 30.75 | 26.93 | 3.82 | 5.18 | 1.36 | 4.23 |
| RW 6 | 4/23/99 | 32.11 | 30.80 | 26.94 | 3.86 | 5.17 | 1.31 | 4.21 |
| RW 6 | 4/28/99 | 32.11 | 30.75 | 27.03 | 3.72 | 5.08 | 1.36 | 4.15 |
| RW 6 | 4/30/99 | 32.11 | 30.71 | 27.03 | 3.68 | 5.08 | 1.40 | 4.16 |
| RW 6 | 5/5/99 | 32.11 | 30.80 | 26.94 | 3.86 | 5.17 | 1.31 | 4.21 |
| RW 6 | 5/11/99 | 32.11 | 30.79 | 27.04 | 3.75 | 5.07 | 1.32 | 4.13 |
| RW 6 | 5/17/99 | 32.11 | 30.78 | 27.00 | 3.78 | 5.11 | 1.33 | 4.17 |
| RW 6 | 5/25/99 | 32.11 | 30.79 | 26.88 | 3.91 | 5.23 | 1.32 | 4.25 |
| RW 6 | 6/2/99 | 32.11 | 30.87 | 26.63 | 4.24 | 5.48 | 1.24 | 4.42 |
| RW 6 | 6/7/99 | 32.11 | 30.86 | 26.92 | 3.94 | 5.19 | 1.25 | 4.21 |
| RW 6 | 6/18/99 | 32.11 | 30.01 | 26.22 | 3.79 | 5.89 | 2.10 | 4.94 |
| RW 6 | 6/23/99 | 32.11 | 30.85 | 26.99 | 3.86 | 5.12 | 1.26 | 4.16 |
| RW 6 | 6/28/99 | 32.11 | 30.69 | 26.37 | 4.32 | 5.74 | 1.42 | 4.66 |

**TABLE 1**
**Historical Well Gauging Summary**
**Sun Belmont Terminal**
**Passyunk Avenue, Philadelphia Pennsylvania**

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| RW 6 | 7/6/99 | 32.11 | 30.20 | 26.59 | 3.61 | 5.52 | 1.91 | 4.62 |
| RW 6 | 7/12/99 | 32.11 | 30.77 | 27.09 | 3.68 | 5.02 | 1.34 | 4.10 |
| RW 6 | 7/20/99 | 32.11 | 31.65 | 27.79 | 3.86 | 4.32 | 0.46 | 3.36 |
| RW 6 | 7/27/99 | 32.11 | 32.16 | 27.97 | 4.19 | 4.14 | -0.05 | 3.09 |
| RW 6 | 8/2/99 | 32.11 | 32.77 | 28.20 | 4.57 | 3.91 | -0.66 | 2.77 |
| RW 6 | 8/9/99 | 32.11 | 32.60 | 28.58 | 4.02 | 3.53 | -0.49 | 2.53 |
| RW 6 | 8/16/99 | 32.11 | 30.08 | 26.33 | 3.75 | 5.78 | 2.03 | 4.84 |
| RW 6 | 8/24/99 | 32.11 | 30.50 | 26.92 | 3.58 | 5.19 | 1.61 | 4.30 |
| RW 6 | 8/30/99 | 32.11 | 30.77 | 26.85 | 3.92 | 5.26 | 1.34 | 4.28 |
| RW 6 | 9/7/99 | 32.11 | 30.49 | 27.21 | 3.28 | 4.90 | 1.62 | 4.08 |
| RW 6 | 9/13/99 | 32.11 | 30.60 | 27.48 | 3.12 | 4.63 | 1.51 | 3.85 |
| RW 6 | 9/20/99 | 32.11 | 30.10 | 26.96 | 3.14 | 5.15 | 2.01 | 4.37 |
| RW 6 | 9/27/99 | 32.11 | 30.09 | 27.12 | 2.97 | 4.99 | 2.02 | 4.25 |
| RW 7 | 8/21/98 | 29.18 | 24.07 | - | - | - | 5.11 | 5.11 |
| RW 7 | 9/18/98 | 29.18 | 30.15 | - | - | - | -0.97 | -0.97 |
| RW 7 | 9/21/98 | 29.18 | 24.04 | - | - | - | 5.14 | 5.14 |
| RW 7 | 9/22/98 | 29.18 | 24.41 | - | - | - | 4.77 | 4.77 |
| RW 7 | 9/23/98 | 29.18 | 24.55 | - | - | - | 4.63 | 4.63 |
| RW 7 | 9/25/98 | 29.18 | 32.45 | - | - | - | -3.27 | -3.27 |
| RW 7 | 9/28/98 | 29.18 | 25.05 | - | - | - | 4.13 | 4.13 |
| RW 7 | 9/29/98 | 29.18 | 28.30 | - | - | - | 0.88 | 0.88 |
| RW 7 | 9/30/98 | 29.18 | 29.40 | - | - | - | -0.22 | -0.22 |
| RW 7 | 10/1/98 | 29.18 | 29.35 | - | - | - | -0.17 | -0.17 |
| RW 7 | 10/5/98 | 29.18 | 24.18 | - | - | - | 5.00 | 5.00 |
| RW 7 | 10/13/98 | 29.18 | 24.67 | - | - | - | 4.51 | 4.51 |
| RW 7 | 10/19/98 | 29.18 | 24.60 | - | - | - | 4.58 | 4.58 |
| RW 7 | 11/20/98 | 29.18 | 28.68 | 27.50 | 1.18 | 1.68 | 0.50 | 1.39 |
| RW 7 | 11/25/98 | 29.18 | 28.05 | 26.30 | 1.75 | 2.88 | 1.13 | 2.44 |
| RW 7 | 12/4/98 | 29.18 | 28.70 | 25.15 | 3.55 | 4.03 | 0.48 | 3.14 |
| RW 7 | 12/11/98 | 29.18 | 28.10 | 24.22 | 3.88 | 4.96 | 1.08 | 3.99 |
| RW 7 | 12/18/98 | 29.18 | 28.13 | 24.65 | 3.48 | 4.53 | 1.05 | 3.66 |
| RW 7 | 12/29/98 | 29.18 | 28.65 | 25.60 | 3.05 | 3.58 | 0.53 | 2.82 |
| RW 7 | 4/1/99 | 29.18 | 29.28 | 27.32 | 1.96 | 1.86 | -0.10 | 1.37 |
| RW 7 | 4/9/99 | 29.18 | 30.30 | 26.59 | 3.71 | 2.59 | -1.12 | 1.66 |
| RW 7 | 4/15/99 | 29.18 | 31.01 | 26.35 | 4.66 | 2.83 | -1.83 | 1.67 |
| RW 7 | 4/23/99 | 29.18 | 31.56 | 26.02 | 5.54 | 3.16 | -2.38 | 1.78 |
| RW 7 | 4/28/99 | 29.18 | 31.80 | 25.70 | 6.10 | 3.48 | -2.62 | 1.96 |
| RW 7 | 4/30/99 | 29.18 | 31.97 | 25.63 | 6.34 | 3.55 | -2.79 | 1.97 |
| RW 7 | 5/5/99 | 29.18 | 27.85 | 23.77 | 4.08 | 5.41 | 1.33 | 4.39 |
| RW 7 | 5/11/99 | 29.18 | 27.52 | 23.99 | 3.53 | 5.19 | 1.66 | 4.31 |
| RW 7 | 5/17/99 | 29.18 | 26.59 | 23.56 | 3.03 | 5.62 | 2.59 | 4.86 |
| RW 7 | 5/25/99 | 29.18 | 25.65 | 23.72 | 1.93 | 5.46 | 3.53 | 4.98 |
| RW 7 | 6/2/99 | 29.18 | 25.36 | 23.75 | 1.61 | 5.43 | 3.82 | 5.03 |
| RW 7 | 6/7/99 | 29.18 | 25.30 | 23.71 | 1.59 | 5.47 | 3.88 | 5.07 |
| RW 7 | 6/18/99 | 29.18 | 25.29 | 23.80 | 1.49 | 5.38 | 3.89 | 5.01 |
| RW 7 | 6/23/99 | 29.18 | 25.22 | 23.74 | 1.48 | 5.44 | 3.96 | 5.07 |
| RW 7 | 6/28/99 | 29.18 | 25.24 | 23.70 | 1.54 | 5.48 | 3.94 | 5.10 |

# TABLE 1
## Historical Well Gauging Summary
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| RW 7 | 7/6/99 | 29.18 | 25.18 | 23.63 | 1.55 | 5.55 | 4.00 | 5.16 |
| RW 7 | 7/12/99 | 29.18 | 25.30 | 23.76 | 1.54 | 5.42 | 3.88 | 5.04 |
| RW 7 | 7/20/99 | 29.18 | 25.20 | 23.71 | 1.49 | 5.47 | 3.98 | 5.10 |
| RW 7 | 7/27/99 | 29.18 | 25.26 | 23.67 | 1.59 | 5.51 | 3.92 | 5.11 |
| RW 7 | 8/2/99 | 29.18 | 25.29 | 23.75 | 1.54 | 5.43 | 3.89 | 5.05 |
| RW 7 | 8/9/99 | 29.18 | 25.29 | 23.74 | 1.55 | 5.44 | 3.89 | 5.05 |
| RW 7 | 8/16/99 | 29.18 | 25.22 | 23.74 | 1.48 | 5.44 | 3.96 | 5.07 |
| RW 7 | 8/24/99 | 29.18 | 25.23 | 23.70 | 1.53 | 5.48 | 3.95 | 5.10 |
| RW 7 | 8/30/99 | 29.18 | 25.22 | 23.67 | 1.55 | 5.51 | 3.96 | 5.12 |
| RW 7 | 9/7/99 | 29.18 | 25.09 | 23.55 | 1.54 | 5.63 | 4.09 | 5.25 |
| RW 7 | 9/13/99 | 29.18 | 25.16 | 23.58 | 1.58 | 5.60 | 4.02 | 5.21 |
| RW 7 | 9/20/99 | 29.18 | 24.90 | 23.35 | 1.55 | 5.83 | 4.28 | 5.44 |
| RW 7 | 9/27/99 | 29.18 | 24.96 | 23.42 | 1.54 | 5.76 | 4.22 | 5.38 |
| RW 15 | 11/25/97 | 31.45 | 28.10 | 26.81 | 1.29 | 4.64 | 3.35 | 4.32 |
| RW 15 | 12/17/97 | 31.45 | 27.99 | 26.86 | 1.13 | 4.59 | 3.46 | 4.31 |
| RW 15 | 8/21/98 | 31.45 | 28.18 | 26.69 | 1.49 | 4.76 | 3.27 | 4.39 |
| RW 15 | 9/18/98 | 31.45 | 29.69 | 28.12 | 1.57 | 3.33 | 1.76 | 2.94 |
| RW 15 | 9/21/98 | 31.45 | 28.44 | 26.75 | 1.69 | 4.70 | 3.01 | 4.28 |
| RW 15 | 9/22/98 | 31.45 | 27.98 | 26.75 | 1.23 | 4.70 | 3.47 | 4.39 |
| RW 15 | 9/23/98 | 31.45 | 28.66 | 26.84 | 1.82 | 4.61 | 2.79 | 4.16 |
| RW 15 | 9/25/98 | 31.45 | 28.95 | 28.40 | 0.55 | 3.05 | 2.50 | 2.91 |
| RW 15 | 9/28/98 | 31.45 | 28.80 | 28.30 | 0.50 | 3.15 | 2.65 | 3.03 |
| RW 15 | 9/29/98 | 31.45 | 27.40 | 26.85 | 0.55 | 4.60 | 4.05 | 4.46 |
| RW 15 | 9/30/98 | 31.45 | 27.28 | 26.82 | 0.46 | 4.63 | 4.17 | 4.52 |
| RW 15 | 10/1/98 | 31.45 | 27.20 | 26.90 | 0.30 | 4.55 | 4.25 | 4.48 |
| RW 15 | 10/5/98 | 31.45 | 28.68 | 26.89 | 1.79 | 4.56 | 2.77 | 4.11 |
| RW 15 | 10/13/98 | 31.45 | 28.41 | 26.87 | 1.54 | 4.58 | 3.04 | 4.20 |
| RW 15 | 10/19/98 | 31.45 | 28.79 | 26.92 | 1.87 | 4.53 | 2.66 | 4.06 |
| RW 15 | 11/20/98 | 31.45 | 29.13 | 27.08 | 2.05 | 4.37 | 2.32 | 3.86 |
| RW 15 | 11/25/98 | 31.45 | 29.35 | 27.09 | 2.26 | 4.36 | 2.10 | 3.80 |
| RW 15 | 12/4/98 | 31.45 | 29.17 | 27.05 | 2.12 | 4.40 | 2.28 | 3.87 |
| RW 15 | 12/11/98 | 31.45 | 29.20 | 27.14 | 2.06 | 4.31 | 2.25 | 3.80 |
| RW 15 | 12/18/98 | 31.45 | 29.45 | 27.20 | 2.25 | 4.25 | 2.00 | 3.69 |
| RW 15 | 12/29/98 | 31.45 | 29.15 | 27.10 | 2.05 | 4.35 | 2.30 | 3.84 |
| RW 15 | 7/6/99 | 31.45 | 28.39 | 26.89 | 1.50 | 4.56 | 3.06 | 4.19 |
| RW 15 | 7/12/99 | 31.45 | 28.52 | 26.95 | 1.57 | 4.50 | 2.93 | 4.11 |
| RW 15 | 7/20/99 | 31.45 | 28.47 | 26.90 | 1.57 | 4.55 | 2.98 | 4.16 |
| RW 15 | 7/27/99 | 31.45 | 28.44 | 26.83 | 1.61 | 4.62 | 3.01 | 4.22 |
| RW 15 | 8/2/99 | 31.45 | 28.51 | 26.92 | 1.59 | 4.53 | 2.94 | 4.13 |
| RW 15 | 8/9/99 | 31.45 | 28.50 | 26.91 | 1.59 | 4.54 | 2.95 | 4.14 |
| RW 15 | 8/16/99 | 31.45 | 28.55 | 26.96 | 1.59 | 4.49 | 2.90 | 4.09 |
| RW 15 | 8/24/99 | 31.45 | 28.48 | 26.93 | 1.55 | 4.52 | 2.97 | 4.13 |
| RW 15 | 8/30/99 | 31.45 | 28.50 | 26.89 | 1.61 | 4.56 | 2.95 | 4.16 |
| RW 15 | 9/7/99 | 31.45 | 28.37 | 26.83 | 1.54 | 4.62 | 3.08 | 4.24 |
| RW 15 | 9/13/99 | 31.45 | 28.41 | 26.85 | 1.56 | 4.60 | 3.04 | 4.21 |
| RW 15 | 9/20/99 | 31.45 | 28.24 | 26.71 | 1.53 | 4.74 | 3.21 | 4.36 |
| RW 15 | 9/27/99 | 31.45 | 28.31 | 26.73 | 1.58 | 4.72 | 3.14 | 4.33 |

**TABLE 1**
**Historical Well Gauging Summary**
**Sun Belmont Terminal**
**Passyunk Avenue, Philadelphia Pennsylvania**

| WELL I.D. | DATE | WELL ELEVATION (ft) | DEPTH TO WATER (ft) | DEPTH TO NAPL (ft) | NAPL THICKNESS (ft) | NAPL ELEVATION (ft) | WATER-TABLE ELEVATION MEASURED (ft) | WATER-TABLE ELEVATION CORRECTED (ft) |
|---|---|---|---|---|---|---|---|---|
| RW 15 | 4/1/99 | 31.45 | 28.96 | 27.21 | 1.75 | 4.24 | 2.49 | 3.80 |
| RW 15 | 4/9/99 | 31.45 | 28.66 | 27.11 | 1.55 | 4.34 | 2.79 | 3.95 |
| RW 15 | 4/15/99 | 31.45 | 28.59 | 27.06 | 1.53 | 4.39 | 2.86 | 4.01 |
| RW 15 | 4/23/99 | 31.45 | 28.56 | 27.04 | 1.52 | 4.41 | 2.89 | 4.03 |
| RW 15 | 4/28/99 | 31.45 | 28.68 | 27.07 | 1.61 | 4.38 | 2.77 | 3.98 |
| RW 15 | 4/30/99 | 31.45 | 28.70 | 27.11 | 1.59 | 4.34 | 2.75 | 3.94 |
| RW 15 | 5/5/99 | 31.45 | 28.11 | 27.01 | 1.10 | 4.44 | 3.34 | 4.17 |
| RW 15 | 5/11/99 | 31.45 | 28.64 | 27.07 | 1.57 | 4.38 | 2.81 | 3.99 |
| RW 15 | 5/17/99 | 31.45 | 28.64 | 27.05 | 1.59 | 4.40 | 2.81 | 4.00 |
| RW 15 | 5/25/99 | 31.45 | 28.60 | 26.95 | 1.65 | 4.50 | 2.85 | 4.09 |
| RW 15 | 6/2/99 | 31.45 | 28.70 | 26.97 | 1.73 | 4.48 | 2.75 | 4.05 |
| RW 15 | 6/7/99 | 31.45 | 28.40 | 26.95 | 1.45 | 4.50 | 3.05 | 4.14 |
| RW 15 | 6/18/99 | 31.45 | 28.66 | 27.02 | 1.64 | 4.43 | 2.79 | 4.02 |
| RW 15 | 6/23/99 | 31.45 | 28.57 | 26.94 | 1.63 | 4.51 | 2.88 | 4.10 |
| RW 15 | 6/28/99 | 31.45 | 28.46 | 26.92 | 1.54 | 4.53 | 2.99 | 4.15 |
| S 74 | 4/30/99 | 32.11 | 26.31 | - | - | - | 5.80 | 5.80 |
| S 74 | 5/17/99 | 32.11 | 26.26 | - | - | - | 5.85 | 5.85 |
| S 74 | 7/20/99 | 32.11 | 26.10 | - | - | - | 6.01 | 6.01 |
| S 74 | 9/22/99 | 32.11 | 25.68 | - | - | - | 6.43 | 6.43 |

Notes: Data collected by Mulry and Cresswell Environmental, Inc.

# TABLE 2
## Product Recovery Totals
## Sun Belmont Terminal
## Passyunk Avenue, Philadelphia Pennsylvania

| | LIQUID PHASE | | | | | | | | VAPOR PHASE | | TOTAL PSH | CUMULATIVE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | RW 1 | RW 1 CUMULATIVE | RW 4 | RW 4 CUMULATIVE | RW 15 | RW 15 CUMULATIVE | PSH TOTAL | PSH CUMULATIVE | SVE TOTAL | SVE CUMULATIVE | GALLONS RECOVERED | PSH RECOVERY % GW | % SVE |
| 9/17/98 | 7 | 7 | 0 | 0 | 0 | 0 | 7 | 7 | | 0 | 7 | 100% | 0% |
| 9/18/98 | 72 | 79 | 0 | 0 | 33 | 33 | 105 | 112 | | 0 | 112 | 100% | 0% |
| 9/21/98 | 852 | 931 | 0 | 0 | 58 | 91 | 910 | 1,022 | 2 | 2 | 1,024 | 100% | 0% |
| 9/22/98 | 269 | 1,200 | 14 | 14 | 0 | 91 | 283 | 1,305 | | 2 | 1,307 | 100% | 0% |
| 9/23/98 | 245 | 1,445 | 16 | 30 | 0 | 91 | 261 | 1,566 | 107 | 109 | 1,675 | 93% | 7% |
| 9/24/98 | 39 | 1,484 | 3 | 33 | 0 | 91 | 42 | 1,608 | | 109 | 1,717 | 94% | 6% |
| 9/25/98 | 202 | 1,686 | 17 | 50 | 171 | 262 | 390 | 1,998 | 117 | 226 | 2,224 | 90% | 10% |
| 9/28/98 | 492 | 2,178 | 34 | 84 | 327 | 589 | 853 | 2,851 | 195 | 421 | 3,272 | 87% | 13% |
| 9/29/98 | 142 | 2,320 | 2 | 86 | 154 | 743 | 298 | 3,149 | | 421 | 3,570 | 88% | 12% |
| 9/30/98 | 182 | 2,502 | 1 | 87 | 4 | 747 | 187 | 3,336 | | 421 | 3,757 | 89% | 11% |
| 10/1/98 | 86 | 2,588 | 5 | 92 | 0 | 747 | 91 | 3,427 | | 421 | 3,848 | 89% | 11% |
| 10/5/98 | 704 | 3,292 | 3 | 95 | 1842 | 2,589 | 2,549 | 5,976 | | 421 | 6,397 | 93% | 7% |
| 10/13/98 | 2648 | 5,940 | 2 | 97 | 1 | 2,590 | 2,651 | 8,627 | 902 | 1,323 | 9,950 | 87% | 13% |
| 10/19/98 | 2339 | 8,279 | 2 | 99 | 0 | 2,590 | 2,341 | 10,968 | 407 | 1,730 | 12,698 | 86% | 14% |
| 10/27/98 | 2370 | 10,649 | 2 | 101 | 0 | 2,590 | 2,372 | 13,340 | | 1,730 | 15,070 | 89% | 11% |
| 11/2/98 | 1278 | 11,927 | 10 | 111 | 0 | 2,590 | 1,288 | 14,628 | | 1,730 | 16,358 | 89% | 11% |
| 11/6/98 | 55 | 11,982 | 6 | 117 | 0 | 2,590 | 61 | 14,689 | | 1,730 | 16,419 | 89% | 11% |
| 11/13/98 | 2108 | 14,090 | 12 | 129 | 0 | 2,590 | 2,120 | 16,809 | | 1,730 | 18,539 | 91% | 9% |
| 11/20/98 | 1799 | 15,889 | 11 | 140 | 0 | 2,590 | 1,810 | 18,619 | 1,591 | 3,321 | 21,940 | 85% | 15% |
| 11/25/98 | 827 | 16,716 | 7 | 147 | 0 | 2,590 | 834 | 19,453 | | 3,321 | 22,774 | 85% | 15% |
| 12/4/98 | 611 | 17,327 | 10 | 157 | 0 | 2,590 | 621 | 20,074 | 1,007 | 4,328 | 24,402 | 82% | 18% |
| 12/11/98 | 439 | 17,766 | 7 | 164 | 0 | 2,590 | 446 | 20,520 | 452 | 4,780 | 25,300 | 81% | 19% |
| 12/18/98 | 562 | 18,328 | 7 | 171 | 0 | 2,590 | 569 | 21,089 | | 4,780 | 25,869 | 82% | 18% |
| 12/29/98 | 551 | 18,879 | 9 | 180 | 0 | 2,590 | 560 | 21,649 | 1,157 | 5,937 | 27,586 | 78% | 22% |
| 1/19/99 | 271 | 19,150 | 6 | 186 | 0 | 2,590 | 277 | 21,926 | 0 | 5,937 | 27,863 | 79% | 21% |
| 2/10/99 | 303 | 19,453 | 6 | 192 | 0 | 2,590 | 309 | 22,235 | 0 | 5,937 | 28,172 | 79% | 21% |
| 2/16/99 | 43 | 19,496 | 0 | 192 | 0 | 2,590 | 43 | 22,279 | 0 | 5,937 | 28,216 | 79% | 21% |
| 2/22/99 | 833 | 20,330 | 8 | 200 | 0 | 2,591 | 842 | 23,120 | 0 | 5,937 | 29,057 | 80% | 20% |
| 3/1/99 | 3324 | 23,654 | 2 | 202 | 0 | 2,591 | 3,326 | 26,446 | 0 | 5,937 | 32,383 | 82% | 18% |
| 3/10/99 | 4581 | 28,235 | 4 | 205 | 0 | 2,591 | 4,585 | 31,031 | 0 | 5,937 | 36,968 | 84% | 16% |
| 3/17/99 | 2116 | 30,350 | 3 | 208 | 1 | 2,592 | 2,119 | 33,150 | 0 | 5,937 | 39,087 | 85% | 15% |
| 3/25/99 | 1548 | 31,898 | 9 | 217 | 0 | 2,592 | 1,557 | 34,707 | 0 | 5,937 | 40,644 | 85% | 15% |
| 4/1/99 | 1346 | 33,244 | 78 | 258 | 2 | 2,592 | 1,426 | 36,133 | 0 | 5,937 | 42,070 | 86% | 14% |
| 4/9/99 | 80 | 33,324 | 37 | 295 | 0 | 2,592 | 116 | 36,249 | 0 | 5,937 | 42,186 | 86% | 14% |

**TABLE 2**
**Product Recovery Totals**
**Sun Belmont Terminal**
**Passyunk Avenue, Philadelphia Pennsylvania**

| | LIQUID PHASE | | | | | | | | VAPOR PHASE | | TOTAL PSH | CUMULATIVE | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| DATE | RW 1 | RW 1 CUMULATIVE | RW 4 | RW 4 CUMULATIVE | RW 15 | RW 15 CUMULATIVE | PSH TOTAL | PSH CUMULATIVE | SVE TOTAL | SVE CUMULATIVE | GALLONS RECOVERED | PSH RECOVERY % GW | % SVE |
| 4/15/99 | 82 | 33,406 | 60 | 355 | 0 | 2,592 | 142 | 36,391 | 0 | 5,937 | 42,328 | 86% | 14% |
| 4/23/99 | 114 | 33,520 | 109 | 463 | 0 | 2,592 | 222 | 36,614 | 0 | 5,937 | 42,551 | 86% | 14% |
| 4/28/99 | 46 | 33,566 | 78 | 542 | 0 | 2,592 | 125 | 36,738 | 0 | 5,937 | 42,675 | 86% | 14% |
| 4/30/99 | 5 | 33,571 | 52 | 594 | 0 | 2,592 | 58 | 36,796 | 0 | 5,937 | 42,733 | 86% | 14% |
| 5/5/99 | 24 | 33,595 | 125 | 720 | 0 | 2,592 | 149 | 36,945 | 0 | 5,937 | 42,882 | 86% | 14% |
| 5/11/99 | 59 | 33,654 | 82 | 801 | 0 | 2,592 | 141 | 37,086 | 0 | 5,937 | 43,023 | 86% | 14% |
| 5/17/99 | 743 | 34,398 | 107 | 908 | 0 | 2,592 | 850 | 37,937 | 0 | 5,937 | 43,874 | 86% | 14% |
| 5/25/99 | 621 | 35,019 | 52 | 961 | 0 | 2,592 | 674 | 38,610 | 0 | 5,937 | 44,547 | 87% | 13% |
| 6/2/99 | 1402 | 36,421 | 80 | 1,041 | 0 | 2,592 | 1,482 | 40,092 | 0 | 5,937 | 46,029 | 87% | 13% |
| 6/7/99 | 681 | 37,102 | 0 | 1,041 | 0 | 2,592 | 681 | 40,773 | 0 | 5,937 | 46,710 | 87% | 13% |
| 6/18/99 | 2848 | 39,950 | 0 | 1,041 | 0 | 2,592 | 2,848 | 43,621 | 0 | 5,937 | 49,558 | 88% | 12% |
| 6/23/99 | 555 | 40,504 | 0 | 1,041 | 0 | 2,592 | 555 | 44,176 | 0 | 5,937 | 50,113 | 88% | 12% |
| 6/28/99 | 71 | 40,575 | 30 | 1,071 | 0 | 2,592 | 101 | 44,277 | 0 | 5,937 | 50,214 | 88% | 12% |
| 7/6/99 | 231 | 40,806 | 2 | 1,073 | 0 | 2,592 | 233 | 44,510 | 0 | 5,937 | 50,447 | 88% | 12% |
| 7/12/99 | 335 | 41,141 | 33 | 1,107 | 0 | 2,592 | 368 | 44,878 | 0 | 5,937 | 50,815 | 88% | 12% |
| 7/20/99 | 1 | 41,142 | 9 | 1,115 | 0 | 2,592 | 9 | 44,888 | 0 | 5,937 | 50,825 | 88% | 12% |
| 7/27/99 | 161 | 41,303 | 0 | 1,115 | 0 | 2,592 | 161 | 45,049 | 0 | 5,937 | 50,986 | 88% | 12% |
| 8/2/99 | 114 | 41,417 | 1 | 1,116 | 0 | 2,592 | 115 | 45,164 | 0 | 5,937 | 51,101 | 88% | 12% |
| 8/9/99 | 619 | 42,036 | 1 | 1,117 | 0 | 2,592 | 620 | 45,784 | 0 | 5,937 | 51,721 | 89% | 11% |
| 8/16/99 | 1 | 42,037 | 0 | 1,117 | 0 | 2,592 | 1 | 45,785 | 0 | 5,937 | 51,722 | 89% | 11% |
| 8/24/99 | 789 | 42,827 | 0 | 1,117 | 0 | 2,592 | 789 | 46,575 | 0 | 5,937 | 52,512 | 89% | 11% |
| 8/30/99 | 14 | 42,841 | 0 | 1,117 | 0 | 2,592 | 14 | 46,589 | 0 | 5,937 | 52,526 | 89% | 11% |
| 9/7/99 | 734 | 43,575 | 0 | 1,117 | 0 | 2,592 | 734 | 47,323 | 0 | 5,937 | 53,260 | 89% | 11% |
| 9/13/99 | 538 | 44,113 | 0 | 1,117 | 0 | 2,592 | 538 | 47,861 | 0 | 5,937 | 53,798 | 89% | 11% |
| 9/20/99 | 402 | 44,515 | 0 | 1,117 | 0 | 2,592 | 402 | 48,263 | 0 | 5,937 | 54,200 | 89% | 11% |
| 9/27/99 | 327 | 44,842 | 0 | 1,117 | 0 | 2,592 | 327 | 48,590 | 0 | 5,937 | 54,527 | 89% | 11% |

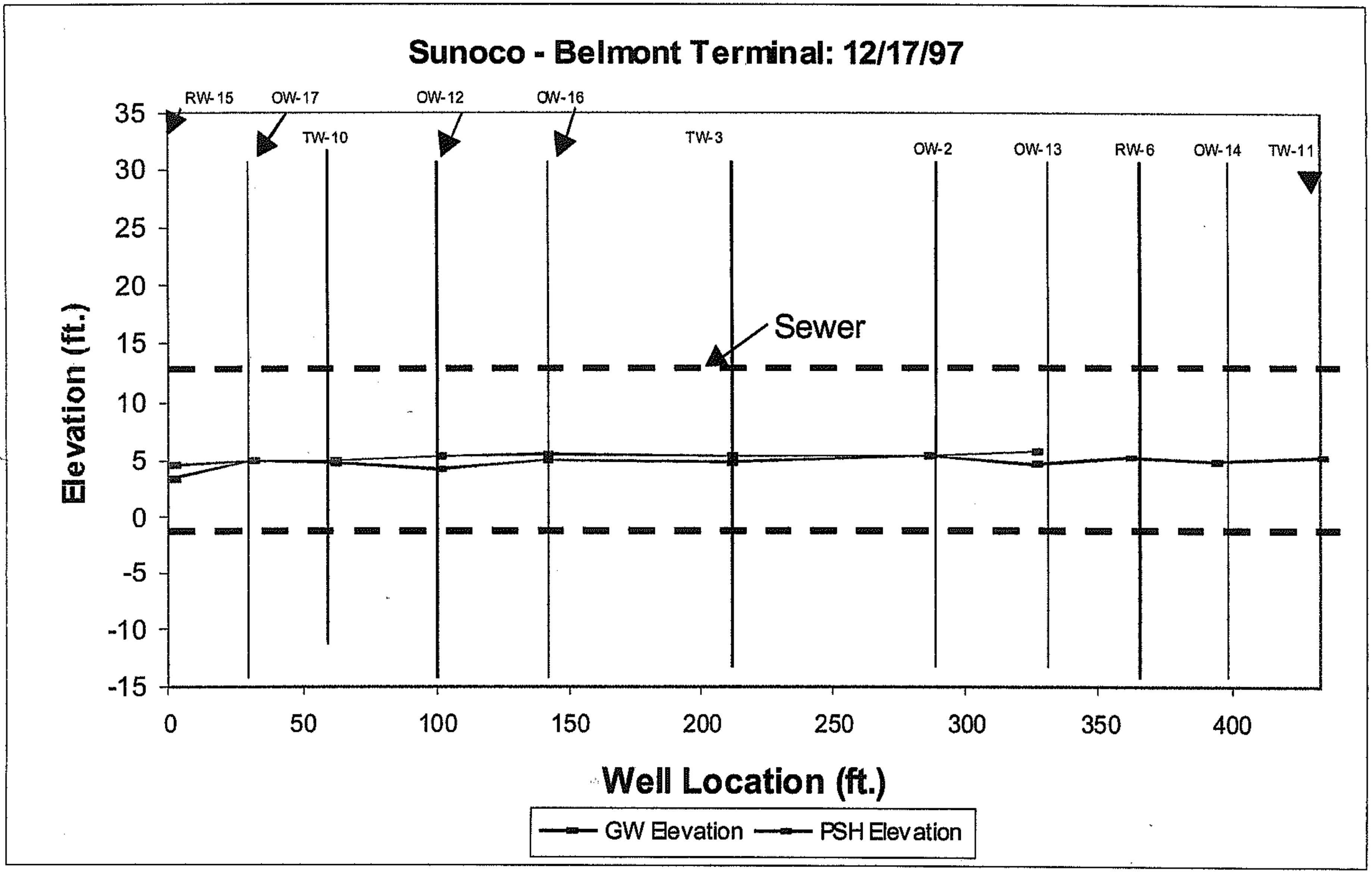
## TABLE 3

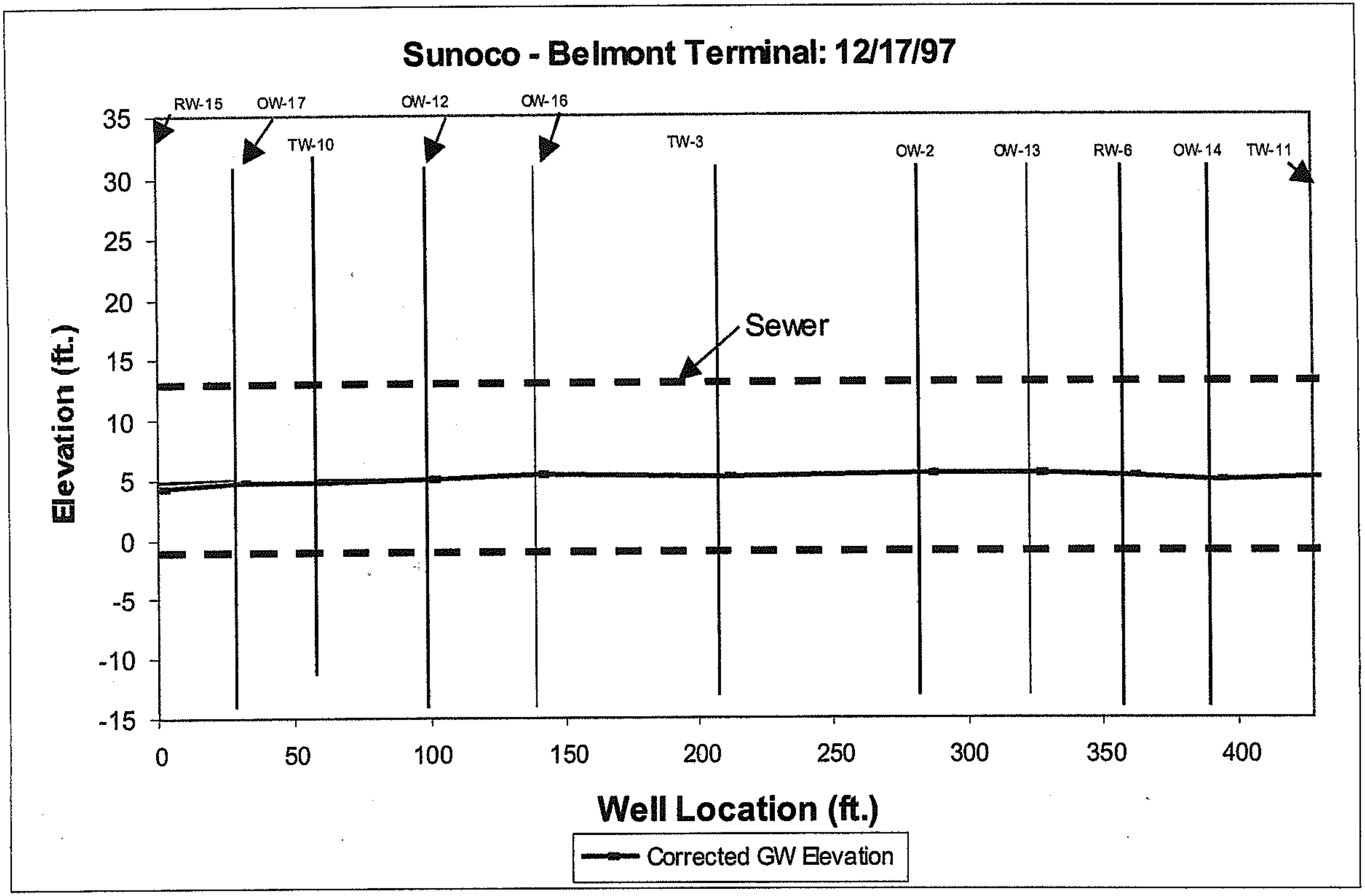
## Summary of Estimated Unit Costs for PSH Recovery
## Belmont Terminal
## Passyunk Avenue, Philadelphia, Pennsylvania

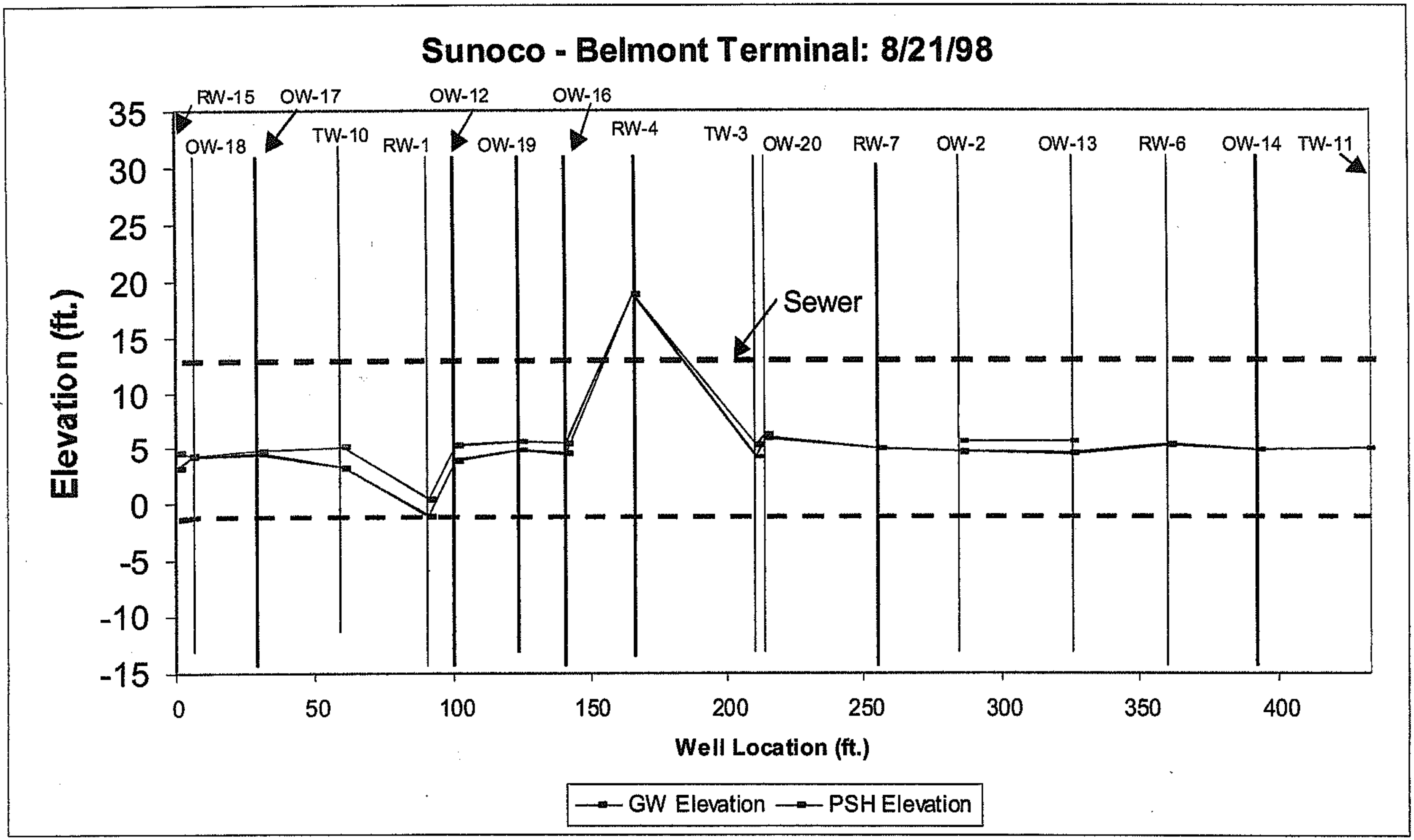
| | GROUND WATER DEPRESSION AND PSH RECOVERY | SVE |
|---|---|---|
| **System Installation** | **$158,900** | **$198,800** |
| Labor | $36,000 | $27,000 |
| Treatment Building | $20,000 | $20,000 |
| Well Installation | $30,000 | $50,000 |
| Treatment (oil/water sep. & thermal ox.) | $15,000 | $65,000 |
| Pumps/Blowers | $45,000 | $20,000 |
| Piping | $6,900 | $12,300 |
| Electrical | $5,000 | $3,500 |
| Misc. | $1,000 | $1,000 |
| **Start-Up** | **$6,700** | **$22,800** |
| Labor | $5,200 | $12,800 |
| Analytical | $1,000 | $7,500 |
| Materials | $500 | $2,500 |
| **Operation & Maintenance (1 Year)** | **$51,800** | **$140,700** |
| Labor | $28,600 | $98,800 |
| Analytical | $5,000 | $10,000 |
| Reports (Quarterly) | $5,000 | $7,500 |
| Electricity | $13,200 | $14,400 |
| Supplemental Fuel | $0 | $10,000 |
| **Total** | **$217,400** | **$362,300** |
| Average cost per day | $293.15 | $587.85 |
| Average cost per month | $8,916.67 | $17,880.56 |
| Gallons PSH recovered 9/17/98 to 12/29/98 | 21,649 | 5,937 |
| Average cost per gallon PSH Recovered | $1.39 | $10.20 |
| Average cost per gallon PSH based on yearly O&M cost only | $0.68 | $6.69 |
| **TOTAL PER GALLON** | **$2.07** | **$16.89** |

# APPENDIX A

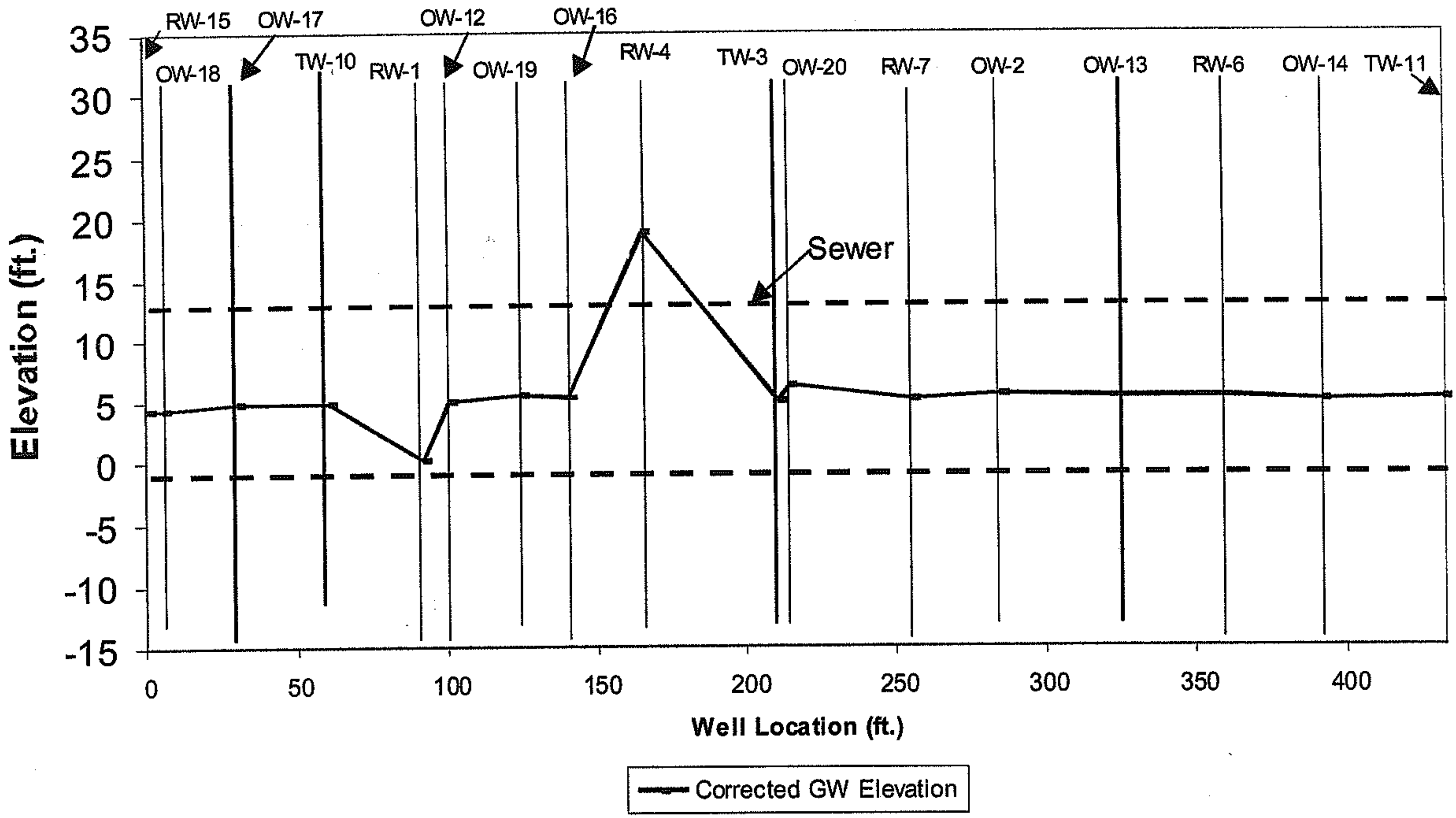
## PLOTS OF DEPTH TO GROUND WATER AND PSH AND CORRECTED GROUND WATER ELEVATION

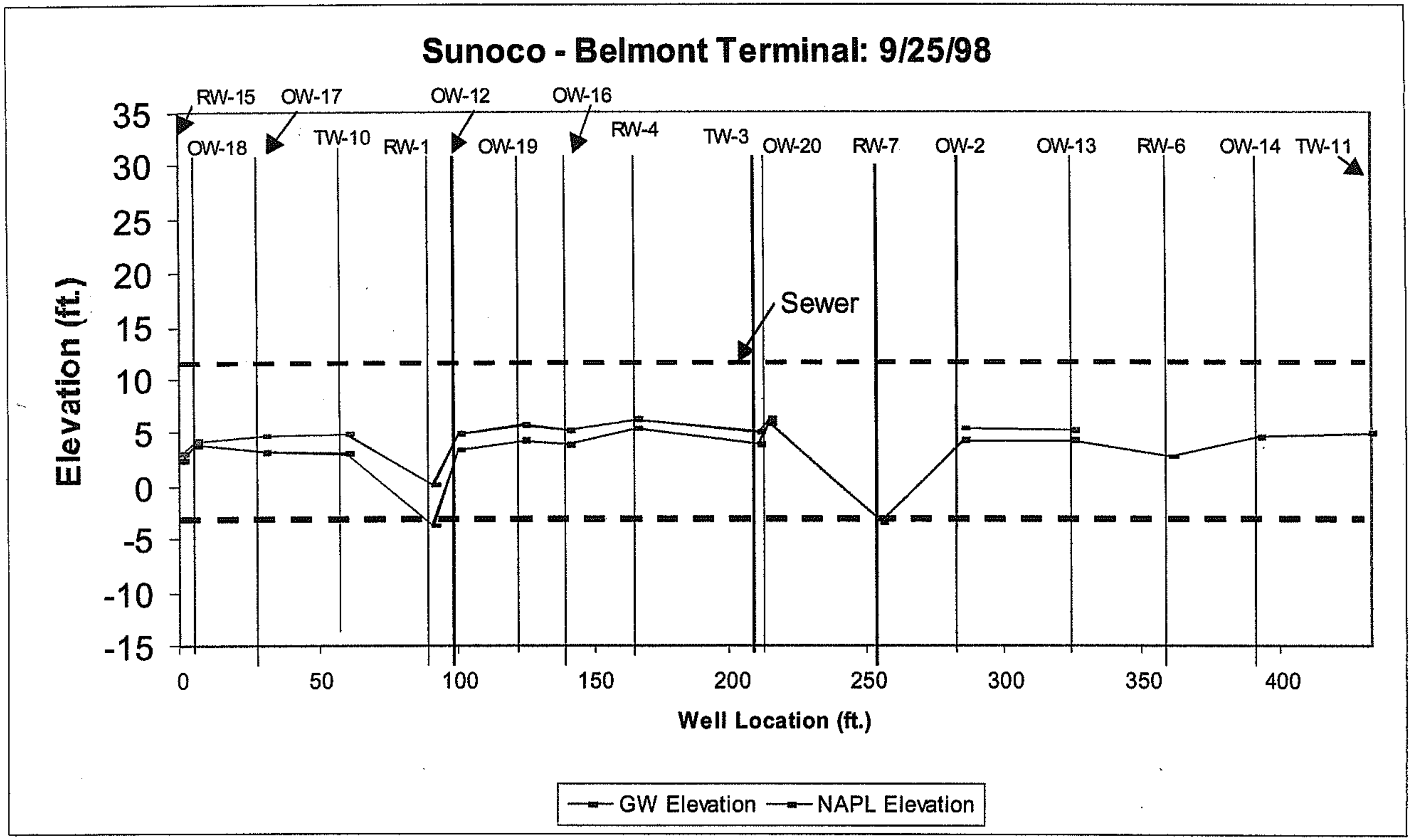

Sunoco - Belmont Terminal: 12/17/97
RW-15
OW-17
TW-10
OW-12
OW-16
TW-3
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
PSH Elevation

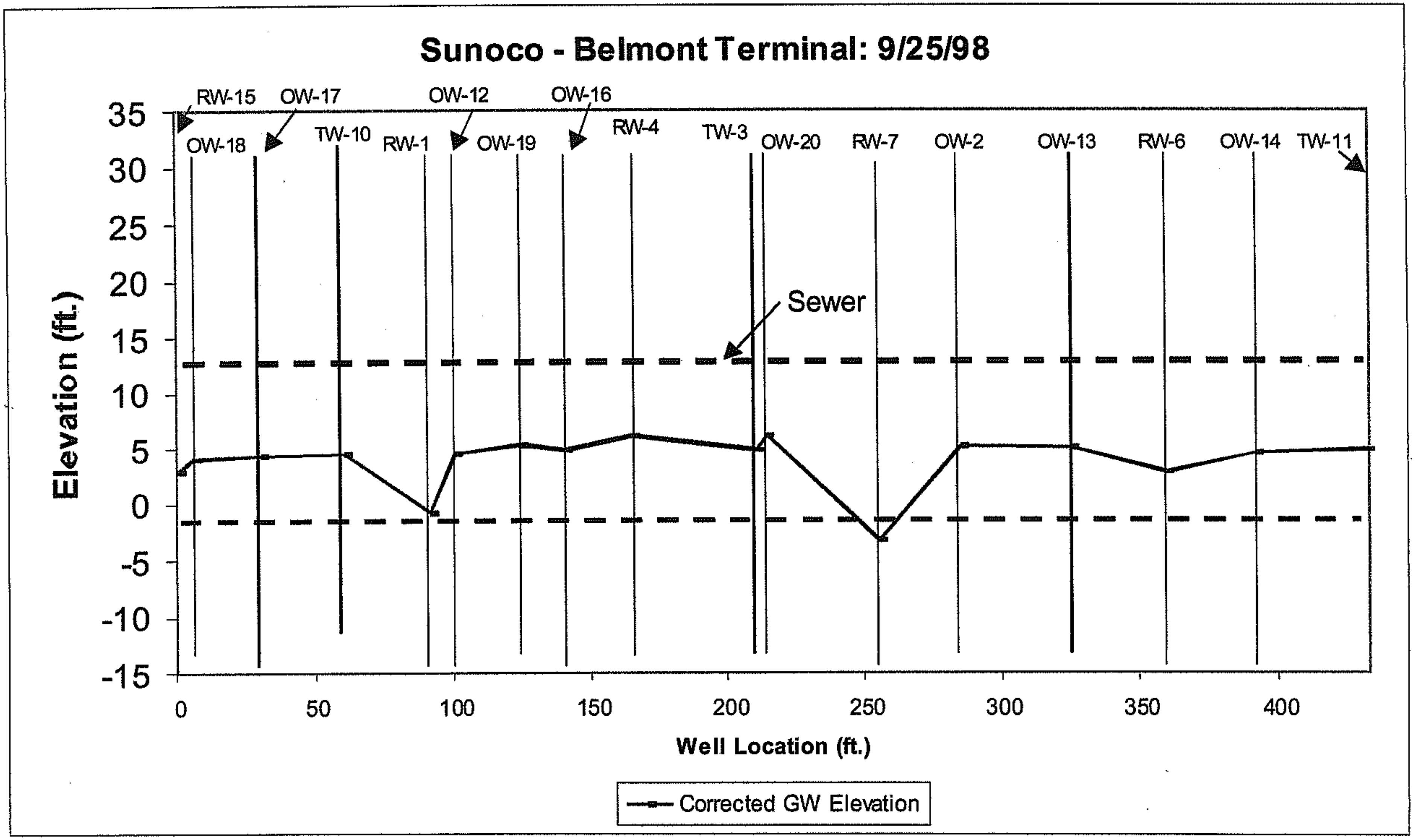

Sunoco - Belmont Terminal: 12/17/97
RW-15
OW-17
TW-10
OW-12
OW-16
TW-3
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation

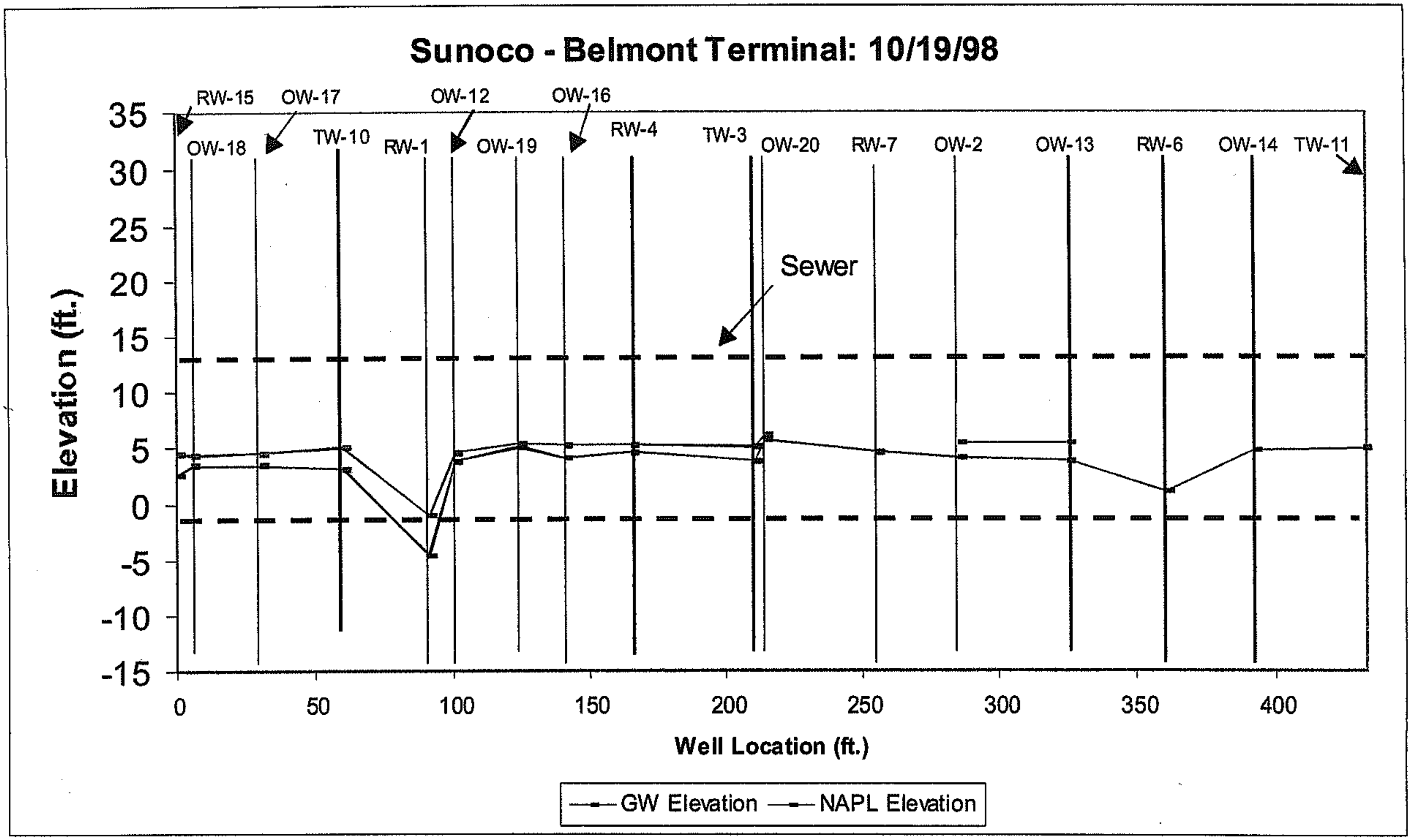

Sunoco - Belmont Terminal: 8/21/98
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
PSH Elevation

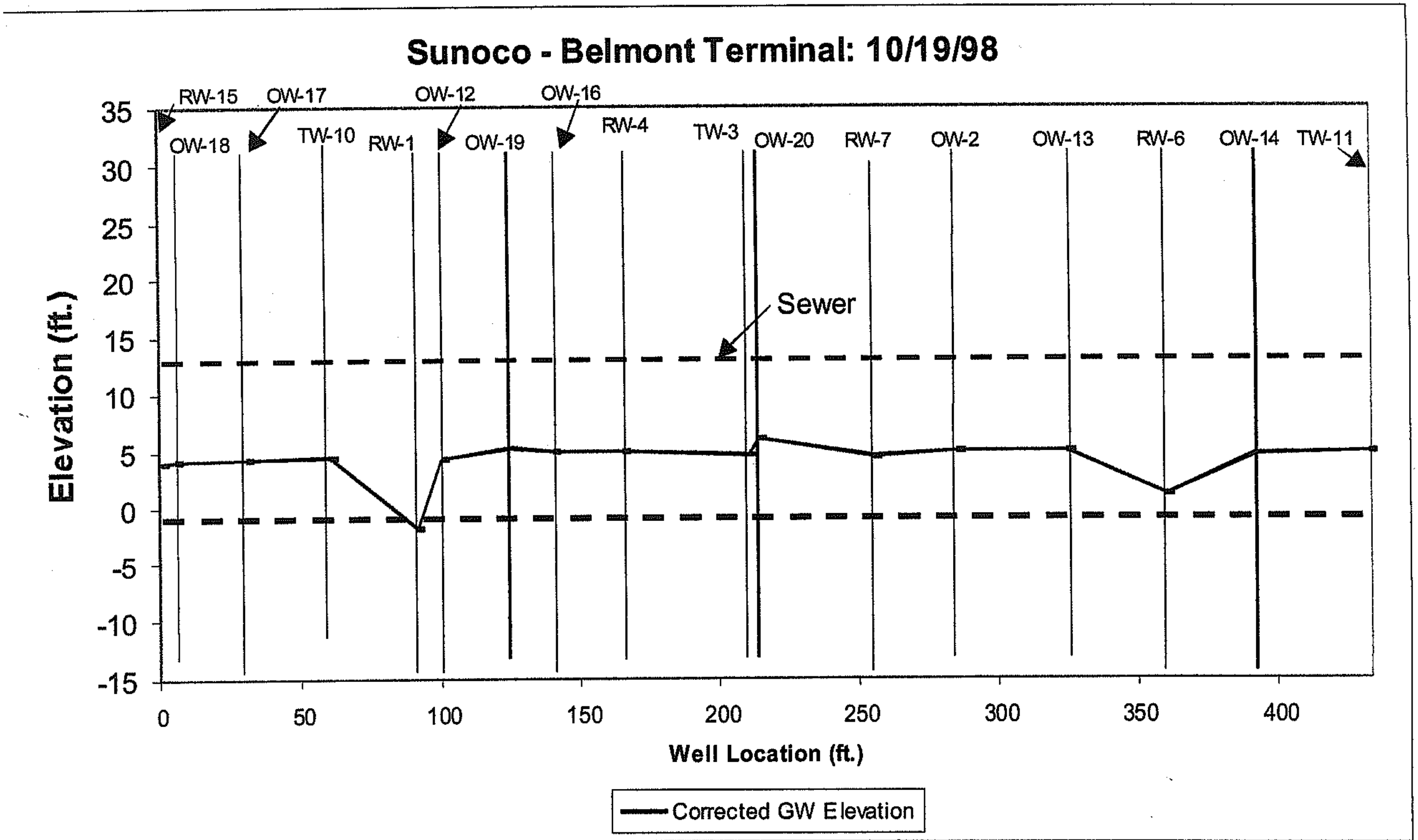
## Sunoco - Belmont Terminal: 8/21/98

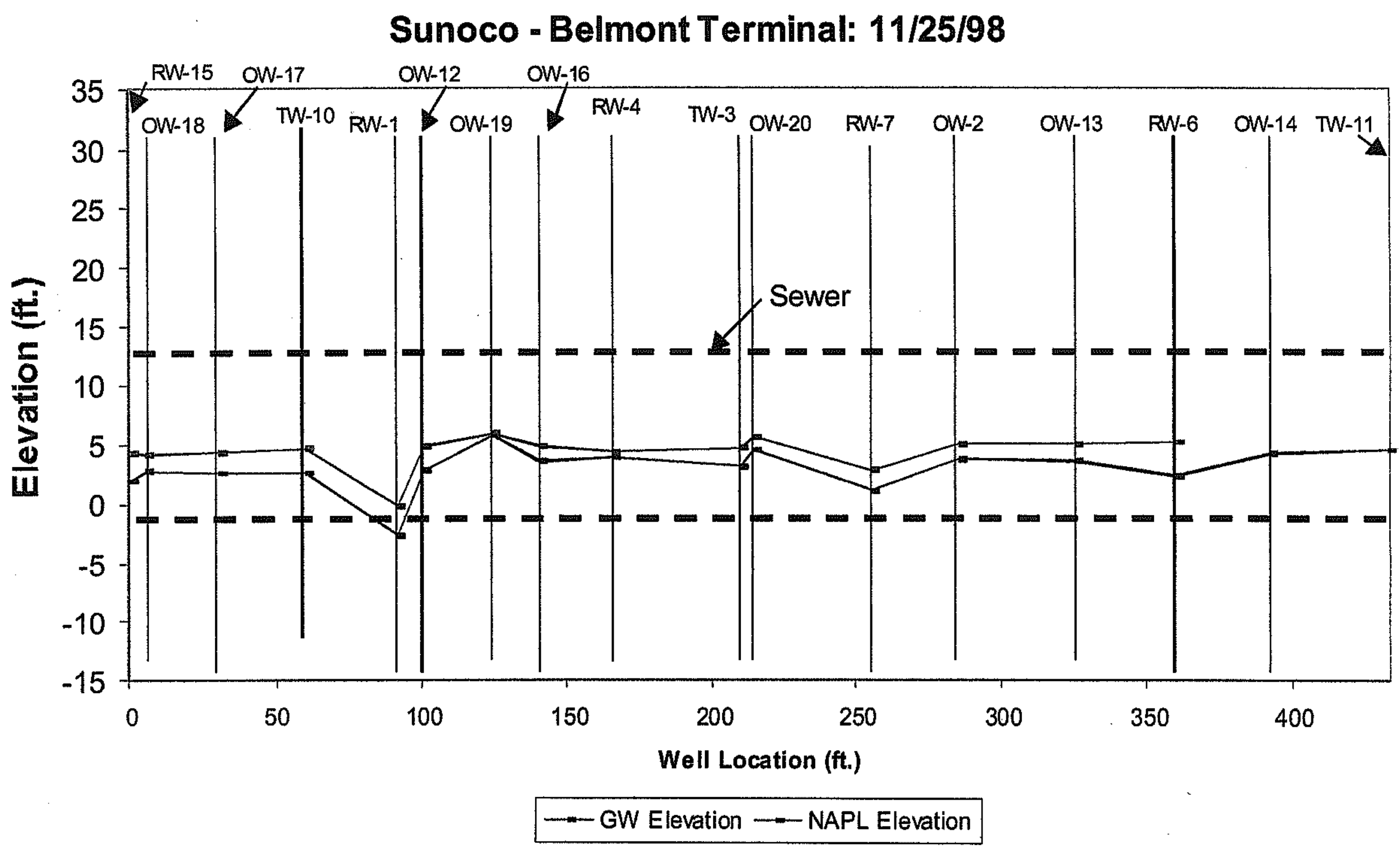



Sunoco - Belmont Terminal: 9/25/98
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

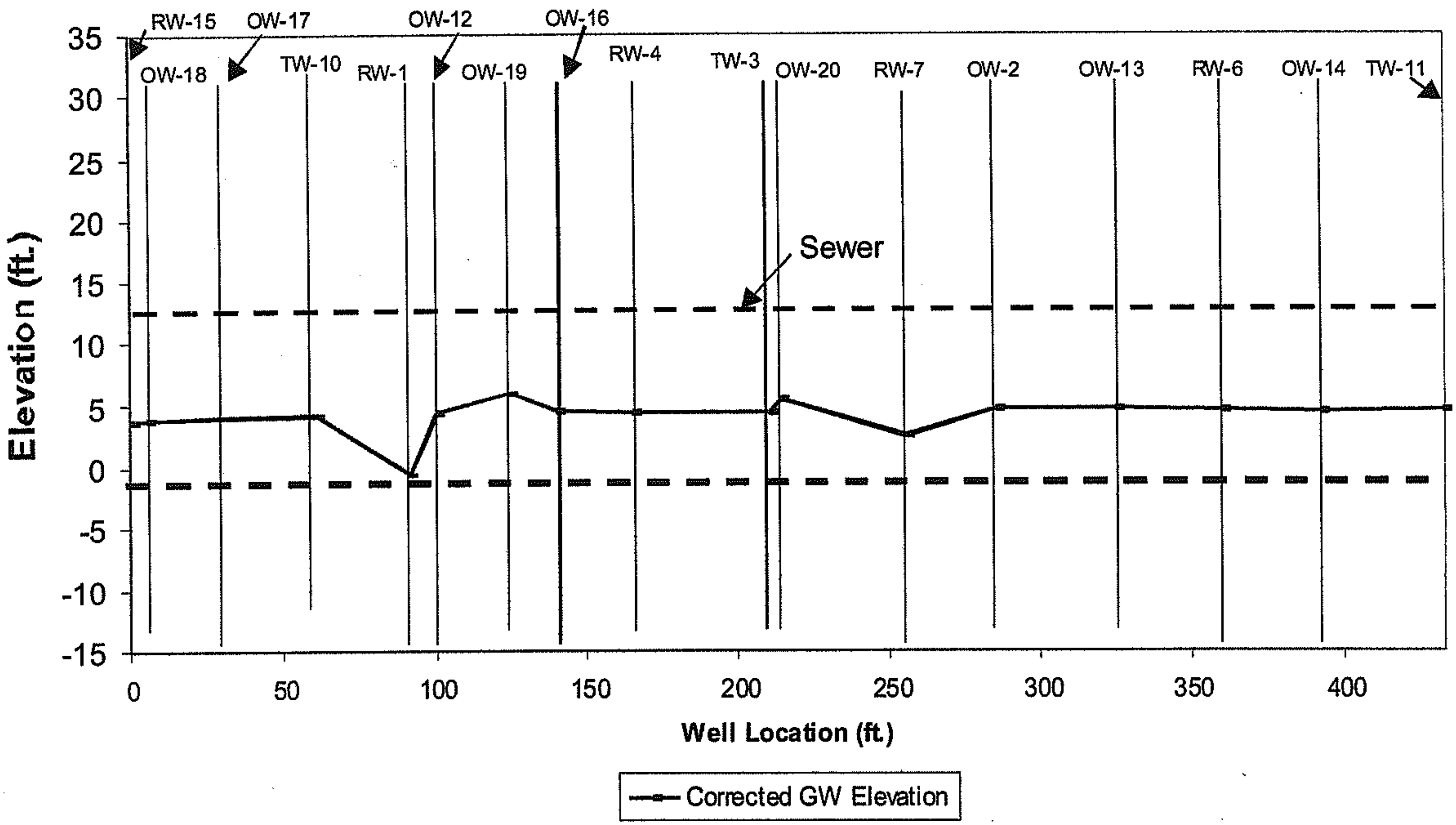

Sunoco - Belmont Terminal: 9/25/98
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation

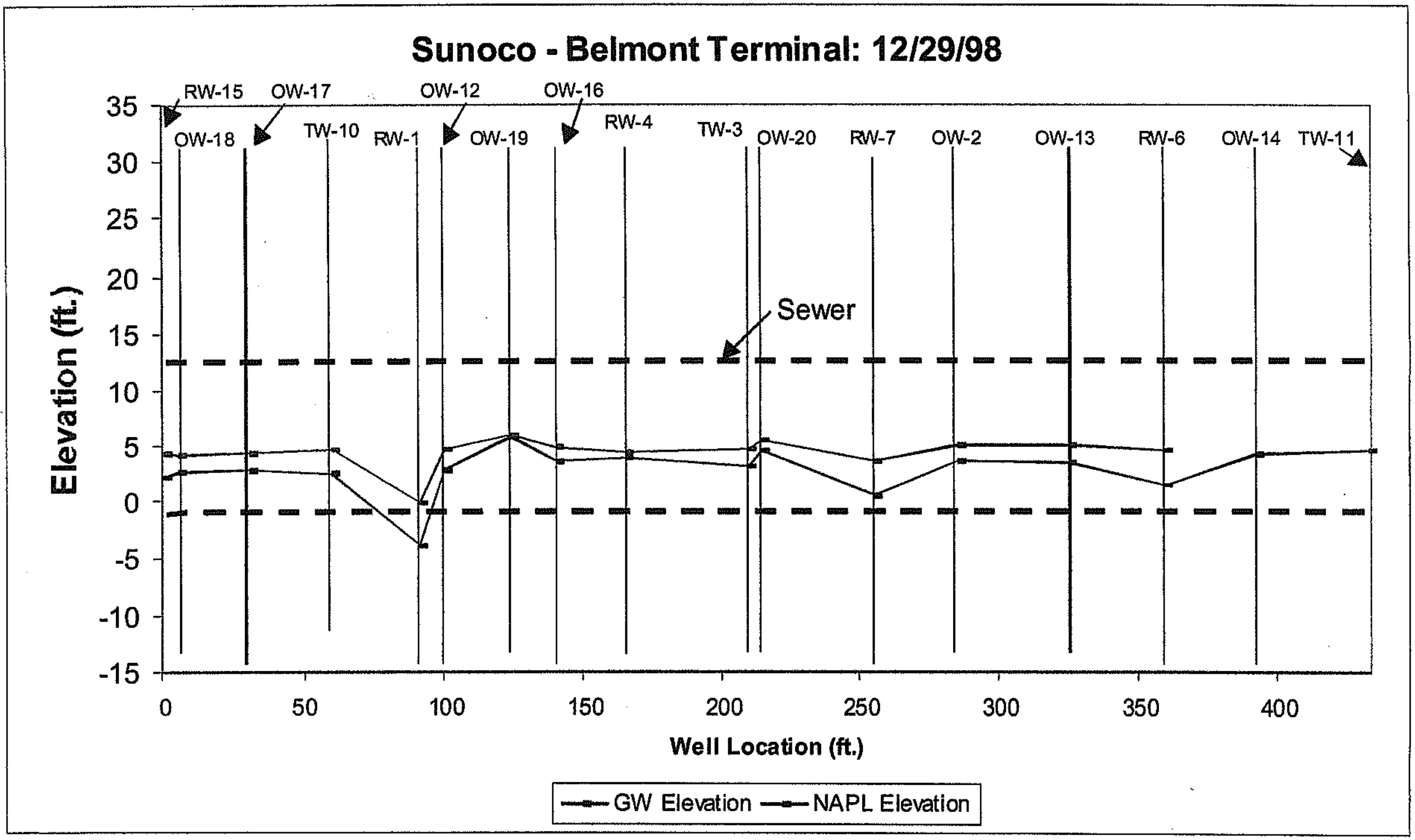

Sunoco - Belmont Terminal: 10/19/98
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

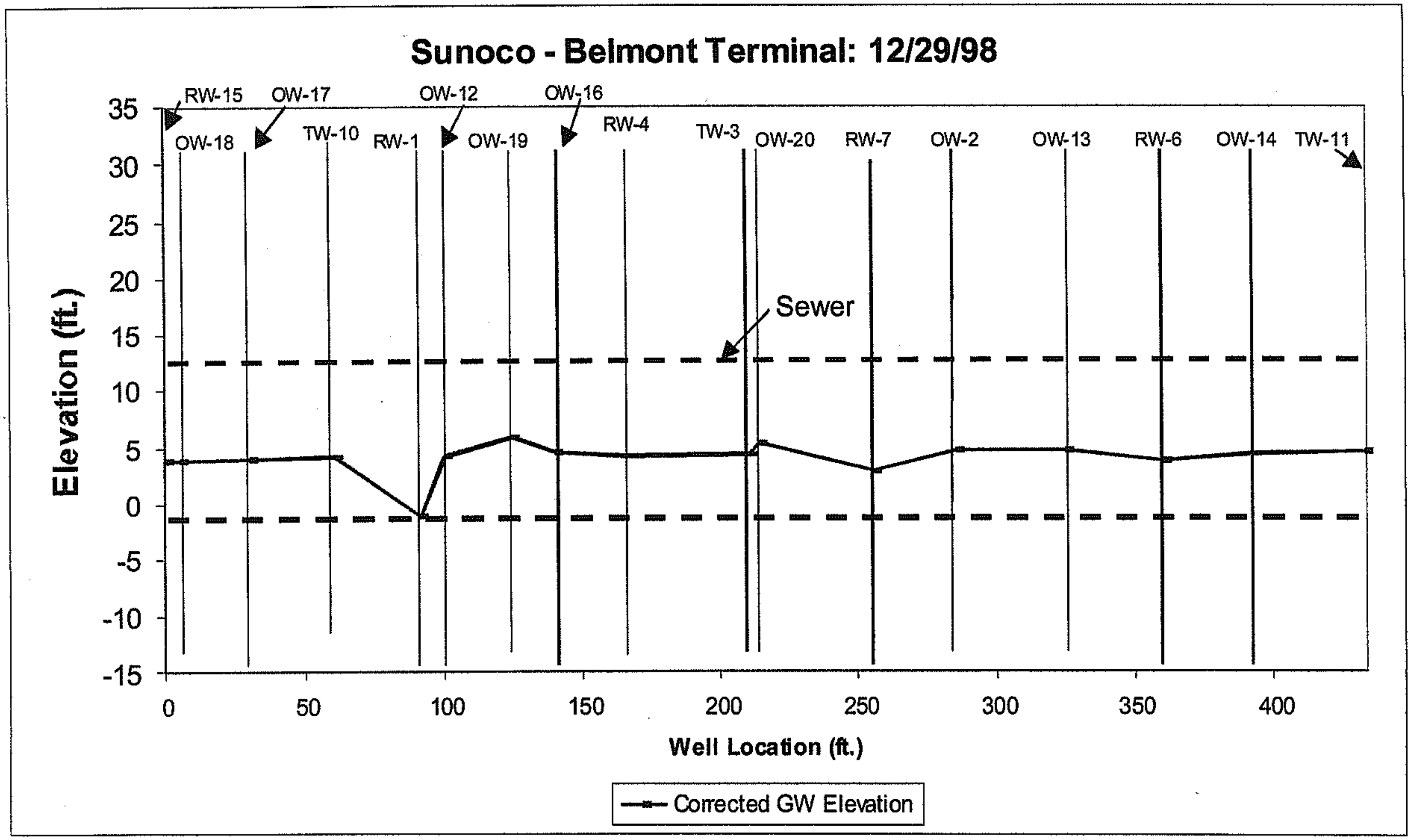

Sunoco - Belmont Terminal: 10/19/98
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation


Sunoco - Belmont Terminal: 11/25/98
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

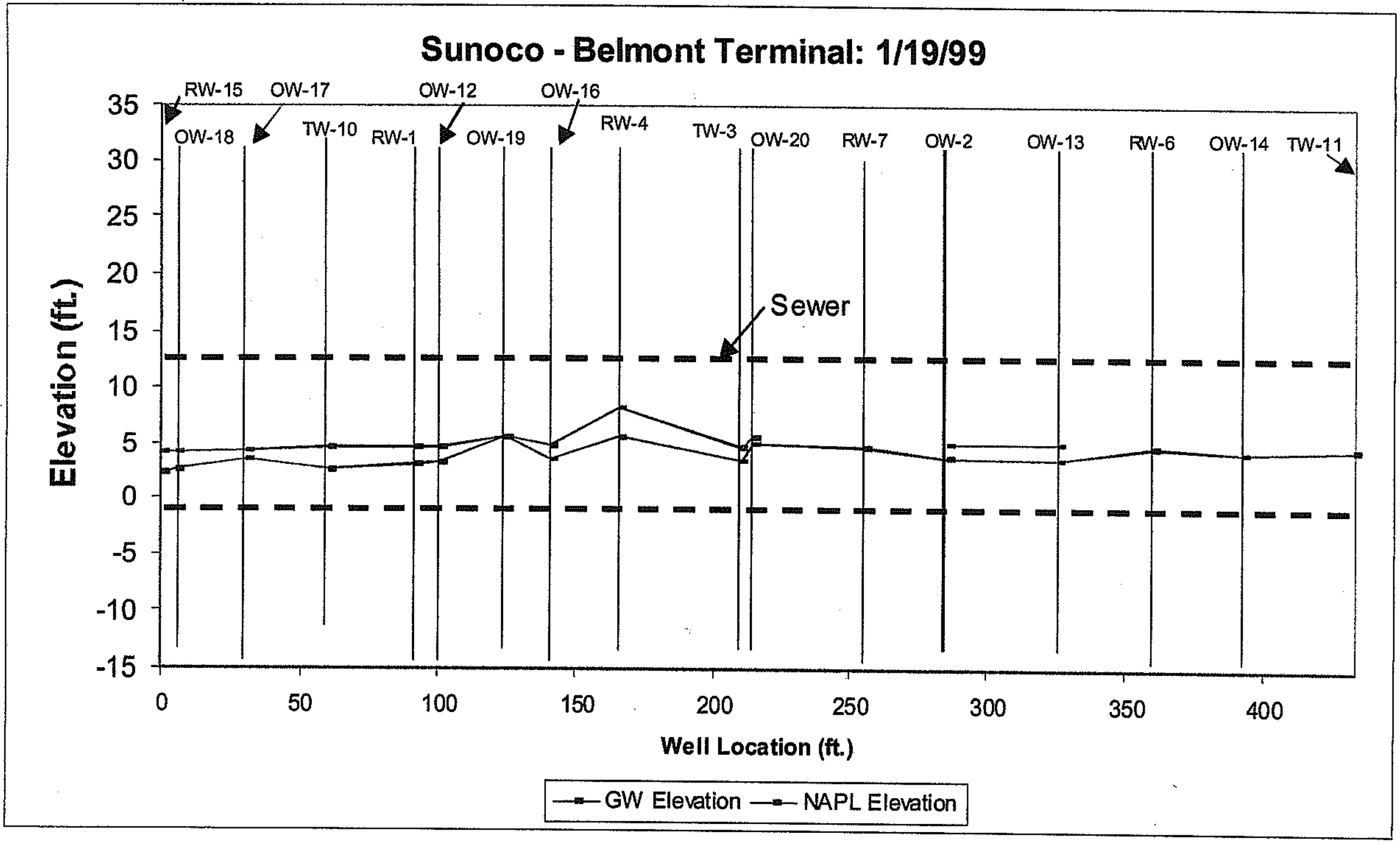
# Sunoco - Belmont Terminal: 11/25/98

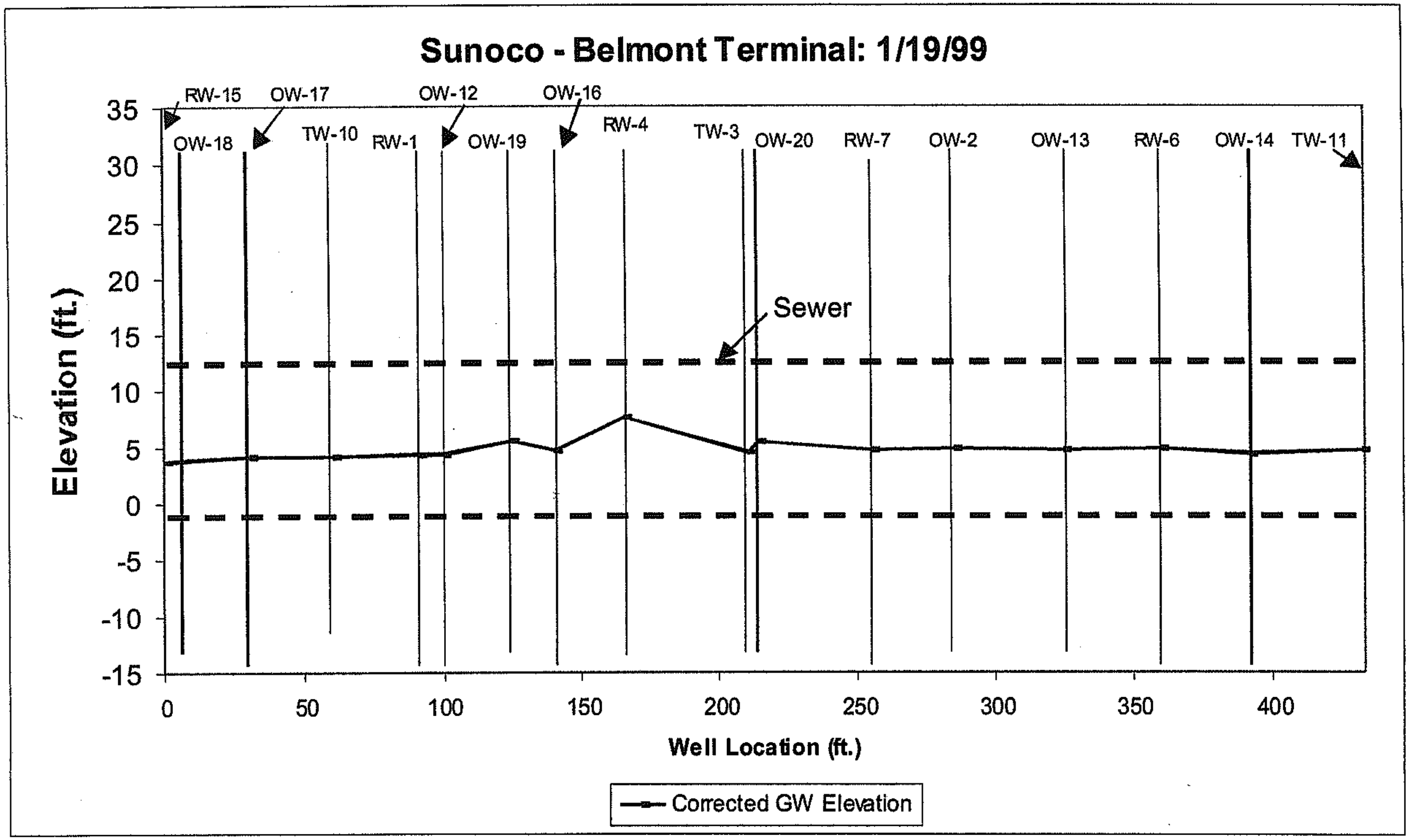



Sunoco - Belmont Terminal: 12/29/98
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

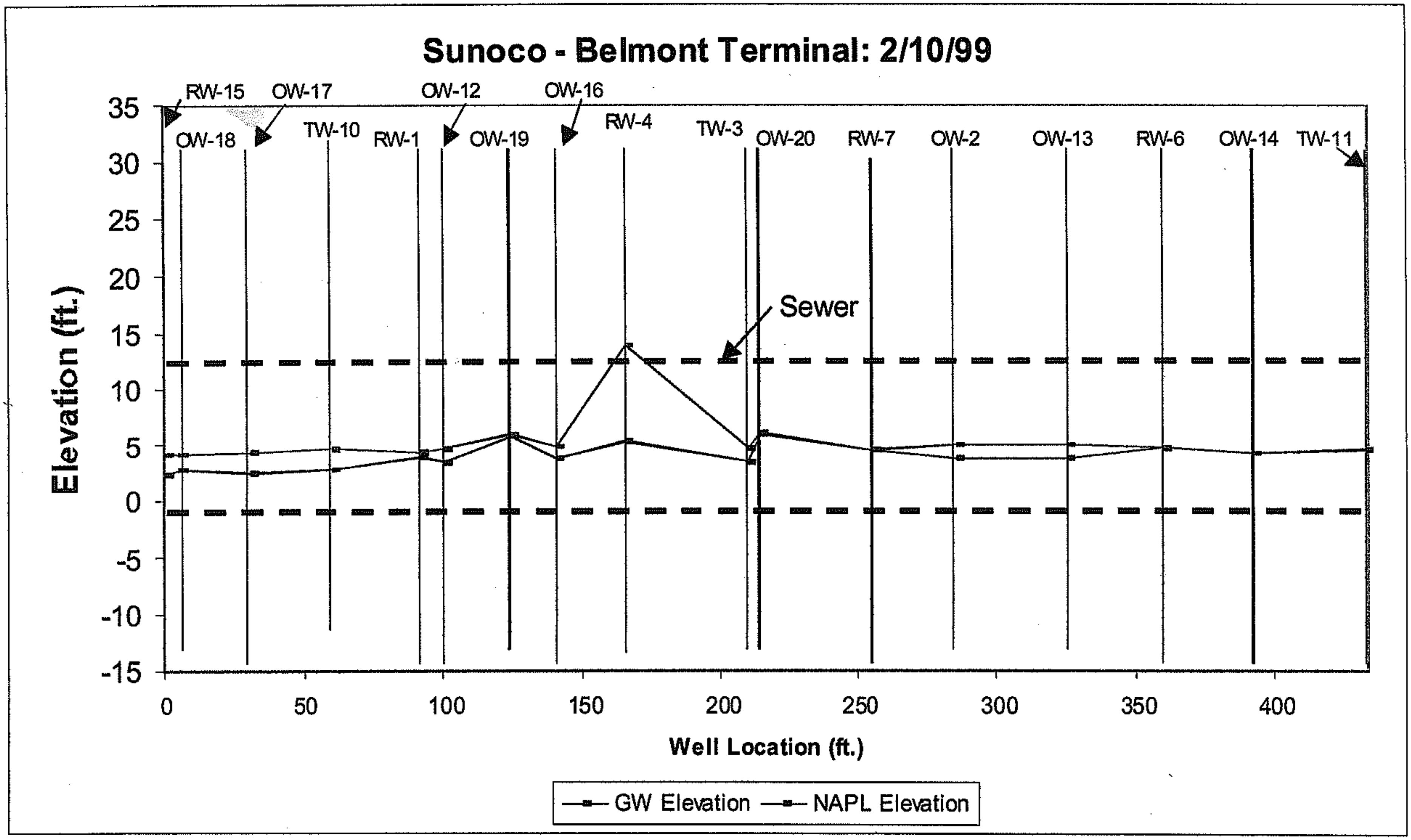


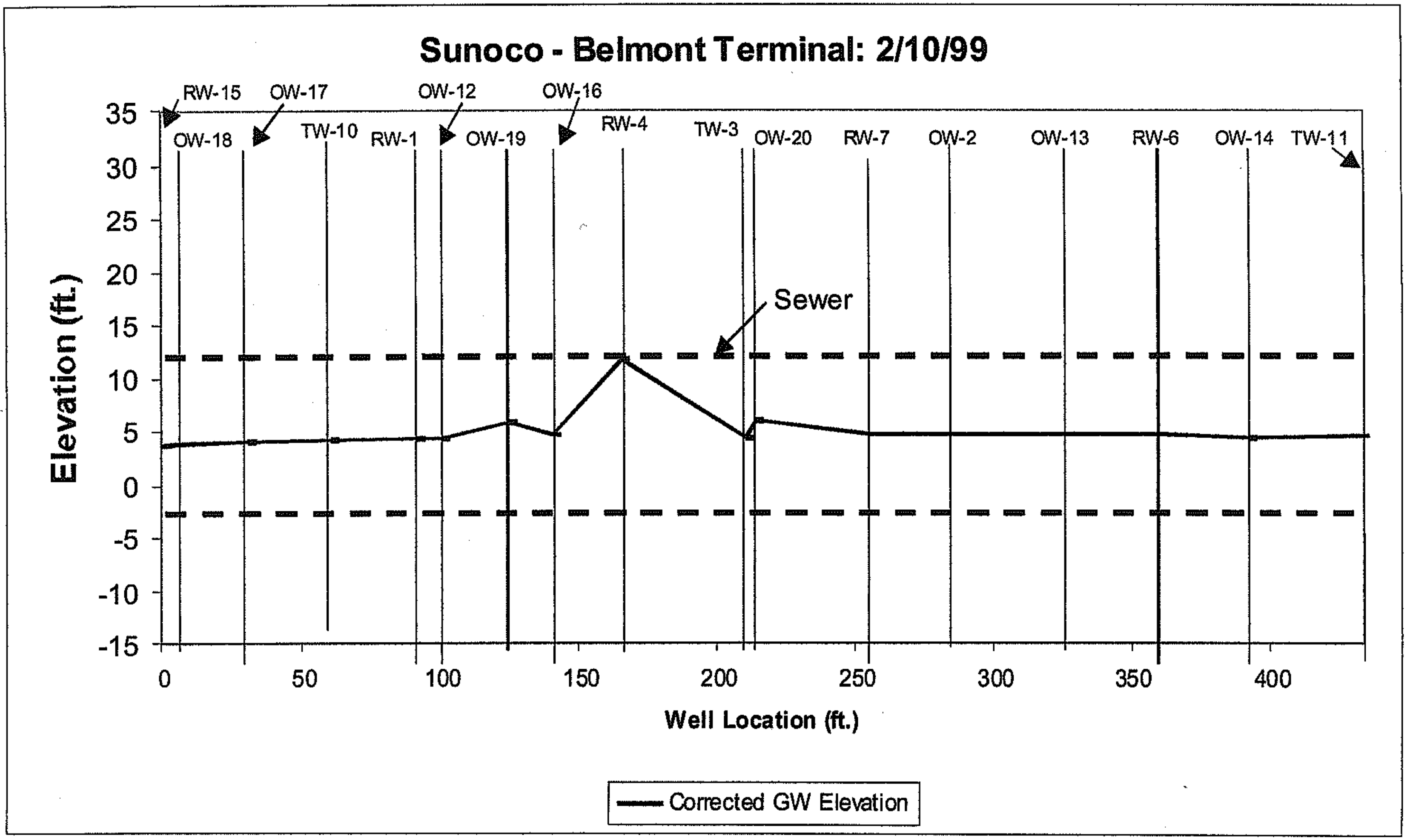
Sunoco - Belmont Terminal: 12/29/98
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation

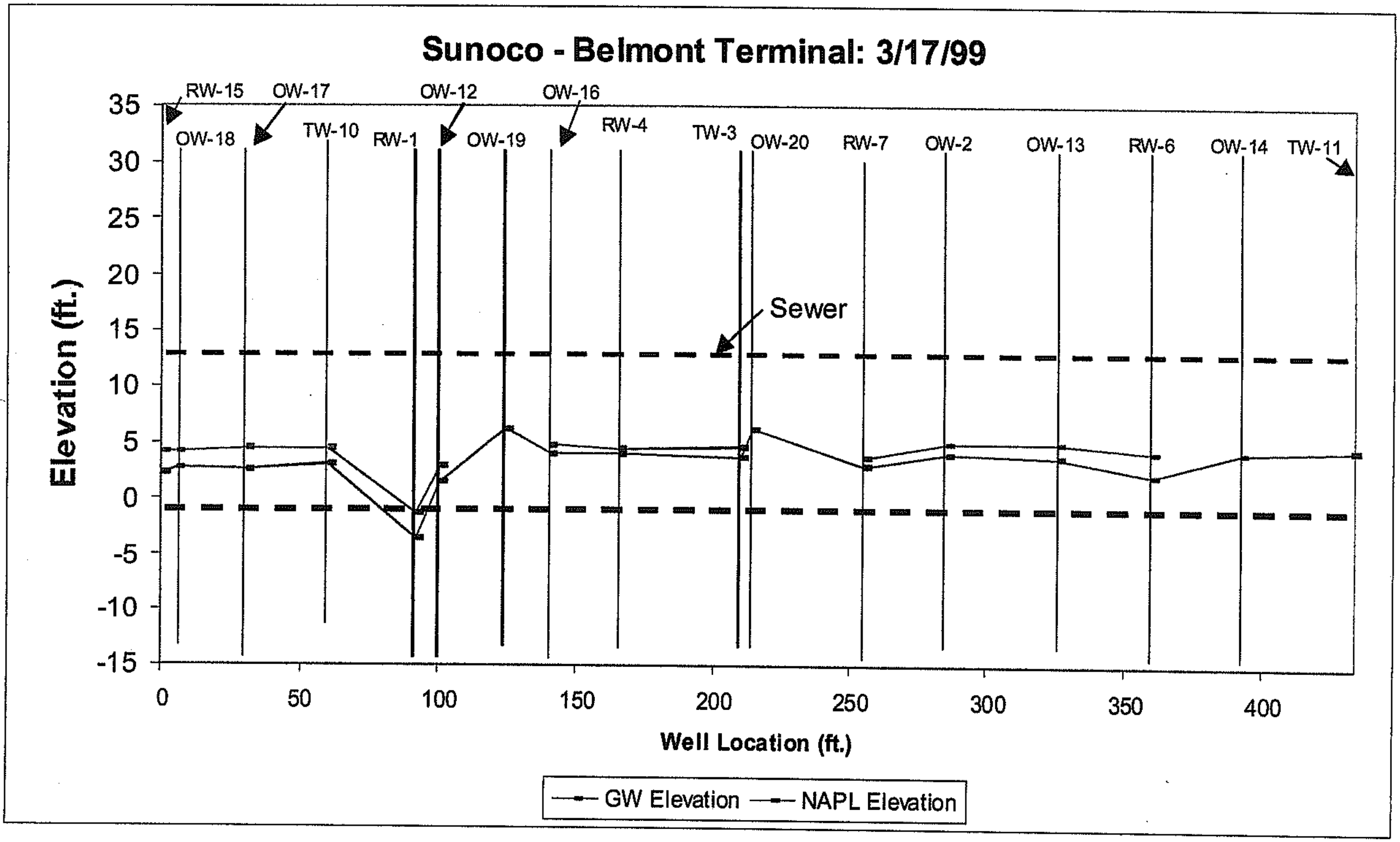

Sunoco - Belmont Terminal: 1/19/99
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

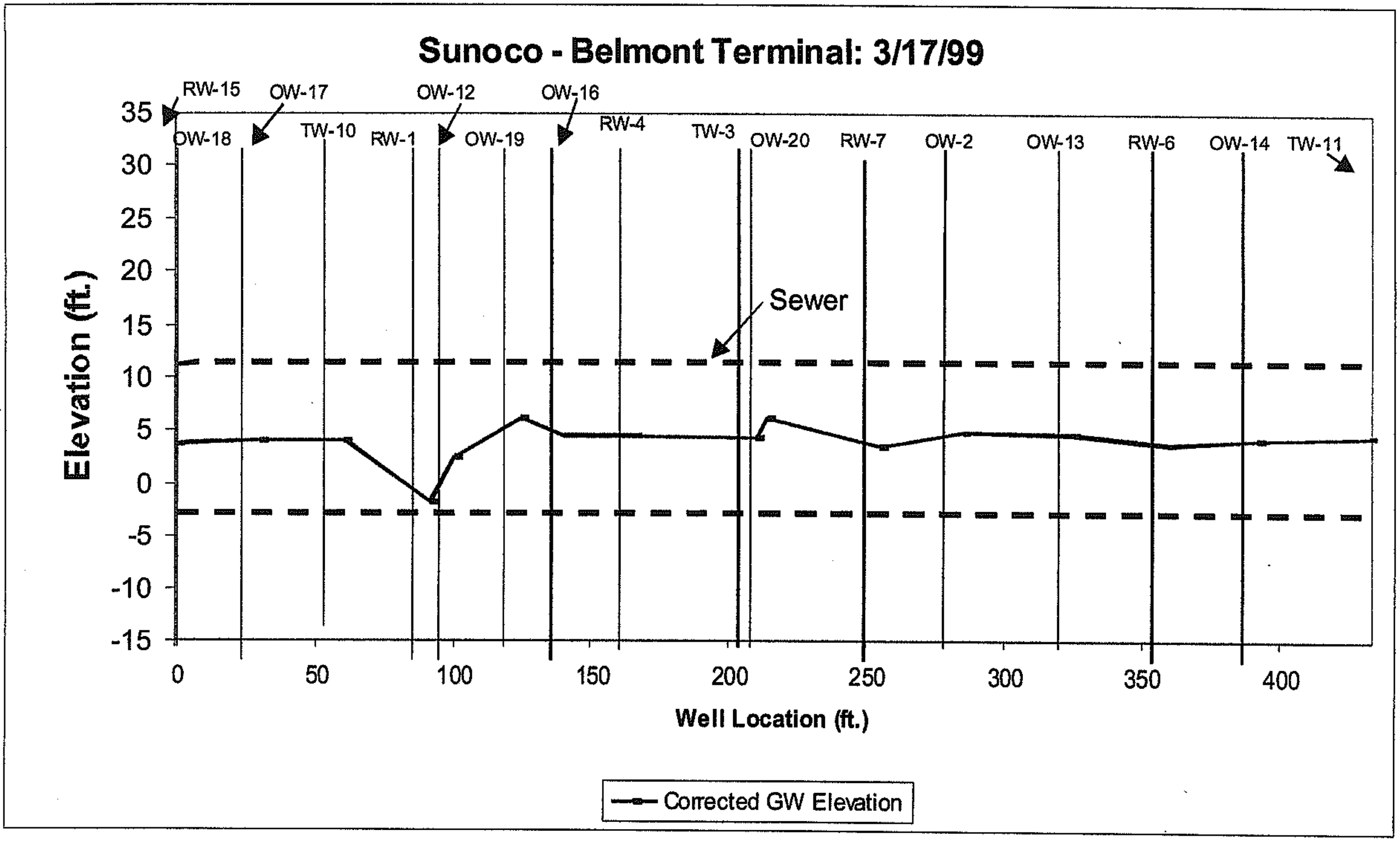


Sunoco - Belmont Terminal: 1/19/99
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation

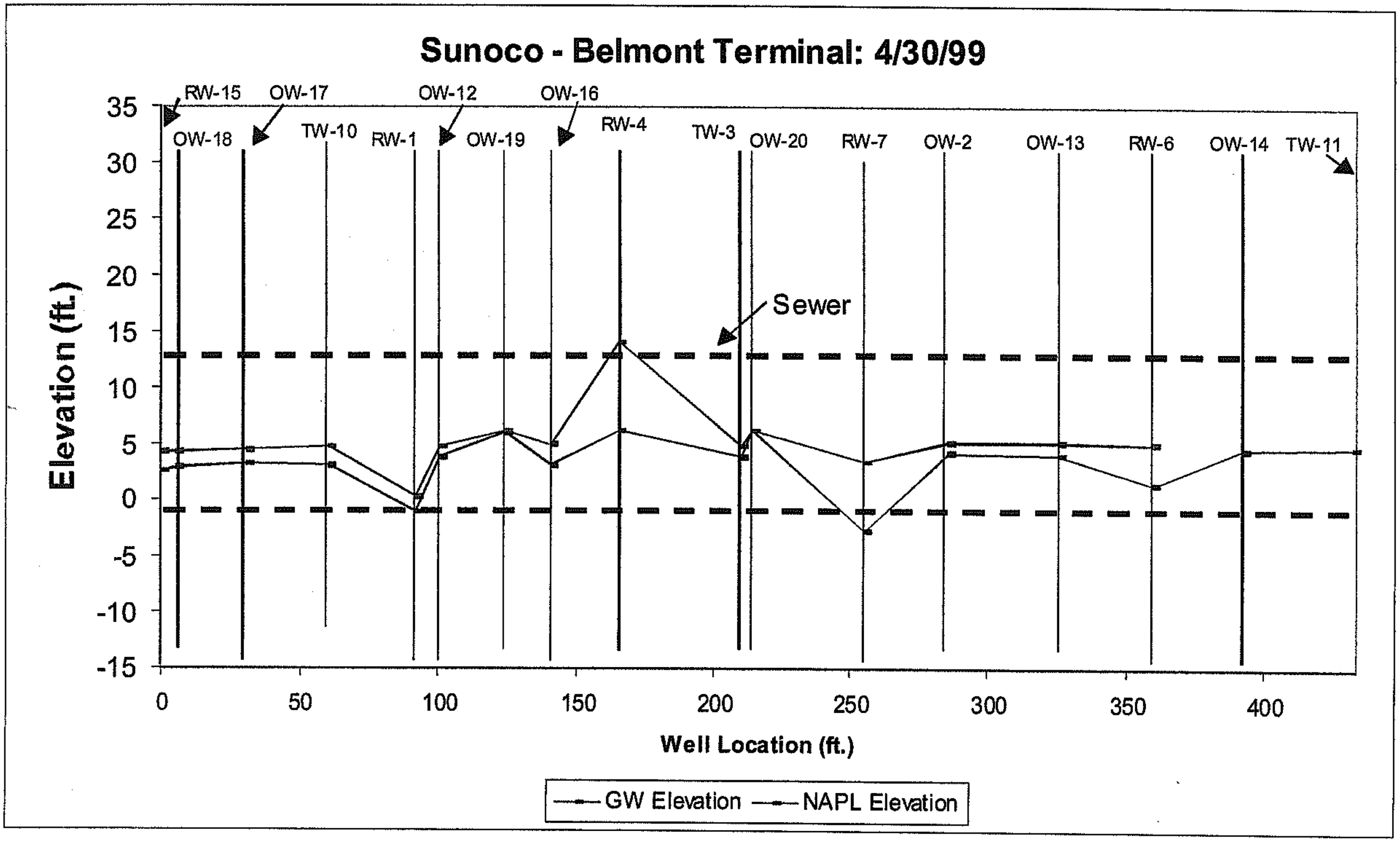

Sunoco - Belmont Terminal: 2/10/99
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
Well Location (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
GW Elevation
NAPL Elevation

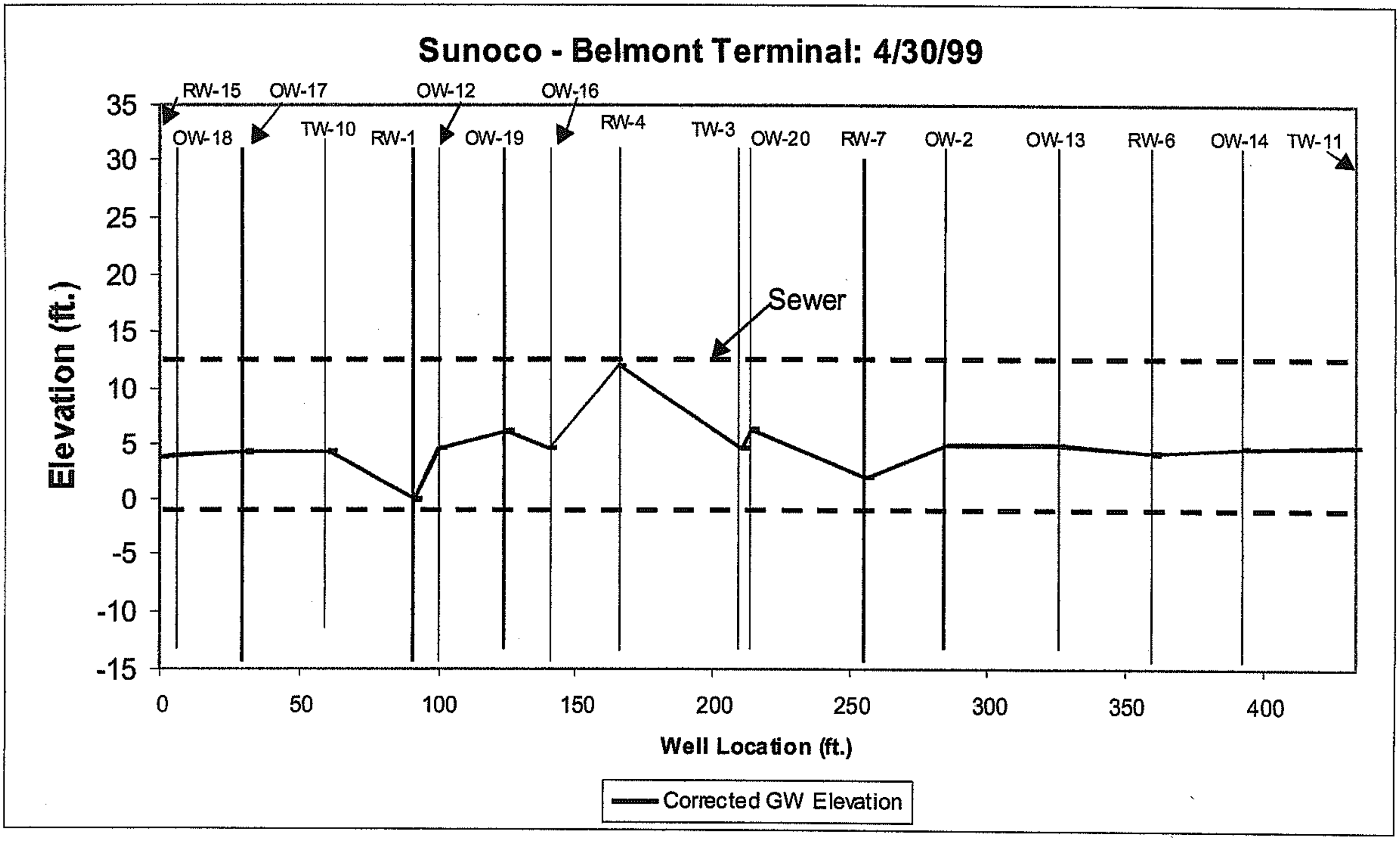

Sunoco - Belmont Terminal: 2/10/99
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation


Sunoco - Belmont Terminal: 3/17/99
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

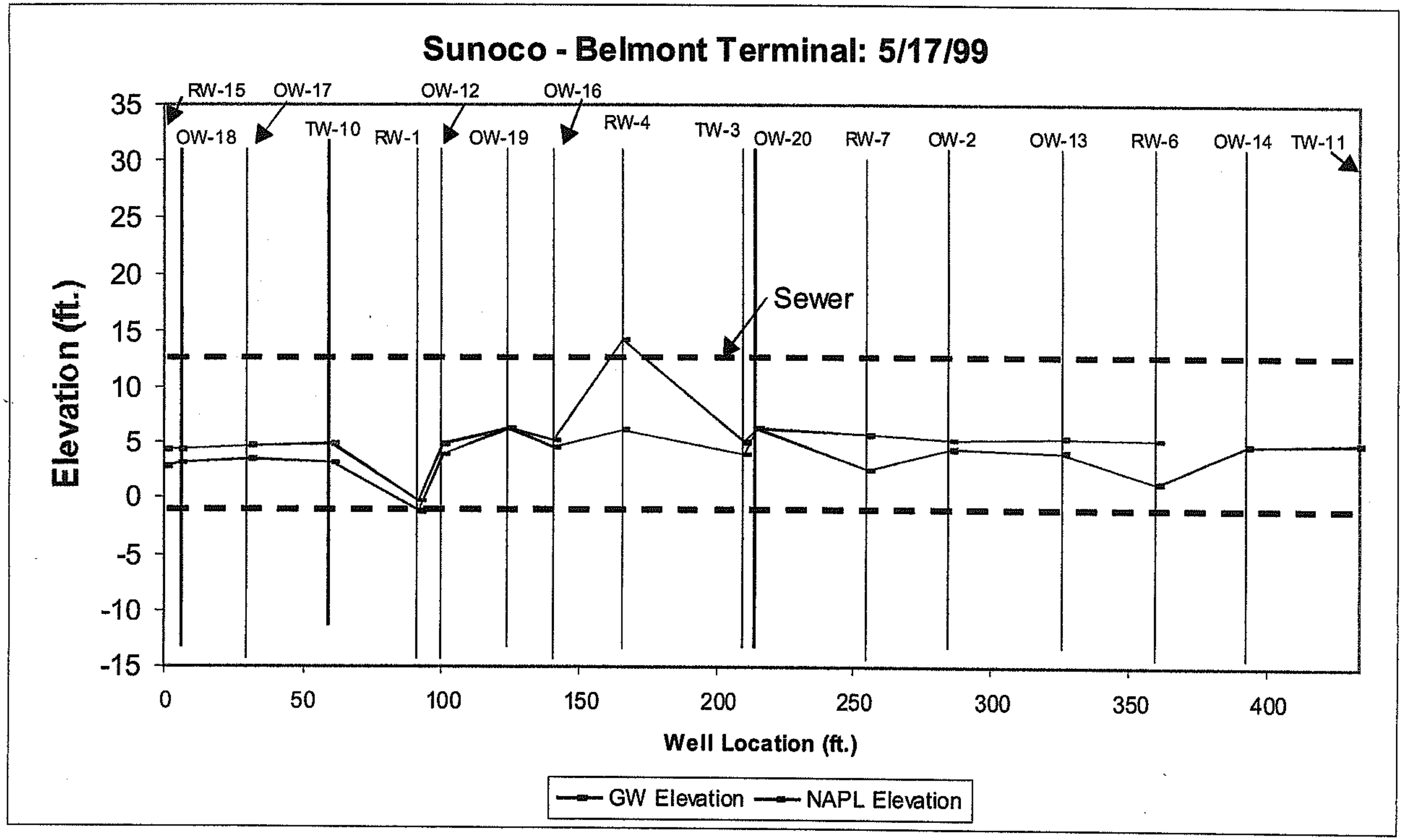


Sunoco - Belmont Terminal: 3/17/99
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
35
30
25
20
15
10
5
0
-5
-10
-15
Elevation (ft.)
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation


Sunoco - Belmont Terminal: 4/30/99
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

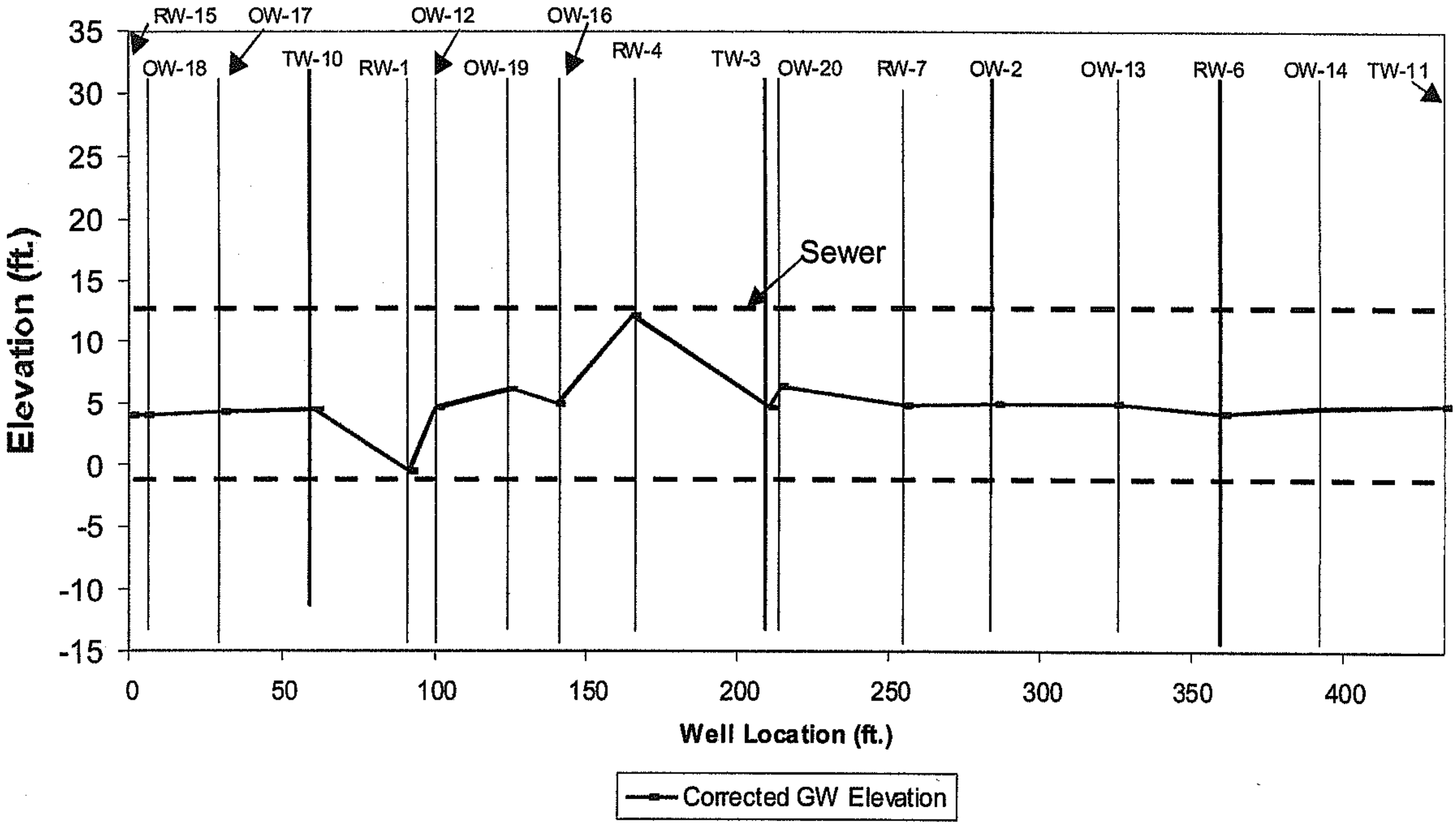


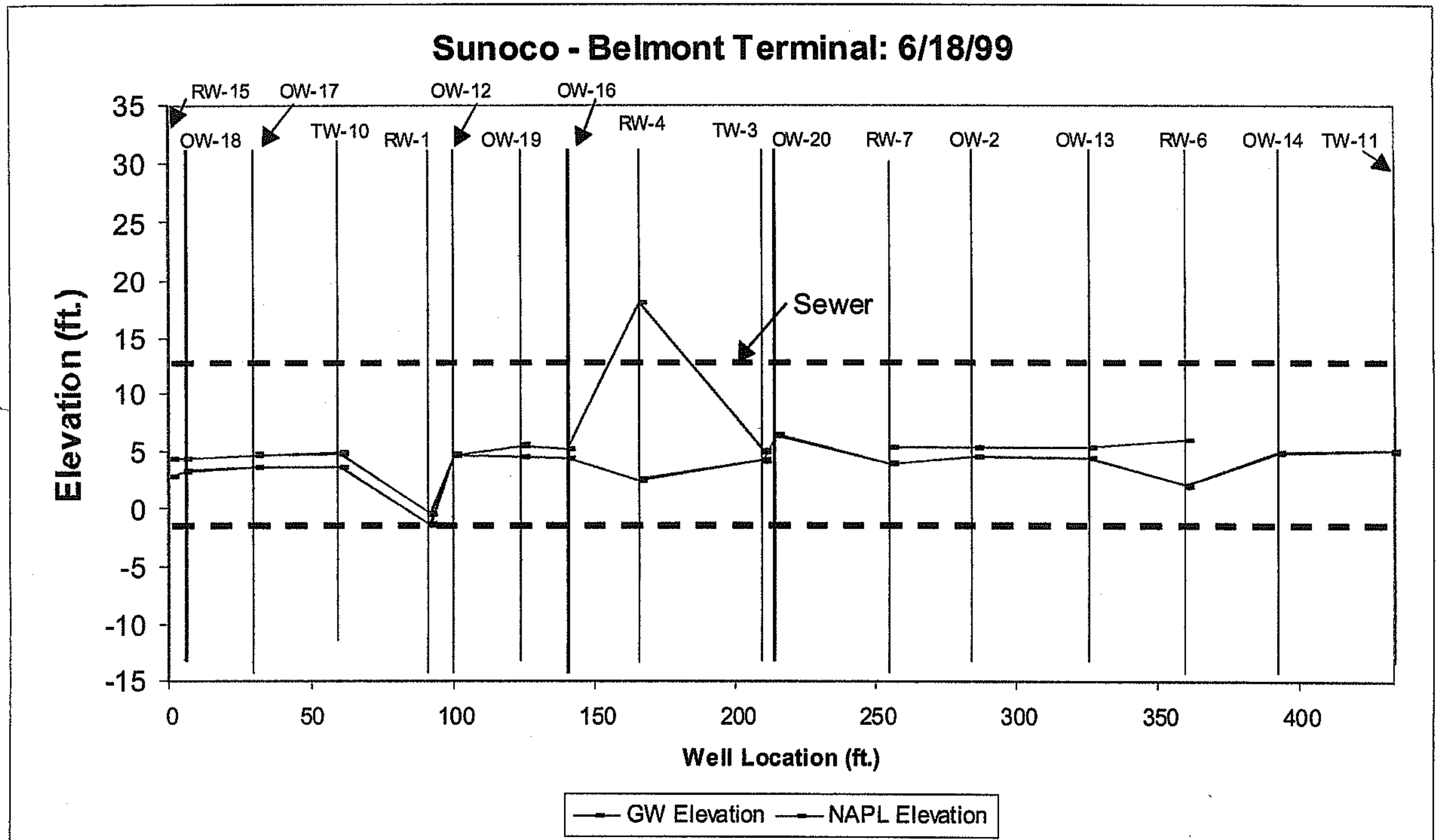
Sunoco - Belmont Terminal: 4/30/99
RW-15
OW-17
OW-12
OW-16
OW-18
TW-10
RW-1
OW-19
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation

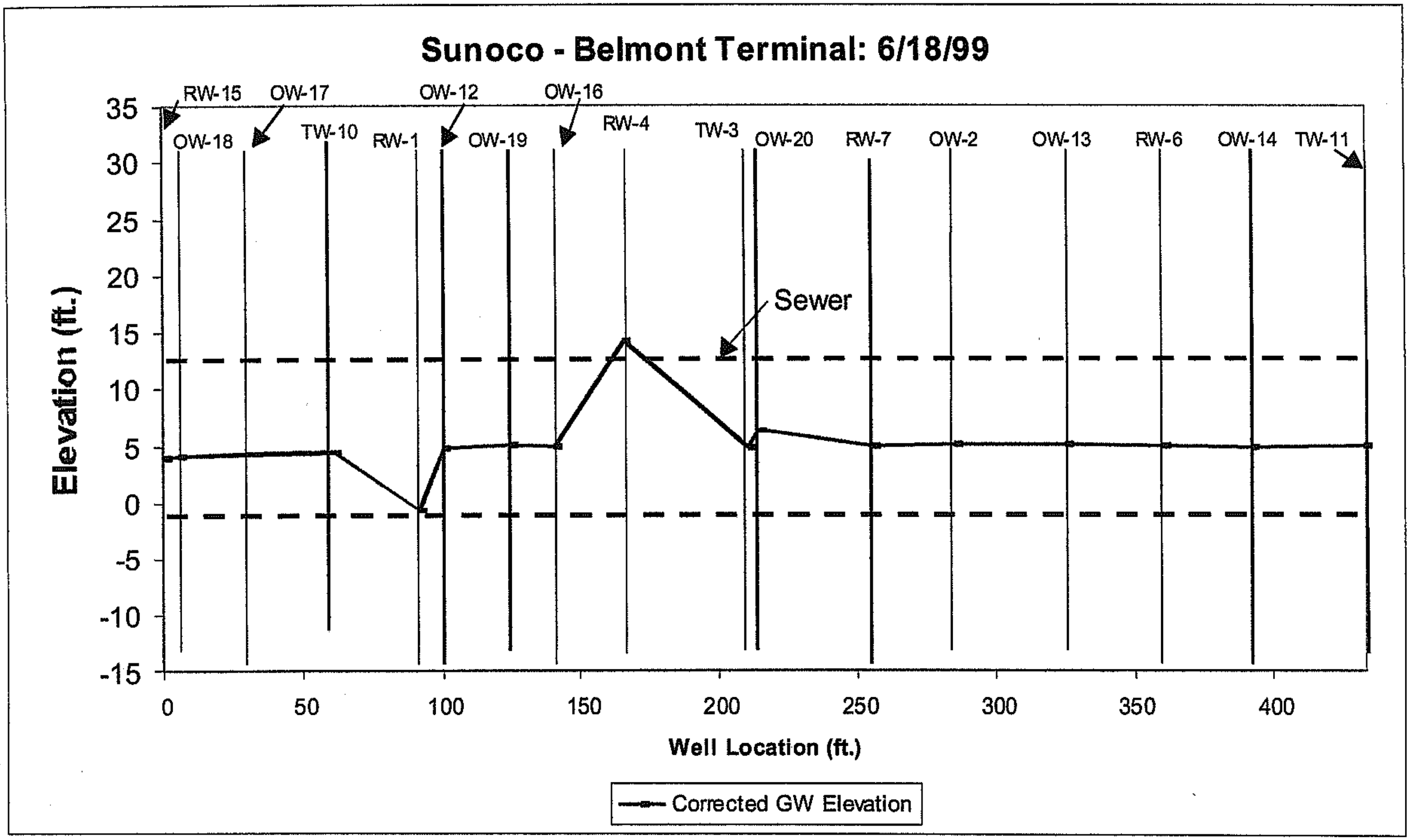


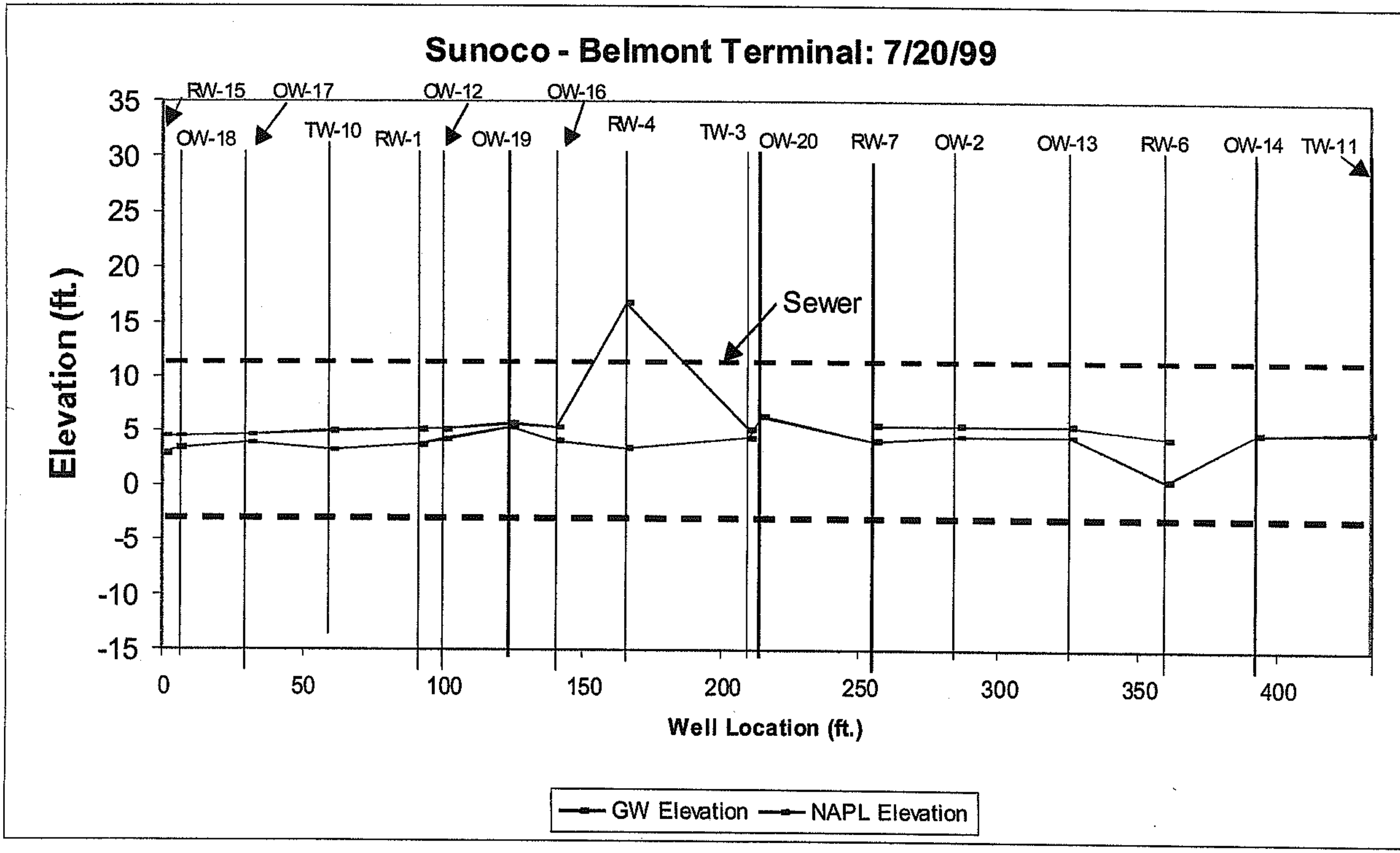
Sunoco - Belmont Terminal: 5/17/99
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
35
30
25
20
15
10
5
0
-5
-10
-15
Elevation (ft.)
0
50
100
150
200
250
300
350
400
Well Location (ft.)
GW Elevation
NAPL Elevation

# Sunoco - Belmont Terminal: 5/17/99

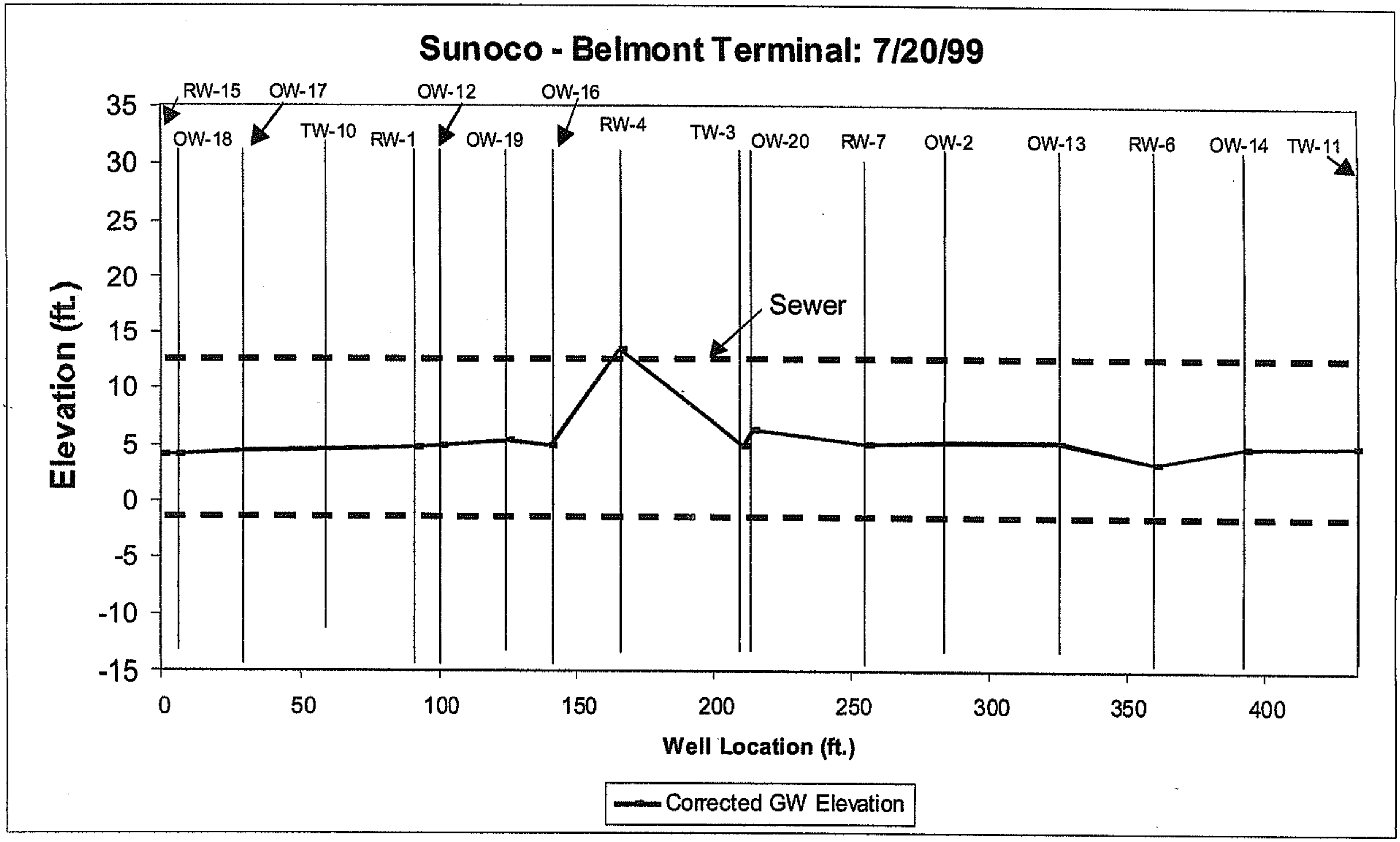



Sunoco - Belmont Terminal: 6/18/99
Elevation (ft.)
Well Location (ft.)
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
GW Elevation
NAPL Elevation


Sunoco - Belmont Terminal: 6/18/99
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
Elevation (ft.)
35
30
25
20
15
10
5
0
-5
-10
-15
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation



Sunoco - Belmont Terminal: 7/20/99
Elevation (ft.)
Well Location (ft.)
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
GW Elevation
NAPL Elevation



Sunoco - Belmont Terminal: 7/20/99
RW-15
OW-18
OW-17
TW-10
RW-1
OW-12
OW-19
OW-16
RW-4
TW-3
OW-20
RW-7
OW-2
OW-13
RW-6
OW-14
TW-11
Sewer
35
30
25
20
15
10
5
0
-5
-10
-15
Elevation (ft.)
0
50
100
150
200
250
300
350
400
Well Location (ft.)
Corrected GW Elevation