AR TARGET SHEET

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SECTION 2 OF 2

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4.0 PRELIMINARY CONCEPTUAL SITE MODEL

Section 4.1 presents the chemical and radiological data that are available for the groundwater in the 200 East Groundwater Aggregate Area. These chemical and radiological data are evaluated in Sections 4.2 and 5.0 in order to qualitatively assess the potential impacts of the contamination to human health and to the environment. The quality and sufficiency of the existing data are assessed in Section 8.0. This information is also used to identify applicable or relevant and appropriate requirements (ARARs) (Section 6.0). Contaminant information is assessed in Section 7.0 to provide a basis for selecting technologies that can be implemented at the site.

Contaminants that are released into the environment at a waste management unit or unplanned release site may migrate from the point of release into other types of media. The potentially affected media in the 200 East Groundwater Aggregate Area include vadose zone soil, vadose zone moisture, vadose zone vapor, perched groundwater, perched zone soils, groundwater, aquifer materials, potable water supplies, surface water, sediment, surface soil, vegetation, atmosphere, and biota. While the focus of this evaluation is groundwater quality, other media are included that potentially affect or contribute to groundwater contamination. The media that are affected at a specific site will depend upon the quantities, chemical and physical properties of the material that was released, and the subsequent contaminant migration history.

4.1 KNOWN AND SUSPECTED CONTAMINATION

Contaminants are identified in the groundwater underlying the 200 East Groundwater Aggregate Area. This section presents the nature and extent of groundwater contaminants, probable sources of these contaminants, and potential future migration. Section 4.1.1 discusses the areal distribution of each contaminant plume and identifies waste management units and other facilities the plume underlies. The intent is to identify those areas that may potentially contribute to the underlying and nearby groundwater contamination. Other potential upgradient historical source areas may have contributed to existing plumes, but need to be further evaluated with regard to historical groundwater flow conditions. Waste inventories associated with 200 East Groundwater Aggregate Area facilities are discussed in Section 2.0.

4.1.1 Results of Groundwater Quality Monitoring

The distribution of elevated chemical compounds in the groundwater at the 200 East Groundwater Aggregate Area is evaluated by groundwater monitoring. The five groundwater

quality monitoring programs [Operational Groundwater Monitoring Network (OGWMN), Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), Pacific Northwest Laboratory (PNL) and Hanford Environmental Health Foundation (HEHF)] currently in operation at the Hanford Site collect the data used to evaluate the distribution of chemical compounds. These monitoring programs evaluate the groundwater quality by sampling selected wells for a variety of chemical compounds. Section 2.8 summarizes the monitoring well network and the chemical compounds analyzed for in each of these monitoring programs. Wells monitored in the network are identified in Tables 2-9, 2-10, 2-24, and 2-25. These tables identify each monitoring well, its screened interval, and the formation being monitored for each program.

Groundwater quality data collected for these monitoring programs are summarized in reports prepared by Connelly et al. (1992a); Last et al. (1991); Evans et al. (1990); DOE/RL (1991a); Serkowski and Jordan (1989); Schmidt et al. (1991); DOE/RL (1991b); Hoover and LeGore (1991); Evans et al. (1989); and Elder et al. (1989).

4.1.1.1 Groundwater Monitoring Data. The bulk of the groundwater quality data reported herein for the 200 East Groundwater Aggregate Area were compiled by Connelly et al. (1992a) from monitoring well samples conducted under the auspices of the five programs identified above between January 1, 1988 and April 1992. Due to a lack of laboratory capacity, chemical data for most chemical compounds and selected radionuclides were not collected between June 1990 and May 1991. Chemical and radionuclide data collected after April 1992 were not available from Westinghouse Hanford Company at the time this report was prepared. Groundwater contaminant plume maps were prepared by Connelly et al. (1992a) using sampling from January 1988 to December 1991 as discussed in Section 4.1.2.3.

Tables 2-9, 2-10, 2-24, and 2-25 identify for each monitoring well the screened interval, the formation that the well is screened, and where information is available whether the well is screened in the confined aquifer (Rattlesnake Ridge aquifer), or semiconfined or unconfined portions of the uppermost aquifer. Information identifying the aquifer screened by the well is not readily available. For the purposes of the 200 East Groundwater Aggregate Area Management Study Report, the aquifers in which the wells are screened were determined by comparing the wells' screened interval with available geologic data provided by Lindsey et al. (1992) and Connelly et al. (1992a).

Chemical compounds detected in the groundwater within the 200 East Groundwater Aggregate Area (January 1988 to April 1992) are listed on Table 4-1. This list was generated from data provided by Westinghouse Hanford and used by Connelly et al. (1992a) by searching the Hanford Site Groundwater Database for all contaminants detected within the 200 East Groundwater Aggregate Area wells from 1988 to 1992. For each constituent listed,

this table identifies the well with the maximum average reported concentration and the maximum and minimum concentrations over this time period for that well. The number of detections and the number of samples less than the detection limit for that well are also listed. Table 4-1 also identifies for all monitoring wells the minimum reported detection limit, the total number of analyses conducted, and the total number of wells with detections.

Table 4-2 provides an initial, preliminary comparison of chemical data from the same database used for Table 4-1 (see Table A-1) obtained from the shallow, unconfined portion of the uppermost aquifer system with sampling results from selected deeper nearby wells. The shallow wells are screened in the Hanford formation sands and gravels, and Ringold Formation gravels depending on their location (compare Plate 3 well locations with geologic units identified on Figure 3-47). The deeper wells include those screened in the deep portions of the unconfined aquifer, the semiconfined aquifer (areas where the Ringold unit A gravels are confined or partially confined by the Ringold lower mud sequence), and the uppermost confined aquifer (Rattlesnake Ridge aquifer). Deep and shallow wells compared in the text for groundwater contamination in a specific geographic area are grouped together on the table. The deeper wells were selected based on the availability of chemical information, spatial distribution across the area, reliability of well construction data, and proximity to shallow wells for comparison. Table 4-2 does not include an exhaustive list of all deep wells for which chemical data exists, nor additional shallow wells more distant from the deeper well locations. Additional detailed assessment of the vertical distribution of groundwater contamination will be completed on an area-specific or contaminant-specific basis as part of on-going and future groundwater assessment programs described in Chapter 8.0.

The criteria used to evaluate the groundwater quality data collected by the groundwater monitoring programs are based on maximum contaminant levels (MCLs) established by the U.S. Environmental Protection Agency (EPA) under the Safe Drinking Water Act; 4% of the derived concentration guide (DCG) as prescribed by DOE Order 5400.5; Washington State Groundwater Quality Standards (WAC 133-200) and the Washington State Model Toxics Control Act regulations (WAC 173-340). Contaminant plume maps were drawn for all contaminants detected in the 200 East Groundwater Aggregate Area since January 1, 1988 that exceeded at least one of these groundwater quality criteria (Connelly et al. 1992a).

4.1.1.2 Background Concentrations. Hoover and LeGore (1991) developed a program to determine background concentrations of naturally-occurring inorganic chemicals, water quality parameters, and radionuclides and radioactivity parameters. The results of the initial implementation of this program have been published (DOE/RL 1992d) and provide an estimate of baseline ("reasonable upper limit") levels ("provisional threshold values") against which contaminant concentrations can be compared (Table 4-3). The results of the background study have not been accepted by all concerned parties for regulatory purposes.

The method used to determine these background levels included the following:

- Development of a conceptual model describing the geochemical changes which groundwater would undergo from the point of recharge through interactions with the rock and soil matrices

- Physical tests of groundwater-rock interactions using basalt and Ringold Formation sediments under both open- and closed-system conditions

- Development of data quality objectives, review of existing data, selection of a background study subset of wells which meet selection criteria (appropriate hydrostratigraphic regime, uncontaminated, completeness in charge balance, and consideration of well construction)

- Statistical interpretation of these data to check the fit of the data with a normal distribution: in most cases the sample size was too small to allow determination of a 95% confidence limit and the maximum recorded value was used for the provisional threshold value

- Interpretation of the results, revision of the conceptual model (accounting for possible effects from anthropomorphic influences), assessment of limitations, and recommendations for follow-up work.

The study found that the groundwater in the uppermost (unconfined) aquifer is dominantly an open-system regime (i.e., high hydraulic conductivity and susceptible to flushing by recharge waters) with modest basalt rock-water interactions leading to its compositional characteristics. This regime may however be more associated with the portion of the Hanford Site where the background study subset wells are located (mainly along the western and southwestern boundaries of the Hanford Site, near the Rattlesnake Hills) which could differ from the Hanford Site as a whole or the 200 Areas in particular where the study could not be conducted because of the presence of contamination. The study therefore recommends the extension of the study to new wells, both in other portions of the Hanford Site than were studied before as well as using newer construction, sampling, and analysis techniques to reduce the uncertainty of the background estimates and to characterize the processes going on in the aquifer.

4.1.1.3 Basis for Plume Evaluation. Plume maps provided by Connelly et al. (1992a) were developed by averaging detected concentration values at each well for chemical compounds identified in Table 4-1 and identifying those that exceeded groundwater quality criteria. This approach provides a gross indication of the extent of contamination for each constituent and sufficient data for contouring. Some of the plumes have areal extents that are indeterminant because they are essentially based on one well and surrounding well coverage

is inadequate to delineate the plume boundaries. The interpolation of these plume boundaries could be changed markedly with additional data. Plume maps discussed in this text are from Connelly et al. (1992a) and are based on sampling data from January 1988 to December 1991.

Interpretations of the groundwater contaminant plume configurations are dependent on the quality of the data. Limitations associated with the data used to compile contaminant plume maps are as follows:

- Monitoring well construction variations
- Differences in groundwater sampling and analyses procedures and methodologies (e.g., use of bailer rather than submersible pump)
- Monitoring well coverage variations and limitations
- Computer contouring routines and groundwater model interpretations.

These items may result in a change in the interpreted configuration of the plume map. In some cases the estimated areal extent of the plume may either be reduced or increased.

4.1.1.4 Chemical Compound Plume Evaluation. Thirteen individual plumes of chemical compounds were identified in the groundwater of the 200 East Groundwater Aggregate Area. Of these plumes, two (^{137}Cs and $^{239,240}Pu$) are contained within the 200 East Groundwater Aggregate Area fence boundary, and eleven plumes (chromium, nitrate, arsenic, ^{90}Sr, ^{60}Co, cyanide, gross alpha, gross beta, tritium, ^{99}Tc, and ^{129}I) extend beyond the boundary of the 200 East Groundwater Aggregate Area. The extent of the 13 plumes is discussed in this section. Section 4.1.2 discusses the various potential sources for these plumes.

The December 1991 water table elevation table map was used to evaluate the migration patterns of these plumes (Figure 3-49; Kasza et al. 1992). In addition, Connelly et al. (1992a) presented a map modified from Kasza et al. (1991) and Jackson (1992) which compares June 1991 water table elevations with the potentiometric surface of the Rattlesnake Ridge aquifer (Figure 3-70). This map provides a gross evaluation of areas with likely intercommunication where the hydraulic head indicates the potential for significant vertical flow from one aquifer to another.

4.1.1.5 Estimates of Areal Distribution of Contaminant Plumes. Estimates of areal extent for the 13 chemical compounds found at the 200 East Groundwater Aggregate Area were made from contaminant plume maps generated by Connelly et al. (1992a) (Figures 4-1 through 4-15). Additional Hanford site-wide maps of nitrate and tritium distributions are provided from Evans et al. (1990) for comparison (Figures 4-5 and 4-9). As discussed by

Connelly et al. (1992a), the plumes delineated represent areas which must be addressed when considering the lowest regulatory cleanup levels. In some cases the detection limit is above the lowest regulatory levels; when this occurs, the contour is set at or slightly above the detection limit.

Table 4-4 provides the areal estimates for each plume. For the plume maps generated by Connelly et al. (1992a), a computer interpolated grid of concentration levels was obtained from the authors, and the areas and total mass were obtained by integration of the values. For cyanide and parts of tritium, nitrate, and ^{129}I plumes where only a graphical representation (map) was available, estimates of area were obtained by graphically measuring the plume on the map, and masses were estimated from the area and the average concentration within the plume. As discussed in Section 4.1.1.3, the areal distributions of plumes with limited well coverage were calculated by interpolating the chemical data between monitoring wells, based on the computer-generated contours. These areas include plumes defined by a positive detection in a single well and nondetections in adjacent wells. This calculation therefore represents an estimate of the actual extent of the plumes, and provides for a consistent basis for analysis. Multiple plumes or plumes with complex geometries are divided in the discussion by individual plumes or lobes.

4.1.1.6 Vertical Extent of Contamination. Limited data are available regarding the vertical extent of chemical and radionuclide contamination (Last et al. 1991; Connelly et al. 1992a). In 1976 Eddy et al. investigated the vertical extent of selected radionuclides in the uppermost aquifer. The bulk of this study was conducted southeast of the 200 East Groundwater Aggregate Area on selected 600 Area wells. Eddy et al. (1978) conclude that some contamination in the lower portion of the uppermost aquifer had occurred; however, concentrations of individual constituents appeared higher near the water table. Samples collected from Monitoring Well 699-31-31 contained concentrations of ^{106}Ru, tritium, and ^{60}Co at depths of up to 182 m (597 ft).

Jensen (1987) evaluated the intercommunication between the uppermost aquifer and Rattlesnake Ridge aquifer. The objective for Jensen's study was to determine the extent of intercommunication between the uppermost aquifer and the uppermost regionally extensive confined aquifer (Rattlesnake Ridge aquifer). Hydraulic head data collected during December 1986 was evaluated as part of this study. As discussed in Section 4.1.1.3, the extent of vertical plume migration was assessed by comparing water table elevations with the potentiometric surface of the Rattlesnake Ridge aquifer. The assessment included review of data reported by Connelly et al. (1992a), Kasza et al. (1991), and Jackson (1992). In addition, hydraulic intercommunication was discussed by Jensen (1987) and Graham et al. (1984). Jensen (1987) also compiled a map which compares the water table elevation with the potentiometric surface of the Rattlesnake Ridge aquifer. Data used to generate the water table and potentiometric surface were collected in December 1986. This map indicates that a downward vertical gradient existed at that time over most of the 200 East Area and in the

B Pond area. This downward gradient may have permitted contaminated waters within the uppermost aquifer system to discharge into the Rattlesnake Ridge aquifer.

Graham et al. (1984) also conducted an assessment of the intercommunication of the uppermost aquifer and Rattlesnake Ridge aquifer in the areas of the B Pond and Gable Mountain Pond. They evaluated the areas where the Elephant Mountain Basalt was eroded and estimated the potential for aquifer intercommunication based on groundwater chemistry and barometric pressure efficiencies. Graham et al. (1984) identified a downward gradient from the uppermost aquifer system to the Rattlesnake Ridge aquifer in the vicinities of Gable Mountain and the B Pond complex. In addition, they identified an area south and east of Gable Mountain Pond where groundwater chemical data indicated that aquifer intercommunication had occurred. They concluded that downward flow from the uppermost aquifer had probably occurred in the late 1960's and late 1970's when groundwater levels in the area were much higher. This downward flow apparently resulted in low levels of tritium and ^{129}I in the Rattlesnake Ridge aquifer in this area.

For each of the 13 contaminant plumes being evaluated, a nominal value of 10 m (33 ft) was chosen for the vertical extent of dissolved chemical constituents in the groundwater (Evans et al. 1990; Connelly et al. 1992a; and Last et al. 1991). Table 4-4 provides volume estimates for the quantity of contaminated water by each of the chemical compounds, based on this nominal thickness. Although this 10 m thickness does not account for the chemical constituents identified at greater depths, nor areas where the saturated aquifer may be thinner, this depth was selected to provide a preliminary estimate for the potential volume of the compound in the groundwater. Further characterization of the vertical extent of chemical constituents will be required to refine this thickness estimate, as discussed below.

4.1.1.7 Plumes of Chemical and Radionuclide Constituents. Thirteen chemical constituent plumes are presented for this investigation. The areal distribution and migration patterns of these plumes are discussed separately below.

It should be noted that the posted values on the plume maps (Figures 4-1 through 4-15) are based on a slightly earlier data set (January 1988 to December 1991) than the data in the tables and which are also used in the text (January 1988 to April 1992). The text therefore uses the most up-to-date information available; however, a check of the differences indicates that the overall plume distributions shown in the figures are still reasonably accurate.

4.1.1.7.1 Arsenic. Four distinct plumes of arsenic (plumes A, B, C, and D) were identified in the 200 East Area (Figure 4-1) based on analytical results of filtered samples. These plumes of dissolved arsenic cover a combined area of approximately 740,000 m^2 (7,900,000 ft^2) for concentrations equal to or greater than 10 μg/L. This bounding contour of 10 μg/L does not meet the potential MTCA criteria at 5 μg/L or the Washington Groundwater Quality Standard for arsenic of 0.05 μg/L due to detection limits for the data

set, but is below the MCL of 50 μg/L. In addition, the background concentration of arsenic at Hanford is reported by DOE/RL (1992d) at 10 μg/L (Table 4-3). Therefore, some relatively low concentrations of arsenic for the plumes reported below may reflect levels at natural background levels (see Section 4.1.2.2.1).

Table 4-4 provides the areal distribution for plumes A, B, C, and D. Concentrations of arsenic range from below the detection limit (5 μg/L) to 56 μg/L (Monitoring Well 299-E25-17). Dissolved arsenic (filtered) ranges only up to 34 μg/L. Except for the one unfiltered sample, the MCL of 50 μg/L was not exceeded in the 200 East Area.

The highest average concentration of arsenic was found in plume C. This plume is located beneath the 216-A-6, 216-A-30, 216-A-37-1, 216-A-37-2, and 216-A-42 Cribs in the southern part of the PUREX Plant Aggregate Area. Seventeen wells were used to roughly define the areal extent of this plume, although control on the southeast side of the plume is poor because of inadequate well coverage. The water table elevation map (Figure 3-49) indicates that groundwater flow is predominantly toward the south.

Plume A is the northernmost plume. It is located beneath the northeastern corner of the 216-B-3 Pond. This plume is defined by one high concentration value of 13 μg/L. Six wells were used to delimit the areal distribution of plume A. This plume is associated with the groundwater mound located beneath the 216-B-3 Pond and, therefore, the plume should spread radially with the predominant direction of groundwater flow beneath the plume toward the northwest.

One higher concentration value of 10.4 μg/L dominates plume B (Figure 4-1). This plume is located west of the 216-B-3 Pond. Data were insufficient to define the shape and orientation of this plume. The water table elevation map (Figure 3-49) indicates a westerly flow for this plume.

Plume D (Figure 4-1) is defined by two wells which have yielded concentrations of 16.8 μg/L and 10.4 μg/L. Plume D is located in the southern part of the B Plant Aggregate Area just west of the 2101-M Building. Data were insufficient to define the shape and orientation of this plume. The water table elevation map indicates a southeasterly flow for this plume.

The mass of arsenic in groundwater within the 10 ppb contour line is estimated at approximately 22.8 kg (50 lb). This estimate is based on a vertical extent of 10 m (33 ft), a porosity of 0.2, and the computer interpolation of well averages.

An evaluation of the vertical extent of arsenic indicates that low levels of arsenic are found in the groundwater within the deep, unconfined and semiconfined portions of the uppermost aquifer and the confined aquifer. These arsenic concentrations ranged from 2.3 to

31 μg/L, below the MCL for arsenic. Table 4-2 lists arsenic concentrations for wells screened in different aquifers. The horizontal and vertical extent of arsenic concentrations in the deeper aquifers was not identified during this evaluation.

Arsenic concentrations measured in the deeper aquifers correspond to those areas where the uppermost aquifer is in hydraulic communication with the deeper aquifers. This occurs where the confining unit separating the uppermost aquifer from these deeper aquifers is absent. A vertical downward gradient appears to exist between the uppermost aquifer and the deeper aquifers within or adjacent to these areas.

Below unconfined portions of the uppermost aquifer, the highest average arsenic concentrations were measured in Well 299-E16-2 (31 μg/L), a well screened in the semiconfined portion of the uppermost aquifer. This well is located beneath Plume C, southwest of the 216-B-3 Pond System and southeast of Well 299-E25-17, the well with the maximum average arsenic concentrations (56 μg/L) (Table 4-1). Wells 299-E25-23 and 299-E25-24 are adjacent to Well 299-E16-2 and are screened within the shallow, unconfined portion of the uppermost aquifer. These wells had average arsenic concentrations of 17 to 24 μg/L.

Stratigraphic units within the semiconfined portion of the aquifer in this area have a southerly dip. North of this area the Hanford formation unconformably overlies the Ringold Formation. The Ringold Formation lower mud sequence, which creates the confining layer, is absent in this area. A vertical downward gradient is present in this area as evidenced by comparing the groundwater levels from the unconfined and semiconfined portions of the uppermost aquifer. Dissolved arsenic found in the unconfined portion of the aquifer would have the potential to migrate downward into the semiconfined portion in this area.

Arsenic concentrations were averaged for Well 699-42-40B at 5 μg/L. This well is screened in the semiconfined portion of the uppermost aquifer. This well is located immediately adjacent to the 216-B-3 Pond System in the area beneath plume B. Mounded groundwater present in the area may be providing a downward gradient, which would drive dissolved arsenic into the semiconfined system.

One well, Well 699-47-50, screened in the Rattlesnake Ridge confined aquifer contained arsenic concentrations at 2.7 μg/L. This well is located just north of the area where a portion of the confining layer, the Elephant Mountain Basalt has been eroded. Thus, dissolved arsenic has the potential to migrate to the confined aquifer in this area. The horizontal hydraulic gradient in this area is toward the west.

Well 299-E33-40 contained low levels of arsenic (2.3 μg/L). This well is located at the northwestern end of the 200 East Area. The well is screened within the Rattlesnake

Ridge aquifer. Improper well construction may have permitted the vertical migration of arsenic from the uppermost aquifer to this greater depth.

4.1.1.7.2 Chromium. Three areas of elevated concentrations of dissolved (filtered) chromium within the 200 East Area were identified as plumes A, B, and C (Figure 4-2). These plumes are distributed over an area of 120,000 m^2 (1,300,000 ft^2), based on chromium concentrations greater than or equal to the MCL of 50 μg/L. The contoured data on Figure 4-2 represent dissolved chromium concentrations based on analytical results of filtered samples. Results of unfiltered samples are not presented because they also reflect concentrations present in any suspended sediment and such values, therefore, are considered less representative. The reported background concentration for chromium in Hanford Site groundwater is reported to be below a detection limit of 30 μg/L (Table 4-3). The maximum average concentration in groundwater for unfiltered (total) chromium was 395 μg/L in Monitoring Well 699-40-40B and for filtered chromium was 65 μg/L in Well 299-E24-19 (Table 4-1). Well 699-40-40B is located at the south end of the 216-B-3 Pond System, and Well 299-E24-19 is located just south of the 241-A Tank Farm within plume C. Some of the elevated chromium levels may be contributed in past from chromium present in stainless steel used in newer wells, such as Well 699-40-40B although the effect is expected to be relatively minor compared to other potential sources.

Plume A is located in the B Plant Aggregate Area northwest of the 216-B-35 through -42 Cribs. The highest chromium concentration measured for plume A is 12 μg/L, which is below the MCL value of 50 μg/L. Plume A is defined by only one well, Well 299-E33-30. The water table elevation map (Figure 3-49) indicates a northerly flow for this plume.

Plume B lies beneath the southwest side of the 241-BX Tank Farm and the southeast side of the 216-B-35 through -42 Cribs. The highest average concentration measured for plume B is 51.2 μg/L from Well 299-E33-32. The shape and areal extent of plume B is poorly constrained. The water table elevation map indicates a northwesterly flow for this plume.

Plumes A and B possibly represent the highest concentrations of a single plume that is for the most part slightly below MCL concentrations.

Plume C lies beneath the 241-A Tank Farm. The highest concentration measured for this plume is 65 μg/L from Well 299-E24-19. The shape and areal extent of plume C is poorly constrained. Groundwater flow in this area is uncertain as the plume is located near a groundwater divide. Flow is generally in a westerly direction with a probable southwesterly component according to the water table elevation map. Because of the plume's proximity to the groundwater divide, it may have a northwest component to its flow.

The mass of chromium in the 200 East Area is estimated at 13.5 kg (30 lb) (Table 4-4). This mass is based on the total areal distribution of the plumes as interpolated for the contour lines, a 10 m (33 ft) vertical extent, and a porosity of 20%.

Analytical data for dissolved chromium are relatively sparse for the deep, unconfined and semiconfined portions of the uppermost aquifers and the Rattlesnake Ridge aquifer (Table 2-2). Chromium concentrations detected within the deep unconfined portion of the uppermost aquifer ranges from below detection limits to 12.7 μg/L in well 299-E25-25. For the Rattlesnake Ridge aquifer, chromium concentrations are 9.80 and 20.8 for wells 699-49-578B and 699-49-55A, respectively. These concentrations generally are comparable to concentrations present in the shallow, unconfined portion of the uppermost aquifers which range from below detection limits to 26.4 μg/L.

The highest concentration of chromium identified in the deeper aquifers was measured in the semiconfined portion of the aquifer (Well 699-43-41E) near the 216-B-3 Pond. In this area, a downward gradient exists from the unconfined portion of the aquifer.

Chromium concentrations identified in the Rattlesnake Ridge aquifer ranged from 73.1 to 86.1 μg/L. These concentrations were measured in wells located north of the northwest end of the 200 East Area (Wells 699-47-50, 699-49-55b, 699-49-57B and 699-50-53). The head differential between the uppermost aquifer system and the Rattlesnake Ridge aquifer in this area is nearly equivalent, but with a slight upward gradient in places. This area is also characterized by an erosional window in the basalt that likely results in intercommunication between the Rattlesnake Ridge aquifer and the uppermost aquifer. The potentiometric surface in this area slopes toward the northwest and ultimately discharges into the West Lake area, where the Rattlesnake Ridge confined aquifer is absent.

One deep unconfined well (299-E25-25) contained detectable concentrations of chromium (30.5 μg/L). This well is located southwest of 216-B-3 Pond.

Well 299-E33-40 is screened within the Rattlesnake Ridge aquifer. Chromium concentrations in this well ranged up to 39 μg/L. This well was drilled across multiple aquifers, and it is possible that chromium may have entered the well during its construction or during the construction of nearby Well 299-E33-12 (Connelly et al. 1992a). However, recent increases in the concentration of chromium are not easily explained by this potential transport pathway.

The vertical extent of chromium in the various aquifers at the site has not been fully characterized. Additional characterization will be required in this area to better evaluate the distribution of chromium at the site.

4.1.1.7.3 Cyanide. One cyanide plume is present beneath the 200 East Area (Figure 4-3). The plume has an areal extent of 850,000 m^2 (9,200,000 ft^2) (Table 4-4). The highest average concentration of cyanide in this plume is 869 μg/L from Well 699-50-53A, which is the only well within the plume above the 200 μg/L (MCL) concentration. Groundwater flow in this area is toward the northwest.

The mass of cyanide in the 200 East Area is estimated at 985 kg (2,170 lb) (Table 4-4). This mass is based on the total areal distribution of the plume as interpolated from the contour lines, a 10 m (33 ft) vertical extent, and a porosity of 20%.

The vertical extent of cyanide was evaluated by reviewing wells screened in the deep unconfined and semiconfined portions of the uppermost aquifer and in the Rattlesnake Ridge confined aquifer wells for the presence of cyanide. None of the wells had cyanide concentrations above the detection limit. Table 4-2 identifies the wells that were evaluated.

4.1.1.7.4 Nitrate. Elevated nitrate concentrations are widespread across the 200 East Area. Five plumes were delineated (plumes A, B, C, D, and E) (Figure 4-4). The areal distribution of nitrate for concentrations greater than or equal to the MCL of 45,000 μg/L (as nitrate) is estimated at 2,100,000 m^2 (23,000,000 ft^2). The maximum sample concentration of nitrate identified within the 200 East Area is 503,000 μg/L from Well 699-50-53A. The reported background concentration of nitrate for Hanford Site groundwater is 12,400 μg/L (Table 4-3). The concentrations of nitrate detected to the west of the 200 East Area are attributed to migration from the 200 West Area, as indicated in the 200 West AAMSR.

Plume A is located northeast of the 216-A-25 Pond. The highest average concentration of nitrate for this plume is 492,000 μg/L from Well 699-54-48. The shape and areal extent of this plume is poorly constrained due to a lack of wells. The water table elevation map (Figure 3-49) indicates that this plume is moving in a northwesterly direction.

Plume B is located north of the B Plant Aggregate Area. This plume contains Well 699-50-53A which has the highest average nitrate concentration of the 200 East Area wells with a concentration of 503,000 μg/L. The horizontal extent of this plume is not tightly constrained due to a lack of well coverage in this area. The water table elevation map indicates that this plume may be radially spread and flow in a generally northwest direction.

Plume C is located beneath the 241-AN, 241-AX, and 241-AY Tank Farms and the 216-A-10 Crib and 216-A-18 Trench. The highest average concentration in this plume is 142,000 μg/L for Well 299-E25-13. The southern extent of this plume is constrained by three wells, but the northern extent of the plume is poorly constrained. The 1990 groundwater map indicates that groundwater flow is toward the west in the vicinity of this plume.

Plume D is located in the southern portion of the PUREX Plant Aggregate Area beneath the 216-A-6, 216-A-30, 216-A-37-1, and 216-A-37-2 Cribs. The highest concentration of nitrate in plume D is 150,000 μg/L from Well 299-E25-20. Groundwater flow in plume D is toward the south.

Plume E is located in the PUREX Plant Aggregate Area beneath the 216-A-10, 216-A-36A, 216-A-36B, and 216-A-45 Cribs. A concentration of 244,000 μg/L is the maximum concentration for this plume. The areal extent of the plume is reasonably well constrained by four wells outside the plume's perimeter. The groundwater indicates that groundwater movement in this plume is toward the southeast.

Figure 4-5 shows the distribution of nitrate on the Hanford Site for 1989. This map shows a large plume is approaching the 200 East Area from the west. This northerly flow reflects groundwater flow in the vicinity of the 200 East Area, as some nitrate has moved from the 200 East Area toward the northwest and some has moved toward the southeast.

According to Thornton (1992), nitrate discharges associated with waste effluent appear to have significantly disturbed local reduction/oxidation (redox) conditions in the uppermost aquifer. The addition of large amounts of nitrate has resulted in the increased oxidation potential of the system. As a result, constituents that are more mobile under oxidizing conditions will be dissolved in the groundwater. Uranium and hexavalent chromium are examples of these constituents.

The mass of dissolved nitrate in the groundwater in the vicinity of the 200 East Area is estimated at 740,000 kg (1,630,000 lb). This estimate is based on computer integration of the distribution, a vertical extent of 10 m (33 ft), a porosity of 20%, and graphical adjustment for some portions of the plume (mainly from the 200 West Area).

The vertical extent of nitrate was evaluated by reviewing wells screened in the deep unconfined and semiconfined portions of the uppermost aquifer and in the Rattlesnake Ridge confined aquifer for the presence of nitrate. Table 4-2 provides a comparison of nitrate concentrations for these wells.

Chemical data from four wells screened in the deep, unconfined portion of the uppermost aquifer (299-E24-1, 299-E24-4, 299-E25-25 and 299-E26-5) were examined and compared for nitrate. These wells are located west to southwest of the B Pond complex. Average nitrate concentrations in these wells ranged from 756 to 155,000 μg/L.

Nitrate concentrations were examined in nine wells screened within the semiconfined portion of the uppermost aquifer (Table 4-2). Average nitrate concentrations in these wells ranged from 1,980 to 124,000 μg/L, which exceed the 45,000 μg/L MCL for nitrate. These

wells are located west to southwest of the 216-B-3 Pond, within the general area of plumes C and D.

Two wells (699-47-50 and 699-52-46A) screened within the Rattlesnake Ridge confined aquifer contained average nitrate concentrations ranging from 3,560 to 6,470 μg/L. These wells are located north of the 200 East Area fence.

A comparison of the Rattlesnake Ridge aquifer potentiometric surface and the uppermost aquifer water table indicates that the difference in hydraulic head is nearly zero. This suggests that presently vertical flow between aquifer is minor. During periods of a higher groundwater table, dissolved nitrate may have migrated downward into the Rattlesnake Ridge aquifer. This is supported by the presence of nitrates in the confined aquifer.

Elevated average concentrations of nitrate were identified in three wells (299-E17-6, 699-28-40 and 699-32-62) that may be completed across multiple aquifer zones. These wells pose a potential source for the vertical migration of chemical constituents.

4.1.1.7.5 Gross Alpha. Gross alpha measurements detected in the groundwater can be attributed to the presence of uranium and other high atomic number radionuclides such as plutonium and americium. Gross alpha analyses are run as a screening method for these isotopes. If elevated activity of gross alpha is measured, a more specific analysis can be conducted to identify the source for the gross alpha activity. Not all gross alpha contamination can be accounted for by specific radioisotopes due to the varying sensitivities of the analyses to specific radionuclides.

The gross alpha detections in the 200 East Area were divided into four plumes, plumes A, B, C and D (Figure 4-6). The areal extent of these plumes is estimated at 660,000 m^2 (7,100,000 ft^2) (Table 4-4) and is based on gross alpha concentrations greater than the MCL of 15 pCi/L. The reported background level of gross alpha for Hanford Site groundwater is 63 pCi/L although it may be only 5.79 pCi/L (Table 4-3).

Plume A is defined by one well, Well 699-55-57, and is located just east of the 200 North Aggregate Area. Because of poor well coverage in this area, this plume is poorly constrained. Groundwater flow in this area is toward the northwest.

Plume B is defined by one well, Well 699-52-54, and is located southeast of the 200 North Aggregate Area. Three wells, located north, west, and south of Well 699-52-54, indicate that this plume is not extensive. Groundwater flow in this area is toward the northwest.

Plume C is located beneath the 216-B-43 through -50 Cribs in the B Plant Aggregate Area. The highest average concentration in the plume is 30 pCi/L from Well 299-E33-7. The southern extent of the plume is fairly well constrained by eight wells, but the northern shape and extent of the plume is poorly constrained due to a lack of wells. The water table elevation map indicates that groundwater flow is toward the north in the vicinity of plume A.

Plume D is located beneath the 216-B-5 Reverse Well. Well 299-E28-24 has an average maximum concentration of 166 pCi/L and defines this plume. Groundwater movement at this location is toward the northwest according to the water table elevation map.

The activity of gross alpha was estimated at 0.03 Ci (Table 4-4). This estimate is based on the computer interpolated grid values; a 10 m (33 ft) vertical extent, and a porosity of 20%.

The vertical extent of gross alpha was evaluated by reviewing wells screened in the deep, unconfined and semiconfined portions of the uppermost aquifer and in the Rattlesnake Ridge confined aquifer for the presence of gross alpha. Table 4-2 identifies the wells that were evaluated. Gross alpha concentrations were identified in three wells screened in the deep, unconfined portion of the uppermost aquifer, eight wells in the semiconfined portions, and eleven wells in the Rattlesnake Ridge confined aquifer. In addition, six wells were identified that are possibly screened across more than one aquifer.

Wells identified in the deep, unconfined portion of the uppermost aquifer (Wells 299-E24-1, 299-E24-4, and 299-E25-25) had average gross alpha concentrations that ranged from 0.73 to 3.97 pCi/L. These wells are located in the southeast end of the 200 East Area.

Wells screened in the semiconfined portion of the uppermost aquifer had average gross alpha concentrations that ranged from 0.81 to 6.09 pCi/L (Table 4-2). These wells are located on the eastern half of 200 East Area and did not appear to correspond to the gross alpha plumes identified in the shallow, unconfined portion of the aquifer.

The eleven wells screened in the Rattlesnake Ridge confined aquifer had average gross alpha concentrations that ranged from 0.34 to 29.2 pCi/L, which exceeded the MCL for gross alpha. These wells are located in the area of plumes C and D, and in the areas across the 200 East Area where a downward vertical gradient from the unconfined aquifer was identified by Jensen (1987).

Five wells, 699-28-52A, 299-E17-6, 299-E33-40, 699-28-40, and 699-32-62, were identified as being screened across more than one aquifer. Average gross alpha concentrations ranging from 1.38 to 6.40 pCi/L were identified in these wells. These wells may create vertical conduits for contaminants to reach deeper aquifers.

4.1.1.7.6 Gross Beta. Gross beta levels can commonly be attributed to the presence of one or more of the following radionuclides in the groundwater: tritium, ^{60}Co, ^{90}Sr, ^{99}Tc, ^{106}Ru, ^{125}Sb, ^{137}Cs, ^{234}Th, ^{234}Pa, and ^{129}I. In most cases the gross beta activity in the 200 East Groundwater Aggregate Area plumes is derived from ^{99}Tc and ^{106}Ru activity. Beta measurements are used as a screening tool, and if activity is identified, then a more specific analysis can be conducted to identify the sources. As discussed for gross alpha contamination in Section 4.1.1.6.5, not all gross beta contamination can be accounted for by specific radioisotopes due to varying sensitivities of the analyses to specific radionuclides.

The gross beta plume detections in the 200 East Groundwater Aggregate Area formed essentially six plumes, plumes A, B, C, D, E, and F (Figure 4-7). The combined areal extent of these plumes is 1,000,000 m^2 (10,800,000 ft^2). Gross beta levels used to define the areal extent of these plumes range from greater than or equal to 50 pCi/L to 2,760 pCi/L. The reported background concentration of gross beta for Hanford Site groundwater is 35.5 pCi/L (Table 4-3).

Plume A is the northernmost plume and is located in part beneath the 200 North Area. Well 699-55-57 defines this plume and has an average gross beta concentration of 890 pCi/L. The areal extent and shape of plume A is loosely constrained by wells to the east and north and poorly constrained due to a lack of wells to the south and west. Groundwater in the plume A area is flowing in a northerly direction according to the water table elevation map.

Plume B is located north of the 200 East Area beneath the 216-A-25 Pond and just north of an area where basalt extends above the water table. The highest average gross beta concentration in plume B is 558 pCi/L. Plume B is defined by five wells. The water table elevation map indicates a semiradial flow for groundwater from the 216-A-25 Pond to the east through northwest. As groundwater flows away from the 216-A-25 Pond, it is directed either towards the northwest or east.

Plume C extends to the north from the 200 East Area fence and lies beneath the 216-B-25 through -50 Cribs. Plume C has a maximum average concentration as high as 2,760 pCi/L from Well 699-50-53A. The plume is fairly well constrained by 24 wells. Groundwater flow in the plume C area is generally toward the northwest.

Plume D is located in the B Plant Aggregate Area beneath the 216-B-5 Reverse Well and the 216-B-9 Crib and Tile Field. The D plume is defined by the highest concentration of gross beta in the 200 East Groundwater Aggregate Area, 10,254 pCi/L from Well 299-E28-23. The water table elevation map indicates that groundwater flow in this plume is toward the northwest.

Plume E is located in the PUREX Plant Aggregate Area beneath the 216-A-10, 216-A-36, and 216-A-45 Cribs. The highest concentration in this plume is 937 pCi/L from Well

299-E17-15. Fourteen wells constrain the shape and areal extent of this plume. Groundwater flow in the plume E area is toward the southeast.

Plume F is located in the southern part of the B Plant Aggregate Area beneath the 216-B-20 through -36 Cribs. This plume is defined by one well, Well 299-E13-14. The concentration in this well is 100 pCi/L. Groundwater flow in the plume F area is toward the east according to the water table elevation map.

The activity of gross beta is estimated at 5.2 Ci (Table 4-4). This estimate is based on the computer-interpolated grid values, a vertical extent of 10 m (33 ft), and a porosity range of 20%.

The vertical extent of gross beta was evaluated by reviewing wells screened in the deep, unconfined and semiconfined portions of the uppermost aquifer and wells in the Rattlesnake Ridge aquifer for the presence of gross beta. Table 4-2 identifies the wells that were evaluated. Gross beta concentrations were identified in three wells within the deep, unconfined portion of the uppermost aquifer, deeper uppermost unconfined wells, nine wells in the semiconfined portion, and thirteen wells in the Rattlesnake Ridge confined aquifer. In addition, six wells were identified that may be screened across more than one aquifer.

Wells identified in the deep, portion of the uppermost unconfined aquifer (Wells 299-E24-1, 299-E24-4, and 299-E25-25) had average gross beta concentrations that ranged from 5.2 to 44.6 pCi/L. These wells are located in the southeast end of the 200 East Area.

Wells screened in the semiconfined portion of the uppermost aquifer had gross beta concentrations that ranged from 4.39 to 148 pCi/L (Table 4-2). These wells are located on the central and eastern half of the 200 East Area. The highest concentration was identified in Well 299-E28-7, located southeast of the 216-B-5 Reverse Well. The 216-B-5 Reverse Well released liquid waste directly to the water table of the uppermost aquifer.

The thirteen wells screened in the Rattlesnake Ridge confined aquifer had gross beta concentrations that ranged from 6.1 to 287 pCi/L, which exceeds the MCL for gross beta. These wells are located in the area of plumes A and B, and in the areas across the 200 East Area where a downward vertical gradient from the uppermost unconfined aquifer was identified.

The highest average gross beta concentration in wells screened within the confined aquifer was measured in Well 299-E33-12. The maximum average concentration for this well is 286.9 pCi/L (Table 4-2). This maximum concentration is higher than gross beta concentrations in adjacent unconfined aquifer wells. Well 299-E33-12 was initially drilled across multiple aquifers, but has since been selectively sealed so that only the lower screened interval is being monitored. Connelly et al. (1992a) describe Well 299-E33-12 as having

been drilled in the mid-1950's and having not been completed until 1982. The well created a hydraulic connection between the uppermost aquifer and the Rattlesnake Ridge aquifer. Dissolved contaminants in the uppermost aquifer were able to enter the deeper aquifer. A map comparing the vertical hydraulic gradient between the uppermost aquifer and the Rattlesnake Ridge aquifer was prepared by Jensen (1987) based on December 1986 data. This map indicates that within the area of this well a downward vertical gradient was present.

Connelly et al. (1992a) indicate that high-density salt waste discharged from the BY cribs may have migrated along the annular space of the well and entered the deeper aquifer. Elevated beta concentrations measured in this well may be due to this well being improperly sealed or from contamination that entered the confined aquifer during the time the well remained incomplete.

Six wells were identified as potentially being screened across more than one aquifer. Average gross beta concentrations that ranged from 7.88 to 33.2 pCi/L were identified in these wells. These wells require additional evaluation to ensure that they are not contributing to the vertical migration of chemical constituents.

4.1.1.7.7 Tritium. Elevated tritium concentrations have been observed in the groundwater in three plumes (above the MCL of 20,000 pCi/L) in the 200 East Area (Figure 4-8). The area covered by these plumes is 42,000,000 m^2 (452,000,000 ft^2). The highest tritium concentration is 4,270,000 pCi/L.

Plume A is located just north of the 216-B-3 Pond. This plume is defined by only two wells. Groundwater in this area is moving toward the northwest.

Plume B is located beneath the 216-B-3 Pond System. Like plume A, this plume contains two wells. Groundwater beneath this plume is moving toward the north.

Plume C covers a large area of elevated tritium concentrations extending from the western boundary of the 200 East Groundwater Aggregate Area across the central portion of the area to the southeast boundary (Figure 4-8). Four areas of higher concentrations (identified as C_1, C_2, C_3, and C_4 for this discussion) are contained within this plume. Plume C_1 has its highest concentrations beneath the 216-A-10, 216-A-36B, and 216-A-45 Cribs. The 4,270,000 pCi/L for Well 299-E24-11 is the highest tritium concentration in the 200 East Area. Groundwater movement beneath the 200 East Groundwater Aggregate Area is reflected in the shape of the C plume. The water table elevation map indicates groundwater is flowing toward the northeast in the C_2 plume area. The C_2 plume emanates from the 200 West Area, as indicated in the 200 West Groundwater AAMSR. The groundwater in the C_1 plume area is located along a groundwater divide. The water table elevation maps indicate that flow is mainly toward the southeast, but there may be some flow toward the northwest.

The C_3 portion, as occurs for C_1, is located near a groundwater flow divide, although flow appears to occur to the southeast. The C_4 portion of the C plume extends toward the southeast and east beyond the area of Figure 4-8, and reaches the Columbia River, as shown on Figure 4-9. The source of tritium in the C_4 plume is presumably from groundwater flow from the southeastern part of the 200 East Area. The area used to calculate the activity of plume C is approximately that which is included on Figure 4-8. Portions extending beyond the figure are excluded.

Figure 4-9 shows the distribution of tritium on the Hanford Site for 1989. This map shows a large plume approaching the 200 East Area from the west and also suggests that tritium has moved from the 200 East Area to the southeast. The source of tritium to the northwest of the 200 East Area probably is the result of northwesterly movement of groundwater in the northern portion of the 200 East Area.

The total activity of tritium present in the groundwater plumes in the 200 East Area is estimated at 16,400 Ci (Table 4-4). This estimate is based on the computer-interpolation of the plumes, graphical adjustments for some portions, an assumed 10 m (33 ft) depth, the computer-interpolation on a grid and a porosity of 20%. The activity of the entire plume extending to the Columbia River was not estimated because the sparse well coverage introduces a high degree of uncertainty about the concentrations in the plumes.

The vertical extent of tritium was evaluated by reviewing wells screened in the deep, unconfined and semiconfined portions of the uppermost aquifer and wells in the Rattlesnake Ridge confined aquifer for the presence of tritium. Table 4-2 identifies the wells that were evaluated. Tritium concentrations were identified in three wells screened in the deep, unconfined portion of the uppermost unconfined aquifer, ten wells in the semiconfined position, and five wells in the Rattlesnake Ridge confined aquifer. In addition, three wells were identified that may be screened across more than one aquifer.

Wells identified in the deep unconfined portion of the uppermost aquifer (Wells 299-E24-1, 299-E24-4, and 299-E25-25) had average tritium concentrations that ranged from 300 to 3,710,000 pCi/L. These wells are located in the southeast end of the 200 East Area.

Wells screened in the semiconfined portion of the uppermost aquifer had average tritium concentrations that ranged from 170 to 4,270,000 pCi/L (Table 4-2). These wells are located on the eastern half of the 200 East Area and appear to correspond to the tritium plumes identified in the uppermost unconfined aquifer. Well 299-E24-11 had the highest average tritium concentrations. This well is located in the southeast quadrant of the 200 East Area, the area where the highest concentrations were measured in the uppermost unconfined aquifer.

The five wells screened in the Rattlesnake Ridge confined aquifer had average tritium concentrations that ranged from 146 to 2,610 pCi/L. These wells are located in the area of the tritium plume, and in the areas across the 200 East Area where a downward vertical gradient from the unconfined aquifer has been identified.

Three wells were identified as potentially being screened across more than one aquifer. Average tritium concentrations ranging from 2,380 to 30,700 pCi/L were identified in these wells. These wells potentially create vertical conduits for contaminants to reach deeper aquifers. Well 299-E17-6 had the highest average tritium concentration for these wells.

4.1.1.7.8 Cobalt-60. One ^{60}Co plume is present beneath the 200 East Area (Figure 4-10). The plume of ^{60}Co greater than 100 pCi/L has an areal extent of 751,000 m^2 (8,100,000 ft^2). The 699-50-53A Well has a concentration of 474 pCi/L. The 4% Derived Concentration Guide (DCG) for ^{60}Co is j200 pCi/L. Groundwater flow in the plume is toward the northwest to north. No waste management units are located above this plume, so this plume presumably migrated to its present area from the south. The closest waste management units are the 216-B-43 through -50 Cribs.

The activity of ^{60}Co is estimated at 0.43 Ci (Table 4-4). This estimate is based on computer-interpolation of well values to a grid, an assumed vertical extent of 10 m (33 ft), and a porosity of 20%.

The vertical extent of ^{60}Co was evaluated by examining deep unconfined and semiconfined uppermost aquifer wells, and the Rattlesnake Ridge confined aquifer wells for the presence of ^{60}Co. Table 4-2 identifies the wells that were evaluated. Cobalt-60 concentrations were identified in one deeper uppermost unconfined well, five uppermost semiconfined wells, and one Rattlesnake Ridge confined well. Wells that are potentially screened across more than one aquifer were not identified.

Well 299-E24-4 is screened within the deeper portion of the uppermost aquifer. This well had average ^{60}Co concentrations of 1.32 pCi/L. An adjacent well in the upper portion of the uppermost aquifer had concentrations of 1.01 pCi/L. These wells are located in the southeast quadrant of the 200 East Area in an area of elevated concentrations of ^{60}Co.

Wells screened in the semiconfined portion of the uppermost aquifer had average ^{60}Co concentrations that ranged from 0.6 to 3.14 pCi/L (Table 4-2). These wells are located on the eastern half of the 200 East Area and appear to correspond with areas of elevated ^{60}Co concentrations identified in the uppermost unconfined portion of the shallow aquifer. This area corresponds to higher potentiometric heads within the unconfined portion of the uppermost aquifer with respect to the semiconfined portion.

One well, 299-E33-12, presently screened in the Rattlesnake Ridge confined aquifer had ^{60}Co concentrations of 10.5 pCi/L. This well is located in the northwestern quadrant of the 200 East Area. This well is present in an area where the potentiometric head of the uppermost aquifer was at one time higher than the hydraulic head in the Rattlesnake Ridge aquifer (Jensen 1987). As a result, groundwater from the uppermost aquifer may have flowed downward into the Rattlesnake Ridge aquifer. Connelly et al. (1992a) hypothesized that high-density salt waste discharged from the BY cribs (Cribs 216-B-43 through 216-B-49) may have migrated vertically down this well and entered the deeper aquifer prior to completing a well seal to isolate the Rattlesnake Ridge aquifer in 1982. Either of these mechanisms may have contributed to the elevated ^{60}Co concentrations identified in the Rattlesnake Ridge aquifer.

4.1.1.7.9 Strontium-90. Four plumes of ^{90}Sr were identified for the 200 East Groundwater Aggregate Area (plumes A, B, C, and D) (Figure 4-11). These plumes cover a combined area of approximately 1,100,000 m^2 (11,800,000 ft^2). This areal estimate is based on dissolved ^{90}Sr concentrations of greater than 8 pCi/L, which is equivalent to the 4% DCG.

Plume A is centered just east of the 216-A-25 Pond. The highest average concentration of ^{90}Sr in this plume is 311 pCi/L from Well 699-53-48B. This plume is defined by six wells. Groundwater flow is toward the northwest.

Plume B is located beneath the 216-B-5 Reverse Well. This plume is defined by four wells. The highest concentration is 5,150 pCi/L. Groundwater flow in the B plume area is toward the northwest.

Plume C is centered beneath the 241-A and 241-AW Tanks. Groundwater flow at this location appears to be toward the south-southeast. The flow direction in this area is difficult to discern due to the relatively flat groundwater levels and the no flow boundary created by groundwater moving radially from the B Pond area.

Plume D is located just south of plume C and is located beneath the 216-A-9 Cribs. This plume has a maximum concentration of 19 pCi/L. Except for its eastern side which has no well data, the shape and areal extent of this plume is controlled by eight wells. The groundwater flow is toward the southeast.

The activity of ^{90}Sr is estimated at 0.17 Ci (Table 4-4). This estimate is based on computer-interpolation of well values to a grid, an assumed vertical extent of 10 m (33 ft), and a porosity of 20%.

The vertical extent of ^{90}Sr was evaluated by examining reviewing wells screened in the deep unconfined and semiconfined portions of the uppermost aquifer, along with wells in the

Rattlesnake Ridge confined aquifer for the presence of ^{90}Sr. Table 4-2 identifies the wells that were evaluated. Strontium-90 concentrations were identified in one well screened in the deep, unconfined portion of the uppermost aquifer, two wells in the semiconfined portion, and one well in the Rattlesnake Ridge confined aquifer.

Well 299-E24-1 completed in the deep, unconfined uppermost aquifer had ^{90}Sr concentrations of 10.35 pCi/L. This well is located in the southeast quadrant of the 200 East Area.

Three wells screened in the semiconfined portion of the uppermost aquifer had ^{90}Sr concentrations that ranged from 0.29 to 75.6 pCi/L. These wells (699-42-40B, 299-E24-11 and 299-E28-7) are located at the 216-B-3 Pond System, in the southeast quadrant and the northwest quadrant of the 200 East Area. Wells 299-E28-7 and 299-E24-11 correspond to the plumes identified near the 216-B-5 Reverse Well (plume B) and the 216-A-9 Cribs (plume D), respectively.

One well, 699-54-57, was identified as being screened in the Rattlesnake Ridge aquifer. The ^{90}Sr concentration in this well was 0.37 pCi/L. Well 699-55-57, an adjacent shallow well located downgradient of Well 699-54-57, has no detections of ^{90}Sr. Well 699-54-57 is located in an area where the hydraulic heads are greater in the Rattlesnake Ridge aquifer than in the uppermost aquifer system, resulting in an upward gradient from the Rattlesnake Ridge aquifer. An erosional window is present in the Elephant Mountain Member Basalt east of Well 699-54-57, possibly resulting in aquifer intercommunication and the elevated concentrations of ^{90}Sr found in the Rattlesnake Ridge aquifer. The erosional window may have intercepted chemical compounds dissolved in the uppermost aquifer before they could have reached Well 699-55-57.

4.1.1.7.10 Technetium-99. Two distinct plumes of ^{99}Tc (plumes A and B) were identified in the 200 East Groundwater Aggregate Area (Figure 4-12). The estimated combined areal extent of these plumes is 1,500,000 m^2 (16,100,000 ft^2) (Table 4-4). This estimate is based on the areas delimited by ^{99}Tc concentrations greater than 900 pCi/L. Technetium-99 concentrations at the 200 East Groundwater Aggregate Area range from nondetections to 21,700 pCi/L. The 4% DCG for ^{99}Tc is 4,000 pCi/L.

The highest concentrations of ^{99}Tc are found in plume B, which is located north of the 200 East Area fence. The southern end of this plume is constrained by two wells with concentrations of 878 and 770 pCi/L. One well samples groundwater beneath the 216-B-43 through -50 Cribs. The rest of the plume is loosely constrained by five wells. Groundwater flow in this area is toward the northwest.

Plume A is defined by one well, Well 699-55-57. This well has an average ^{99}Tc concentration of 2,150 pCi/L and is located just east of the 200 North Area. Groundwater flow in this area is toward the northwest.

The activity of ^{99}Tc is estimated at 21.9 Ci (Table 4-4). This estimate is based on computer-interpolation of well values to a grid, an assumed vertical extent of 10 m (33 ft), and a porosity of 20%.

The vertical extent of ^{99}Tc was evaluated by reviewing wells screened in the deep, unconfined and semiconfined portions of the uppermost aquifer and in the Rattlesnake Ridge confined aquifer for the presence of ^{99}Tc. Table 4-2 identifies the wells that were evaluated. Technetium-99 concentrations were identified in one well screened in the deep, confined portion of the uppermost aquifer, two in the semiconfined portions, and six in the Rattlesnake Ridge confined aquifer.

Well 299-E25-25, which is screened in the deep, unconfined portion of the uppermost unconfined aquifer, had detection of ^{99}Tc at 0.73 pCi/L. This well is located in the southeast quadrant of the 200 East Area.

Two wells screened in the semiconfined portion of the uppermost aquifer had ^{99}Tc concentrations that ranged from 28.9 to 92.4 pCi/L. These wells, 299-E28-1 and 299-E28-7, are located at the northwest quadrant of the 200 East Area. These wells correspond to the elevated ^{99}Tc concentrations identified near the 216-B-5 Reverse Well.

The ^{99}Tc concentration for six wells screened in the confined aquifer ranged from 4.84 to 705 pCi/L (Table 4-2). Wells in the shallow, unconfined portion of the uppermost aquifer adjacent to Wells 299-E33-12 and 699-54-57 have higher ^{99}Tc concentrations. These higher concentrations suggest that the uppermost aquifer may be the source for ^{99}Tc concentrations measured in the confined aquifer.

Higher ^{99}Tc concentrations were measured in Rattlesnake Ridge aquifer Wells 699-47-50 (153.4 pCi/L) and 699-42-40C (4.8 pCi/L) than in adjacent wells screened in the uppermost aquifer. The higher ^{99}Tc concentrations in the Rattlesnake Ridge aquifer at Well 699-47-50 probably reflect dissolved constituents that have entered the aquifer across a hydraulic connection (possibly fractures or erosionally thinned areas of the basalt) near the northeast corner of the 200 East Area and upgradient of this well. Adjacent uppermost aquifer wells, 299-E34-6 and 299-E34-5 are cross gradient of this erosional window and Well 699-47-50. Connelly et al. (1992a) indicate that in recent sampling events, concentrations of dissolved constituents have reduced in this well. They hypothesize that this concentration reduction may be associated with a reduction in the vertical hydraulic gradient between the uppermost aquifer and the Rattlesnake Ridge aquifer.

Well 699-42-40C had higher ^{99}Tc than adjacent wells located in the uppermost aquifer. This well is located in an area where a downward vertical hydraulic gradient is present as a result of aquifer recharge at the 216-B-3 Pond. Connelly et al. (1992a) hypothesize that since contaminant concentrations in this well have increased recently, the well may have an improper seal separating it from the uppermost aquifer system.

A slightly upward gradient from the Rattlesnake Ridge confined aquifer to the uppermost unconfined aquifer is probably responsible for preventing the higher concentrations of ^{99}Tc in the unconfined portion of the uppermost aquifer from entering the Rattlesnake Ridge confined aquifer (Wells 699-49-55B and 699-49-55A). Because of the low concentrations of ^{99}Tc in the confined aquifer and the slight differences in the potentiometric head, it is possible that the uppermost aquifer water containing dissolved ^{99}Tc may have once discharged into the Rattlesnake Ridge confined aquifer.

4.1.1.7.11 Iodine-129. The ^{129}I plume areas cover a combined area of 29,000,000 m^2 (312,000,000 ft^2) in the vicinity of the 200 East Area (Figure 4-13 and Table 4-4). This areal estimate is based on dissolved ^{129}I concentrations $\geq$ 1 pCi/L, whereas the 4% DCG is 20 pCi/L. The areal extent and shape of the central plume within the 200 East Area is defined by 33 wells. The highest concentrations of ^{129}I are beneath the 216-A-10 and 216-A-45 Cribs. The overall shape of the plume reflects groundwater flow. In the southwest part of the plume, groundwater flow is toward the east, while groundwater flow in the eastern part of the plume is toward the west. In part of the southeastern side of the plume, groundwater flow may be toward the southeast. This is supported by elevated concentrations of ^{129}I to the southeast of the 200 East Area (Figure 4-13). Groundwater flow in the rest of the plume is toward the northwest. Two additional plumes are identified on Figure 4-13, a plume to the west of the 200 East Area which originates from the 200 West Area, and a plume southeast of the 200 East Area.

The activity of ^{129}I is estimated at 0.24 Ci (Table 4-4). This estimate is based on computer-interpolation of well values to a grid, an assumed vertical extent of 10 m (33 ft), and a porosity of 20%. The ^{129}I concentrations shown in the westernmost portion of Figure 4-13 emanate from the 200 West Area, as indicated in the 200 West Groundwater AAMSR, and have to be removed from the estimate by a graphical method. The activity of the plume to the east of the 200 East Area was not estimated because the sparse well coverage introduces a high degree of uncertainty about the concentration in that portion of the plume.

The vertical extent of ^{129}I was evaluated by examining deep unconfined and semiconfined uppermost aquifer wells, and the Rattlesnake Ridge confined aquifer wells for the presence of ^{129}I. Table 4-2 identifies the wells that were evaluated. Average ^{129}I concentrations were identified in two wells screened in the deep, unconfined portion of the uppermost aquifer, three wells in the semiconfined portion of the uppermost aquifer, and

nine Rattlesnake Ridge confined aquifer wells. In addition to these wells, two wells, 699-28-40 and 699-32-62, were identified as potentially being screened across multiple aquifers.

Wells 299-E24-1 and 299-E25-25, which are screened in the uppermost aquifer, have average ^{129}I concentrations that ranged from 0.3 to 26.6 pCi/L. These wells are located in the southeast quadrant of the 200 East Area.

Three wells, screened in the semiconfined portion of the uppermost aquifer, had average ^{129}I concentrations that ranged from 0.01 to 2.6 pCi/L. These wells (299-E28-01, 299-E28-7 and 299-E16-2) are located at the southeast and northwest quadrants of the 200 East Area.

Nine wells are screened in the Rattlesnake Ridge confined aquifer with average concentrations that ranged from 0.0005 to 0.11 pCi/L (Table 4-2). Most of these wells appear to be located within the ^{129}I plume identified in the upper portion of the uppermost aquifer. The wells that are outside the ^{129}I plume are located north of the 200 East Area and within the 216-B-3 Pond System.

Two wells, 699-28-40 and 699-32-62, are identified as potentially being screened in multiple aquifers. Low levels of ^{129}I were detected in these wells. These values may represent an average concentration for the screened interval sampled. In addition, these wells potentially create a vertical conduit for contaminants to reach the deeper aquifers.

4.1.1.7.12 Cesium-137. One ^{137}Cs plume is present in the 200 East Groundwater Aggregate Area (Figure 4-14). The plume is defined by concentrations greater than 120 pCi/L, which is equivalent to the 4% DCG. This plume is defined by four wells, with the highest average ^{137}Cs concentration of 1,330 pCi/L in Well 299-E28-23. The 299-E28-23 Well samples groundwater near the 216-B-5 Reverse Well. Groundwater flow at this location is toward the northwest, and the areal extent of this plume is estimated at 22,000 m^2 (237,000 ft^2) (Table 4-4) greater than 120 pCi/L.

The total activity of ^{137}Cs is estimated at 0.014 Ci (Table 4-4). This estimate is based on the computer interpolation (actually extrapolation) of the plume, a porosity of 20% and a depth of 10 m (33 ft).

The vertical extent of ^{137}Cs was evaluated by examining wells screened in the deep, unconfined and semiconfined portions of the uppermost aquifer and wells in the Rattlesnake Ridge confined aquifer for the presence of ^{137}Cs. Table 4-2 identifies the wells that were evaluated. Average ^{137}Cs concentrations were identified in three wells in the semiconfined portion and one well screened across multiple aquifers. Cesium-137 was either not detected or not analyzed for in deep, unconfined portions of the uppermost aquifer and in confined wells (Table 4-2).

Wells 699-42-40A and 699-42-40B located near the 216-B-3 Pond System and Well 299-E28-7 located near the 216-B-5 Reverse Well were screened in the semiconfined portion of the uppermost aquifer. These wells had concentrations that ranged from 0.11 to 3.75 pCi/L (Table 4-2).

Well 299-E17-6 was potentially screened across multiple aquifers. Low levels of ^{137}Cs were detected in this well (4.58 pCi/L). This well is located in the southeast quadrant of the 200 East Area.

4.1.1.7.13 Plutonium-239/240. One $^{239/240}Pu$ plume is present in the 200 East Groundwater Aggregate Area (Figure 4-15). The plume is defined by concentrations of greater than 1 pCi/L, which is similar to the 4% DCG of 1.2 pCi/L. This plume is defined by three wells. The highest $^{239/240}Pu$ (73.9 pCi/L) was detected in Well 299-E28-23. The 299-E28-23 Well samples groundwater near the 216-B-5 Reverse Well. Groundwater flow at this location is toward the northwest. The areal extent of this plume is estimated at 19,000 m^2 (205,000 ft^2) (Table 4-4).

The total activity of $^{239/240}Pu$ is estimated at 0.0006 (Table 4-4). This estimate is based on an average concentration of 73.9 pCi/L (the one well with data), a porosity of 20%, and a depth of 10 m (33 ft).

The vertical extent of $^{239/240}Pu$ was evaluated by examining wells screened in the deep, unconfined and portions of the semiconfined uppermost aquifer and wells in the Rattlesnake Ridge confined aquifer for the presence of $^{239/240}Pu$. Table 4-2 identifies the wells that were evaluated. Plutonium-239/240 concentrations were identified in two wells in the semiconfined portion of the uppermost aquifer. Plutonium-239/240 was either not detected or not analyzed for in deep uppermost unconfined and confined wells (Table 4-2).

Wells screened in the semiconfined portion of the uppermost aquifer, Wells 299-E28-1 and 299-E28-7, had concentrations that ranged from 0.02 to 0.05 pCi/L (Table 4-2). These wells are located in the northeast quadrant of the 200 East Area near the 216-B-5 Reverse Well. Detection of $^{239/240}Pu$ was not made in adjacent Well 299-E28-5 screened in the shallow, unconfined portion of the uppermost aquifer.

4.1.2 Known Releases from 200 East Area and 200 North Area Facilities

This section correlates contaminants identified in the groundwater to known releases from waste management units in the 200 East and 200 North Areas. The discussion is divided into identification of the factors that have contributed to the presence of contaminants in the groundwater followed by a discussion of individual contaminants.

4.1.2.1 Factors Contributing to Groundwater Contamination. Factors that have led to the observed groundwater contamination include: operation processes at the four plants in the 200 East and 200 North Areas that generated waste streams; content, quantity, and areal extent of disposed wastes; and mobility of each contaminant in the vadose zone. This list is not intended to be exhaustive.

4.1.2.1.1 Plant Operations and Waste Generation. Table 4-4 summarizes the waste streams from the various plant operations in the 200 East and 200 North Areas which were disposed to waste management units that potentially contributed contaminants to groundwater. It also indicates the period of disposal. Operations and waste generation for each of the plants in the 200 East and 200 North Areas are described in Section 2.4. That discussion includes a summary of the waste-producing processes (Table 2-6) and identification of waste-management units where process wastes were disposed.

4.1.2.1.2 Sources of Groundwater Contaminants. Disposal of waste to waste management units potentially contributing contaminants to groundwater is identified below for the primary contaminants of concern in the groundwater. Waste disposal and storage is discussed in Section 2.3 by waste management unit. Tables 2-5 and 2-6 identify known inventories for specific waste management units that potentially have contributed contaminants to groundwater. Inventories are presented as a general guide to contaminants present, although the data presented in these tables must be viewed as incomplete. The dates of operation for these waste management units are shown on Table 2-4. This information is reformatted in this section to help identify potential sources for contaminant plumes identified in the groundwater. Where possible, contaminant plumes are related back to probable release sources in Sections 4.1.2.2 and 4.1.2.3.

4.1.2.1.3 Mobility of Contaminants Released to the Vadose Zone. Calculations were performed for waste management units in all of the 200 East and 200 North Areas source reports based on liquid waste discharge volumes and soil pore capacities. Waste management units receiving sufficient discharge for liquids to reach the water table by this calculation are identified in Section 2.3 as potentially contributing contaminants to the groundwater. This section discusses the potential for contaminants in these units to migrate to the uppermost aquifer.

The major processes affecting transport of chemicals discharged to the vadose zone include: precipitation/dissolution, adsorption/desorption, filtration of colloids and suspended particles, and diffusion into micropores within mineral grains (Serne and Wood 1990). The precipitation/dissolution and adsorption/desorption are considered the most important. Factors that affect the migration of contaminants in the vadose zone are summarized below:

- Ionic state--cations are more strongly sorbed than anions and nonionized solutions are more weakly sorbed.

- Valence state--generally, multivalent ions are more strongly sorbed than univalent ions with similar ionic radii.

- Particle size of contaminant--deposition of the contamination increases with increasing particle size.

- Soil grain size--sorption increases as soil (sorbent) particle size decreases. Filtration and ion exchange also increase with decreased soil grain size.

- pH and redox potential--the chemical species of a contaminant is dependent on these conditions, both in the waste and in the soil.

- Soil mineralogy--mineralogy affects the abundance of sorption sites as well as the availability of ions for precipitation.

- Waste stream constituents--sorption may be decreased if competing chemicals in the waste interfere, and complexing of inorganics with organics in the waste stream may increase the mobility of inorganics.

- Volume of discharge--hydrostatic forces are the primary driving force for contaminant migration, so that discharges that maintain saturated conditions in the vadose zone result in more rapid downward migration.

- Lithology--variations of the soil stratigraphy with depth, such as the presence of low-permeability layers, may increase the flowpath length of contaminant migration and slow its rate of descent.

- Monitoring wells--poorly sealed monitoring wells may provide a conduit by which contaminants may flow through the vadose zone to the groundwater.

Further discussion of contaminant mobility and transport is contained in Section 4.2.2 below. The potential for migration to the unconfined aquifer for each contaminant detected in the groundwater is discussed below in Sections 4.1.2.2 and 4.1.2.3.

4.1.2.2 Source and Mobility of Chemicals Released to Vadose Zone. Groundwater monitoring has detected numerous chemicals present in the groundwater of the 200 East and 200 North Areas (Table 4-1). Section 4.1.1 describes the plumes for the chemicals with the most significant concentrations. The probable source and mobility in the vadose zone of each of these chemicals with identified groundwater plumes are discussed below, beginning with inorganic and then organic compounds. Other inorganic and organic compounds detected in groundwater but not shown on plume maps are also discussed.

4.1.2.2.1 Inorganic Compounds. Inorganic compounds for which plumes in the groundwater are described include: arsenic, chromium, cyanide, and nitrate. Other inorganic compounds detected are listed in Table 4-1.

Arsenic. Arsenic was not reported in inventories of chemical wastes discharged to waste management units for disposal, as presented in Table 2-6. Even so, arsenic is reported as a chemical disposed of to the PUREX Plant and to the B Plant. Arsenic is also reported to have been used in the separation and recovery process at U Plant. Some of the waste from this process was disposed of in the 216-B Cribs. Alternatively, lowering of the vadose zone pH and groundwater pH through release of acidic waste may alter iron oxide (e.g., iron hydroxide) to ionic iron (ferric iron), thereby mobilizing other metal ions such as arsenic that were adsorbed to the iron oxide. In addition, a lower pH may reduce arsenic to a lower valence state, thus making it less likely to adsorb to iron oxide.

Plume A (Figure 4-1) underlies the 216-B-3 Pond. The 216-B-3 Pond may also have contributed to plume B. Plume C would appear to have formed from discharges to the 216-A-37-1, 216-A-37-2, and 216-A-30 Cribs. The source of arsenic for plume D may be the 2101-M Pond. The pond may have received waste from the Basalt Waste Isolation Project laboratories, however, arsenic is reportedly not known to have been included with the wastes discharged (DOE/RL 1991d).

Arsenic exists as a negative ion in most soil conditions or as an oxide in slightly oxidizing to slightly reducing conditions (Dragun 1988). It is expected that arsenic in Hanford soils is a monovalent or divalent anion under most site conditions and therefore has a moderate to high mobility (Dragun 1988).

Some of the concentrations of arsenic detected in a groundwater sampling from the 200 East Groundwater Aggregate Area may reflect background concentrations (DOE/RL 1991d), although the plausibility of this source has not been demonstrated. DOE/RL (1992d) presents a 10 μg/L background concentration for arsenic, as listed on Table 4-3.

Chromium. Chromium was not reported in inventories of chemical wastes discharged to waste management units for disposal, but sodium dichromate is reported at the PUREX Plant as 110 kg (242 lb) released to 216-A-4 Crib, 300 kg (660 lb) released to 216-A-21 Crib, 200 kg (440 lb) released to 216-A-27 Crib, at the B Plant as 100 kg (220 lb) released to 216-B-10A Crib, and 100 kg (220 lb) released to 216-B-5 Reverse Well (Table 2-6). In addition to these inventories, chromium may be associated with some of the process waste streams discharged to other units. Chromate waste was produced by the Semi-Works Plant and waste streams from Semi-Works were disposed of in the Semi-Works Aggregate Area. Chromium is stable in the dissolved form under oxidizing conditions as hexavalent chromium which is more mobile. Within the 200 East Area chromium concentrations are largely below the detection limits despite the presence of oxidizing conditions. Thornton (1992) indicates

that this suggests waste streams from the 200 East Area were "essentially absent of hexavalent chromium." Besides release as sodium dichromate, chromium in the waste stream may have originated as a by-product of the separation processes or through dissolution of the walls of stainless steel process equipment by the strong acid solutions.

The source of chromium in plumes A and B (Figure 4-2) is uncertain. Plume C underlies the PUREX tank farms. The 216-B-35 through -42 Cribs are the most likely source for elevated chromium concentrations in the vicinity of plumes A and B. These two single well plumes probably represent the highest concentrations of a single plume that is for the most part below MCL concentrations.

Chromium is mobile under oxidizing conditions (in its hexavalent state), but relatively immobile under more reducing conditions. Hexavalent chromium exists as a monovalent (pH <6) or divalent (pH >6) anion and has a high mobility in soil types present at the site, while trivalent chromium has low mobility (Dragun 1988).

Cyanide. Inventories (Table 2-6) indicate that cyanide was disposed in the form of ferrocyanide to 13 cribs and 12 trenches in the B Plant Aggregate Area. A total of 73,800 kg (162,000 lb) is shown for the cribs and trenches. In addition to the ferrocyanide reported in Table 2-6, cyanide and ferric cyanide are reported as being disposed within the PUREX Plant Aggregate Area. Ferrocyanide was used to enhance precipitation of long-lived radionuclides before the supernatant was discharged to the ground.

The cyanide plume is not beneath any waste management units (Figure 4-3). The plume may have migrated to its present position from beneath the 216-B-43 through -50 Cribs. These cribs had ferrocyanide released to them.

The chemical form of cyanide present in the subsurface is believed to be ferrocyanide based on its known form of release to the vadose zone and limited laboratory studies using a special ion chromatography method (Last et al. 1991). Ferrocyanide, which is neutral, likely is very mobile in the soil and groundwater. Cyanide also is expected to have high mobility as an anion where it exists as a free ion.

Nitrate. The chemical waste inventory (Table 2-6) indicates that nitrate was discharged in many forms to waste management units that potentially contributed contaminants to groundwater. Release of nitrate to these units is reported at 32,800,000 kg (72,000,000 lb) with the largest component discharged at B Plant. Other forms of nitrate discharged include aluminum nitrate 5,000 kg (11,000 lb), ammonium nitrate 2,600,000 kg (5,720,000 lb), and nitric acid 27,000 kg (59,000 lb). Nitrate discharge is associated with most of the units in Table 2-6. The nitrate plume in groundwater is estimated to represent 740,000 kg (1,630,000 lb).

Disposal of nitrate has been widespread, and the plumes may reflect contributions from many sources (Figure 4-4). Plume A is associated with the 216-A-25 Pond. Plume B does not currently underlie any waste management units, but a likely source of nitrate would have been the 216-B-43 through -50 Cribs. Possible contributors to plume C are the 216-A-10 Crib or the 216-A-18 Trench. Plume D underlies the 216-A-9 Crib. Plumes E and F are associated with several cribs that may have been nitrate sources (216-A-5, 216-A-10, 216-A-4, 216-A-21, 216-A-27, 216-A-36A, 216-A-36B, 216-A-45 Cribs).

Nitrate exists as a negative ion and is readily soluble in water, so virtually no sorption is expected to occur in Hanford soils (Serne and Wood 1990; Evans et al. 1990). Nitrate degrades through natural (biological) processes to ammonia, thereby resulting in reduced concentrations with time.

Other Inorganics. Other inorganics detected during groundwater monitoring are listed on Table 4-1. Chemical inventories (Table 2-6) include records for discharge of some of these inorganics as compounds, although this record is not considered to be complete. Aluminum was disposed of in the form of aluminum nitrate to the 216-B-5 Reverse Well in B Plant. A total of 5,000 kg (11,000 lb) of aluminum nitrate was discharged to the well. Aluminum discharge at B Plant also is reported in the form of sodium aluminate to the 216-B-36 and 216-B-40 Trenches at a quantity of 44,000 kg (96,800 lb). Iron was discharged in the form of 73,800 kg (162,000 lb) of ferrocyanide to the majority of the cribs and trenches at B Plant. The inventory data in Table 2-6 indicates that 374,000 kg (823,000 lb) of fluoride was disposed of to six waste management units at B Plant with 240,000 kg (528,000 lb) attributed to the 216-B-7A and B Cribs. Process waste that was disposed of in the 200 East Area included a large number of different metals for which no inventory data were available.

The cation exchange capacity of the Hanford Site soils is low due to its coarse nature and low organic content. Thus, sorption through cation exchange of ionic metals is expected to be relatively low. The complex chemistry of the waste discharged at 200 East Area included many metal compounds and many other elements and compounds that likely altered the mobility of each metal. In general, the soil types present in the vadose zone at the site and natural soil conditions suggest that metals with anticipated high mobilities include selenium, metals with anticipated moderate or moderate to high mobilities include barium, cadmium, copper, iron, manganese, silver, and zinc, and metals with anticipated low mobilities include aluminum and mercury (Krauskopf 1979; Matthess 1982; Dragun 1988). However, changes to the pH and redox potential, as has happened in many cases, and the very complex chemistry of the waste could greatly affect predicted mobilities.

4.1.2.2.2 Organic Compounds. Organic compounds detected are listed in Table 4-1. Plume maps were not generated for these compounds because to be considered mappable, the

contaminant had to have at least one plume with multiple-well exceedances which are contiguous, or nearly so.

Carbon Tetrachloride (CCl_4). Carbon tetrachloride was used in the PUREX Aggregate Area in the 202-A Building Analytical Laboratory. It is identified as being part of the waste stream from PUREX that was disposed of in the B Plant. Carbon tetrachloride is not included in the chemical waste inventory (Table 2-6).

Carbon tetrachloride is a DNAPL, meaning that it sinks in water and has a low solubility. Mechanisms for transport through the vadose zone to the unconfined aquifer include gravity-driven liquid phase descent, aqueous phase transport (dissolved or as an emulsion in water), and density-driven vapor phase flow (Last et al. 1991). If carbon tetrachloride has been present at the water table in sufficient quantity, then it may have continued to sink through the aquifer as a separate phase until it reached a low permeability zone. In addition, because carbon tetrachloride has a low dielectric constant, it can increase the permeability of subsurface materials, thereby strongly influencing its migration pathways and permitting it to migrate vertically.

Chloroform. Chloroform is not included in the inventory for chemical waste (Table 2-6). Chloroform is reported to have been used in B Plant processes and is listed as being disposed of within the PUREX and B Plant areas.

Chloroform is probably a degradation product of carbon tetrachloride either through radiolytic processes prior to disposal or through natural transformation processes (i.e., microbial degradation) in the subsurface (Evans et al. 1990). Chloroform is a DNAPL and, as such, is expected to migrate by similar means as described for carbon tetrachloride.

Other Organic Compounds. Other organic compounds detected in groundwater are listed in Table 4-1. These compounds likely were included in the waste discharged to the waste management units from peripheral activities to the main process operations. The compounds 1,2-dichloroethane, 1,1,1-trichloroethane, tetrachloroethylene, and bis(2-ethylhexyl) phthalate are all DNAPLs and, as such, are expected to migrate by similar means as described for carbon tetrachloride. Bis(2-ethylhexyl)phthalate is a common laboratory contaminant and may be a spurious detection. Toluene is a light nonaqueous phase liquid with low solubility in water that may be transported by gravity-driven liquid phase descent or by aqueous phase transport (dissolved or as an emulsion in water). If liquid-phase descent has occurred, toluene will pool above the water table. DDT is practically insoluble in water, but may be dissolved in another solvent that has migrated to the groundwater.

4.1.2.3 Source and Mobility of Radionuclides Released to Groundwater. Groundwater monitoring also has detected numerous radionuclides present in the groundwater of the 200 East and 200 North Areas (Table 4-1). Section 4.1.1 describes the radionuclides with

mappable plumes. Plume maps include gross alpha, gross beta, ^{60}Co, ^{137}Cs, ^{90}Sr, tritium, ^{99}Tc, ^{129}I, uranium, and $^{239,240}Pu$. The probable source and mobility in the vadose zone of each of these radionuclides chemicals with identified groundwater plumes are discussed below. Other radionuclides detected in groundwater but not shown on plume maps are also discussed. These include: ^{14}C, ^{63}Ni, ^{106}Ru, radium, and ^{241}Am.

4.1.2.3.1 Gross Alpha. The radiological waste inventory (Table 2-5) includes gross alpha values as an indicator of radionuclide releases. Most of the waste management units that potentially contributed contaminants to the groundwater in the PUREX, B Plant, and 200 North Aggregate Areas include alpha in their waste inventory. Alpha is not included in the waste inventory of the Semi-Works Aggregate Area. The alpha for PUREX units is 81 Ci with 28.1 Ci attributed to the 216-A-10 Crib. The alpha for B Plant is 887 Ci with 264 Ci attributed to the 216-B-7A and B Cribs and 262 Ci attributed to the 216-B-5 Reverse Well. The reported alpha for the 200 North Aggregate Area is 0.184 Ci. The contaminant plumes described in 4.1.1.7.5 represent roughly 0.03 Ci in groundwater.

Plume A (Figure 4-6) is partially located beneath the 216-B-43 through -50 Cribs. These cribs are a likely source of alpha emitters. The most likely source for plume B is the 216-B-5 Reverse Well.

Gross alpha primarily is an indicator of uranium and other high atomic number radionuclides such as plutonium and americium. Thus, alpha detections primarily are dependent on the migration potential and concentrations of uranium, plutonium, and americium.

4.1.2.3.2 Gross Beta. The radiological waste inventory (Table 2-5) includes gross beta values as an indicator of radionuclide releases. Most of the waste management units that potentially contributed contaminants to the groundwater in PUREX, B Plant, and 200 North aggregate areas include beta in their waste inventory. Beta is not included in the waste inventory for the Semi-Works Aggregate Area. The beta for PUREX units is 7,611 Ci with 3,630 Ci attributed to the 216-A-36A Crib, 1,360 Ci attributed to the 216-A-36B Crib and 1,110 Ci attributed to the 216-A-8 Crib. The beta for B Plant is 40,500 Ci with 4,490 Ci attributed to the 216-B-7A and B Cribs. The beta for the 200 North Aggregate Area is 2.168 Ci. Beta levels can be attributed to uranium fission products including ^{60}Co, ^{90}Sr, ^{99}Tc, ^{106}Ru, ^{125}Sb, ^{137}Cs, ^{234}Th, and ^{234}Pa, and to a lesser extent, ^{129}I. Some shorter-lived beta emitters, such as ^{131}I, may also have contributed initially, but have since decayed significantly. The contaminant plume described in Section 4.1.1.7.6 represents roughly 5.15 Ci in the groundwater.

Plume A (Figure 4-7) is located partially beneath the 200 North Area. The source of this plume may be from waste disposal at the 200 North Area or from upgradient sources. Plume B is located partially beneath the 216-A-25 Pond, and the pond is a likely contributor

to the plume. Plume C is for the most part downgradient from 200 East sources of contamination, but its southern boundary is beneath the 216-B-35 through -42 Cribs. These cribs are likely sources for contributing to plume C. The source of plume D is the 216-B-5 Reverse Well. The 216-A-10, 216-A-36, and 216-A-45 Cribs are likely contributors to plume E. The 216-B-20 through 216-B-36 Trenches are the likely contributors to plume F.

Gross beta is an indicator of many radionuclides and does not have a migration potential of its own.

4.1.2.3.3 Tritium. Tritium (^3H) is reported in the radiological inventory for waste management units for all but the 200 North Aggregate Area (Table 2-5). Tritium was present in many of the waste streams discharged to the soil column in 200 East Area (Evans et al. 1990). A total of 32,521 Ci is reported in Table 2-5 with 18,500 Ci attributed to the 216-A-10 Crib and 4,000 Ci attributed to the 216-A-9 Crib. Concentrations of tritium detected in groundwater indicate 16,420 Ci are present in the groundwater.

Plumes A and B (Figure 4-8) are probably the result of discharges to the 216-B-3 Pond. Plume C reflects migration of tritium into the 200 East Area from the 200 West Area and contributions from various waste management units in the PUREX Plant Aggregate Area.

Tritium (^3H), as a constituent of tritiated water, closely resembles ordinary water in its structure (although is 11% heavier) and it travels unretarded along with water. The half life for tritium is 12.3 years.

4.1.2.3.4 Carbon-14. Carbon-14 is not included in the inventory for radiological waste (Table 2-5). Carbon-14 is a fission product and likely was associated with process waste from reactor fuel reprocessing. Carbon is listed as an impurity in uranium metal that may have been present in small quantities throughout the separation precesses. Carbon exists primarily in the form of carbon dioxide, which is readily soluble in water. Thus, carbon migrates unretarded with water. The half life for ^{14}C is 5,730 years.

4.1.2.3.5 Cobalt-60. Cobalt-60 is reported in the radiological inventory for waste management units for all but the 200 North Aggregate Area (Table 2-5), although cobalt is presumed to have been present in the waste at 200 North due to the presence of irradiated uranium. Cobalt-60 is a fission product and likely was associated with precess waste from reactor fuel reprocessing. Cobalt is listed as an impurity in uranium metal that may have been present in small quantities throughout the separation processes. The inventory in Table 2-5 shows a total of 7.8 Ci released to units that potentially contributed contaminants to the groundwater. The largest release was 3.32 Ci to the 216-A-5 Crib. The contaminant plume described in Section 4.1.1.7.8 represents 0.43 Ci. The ^{60}Co plume (Figure 4-10) is not located beneath any waste management units. The plume is located downgradient from

the 216-B-43 through -50 Cribs. These cribs are the closest units that may have contributed to the plume.

Cobalt exists primarily as a divalent cation up to a pH of approximately 9.5 that forms complexes with common anions (chloride, nitrate, hydroxide, and sulfate) to form mostly neutral or anionic species (Serne and Wood 1990). At a pH of 9 or less, which includes conditions present in the vadose zone, cobalt should sorb via cation exchange if it does not react with other anions to form anionic or neutral species. The formation of anionic and neutral complexes, as well as the formation of colloids, can result in a moderate to high mobility for cobalt (Serne and Wood 1990). Thus, some cobalt is expected to have sorbed to vadose zone soil through cation exchange, but that anionic and neutral species have allowed some migration to the unconfined aquifer. The half life for ^{60}Co is 5.3 years.

4.1.2.3.6 Nickel-63. Nickel-63 is not included in the inventory for radiological waste (Table 2-5). Nickel-63 is a fission product and likely was associated with process waste from reactor fuel reprocessing. The half life for ^{63}Ni is 100.1 years.

Nickel mobility exists primarily as a cation in the soil types at the site and is expected to have a high mobility due to the low cation exchange capacity. Nickel may have formed complexes in the waste stream that are less mobile.

4.1.2.3.7 Strontium-90. Strontium-90 is reported in the radiological inventory of Table 2-5 for most of the waste management units. The inventory in Table 2-5 shows a total of 13,300 Ci released to units that potentially contributed contaminants to the groundwater. The largest release was 2,200 Ci to the 216-B-7A and B Cribs. As discussed below, releases of ^{90}Sr (and ^{137}Cs) are also suspected for the BY Cribs (Cribs 216-B-43 through 216-B-50). The contaminant plumes described in Section 4.1.1.7.9 represent 0.17 Ci.

Plume A (Figure 4-11) is associated with the 216-A-25 Pond. The source of contaminants for plume B is the 216-B-5 Reverse Well. The 216-A-4, 216-A-5, 216-A-10, 216-A-21, 216-A-27, 216-A-36A, 216-A-36B, and 216-A-45 Cribs are all potential contributors to plumes C and D.

Strontium exists as a divalent cation throughout the potential range of groundwater pH in the absence of complexing anions and organic ligands. Strontium sorbs by ion exchange as a cation, with the degree of sorption in Hanford soil dependent on the types and concentrations of other cations in solution that can compete successfully for sorption sites (Serne and Wood 1990). Strontium may also precipitate as phosphate complexes. However, numerous organic anions react with strontium to form soluble organic complexes, which increases strontium mobility when present in the waste stream, and strontium is very mobile under acid conditions (Serne and Wood 1990). Thus, strontium commonly will be moderately sorbed or precipitated, but may be much more mobile in soil and groundwater

where significant cationic competition for sorption sites occurs (e.g., high calcium conditions or high salt wastes), where significant organics are present in the waste, or where conditions are highly acidic. The half life for ^{90}Sr is 28.5 years.

Evidence for vertical migration for ^{90}Sr and ^{137}Cs as a density plume associated with high-salt wastes from the 216-BY Cribs was presented by Smith (1980). During this study Smith (1990) cited gamma logging and groundwater sampling results from deep wells north and south of the 241-B-361 Settling Tank. These wells included wells 299-E-28-7, and 299-E28-23 through 299-E28-25. The wells were screened in the deep unconfined portion of the uppermost aquifer near the basalt surface (Plate 1A and Plate 2). Results cited by Smith (1980) indicated that low-level gamma activity and ^{137}Cs concentrations were present near the basalt surface south and east of the BY Cribs and the 216-B-5 Reverse Well. Smith (1980) attributed the likely source of the contamination to the 216-BY Cribs where relatively large quantities of high-salt ^{90}Sr and ^{137}Cs wastes discharged.

Transport of ^{90}Sr and ^{137}Cs contaminants as a gravity-driven density flow would resemble the DNAPL transport mechanism described in Section 4.1.2.2.2 for carbon tetrachloride in an aquifer, given a sufficient waste quantity to sink through the saturated zone to a low-permeability layer or the basalt surface. The southward slope of the basalt surface toward the axis of the Cold Creed syncline would also tend to promote spreading of the density flow. Additional deep well exploration in this area and to the southeast is needed to more-completely assess the condition and to substatiate the presence of these contaminants as a density plume.

4.1.2.3.8 Technetium-99. Technetium-99 is not included in the inventory for radiological waste (Table 2-5). Technetium-99 is a fission product and likely was associated with process waste from reactor fuel reprocessing. Fission products are associated with numerous operations processes. The plumes described in Section 4.1.1.7.10 indicate that 21.9 Ci are present in the 200 East Area groundwater.

Plume A (Figure 4-12) is associated with the 200 North Area. Plume B is downgradient from the 200 East Area except for the southern portion of the plume which underlies the 216-B-43 through -50 Cribs.

Technetium exists as a negative ion in oxidizing environments and in soil types present at Hanford, and thereby, does not readily complex with other chemical species (Serne and Wood 1990). Consequently, technetium is considered nonsorbing in the Hanford soil environment. These conditions result in a high mobility for technetium in Hanford soils. Sorption may occur in soils that contain considerable organic matter, which tends to sorb anionic species, and the valence state may be reduced to the +4 state, causing precipitation or sorption. However, organic soils are not present at the site. The half life for ^{99}Tc is 213,000 years.

4.1.2.3.9 Ruthenium-106. Ruthenium is included in the inventory for radiological waste (Table 2-5) for most of the waste management units in the PUREX, Semi-Works, and 200 North areas and for some of the units in the B Plant area. The inventory in Table 2-5 shows a total of 5.5 Ci released to the units that potentially contributed contaminants to the groundwater. The largest release was 3.17 Ci to 216-A-36B Crib. Ruthenium-106 is a fission product and likely was associated with process waste from reactor fuel reprocessing. Ruthenium is a primary contaminant in purified plutonium and uranium streams.

Ruthenium exists primarily in the +3 and +4 oxidation states and complexes readily with common anions to form a variety of anions or cations, depending on chemical conditions (Serne and Wood 1990). Mobility of ruthenium is greatly increased in the presence of nitrite and nitrate (Serne and Wood 1990), which results in a generally high mobility in the areas of nitrate releases. The half life for ^{106}Ru is 1.0 years.

4.1.2.3.10 Iodine-129. Iodine-129 is reported in the waste inventory for the 216-A-10, 216-A-36B, 216-A-37-1, and 216-A-45 Cribs in the PUREX Aggregate Area. A total of 0.131 Ci are reported for these cribs with 0.107 Ci attributed to the 216-A-10 Crib. Iodine-129 is a fission product and likely was associated with process waste from fuel reprocessing. The plume described in Section 4.1.1.7.11 indicates that 0.24 Ci are present.

The ^{129}I plume lies beneath a large part of the 200 East Area (Figure 4-13). The highest concentrations appear to be from the contributions of the 216-A-10 and 216-A-45 Cribs.

Iodine exists as a negative ion in oxidizing environments and in soil types present at Hanford, and thereby, does not readily complex with other chemical species (Serne and Wood 1990). Consequently, iodine is considered nonsorbing in the Hanford soil environment. Sorption may occur in soils that contain considerable organic matter, which tends to sorb anionic species, but such soils are not present at the site. The half life for ^{129}I is 1.6×10^7 years.

4.1.2.3.11 Cesium-137. Cesium-137 is reported in the radiological inventory of Table 2-5 for most of the waste management units. The inventory in Table 2-5 shows a total of 11,599 Ci released to units that potentially contributed contaminants to the groundwater. The largest releases were 1,570 Ci to the 216-B-30 Trench and 1,350 Ci to the 216-B-37 Trench. The plume described in Section 4.1.1.7.12 is estimated to contain 0.014 Ci ^{137}Cs. The plume (Figure 4-14) appears to be related to releases to the 216-B-5 Reverse Well.

Cesium exists as a monovalent cation within the range of soil and groundwater pH at Hanford and shows no tendency to complex with inorganic or organic ligands, no tendency to polymerize, nor a tendency to form colloids (Serne and Wood 1990). Consequently, cesium is expected to sorb primarily by ion exchange, with the degree of sorption dependent

on the concentrations of other cations that can compete for sorption sites. Cesium is very mobile under acid conditions (pH <3). The half life for ^{137}Cs is 30 years.

As discussed for ^{90}Sr on Section 4.1.2.3.7, relatively low concentrations of ^{137}Cs and gamma radiation were detected in groundwater samples from the deep, unconfined portion of the uppermost aquifer, near the basalt contact (Smith 1980). These detections from near the basalt contact may indicate downward migration by density driven flow of high-salt liquids originating from historic discharges to the BY Cribs (Cribs 216-B-43 through 216-B-50).

4.1.2.3.12 Radium. Radium is not included in the inventory for radiological waste (Table 2-5). Radium is a decay product of uranium and likely was associated with waste for which uranium was identified.

4.1.2.3.13 Uranium. Uranium (^{238}U and total U) is reported in the radiological inventory for most of the waste management units (Table 2-5). The inventory in Table 2-5 shows 30.89 Ci for total uranium released to units that potentially contributed contaminants to the groundwater. The largest releases were 13 Ci to the 216-A-19 Trench and 6.96 Ci to 216-B-12 Crib.

Serne and Wood (1990) report that under oxidizing conditions that exist at Hanford, dissolved uranium is predicted to exist as a cation up to a pH of approximately 6, as a neutral hydroxide species from a pH of approximately 6 to 8, and as an anionic carbonate above a pH of 8. This suggests that uranium would sorb via cation exchange under acid conditions and sorb very poorly under neutral and basic conditions. However, strong evidence suggests that a uranium phosphate has precipitated beneath the cribs because of the high phosphate content in the waste streams (Serne and Wood 1990). Data compiled in the U Plant AAMSR indicate that uranium (^{238}U) has reacted with the soil where it has been discharged to form carbonate-phosphate compounds in the upper portions of the vadose zone, with little uranium normally reaching the unconfined aquifer. The half life for ^{238}U is 4.5×10^9 years.

Remobilization of uranium through acidic discharge is shown by events related to the 216-U-1 and 216-U-2 Cribs (Baker et al. 1988), which had received some 0.7 Ci of uranium between 1951 and 1967 that apparently precipitated in the soil. Acidic decontamination wastes, which were discharged to the cribs toward the end of their service life, had partially dissolved the sorbed uranium beneath the cribs but was of insufficient volume to transport the dissolved uranium to the groundwater. In 1984, a new crib (216-U-16) was installed south of the 216-U-1 and 216-U-2 Cribs. Liquid discharges to 216-U-16 Crib were sufficient to form a perched zone above a caliche layer that by 1985 migrated under the 216-U-1 and 216-U-2 Cribs. This additional discharge mixed with the uranium-bearing fluid and uranium migrated downward with the liquid discharge to the unconfined aquifer. This was observed

in a nearby monitoring well, as uranium concentrations rose from 166 pCi/L to about 72,000 pCi/L over a short period. A pump and treat remediation of the groundwater followed.

4.1.2.3.14 Plutonium-238/239/240/241. Plutonium-238 is reported for three waste management units in Table 2-5: 216-A-10 Crib, 216-A-45 Crib, and the 216-B-3 Pond. The inventory in Table 2-5 shows a total of 0.338 Ci released to the three cribs with 0.329 Ci attributed to the 216-A-10 Crib. Plutonium-239 is reported for the majority of the waste management units in Table 2-5. The inventory in Table 2-5 shows a total of 952 Ci released with 373 Ci attributed to the 216-A-37-2 Crib, 246 Ci attributed to the 216-B-7A and 216-B-7B Cribs, and 244 Ci attributed to the 216-B-5 Reverse Well. Plutonium-240 is reported for the majority of the waste management units in Table 2-5. The inventory in Table 2-5 shows a total of 156 Ci released with 66.2 Ci attributed to the 216-B-7A and 216-B-7B Crib and 65.7 Ci attributed to the 216-B-5 Reverse Well. Plutonium-241 is reported for three waste management units in Table 2-5: 216-A-10 Crib, 216-A-36B Crib, and 216-A-45 Crib. The inventory in Table 2-5 shows that the 43.5 Ci were released to the three cribs with 42.3 Ci attributed to the 216-A-10 Crib. The inventory in Table 2-5 shows 11,467 g (25.3 lb) of plutonium released to waste management units that may have contributed contaminants to the groundwater with 4,300 g (9.5 lb) attributed to the 216-B-7A and 216-B-7B Cribs and 4,270 g (9.4 lb) attributed to the 216-B-5 Reverse Well.

The plume described in Section 4.1.1.7.13 contains an estimated 0.00056 Ci of plutonium. The source of this plume appears to be the 216-B-5 Reverse Well.

As described by Nishita et al. (1979), sorption of ^{239}Pu (and ^{241}Am) is greatest is calcareous soils between pH of 2 and 8, with high solubility below pH 2 and low to moderate solubility above pH 8. Below pH 2, TRUs are primarily in the ionic forms. Between a pH 2 and 8, low solubility indicates rapid hydrolysis, polymerization, and colloid and aggregate formation of TRUs. The solubilities mimic the pH solubility curves for aluminum, iron, and manganese, indicating that the insoluble hydrous oxides of these metals provide sorption sites for the TRUs. Nishita et al. (1979) also note that the presence of complexing or chelating agents, such as nitrate and organics (both of which are present in 200 East Area liquid discharges), increase the solubility of TRUs and are the likely mechanism for some transport of TRUs to the groundwater. Serne and Wood (1990) indicate that the maximum ^{239}Pu sorption occurs at the site in the pH range of 4 to 8.5. Price et al. (1979) indicate that most of the ^{239}Pu is retained in the top 15 m (49 ft) of the vadose zone beneath the 216-Z-1A Crib, with a maximum depth penetration of 30 m (98 ft), due to silicate hydrolysis reactions between the acidic waste liquid and the sediments and precipitation by plutonium-carbonate complexes. Price and Ames (1975) also show that ^{239}Pu at the 216-U-9 and 216-Z-1A Cribs decreases sharply in concentration in the top 9 m (30 ft), including apparent filtering of small plutonium oxide particles in the soil close to the discharge outlet. The half life of ^{239}Pu is 24,400 years.

4.1.2.3.15 Americium-241. Americium-241 is reported in the radiological inventory for waste management units for the PUREX and B Plant areas (Table 2-5), although americium is presumed to have been present in the processes at all four 200 East Groundwater Area plants due to the presence of irradiated uranium. The values presented in Table 2-5 indicate a total of 5.3 Ci of americium for units at PUREX and B Plant.

Sorption of americium through ion exchange and physical sorption (polymerization and precipitation) to the soil is favored because the predicted ionic state of americium is cationic within the normal soil pH range (Serne and Wood 1990). Numerous organic anions react with americium to form soluble organic complexes, which increases americium mobility when present in the waste stream (Serne and Wood 1990). Americium is very mobile under acid conditions (pH of 1 to 3) and, thus, may be remobilized by acidic releases (Nishita et al. 1979). Price et al. (1979) observed that americium has the same distribution pattern as plutonium in the soil beneath the 216-Z-1A Crib and concluded that americium likely behaves the same as plutonium in the vadose zone. The half life for ^{241}Am is 432 years.

4.1.3 Potential Future Contaminant Plumes

4.1.3.1 Anticipated Changes in Groundwater Flow. Artificial recharge to the unconfined aquifer in the separation areas has dramatically altered the shallow groundwater flow. Before 1944 groundwater within the upper unconfined aquifer flowed generally in a west to east trend across the Hanford Site and the 200 West Area, as discussed in Section 3.5.2. Local groundwater mounding due to artificial recharge, primarily in the vicinity of the 216-B-3 Pond (within the 200 East Area) and the 216-U-10 Pond (within the 200 West Area), has significantly altered the dynamics of this system. Mounding of the water table has caused radial horizontal flow, steepened horizontal hydraulic gradients, and localized downward vertical gradients. As the patterns of artificial recharge have changed, so have the patterns of groundwater flow. This section addresses future groundwater flow patterns that may occur based on anticipated artificial recharge and its overprint on the natural flow regime.

4.1.3.1.1 Existing Conditions. Currently, groundwater flow within the 200 East Area radiates away from 216-B-3 Pond initially, then trends primarily to the east and southeast toward the Columbia River, with a smaller portion directed to the northeast and Gable Gap. Groundwater flow within the 200 West Area trends northeast and east towards the 200 East Area and Gable Gap, with a small component trending to the northwest and the gap west of Gable Butte (Figure 4-16 and Section 3.5.2). Eastward flow from 200 West Area and westward flow from B Pond converge in an area underlying the western portion of the 200 East Area and divide into northern and southern components of flow. The flow ridgeline that divides north from south in this convergence zone approximately bisects the fenced area of the 200 East Area in an east-west direction. Groundwater north of this

ridgeline flows north to Gable Gap, and groundwater south of this ridgeline flows southeastward toward the Columbia River (Figure 4-16).

The configuration of past and present contaminant plumes discussed in Section 4.1.2 provides insight on flow paths from the 200 West Area. Tritium and nitrate, both common components of the waste streams contributing to artificial recharge, are good tracers for defining groundwater flow directions. The tritium plume for the 200 East Groundwater Aggregate Area extends to the southeast and then to the east across a large area, ultimately reaching the Columbia River, as well as to the northwest and apparently through Gable Gap (Figures 4-8 and 4-9). Nitrate has a similarly shaped plume that extends over much of the same area as tritium (Figures 4-4 and 4-5). These trends agree with the flow paths indicated by historical and present potentiometric surfaces (Figures 3-57 to 3-62).

4.1.3.1.2 Future Artificial Recharge. Artificial recharge in the 200 East Groundwater Aggregate Area peaked and remained fairly constant from the 1950's through the 1980's. Mounding of the water table in the area of 216-B-3 Pond appears to have peaked in the mid-1980's following restart of the 202-A Building operations in 1983 and decommissioning of the Gable Mountain Pond (216-A-25) in 1987. Discharge to the 216-B-3 Pond System from sources within the 200 East Area is not expected to decrease substantially until 1997 when replacement for 216-B-3 Pond is completed.

Two SALDS facilities for disposal of treated and untreated wastewater are planned for the 200 Areas. Project C-018H (242-A Evaporator/PUREX Plant Condensate Treatment Facility) plans to construct a crib to the north of the 200 West Area (see Section 2.7). Tri-Party Agreement milestone M-17-14 (Ecology et al. 1991) indicates that discharge of treated effluent to the soil column will be initiated in October 1994. Project W-049H (200 Area Treated Effluent Disposal Facility) plans to construct a crib to the east or north of 216-B-3 Pond, with a location nearly 1 km to the east being the preferred location (see Section 2.7). Tri-Party Agreement milestone M-17-08 indicates that operation of this second SALDS will be initiated in June 1995. This shift in discharge areas from current practice will affect future groundwater flow underlying both the 200 West and East Groundwater Aggregate Areas. Discharge to the two SALDS will continue for an indefinite period, but eventually all artificial recharge will be discontinued and the area will revert to essentially natural flow conditions.

4.1.3.1.3 Anticipated Gradient and Flow Changes. The decrease in artificial recharge to the 200 East Groundwater Aggregate Area and its ultimate termination will alter current groundwater flow directions and gradients. Current groundwater flow directions are shown on Figure 4-16, as based on the 1991 water table contour map (Figure 3-49). The current groundwater flow conditions are expected to remain essentially the same until discharge is shifted to the two SALDS facilities in 200 West and 200 East Areas in 1994 and 1995. A

9 3 1 2 9 7 1 4 3 3

shift from current discharge to discharge at the SALDS facilities should have the following anticipated effects on groundwater flow and contaminant transport:

- The potentiometric surface of the water table underlying the 200 East Area currently has low relief and a shallow gradient with the exception of the mounding beneath 216-B-3 Pond. The transfer of discharge of a similar rate to the Project W-049H SALDS facility to the preferred location east of 216-B-3 Pond will result in formation of a similar water table mound that is simply shifted slightly in location. The shift in mounding to the east can be expected to lower the water table by an estimated 2 to 4 m (6 to 12 ft) in the area underlying 216-B-3 Pond and by an estimated zero to 2 m (zero to 6 ft) in the area to the west, depending on the proximity of any location to the current mound apex. These estimates are made by shifting the current mound to the new locus of discharge.

- Horizontal groundwater gradients will undergo a very slight change due to the shift in the location of mounding. Westward gradients induced by the present mounding will be reduced slightly, thereby resulting in a moderate reduction in the westward-directed flow that occurs in the eastern portion of the 200 Groundwater East Aggregate Area. The current gradient of approximately 0.003 the western flank of the mound could be reduced to about 0.002 following the shift (gradients decrease sharply with increasing distance from the apex of the mound). Reduction of the gradient in the area underlying 216-B-3 Pond and the PUREX Plant will cause a slight shift to the east in the location of the confluence of eastward- and westward-directed flow. The result of this shift will be a slight reduction in the area underlain by flow to the northeast toward Gable Gap and a corresponding increase in area with flow toward the southeast.

- Shifting of discharge in the 200 West Area to the Project C-018H SALDS on the area's north side will have a minor effect on flow in the 200 East Groundwater Aggregate Area. It is possible that the shifting of discharge and resultant water table mounding to the north may slightly increase flow through Gable Gap from the 200 West Area, thereby causing a slight reduction of flow through the gap from 200 East Groundwater Aggregate Area.

- The downward vertical gradient within the unconfined aquifer in the eastern 200 East Groundwater Aggregate Area also can be expected to be slightly reduced due the lowering of the head. A reduction in the downward vertical gradient between the unconfined and confined aquifers in the area of 216-B-3 Pond also will occur.

- Changes to groundwater flow velocities are not expected to be significant due to the very minor changes anticipated for hydraulic gradients. A small reduction in the rate proportional with the gradient reduction is expected for westward-directed flow in the eastern portion of the 200 East Groundwater Aggregate Area. Incremental reductions

in downward flow in the same area will also correspond to slightly decreased downward hydraulic gradients.

- Besides the shift in the location of discharge to the Project W-049H SALDS and its resultant mounding, thereby causing minor changes to groundwater conditions as described above, the overall configuration of groundwater flow will not be greatly affected. Recharge from irrigation has caused groundwater levels to rise approximately 15 m (50 ft) within the upper Cold Creek valley west of the 200 West Area since 1944 (Graham et al. 1984). Groundwater levels across the 200 Areas Plateau have also risen in response to this recharge and will remain at elevated levels compared to pre-Hanford site activity as long as the groundwater recharge to the west is maintained.

Eventually, all wastewater discharges to waste management units within both the 200 West and 200 East Areas will be eliminated. This elimination of wastewater recharge to the unconfined aquifer will cause the dynamics of the unconfined aquifer to approach pre-Hanford conditions, albeit with a higher water table, as discussed above. Termination of all artificial recharge in the 200 Areas at some point in the future will likely result in the following additional changes:

- All mounding due to artificial recharge will dissipate and the dominant horizontal flow direction will revert to east-southeast across the 200 East Groundwater Aggregate Area (Figure 4-18). No groundwater from the 200 East Area is anticipated to flow through Gable Gap once mounding in the 200 East Area dissipates, although some flow of groundwater through the gap (originating from other areas) likely will continue at a reduced rate. As shown by Freshley and Graham (1988), an increased rate of natural recharge through greater infiltration of precipitation could cause all flow from the 200 Areas to be directed through Gable Gap. However, observations of present conditions do not support this alternative as a likely scenario.

- Horizontal hydraulic gradients within the 200 East Groundwater Aggregate Area will be reduced due to elimination of mounding. An area of very low hydraulic gradients will remain underlying the western portion of 200 East Groundwater Aggregate Area, but the overall gradient between the site and the Columbia River is expected to stabilize to a gradient below 0.001.

- Downward vertical gradients between aquifers will be essentially eliminated. The only current area of significant downward gradients, which occurs in the area of 216-B-3 Pond and which will soon shift to beneath the Project W-049H SALDS, will eventually return to natural conditions. The vertical gradient between the unconfined aquifer and the confined basalt aquifers likely will revert to pre-Hanford Site conditions of an upward vertical gradient once mounding is gone, but not at the same magnitude as

previously due to the higher water table that will be maintained by continued artificial recharge from irrigation to the west in upper Cold Creek valley.

- The decrease of horizontal gradient values will result in a proportional decrease in the rate of groundwater flow (and contaminant transport) from the 200 East Groundwater Aggregate Area.

4.1.3.2 Anticipated Releases from Vadose Zone. Potential future releases to the groundwater from the vadose zone include continued downward migration of previously released contaminants, leaching of sorbed or precipitated contaminants from the soil by water discharged through active units or by infiltrating precipitation, and contaminants entrained in discharge to currently active waste management units. It is possible that none of these modes will greatly affect present contaminant plumes, although some additional contribution of contaminants to the unconfined aquifer can be expected.

Gross gamma geophysical logging has not provided evidence that downward migration of radionuclides is ongoing in the vadose zone (spectral gross gamma logging may provide more definitive data in the future). However, non gamma emitting radionuclides and or hazardous waste may be migrating downward as slow draining of soil underlying waste management units occurs. This drainage may contribute additional contaminants to the groundwater.

Leaching of sorbed or precipitated contaminants may occur at locations where water flows through contaminated soil zones. Such occurrences due to natural infiltration are probably negligible due to the very low rate for the site. Leaching of contaminants from the soil may occur in areas of continued artificial recharge. Remobilization of contaminants is not likely to be significant unless the waste discharged significantly alters the chemical conditions (e.g., a significant change to the pH).

The *Liquid Effluent Study Final Project Report* (WHC 1990b) documents the history and characteristics of current liquid discharges. The report includes discussion of twelve waste management units in the 200 East Area, seven of which were active at that time: 216-A-29 Ditch, 216-A-30 Crib, 216-A-37-2 Crib, 216-B-3 Pond System, 216-B-55 Crib, 216-B-62 Ditch, and 216-B-63 Trench. 216-A-8 Crib, which also is discussed, presently is inactive but may be put in service again in the near future. Discharges for these units are listed in a range of 114 m^3/month (216-A-8 Crib) to 4,590,000 m^3/month (216-B-3 Pond System). Calculated travel times for liquid discharge to reach the groundwater range from 25 days (216-B-63 Trench) to 417 days (216-A-29 Ditch). Most of these current discharges contain low concentrations of metals and radionuclides, with some containing organic compounds such as acetone. The largest impact anticipated is the impact on groundwater flow that will result from continued discharge to the 216-B-3 Pond System in the short term. Mounding in the pond area will maintain hydraulic gradients that result in higher rates of groundwater

flow than would occur under natural conditions. Discharges have been reduced significantly since the issuance of the *Liquid Effluent Study Final Project Report* (WHC 1990b) due to restrictions imposed in Tri-Party Agreement Milestone M-17.

4.1.3.3 Projected Contaminant Plumes. Projected groundwater flow paths are presented in Section 4.1.3.1 for periods following cessation of artificial recharge to the 200 West and 200 East Areas (Figures 4-17 and 4-18). These flow paths can be used for estimating the trend of future contaminant plume migration. Section 4.1.3.2 indicates that no significant sources are anticipated for contaminants in the groundwater that will significantly affect the contaminant plumes presented in Section 4.1. Therefore, groundwater flow paths presented in Figures 4-17 and 4-18 can be applied to present contaminant plumes to project future trends in migration.

In general, the most significant change to contaminant migration will not occur in the near future when discharge is shifted to the two SALDS, but rather when all artificial discharge ceases and the water table mound in the 200 East Area has dissipated. When that has occurred and groundwater flow dynamics again approach the pre-Hanford conditions (Figure 4-18), contaminant transport by advection will occur along a generally eastern to southeasterly trend with rates only slightly reduced from present rates. Contaminant transport from the 200 East Groundwater Aggregate Area through Gable Gap will cease.

The projected effect of future contaminant transport by advection with groundwater flow is discussed below for each contaminant plume presented in Section 4.1 (Figures 4-1 to 4-15).

4.1.3.3.1 Arsenic. The arsenic plumes represent relatively small areas of elevated contamination without clear evidence of current plume migration (Figure 4-1). In the near future, plumes C and D will continue to be directed along flowpaths to the southeast. Plumes A and B likely will be directed to the northwest. In the long term, plume migration will be directed along flowpaths to the east and southeast.

4.1.3.3.2 Chromium. Three locations of elevated chromium concentrations (greater than 50 μg/L) occur over limited areas and without clear evidence of current plume migration (Figure 4-2). In the near future, plumes A and B likely will continue to be directed to the northwest and plume C may be shifted from the southeast to the northwest. In the long term, all three plumes will be directed to the east and southeast.

4.1.3.3.3 Cyanide. Elevated levels of cyanide (greater than 200 μg/L) are observed in only one location (Figure 4-3). Current and near future groundwater flow directions will result in a northwestward transport of cyanide. In the long term, the cyanide plume will be directed to the southeast.

4.1.3.3.4 Nitrate. As shown on Figures 4-4 and 4-5, elevated levels of nitrate are widespread in the 200 East Groundwater Aggregate Area with several areas having concentrations greater than 45,000 μg/L and with apparent discharge of nitrate to the Columbia River. Most of the plume extends southeast and east from the source areas, but a component apparently has migrated to the northwest through Gable Gap. Current and near future groundwater flow directions will result in continued migration with only minor shifting in the near future of some nitrate transport from the northwest to the southeast. In the long term, nitrate contaminant transport will be shifted almost entirely to the east and southeast, while transport of nitrate that has already reached the Gable Gap area will continue northward, but its source will be cut off by the change in groundwater flow. Flow of nitrate to the Columbia River will continue, although concentrations are expected to diminish with time as releases of nitrate to the groundwater are reduced.

4.1.3.3.5 Gross Alpha. Gross alpha is an indicator of uranium, plutonium, americium, and other high atomic number radionuclides. As such, it will follow the migration patterns of these radionuclides.

4.1.3.3.6 Gross Beta. Gross beta is an indicator of many of the fission product radionuclides. As such, it will follow the migration patterns of those radionuclides.

4.1.3.3.7 Tritium. As shown on Figures 4-8 and 4-9, elevated levels of tritium, like nitrate, are widespread in the 200 East Groundwater Aggregate Area with great areas having concentrations greater than 20,000 pCi/L and with apparent flow of tritium into the Columbia River. Most of the plume extends southeast and east from the source areas, but a component with lower concentrations apparently has migrated to the northwest through Gable Gap. Current and near future groundwater flow directions will result in continued migration in the same directions with only minor shifting in the near future of some tritium transport from the northwest to the southeast. In the long term, tritium contaminant transport will be shifted almost entirely to the east and southeast, while transport of tritium that has already reached the Gable Gap area will continue northward, but its source will be cut off by the change in groundwater flow. Flow of tritium to the Columbia River will continue, although concentrations are expected to diminish with time as releases of tritium to the groundwater are reduced and released amounts continue to decay.

4.1.3.3.8 Cobalt-60. The ^{60}Co plume, as shown on Figure 4-10, will continue to be directed to the northeast in the present and near future. In the long term, the direction of transport will be reversed to the southeast.

4.1.3.3.9 Strontium-90. Currently, plumes A and B of ^{90}Sr (Figure 4-11) are being directed to the northwest by groundwater flow, with plumes C and D being directed to the southeast. In the near future, plume B might possibly be redirected to the southeast. In the long term, all plumes are expected to be directed to the east and southeast.

4.1.3.3.10 Technetium-99. Plumes A and B of ^{99}Tc (Figure 4-12) are being directed to the northwest by present groundwater flow and this can be expected to continue in the near future. In the long term, the direction of transport flow for both plumes will be redirected to the east-southeast.

4.1.3.3.11 Iodine-129. The ^{129}I plume, as shown on Figure 4-13, underlies the center of 200 East Area and currently is divided by bifurcating groundwater flow into transport to the northwest and southeast. Transport in the near future will be similar, but with a slightly larger component expected to be directed to the southeast. In the long term, all transport is expected to be directed to the east-southeast.

4.1.3.3.12 Cesium-137. The ^{137}Cs plume shown on Figure 4-14 indicates a limited area of elevated concentrations above 120 pCi/L in the central portion of the 200 East Area. Current contaminant transport appears to be to the northeast and this is likely to continue in the near future. However, contaminant transport in the long term is expected to be directed to the east-southeast.

4.1.3.3.13 Plutonium-239/240. The $^{239/240}Pu$ plume shown on Figure 4-15 indicates a limited area of elevated concentrations above 1 pCi/L in the central portion of the 200 East Area. Current contaminant transport appears to be to the northeast and this is likely to continue in the near future. However, contaminant transport in the long term is expected to be directed to the east-southeast.

4.1.4 Interactions of Study Area Groundwater with Other Areas

As discussed above, groundwater flow from the 200 East Area has resulted in contaminant transport through advection in the unconfined aquifer. The transport has occurred primarily to the east-southeast and to the northwest. Nitrate, tritium, ^{99}Tc, and ^{129}I, which have been discharged in large quantities and also are very mobile in groundwater, form the largest plumes and have traveled the longest distance. These four contaminants have been advected to the east-southeast from the 200 East Area and have been discharged to some degree to the Columbia River. They also have been transported northward to the area of Gable Gap, but these and other contaminants do not appear to have travelled a long distance through the gap (at least in high concentrations) and are unlikely to have impacted groundwater in the 100 Area or the Columbia River.

Figure 4-16 illustrates flowpaths for present conditions. The flowpaths indicate that migration of mobile contaminants is divided to the east-southeast and to the northwest.

Qualitatively estimated near-future migration during operation of the SALDS (following closure of all existing 200 Areas liquid waste disposal units) indicates that these contaminants

will continue along similar migration paths to the present, but with slightly increased transport to the east-southeast due to a shift of discharge and mounding to the east (Figure 4-17).

Estimated groundwater flow in the future (also qualitative), when all artificial recharge has ceased and related mounding has dissipated, will result in flow from both 200 Areas to trend to the east-southeast (Figure 4-18). At such a time, mobile contaminants advected from the 200 East Area will be transported eastward and southeastward toward the Columbia River, while contaminant transport to the northwest will have ceased. Mobile contaminants advected from the 200 West Area also will be transported eastward and southeastward where they may commingle with contaminants from the 200 East Area.

4.2 POTENTIAL IMPACTS TO HUMAN HEALTH

This preliminary assessment is intended to provide a qualitative evaluation of potential human health and environmental hazards associated with the known and suspected contaminants in the 200 East Groundwater Aggregate Area. The assessment includes a discussion of potential transport pathways, develops a conceptual model of human exposure based on these pathways, and presents the physical, radiological, and toxicological characteristics of the known or suspected contaminants.

The primary transport pathway addressed in this section is migration of contaminants from waste management units and unplanned releases to groundwater, transport within groundwater, and transport from groundwater to surface water. Other transport pathways that could potentially lead to exposures to human or environmental receptors (e.g., airborne dust transport) were discussed in the AAMSRs for the individual source areas within the 200 East Area boundary.

It is important to note that these evaluations do not attempt to quantify potential human health risks associated with exposure to 200 East Groundwater Aggregate Area contaminants. Such a risk assessment cannot be performed until additional characterization data are acquired. Risk assessments will be performed in accordance with the *Hanford Site Baseline Risk Assessment Methodology* (DOE/RL 1991e) which was prepared in response to the M-29 milestone. This document incorporates the requirements established in the *Risk Assessment Guidance for Superfund* (EPA 1989b) and the *EPA Region 10 Supplemental Risk Assessment Guidance for Superfund* (EPA 1991).

4.2.1 Release Mechanisms

Waste management units and unplanned releases can be divided into two general categories based on the nature of the waste release: (1) units where waste was discharged directly to the environment; and (2) units where waste was disposed of inside a containment structure and must bypass an engineered barrier to reach the environment.

In the first group are those waste management units where release of wastes to the soil column was an integral part of the waste disposal strategy. Included in this group are tile fields, ditches, french drains, seepage basins, cribs, reverse wells, septic system drain fields, and some disposal trenches. Also in this group are unplanned releases that involved waste material contacting soil. For these types of waste management units, if discharges to the unit contained chemicals of concern, it can be assumed that soils underlying the waste management unit may contain some of the chemical being disposed of. The first task in developing a conceptual model for these units is to determine whether chemicals of concern are retained in soil near the waste management unit, or are likely to migrate to the underlying aquifer and then to receptor points such as drinking water wells or surface water bodies. Factors affecting migration of chemicals away from the point of release will be discussed in the following section.

In the second group are waste management units that were intended to act as a barrier to environmental releases. Included in this group are burial grounds containing drums or other containers, vaults and caissons, storage and treatment tanks, cribs with membrane liners, retention basins, waste transfer facilities, and unplanned releases that occurred within containment structures. Waste management units that received only dry waste can also be included in this category, since the potential for wastes to migrate to soils outside of the unit is low due to the negligible natural recharge rate at the Hanford Site. However, early disposal records (prior to about 1968) are incomplete; therefore, it is possible that some liquid wastes may have been disposed to these units. For these waste management units, the first consideration to be addressed in developing a conceptual model is the integrity of the containment structure.

The ability of this report to evaluate the efficacy of engineered barriers is limited by the lack of vadose zone and subsurface soil sampling data for many waste management units. Indication of radioactive waste releases is provided by gamma logging of boreholes; however, the usefulness of these data is limited by methodological problems, and this information also is not available for all waste management units. Available sampling information and gamma logs for the waste management units and unplanned releases are summarized in Section 4.1 of each individual source AAMSR.

The efficacy and integrity of concrete liners (e.g., retention basins), and concrete and steel tanks and vaults have not been determined for all units of this type. Certain single-shell

tanks within the B Plant and PUREX Plant Aggregate Areas have been classified as assumed or confirmed leakers based on historical inventory information and/or the results of gamma logging of boreholes. The potential for releases to groundwater is expected to be low for waste management units that received only dry wastes such as contaminated dirt, decommissioning wastes (e.g., the 218-C-9 Burial Ground) and process equipment.

4.2.2 Transport Pathways

Transport pathways expected to affect contaminants in the 200 East Groundwater Aggregate Area are summarized in this section, including the following:

- Drainage and leaching of bulk fluids and dissolved contaminants from soil to perched water and groundwater
- Transport in the groundwater
- Vapor transport in the subsurface
- Migration between groundwater and surface water.

4.2.2.1 Transport from Soils to Perched Water and Groundwater. Soil is the initial receiving medium for waste discharges in the 200 East Groundwater Aggregate Area, whether the release is directly to soil or through failure of a containment system. Several factors determine whether chemicals that are introduced into the vadose zone will reach a perched water zone or the unconfined portion of the uppermost aquifer, which lies at depths of approximately 60 to 90 m (200 to 290 ft) below ground surface in the 200 East Area. These factors are discussed in the following sections.

4.2.2.1.1 Depth of Release. Waste management units that released wastes at a greater depth below the surface are more likely to contaminate groundwater than waste management units where the release was shallow. Units designed to release wastes below the surface include french drains, cribs, and reverse wells. The deepest units located in the 200 East Area are five reverse wells within the B Plant Aggregate Area, which discharged radioactive liquid wastes slightly above or below the water table. Because of this proximity to the water table, reverse wells are known or presumed to have contributed contaminants to the groundwater.

4.2.2.1.2 Liquid Volume or Recharge Rate. The primary mechanism leading to migration of waste constituents to the water table is distillation from infiltrating soil pore water. In the absence of natural recharge, chemicals migrate by the generally slower mechanism of molecular diffusion. In the 200 East Groundwater Aggregate Area, the

primary sources of recharge are precipitation and waste management units that discharge liquid waste to the soil column. As discussed in Section 3.5.1.2, estimates of natural precipitation recharge range from zero to 10 cm/yr (4 in./yr), primarily depending on surface soil type, vegetation, and topography. Gravelly surface soils with no or minor shallow-rooted vegetation appear to facilitate precipitation recharge. One modeling study (Smoot et al. 1989) indicated that some radionuclide (^{137}Cs and ^{106}Ru) transport can occur with as little as 5 cm/yr (2 in./yr) of natural recharge. However, other researchers (Routson and Johnson 1990) conclude that no net precipitation recharge occurs in the 200 Areas, particularly at waste management units that are capped with fine-grained soils or impermeable covers.

With respect to artificial recharge, as discussed in Section 2.3, waste management units (e.g., the 216-B-12 Crib, 216-A-6 Crib, and 216-C-1 Crib) were identified in which the known volume of liquid waste discharged exceeded the total estimated soil pore volume present below the footprint of the facility. In these cases, the moisture content of soil below the waste management units likely approached saturation during the period of use of these facilities. Because unsaturated hydraulic conductivity is maximized at water contents near saturation, the volume of liquid wastewater historically discharged to the waste management units identified in Table 2-1 probably enhanced fluid migration in the vadose zone beneath these units.

Contaminants that are not initially transported to the water table by downward water flow may be mobilized at a later date if an additional large volume of liquid is added to the waste management unit. In addition, liquids discharged to one unit could mobilize wastes discharged to an adjacent unit if lateral migration takes place within the vadose zone. An example of this process occurred at the 216-U-16 Crib in the U Plant Aggregate Area where lateral migration of waste above a caliche layer mixed with and transported acidic waste beneath the 216-U-1 and 216-U-2 Cribs in the 200 West Area that had remobilized previously sorbed or precipitated radionuclides. At present, artificial recharge within the 200 East Groundwater Aggregate Area is limited to septic wastewaters, cooling waters, and other noncontact wastewaters. The potential interactions between these discharges and adjacent waste management units generally have not been characterized.

4.2.2.1.3 Soil Moisture Transport Properties. As discussed in Section 3.5.2, moisture flux in the vadose zone is dependent on hydraulic conductivity as well as gradients of moisture content or matrix suction. Higher unsaturated hydraulic conductivities are associated with higher moisture contents. However, higher unsaturated hydraulic conductivities may be associated with fine-grained soils compared to coarse-grained soils at low moisture contents. Due to the highly stratified nature of Hanford Site vadose zone soils and the moisture content dependence of unsaturated hydraulic conductivity, lateral spreading is expected. Lateral spreading commonly occurs at any interface within the vadose zone

between fine- and course-grained soils. This lateral spreading may substantially reduce the potential for contaminant migration to the uppermost aquifer.

Conditions leading to the accumulation of soil moisture or liquid waste in soil zones above the water table (perched water zones) are discussed in Section 3.5.1.1.2. The presence of perching layers beneath waste management units where liquid wastes were released may have led to lateral migration of contaminants away from the point of release.

Rapid transport of contaminants to the subsurface may occur if contaminants are able to migrate along the casing of an improperly sealed monitoring well or borehole.

4.2.2.1.4 Retardation. The rate at which contaminants will be transported through unsaturated soils depends on a number of characteristics of the chemical, the waste, and the soil matrix. In general, chemicals that have low solubilities in the leaching fluid or strongly sorb to soils will be retarded in their migration velocity compared to the movement of soil pore water. Studies have been conducted of soil parameters affecting waste migration at the Hanford Site to attempt to identify the factors that control migration of radionuclides and other chemicals. Recent studies of soil sorption applicable to the Hanford Site are summarized by Cantrell and Serne (1992), Ames and Serne (1991), and Serne and Wood (1990). Some of the processes that have been shown to control the rate of transport are the following:

- **Adsorption to Soils.** Most contaminants are chemically attracted to some degree to the solid components of the soil matrix. For organic compounds, the adsorption is generally to the organic fraction of the soil, although in extremely low-organic soils, adsorption to inorganic components may be of greater importance. Soil components contributing to adsorption of inorganic compounds include clays, organic matter, and iron and aluminum oxyhydroxides. In general, surface and Hanford formation soils are characterized as sandy or gravelly with very low organic content (<0.1%) and low clay content (<12%) (Tallman et al. 1981). Thus, site-specific adsorption factors are likely to be lower, and rate of transport higher, than the average for soils nationwide.

- **Filtration.** Filtration of suspended particulates by fine-grained sediments was suggested as a mechanism for concentration of plutonium in certain sedimentary layers at the 216-Z-1A Tile Field in the 200 West Area. This finding suggests that migration of suspended particulates may be an important mechanism of transport for chemicals of low solubility. Particulates in the colloid size range may pass through even fine-grained soils.

- **Solubility.** The migration of some chemicals from the point of release is controlled by the rate of dissolution of the chemical from a separate phase. The concentration of such chemicals in the pore water will be extremely low, even if they are poorly sorbed to soils. An example cited by Serne and Wood (1990) is the low rate dissolution of plutonium oxide, which appears to be the limiting factor controlling the release of plutonium from waste materials at neutral and basic pH.

- **Organic Content of Waste.** Waste liquids containing high concentrations of certain organic compounds can alter the rate of transport of the waste constituents through soils. A liquid with a low dielectric constant, such as carbon tetrachloride, can cause clays within the soil to shrink, which will increase the permeability of the soil by creating cracks and fissures (DOE/RL 1991c). In addition, the complexing of many inorganic compounds with organic compounds in the waste stream can greatly increase the mobility of the compounds (see Section 4.2.2.1.5).

- **Ionic Strength of Waste.** For some inorganics, the dominant mechanism leading to desorption from the soil matrix is ion exchange. Leachant having high ionic strength (high salt content) can bias the sorption equilibrium toward desorption, leading to higher concentrations of the chemical in the soil pore water. Wastes within the 200 East Aggregate Area that can be considered of high ionic strength include any releases from the PUREX and B Plant Aggregate Area tanks, and liquid coating wastes from the REDOX and PUREX pilot process condensates.

- **Waste pH.** The pH of a leachant has a strong effect on inorganic contaminant transport. Acidic leachates tend to increase migration both by increasing the solubility of precipitates and by changing the distribution of charged species in solution. The exact impact of acidic or basic wastes will depend on whether the chemical is normally in cationic, anionic, or neutral form, and the form that it takes at the new pH. Cationic species tend to be more strongly adsorbed to soils than neutral or anionic species. The extent to which addition of acidic leachate will cause a contaminant to migrate will also depend on the buffering or neutralizing capacity of the soil, which is correlated with the calcium carbonate ($CaCO_3$) content of the soil and the extent of reaction of acidic wastes with soil silicates (Price et al. 1979). The soils in the Hanford formation generally have carbonate contents in the range of 0.1 to 5%. Higher carbonate contents (20 to 30%) are observed within the Plio-Pleistocene caliche layer. Once a waste liquid has been neutralized, the dissolved constituents may reprecipitate or become readsorbed to the soil.

Observations of pH impacts on waste transport at the Hanford Site include the following:

- Mobilization of plutonium and americium isotopes beneath the 216-Z-1A Tile Field in the 200 West Area by acid liquid waste depended on a combination of pH effects and complexation by organic components of the waste. These processes were implicated in migration of the radionuclides to a depth of 30 m (100 ft) below the bottom of the crib

- Leaching of americium from 216-Z-9 Trench sediments, in the same vicinity, was found to be solubility controlled and correlated to solution pH (Rai et al. 1981).

4.2.2.1.5 Complexation and Cosolvation. Certain materials disposed of within the 200 East Groundwater Aggregate Area are known to form complexes with inorganic ions, which can enhance the solubility and mobility of the inorganic species. Tributyl phosphate, dibutyl phosphate, EDTA and HEDTA are the primary organic complexing agents disposed of in the 200 East Area. However, these compounds were not analyzed for or not detected (tributyl phosphate) in groundwater in the 200 East Area.

Cyanide ions can form complexes with many metal cations, but formation of such complexes reduces the mobility of cyanide compounds compared to the mobility of the free ion, but commonly increases the mobility of the metal.

The presence in leachate of high levels of water-miscible organic solvents can mobilize strongly sorbed organic compounds by the process of cosolvation, and may also impact mobility of inorganic contaminants. Laboratory studies cited by Price et al. (1979) indicate that the presence of organic wastes reduced sorption of ^{239}Pu to Hanford Site soils. Although water-miscible solvents such as acetone were detected in 200 East Area groundwater at relatively low (ppb) levels, there is no indication that sufficient volumes were disposed of in waste management units to lead to significant cosolvent effects.

4.2.2.1.6 Contaminant Loss Mechanisms. Processes that can lead to loss of chemicals from soils and thus decrease the amount of chemical available for leaching to groundwater include the following:

- **Radioactive Decay.** Radioactivity of radionuclides decays over time and generally decreases the quantities and impacts from radioactive isotopes. However, for some radioactive decay chains, in-growth of daughter products can temporarily lead to a net increase in radioactive emissions over time.

- **Biotransformation.** Microorganisms in the soil may degrade organic chemicals such as acetone and inorganic chemicals such as nitrate.

- **Chemical Transformation.** Hydrolysis, oxidation, reduction, radiolytic degradation, and other chemical reactions are possible degradation mechanisms for contaminants.

- **Vegetative Uptake.** Vegetation may remove chemicals from the soil, bring them to the surface, and at the same time thereby introduce them to the food web.

- **Volatilization.** Organic chemicals and volatile radionuclides can partition into the soil vapor phase. Some elements (mainly fission products such as iodine, ruthenium, cerium, and antimony) are referred to as "semivolatiles" because they have a lesser tendency to volatilize.

4.2.2.2 Transport in Groundwater. The primary mode of contaminant migration in the 200 East Area groundwater is advective transport of dissolved chemicals. Other processes that could lead to migration of contaminants in groundwater include transport of suspended particulates, diffusion, density-driven flow of high-salt liquids (e.g., perhaps from the BY cribs), and bulk flow of dense nonaqueous phase liquids (DNAPLs). The presence of fine-grained silt layers in the unsaturated zone will generally prevent particulates larger than the colloid size range from reaching groundwater. In low hydraulic conductivity materials (e.g., clays) diffusion may be a significant transport mechanism.

The transport of dissolved contaminants in the saturated zone is affected by the groundwater flow rates and flow paths, retardation of contaminants, and contaminant loss mechanisms. The impact of each of these factors is discussed below.

4.2.2.2.1 Hydrologic Factors. Local and regional flow patterns at the 200 East Area and Hanford Site are described in Section 3.5. Based on this information and the plume distributions described in Section 4.1, the primary directions of transport from most of the 200 East Area are east to southeast, toward the Columbia River and north, through Gable Gap. Artificial recharge from disposal of liquid wastes and reactor cooling waters has led to mounding of groundwater beneath the 200 Areas. The effect of the mounding is that a greater fraction of the groundwater flow from the northern part of the 200 East Area is diverted northward toward Gable Gap.

Variations in horizontal hydraulic conductivity across the Hanford Site impact the travel time of contaminants to offsite receptors. As discussed in Section 3.5, the uppermost aquifer in the 200 East Area lies partially within the more permeable Hanford formation while in the 200 West Area, the uppermost aquifer lies within the generally less permeable Ringold Formation, Thus, the rate of contaminant transport is generally faster in the 200 East Area

than in the 200 West Area (Freshley and Graham 1988). The zone of higher permeability strata which crosses the 200 East Area from northwest to southeast appears to act as a preferential flow path for contaminant transport. As discussed in Section 4.1, this flow pattern can be discerned in the contours of the tritium plume which extends in a southwestern direction from the 200 East Area.

The potential for transport of contaminants from the uppermost aquifer to migrate to the confined aquifer and the regional basalt aquifer depends on the existence of downward vertical gradients. As discussed in Section 3.5, hydrologic studies suggest that downward gradients are present in some areas of the Hanford Site due to groundwater mounding beneath wastewater disposal facilities. Vertical gradients are downward to negligible across the 200 East Area; thus, some downward transport of mobile dissolved constituents is likely. Certain highly mobile contaminants have been detected in wells screened within the confined aquifer (e.g., tritium, uranium, technetium).

4.2.2.2.2 Retardation in Groundwater. Mechanisms leading to retardation of contaminants on aquifer solid materials are generally the same as those occurring in the unsaturated zone, which are described in Section 4.2.2.1.4. Physical/chemical mechanisms causing a contaminant to be retarded in its migration relative to the groundwater include adsorption, ion exchange, precipitation, and chemical reaction with aquifer solids.

The geochemical environment of the saturated zone may differ from that of the vadose zone particularly in terms of its redox potential, pH, and soil-water ionic composition. In addition, introduction of concentrated waste solutions into the saturated zone may alter significantly the rate of transport of contaminants compared to their behavior in dilute solutions. Potential impacts of concentrated wastes on contaminant mobility include the following:

- Bacterial metabolism of waste materials that can act as substrates for microbial growth (e.g., biodegradable organic compounds, nitrate, sulfate) can create localized areas of anoxic, low Eh conditions in the groundwater. Some inorganic species (e.g., arsenic, heavy metals) are more mobile under these conditions. Ames and Serne (1991) concluded, however, that the persistence of nitrate in Hanford Site groundwater indicates that biotransformation of nitrate is not a significant process.

- High concentrations of chloride or other ionic species can affect the binding properties of clay surfaces and metal hydroxides, altering the sorption of contaminants to soil materials.

- Anionic contaminants, e.g., chloride (Cl^-) and fluoride (Fl^-), can migrate through clay soils at a velocity greater than the average rate of groundwater movement.

This phenomenon, known as anion exclusion, is due to repulsion between the contaminant anions and negatively charged soil surfaces (Dragun 1988).

- Alteration in groundwater pH due to introduction of acidic or basic wastes into the aquifer can modify contaminant mobility both by affecting the ionic form of the contaminant and by changing the binding characteristics of soil adsorptive surfaces (i.e., metal oxides, clay minerals, and soil organic matter) (Dragun 1988).

4.2.2.2.3 Contaminant Loss Mechanisms. Processes leading to loss of contaminants from groundwater are generally the same as those affecting contaminants in the vadose zone: radioactive, chemical, and biological decay. Contaminant losses from volatilization are expected to occur primarily in near-surface soils, and this loss mechanism is likely to be less important once contaminants reach the water table.

4.2.2.4 Vapor Transport in the Subsurface. Migration of chemical vapors in the unsaturated zone pore spaces was suggested as an important transport pathway for carbon tetrachloride and other volatile organics in the 200 West Area (DOE/RL 1991c). Lateral migration of vapors like carbon tetrachloride vapors above or below the Plio-Pleistocene caliche layer due to density-driven migration and diffusion was proposed as a potential explanation for detection of this chemical at locations distant from known disposal locations. Equilibration of these vapors with infiltrating wastewater or natural recharge can then provide a source of contamination of perched water or groundwater. Due to the slope of the Plio-Pleistocene layer, vapor transport can lead to migration of contaminants in directions opposite to the regional groundwater flow direction (DOE/RL 1991c).

Although numerous volatile organic compounds have been detected sporadically in groundwater in the 200 East Area (see Section 4.1), there is no indication that high concentrations of these chemicals are present in the subsurface. Therefore, the importance of vapor transport in the 200 East Area has not been determined.

4.2.2.5 Transport from Groundwater to Surface Water. The only naturally occurring surface water body in the 200 East Area vicinity is West Lake, a pond near Gable Gap, some distance away from contaminant plumes. Man-made surface water bodies (e.g., ditches and ponds) are present, but these are not in hydraulic contact with the underlying aquifer. Thus, no transport of contaminants from groundwater to these surface waters is anticipated.

Transport of contaminants to surface water bodies outside of the 200 East Groundwater Aggregate Area via groundwater discharge is the primary pathway of potential concern for the 200 East Area. Flow from the unconfined portions of the uppermost aquifer is to the Columbia River, either via springs near the river or by direct flow into the river. As discussed above, groundwater from the 200 East Area may reach the river either to the

north, via Gable Gap, or to the east and southeast. Discharge of water with potential contaminants is also possible from the Rattlesnake Ridge aquifer at discharge points to the Yakima River, and indirectly to the Columbia River via localized upward gradients to the unconfined system. Groundwater flow is discussed in Section 3.5.2.

A number of studies attempt to estimate the time required for contaminants to travel in groundwater from the 200 Areas to the Columbia River. Freshley and Graham (1988) summarize the results of many of these studies as well as the methodology and assumptions used to obtain the estimates. Methods used to derive time of travel estimates include use of plume monitoring data, flow tracer studies, extrapolation of local hydrologic measurements, and groundwater modeling. Based on historical plume configurations of tritium, the most mobile contaminant present in the 200 East Area groundwater, the 30 pCi/L tritium plume reached the river around 1976 to 1979 (Freshley and Graham 1988). Estimates of the time required for tritium from the PUREX cribs to reach the river range from to 13 to 23 years. Time of travel estimates vary due to differing methods used to derive the estimates (i.e., based on monitoring data or flow modeling), the assumed release date, the starting location and the flow path that the contaminant takes to the river. For estimates obtained from modeling, time of travel depends on assumptions incorporated into the model about future hydrologic gradients and recharge conditions.

4.2.3 Conceptual Model

Figure 4-19 presents a graphical summary of the contaminant sources, release mechanisms, and 200 East Area/Hanford Site physical characteristics that could potentially affect the generation, transport, and impact of contaminants in the 200 East Area groundwater on humans and biota (conceptual model).

Sources of potential environmental contamination were summarized in Section 2.0. Some of the major sources of wastes include: stack emissions and drainage, PUREX and REDOX process wastes, critical mass laboratory wastes, analytical laboratory wastes, sanitary waste and sewage, process feed materials, contaminated equipment or waste material that was spilled during transit or disposed of in the burial grounds, and decommissioning debris from Semi-Works.

Contaminants from these and other sources have been disposed of at the PUREX, B Plant and Semi-Works waste management units. The units include ponds, ditches, retention basins, single-shelled tanks, settling tanks, tank farms, trenches, cribs, french drains, reverse wells, diversion boxes, catch tanks, valve pits, septic tanks and drain fields, vaults, WESF Storage Pool, burial grounds, and the various unplanned releases that have occurred within the 200 East Area. Releases from these disposal activities and resulting contamination of the aquifer beneath the 200 East Area are described in Sections 2.0 and 4.1.

The focus of the 200 East Area groundwater conceptual model is on the migration of contaminants from the waste management units and unplanned releases to groundwater, transport within the groundwater, and transport from groundwater to surface water. Other release mechanisms that may have transported contamination to potentially affected surface media are addressed in the source area AAMSRs.

Many waste management units discharge their waste effluents directly to the near surface (vadose zone) soils. The trenches are potential release points via leaching or drainage of the liquid portion of the disposed materials. The cribs provide seepage discharge and similarly the french drains, reverse wells, and septic system drain fields directly inject their effluents into the subsurface sediments. The unplanned releases have mainly impacted surface soils, with the exception of tank leaks, which generally release wastes to the shallow subsurface.

The primary mechanism of vertical contaminant migration is the downward movement of water from the surface through the vadose zone to the unconfined aquifer. The contaminants generally move as a dissolved phase in the water, and their rate of migration is controlled both by water movement rates and by adsorption and desorption reactions involving the surrounding sediments. Other transport pathways that may be significant are vapor transport (for volatile organics) and diffusion (for fine-grained soils). Some contaminants are strongly sorbed on sediments and their downward movement through the stratigraphic column is greatly retarded. Significant lateral migration of contaminants is restricted to perched water zones and to the unconfined aquifer, where water is moving laterally. Again adsorption and desorption reactions may greatly retard lateral contaminant migration. Contaminants that were introduced to the soil column outside of the aggregate area may migrate into the area in the aquifer through advection by groundwater flow. As another potential mechanism of vertical contaminant migration, bad well seals may promote downward movement of chemical constituents within the uppermost aquifer and between the uppermost and Rattlesnake Ridge aquifers. Contamination promoted by suspected bad well seals is discussed in Section 4.1.1.

Once contaminants reach the uppermost unconfined aquifer, their primary mode of continued migration is by advective transport as dissolved chemicals. If sufficient volumes of nonmiscible organic solvents are present, they may migrate via bulk flow either above or below the water table; however, there is no indication that such separate phase organic layers are present in 200 East Area groundwater.

Humans (offsite and onsite) and other biota (plants and animals) can be exposed to groundwater contaminants as a result of withdrawal and use of contaminated groundwater obtained from wells, or as a result of withdrawal and use of surface water that has been contaminated by groundwater migration and discharge to surface water. There are four

general routes by which direct or indirect exposure to contaminants in groundwater can occur at a waste site:

- Inhalation of airborne volatiles or fugitive dusts from surface soils contaminated through irrigation with ground or surface water, or from contaminated potable water or surface water, or from sediments contaminated by groundwater migration

- Ingestion of water, fugitive dust, surface soils, agricultural products, or other biota (either directly or through the food chain)

- Direct contact with waterborne contaminants or contaminated surface soils

- External exposure from radionuclides in water, surface soils, or fugitive dusts.

4.2.4 Characteristics of Contaminants

Table 4-6 is a list of radioactive and nonradioactive chemical substances that represent candidate contaminants of potential concern for the 200 East Groundwater Aggregate Area. Chemicals on this list were identified from the following sources:

- Chemicals detected in groundwater within the 200 East Groundwater Aggregate Area, as reported in Connelly et al. (1992a) and the Westinghouse Hanford groundwater data base.

- Chemicals reported in waste disposal inventories for those PUREX, B Plant and Semi-Works Aggregate Area waste management units which were determined to be potential sources of release to groundwater, based on release volume and soil pore water capacity.

- Chemicals reported in the TRAC inventory system for those single-shell tanks that were determined to be confirmed or assumed leakers based on evaluation of gamma logs or other data.

This table also includes daughters of long-lived parent radionuclides, whether or not the daughter species have been detected or reported.

Given the large number of candidate chemicals of concern identified from the above sources, it is appropriate to focus this assessment on those contaminants that pose the greatest risk to human health or the environment. Table 4-7 lists the contaminants of concern for the

200 East Groundwater Aggregate Area. This list was developed from Table 4-6 and includes only those contaminants which meet the following criteria:

- Radionuclides with a half-life greater than one year

- Radionuclides with a half-life of less than one year and are part of a long-lived decay chain that would result in the building up of the short-lived radionuclide activity to a level of 1% or greater of the parent radionuclide's activity within the time period of interest

- Chemicals that are known or suspected chemical carcinogens or that have a U.S. Environmental Protection Agency (EPA) noncarcinogenic toxicity factor. In addition, chemicals with known chronic toxicity but no toxicity factors are included. These chemicals include:

  - Dibutyl phosphate
  - Lead
  - Tributyl phosphate
  - Uranium.

The following characteristics will be discussed for the contaminants listed in Table 4-6:

- Detection of contaminants in environmental media
- Historical association with plant activities
- Mobility
- Persistence
- Toxicity
- Bioaccumulation.

9 3 1 2 9 7 1 4 3

4.2.4.1 Detection of Contaminants in Environmental Media. Chemicals detected in groundwater samples collected from 200 East Area monitoring wells between 1988 and 1992 are summarized in Table 4-1. A list of chemicals that were analyzed for but not detected in these wells is provided in Table A-3 of Appendix A. It should be noted that groundwater is routinely tested for only a limited number of radionuclides; this limitation is discussed as a data gap in Section 8.0.

4.2.4.2 Historical Association with Source Area Activities. Potential sources of contamination to the 200 East Area groundwater were identified in Section 2.0, including waste management units used for disposal of liquid waste (cribs, trenches, tile fields, french drains, septic fields, reverse wells), leaking tanks, and other unplanned releases. Chemicals that were known or suspected components of the waste streams entering these units are

potential groundwater contaminants. Known or suspected constituents of the waste streams were identified in the PUREX, B Plant, Semi-Works, and 200 North AAMSRs based on waste inventories and process information. Waste inventories are summarized in Tables 2-5 and 2-6 for those waste management units that are considered likely to have impacted groundwater, based on the volume of liquid waste released to the subsurface. Constituents of single-shell tanks that are assumed or suspected leakers and thus are potential contributors to groundwater contamination are summarized in Tables 2-2, 2-3, and 2-4.

It should be noted that the WIDS system does not report all TRU elements and fission products that are likely to occur in radioactive waste streams within the 200 East Area. Thus, it is likely that additional radionuclides were disposed to 200 East Groundwater Aggregate Areas that are not included in the waste inventories. Additionally, only those nonradioactive chemicals that were present in large quantities in the waste were reported (e.g., nitrates, carbon tetrachloride).

Nonradioactive chemicals reportedly released into the 200 East Groundwater Aggregate Area waste management units in large volumes include nitric acid, various metallic nitrates, sodium aluminate, sodium nitrate, kerosene, tributyl phosphate, sodium, ammonium nitrate, sulfates, and ammonium carbonate.

4.2.4.3 Mobility. Since most wastes within the 200 East Groundwater Aggregate Area were released directly to subsurface soils via injection, infiltration, or burial, the mobility of wastes in the subsurface will determine the potential for future exposures. The mobility in the subsurface of the chemicals listed in Table 4-6 varies widely and depends on site-specific factors as well as the intrinsic properties of the chemical. Much of the site-specific information needed to characterize mobility is not available and must be obtained during the RI/FS process. However, it is possible to make general statements about the relative mobility of the candidate chemicals of concern.

The mobility of radionuclides and other inorganic elements in groundwater depends on the chemical form and charge of the element or molecule, which in turn depends on site-related factors such as the pH, redox state, and ionic composition of the groundwater and soil. Cationic species (e.g., Cd^{2+}, Pu^{4+}) generally are retarded in their migration relative to groundwater to a greater extent than anionic species such as nitrate (NO3-). The presence in groundwater of complexing or chelating agents can increase the mobility of metals by forming neutral or negatively charged compounds.

The chemical properties of radionuclides are essentially identical to the nonradioactive form of the element; thus, discussions of the chemical properties affecting the transport of contaminants can apply to both radionuclides and nonradioactive chemicals.

A soil-water distribution coefficient (K_d) can be used to predict mobility of inorganic chemicals in the subsurface. Table 4-8 summarizes soil-water distribution coefficients that have been developed for many of the candidate inorganic chemicals of concern. As discussed above, the pH and ionic strength of the leaching medium have an impact on the adsorption of inorganics to soil; thus, the listed K_ds are valid only for a limited range of pH and waste composition. In addition, soil sorption of inorganics is highly dependent on the mineral composition of the soil, the ionic composition of the soil pore water, and other site-specific factors. Thus, a high degree of uncertainty is involved with use of K_ds that have not been verified by experimentation with site soils.

Serne and Wood (1990) recommended K_d values for use with Hanford waste assessments for a limited number of important radionuclides (Am, Cs, Co, Cu, I, Pu, Ru, Sr, and tritium) based on soil column or batch desorption studies, and proposed conservative average values for a more extensive list of elements based on a review of the literature. A K_d of <1 is recommended for Am, Cs, Pu, and Sr under acidic conditions. A more recent literature review was performed by Cantrell and Serne (1992) for use in the 200-BP-1 Operable Unit investigation at the Hanford Site. Probable K_d values and ranges of K_d values cited by Cantrell and Serne for ambient conditions at the Hanford Site are shown in the first and second columns of Table 4-8, respectively. Where no value was cited by Cantrell and Serne, conservative default values cited by Serne and Wood (1990) are shown in brackets.

Strenge and Peterson (1989) developed default K_d values for a large number of elements for use in the Multimedia Environmental Pollution Assessment System (MEPAS), a computerized waste management unit evaluation system. The K_d values were based on findings in the scientific literature, and include nonsite-specific as well as Hanford Site values. Values are provided for nine sets of environmental conditions: three ranges of waste pH and three ranges of soil adsorbent material (sum of percent clay, organic material, and metal hydrous oxides). The values presented in Table 4-8 are for conditions of neutral waste pH and less than 10% adsorbent material, which is likely to be most representative of Hanford Site soils. The probable K_d values for cesium and cobalt cited in column 3 differ significantly from the MEPAS default values (column 4). In developing the probable values, as well as the ranges present in column 2, the referenced studies examined the range of conditions that would influence K_d. The probable values indicated in column 3 are based on ambient conditions anticipated within the aquifer rather than conditions near the point of release into the vadose zone, which are the basis for the MEPAS default values. Because the evaluations described in this AMMSR address the fate and transport of contaminants present within the aquifer, the probable values cited in column 3 of Table 4-7 (when available) are given precedence over the MEPAS default values.

The mobility of inorganic species in soil can be divided roughly into three mobility classes, using site-specific values (Cantrell and Serne 1992 or Serne and Wood 1990) where available and conservative default values otherwise: highly mobile ($K_d < 5$), moderately

mobile ($5 < K_d < 100$), and low mobility ($K_d > 100$). The mobility classes for the candidate chemicals of concern are as follows:

High Mobility (K_d < 5)

Antimony	Iodine	Silica
Arsenic	Lithium	Sodium
Boron	Neptunium	Sulfate
Carbon (as $^{14}CO_p$)	Nitrate	Technetium
Chloride	Palladium	Thallium
Chromium (VI)	Potassium	Tritium
Cyanide (free ion)	Protactinium	Uranium
Fluoride	Selenium	

Moderate Mobility ($5 < K_d < 100$)

Barium	Copper	Magnesium
Beryllium	Europium	Manganese
Cadmium	Iron	Nickel
Calcium	Lanthanum	Niobium
Cerium	Lead	Phosphate
Polonium	Samarium	Tin
Promethium	Silver	Vanadium
Radium	Strontium	Zinc
Ruthenium	Thorium	Zirconium

Low Mobility (K_d > 100)

Actinium	Cesium	Plutonium
Aluminum	cobalt	Yttrium
Americium	Curium	
Bismuth	Mercury	

Note that the environmental mobility of radionuclides may be determined by the adsorption characteristics of either the parent or daughter species in a decay chain. For example, a contaminant that is itself immobile in the subsurface could be detected at some distance from the source due to its production from a mobile parent species.

The tendency of organic compounds to adsorb to the organic fraction of soils is indicated by the soil organic matter partition coefficient, Koc. Partition coefficients for the candidate organic chemicals of potential concern are listed in Table 4-9. Chemicals with low Koc values are weakly adsorbed by soils and will tend to migrate in the subsurface, although their rate of travel will be retarded somewhat relative to the pore water or groundwater flow. Soils at the Hanford Site have very little organic carbon content and thus sorption to the inorganic fraction of soils may dominate over sorption to soil organic matter. Mobility of organic chemicals in the subsurface can be roughly estimated by the equation:

$$K_d = K_{oc} * f_{oc}$$

where f_{oc} is the organic carbon content of the aquifer solids, which is generally less than 0.1% in Hanford soils.

4.2.4.4 Persistence. Once released to environmental media, the concentration of a chemical may decrease because of biological or chemical transformation, radioactive decay, or the intermediate transfer processes discussed above that remove the chemical from the medium (e.g., volatilization to air). Radiological, chemical, and biological decay processes affecting the persistence of the candidate contaminants of potential concern are discussed below.

The persistence of radionuclides depends primarily on their half-lives. A comparison of the half-lives and specific activities for the candidate radionuclides of potential concern is presented in Table 4-10. The specific activity is the decay rate per unit mass, and is inversely proportional to the half-life of the radionuclide. Half-lives for the radionuclides listed in Table 4-10 range from fractions of a second to over one billion years. Also listed are the decay mechanisms of primary concern for the radionuclide. Note that radionuclides often undergo several decay steps in quick succession, (e.g., an alpha decay followed by release of one or more gamma rays). The daughter products of these decays are often themselves radioactive.

Nonradioactive inorganic chemicals detected at the site are generally persistent in the environment, although they may decline in concentration due to transport processes or change their chemical form due to chemical or biological reactions. Nitrate and sulfate undergo chemical and biological transformations that may lead to their loss to the atmosphere (as N_2 and H_2S) or incorporation into living organisms, depending on the redox environment and microbiological communities present in the medium.

Biotransformation rates for organics vary widely and are highly dependent on site-specific factors such as soil moisture, redox conditions, and the presence of nutrients and of organisms capable of degrading the compound. Ketones, such as acetone and MIBK, are easily degraded by microorganisms in soil and thus would tend not to persist. Chlorinated solvents (e.g., carbon tetrachloride) may undergo slow biotransformation in the subsurface

under appropriate conditions of soil redox state and nutrient availability. Volatile aromatics such as toluene are generally intermediate in their biodegradability between these two example groups.

4.2.4.5 Toxicity. Contaminants may be of potential concern for impacts to human health if they are known or suspected to have carcinogenic properties, or if they have adverse noncarcinogenic human health effects. The toxicity characteristics of the candidate contaminants of potential concern are summarized below.

4.2.4.5.1 Radionuclides. All radionuclides are classified by EPA as known human carcinogens based on their property of emitting ionizing radiation and on the evidence provided by epidemiological studies of radiation-induced cancers in humans. Noncarcinogenic health effects associated with radiation exposure include genetic and teratogenic effects; however, these effects generally occur at higher exposure levels than those required to induce cancer. Thus, the carcinogenic effect of radionuclides is the primary identified health concern for these chemicals.

Risks associated with radionuclides differ for various routes of exposure depending on the type of ionizing radiation emitted. Nuclides that emit alpha or beta particles are hazardous primarily if the materials are inhaled or ingested, since these particles expend their energy within a short distance after penetrating body tissues. Gamma-emitting radioisotopes are of concern as both external and internal hazards. A fourth mode of radioactive decay, neutron emission, is generally not of major health concern, since this mode of decay is much less frequent than other decay processes. In addition to the mode of radioactive decay, the degree of hazard from a particular radionuclide depends on the rate at which particles or gamma radiation are released from the material.

Excess cancer risks for exposure to radionuclides by inhaling air, drinking water, ingesting soil, and by external irradiation are shown in Table 4-11 for the radionuclides of potential concern. The unit risk values represent the increase in probability of cancer to an individual exposed for a lifetime to a radionuclide at a level of 1 pCi/m^3 in air, 1 pCi/L in drinking water, 1 pCi/g in ingested soil, or to external radiation from soil having a radionuclide content of 1 pCi/g.

For those radionuclides without slope factors, the *Hanford Site Baseline Risk Assessment Methodology* (DOE/RL 1991e) proposes to use the dose conversion factors developed by the International Commission on Radiological Protection to calculate a risk value. For those radionuclides without slope factors, the document proposes to consult the EPA Region 10 risk assessment staff or the EPA Office of Radiation Programs to request the development of a slope factor. Any Hanford Site risk assessments will be performed in accordance with the *Hanford Site Baseline Risk Assessment Methodology* document (DOE/RL 1991e) which includes the guidance established in the *Risk Assessment Guidance for*

Superfund (EPA 1989b) and the *EPA Region 10 Supplemental Risk Assessment Guidance for Superfund* (EPA 1991).

The unit risk factors for different radionuclides are roughly proportional to their specific activities, but also incorporate factors to account for distribution of each radionuclide within various body organs, the type of radiation emitted, and the length of time that the nuclide is retained in the organs.

Based on the factors listed in Table 4-11 the highest risk for ingestion of water containing 1 pCi/L of a radionuclide is from the transuranic isotopes ^{238}Pu, ^{239}Pu, ^{240}Pu, ^{241}Am, ^{243}Am, and ^{237}Np, and the fission products ^{210}Po, ^{210}Pb, and ^{227}Ac. The highest risk from inhalation of 1 pCi/m^3 in air is from alpha emitters (e.g., ^{238}U, ^{241}Am, ^{238}Pu, ^{227}Ac). The highest risks from ingestion of soil at 1 pCi/g are for ^{227}Ac, ^{241}Am, ^{243}Am, ^{238}Pu, ^{244}Cm, and ^{243}Cm. The highest risk from external exposure to a surface contaminated at 1 pCi/g is from ^{60}Co, ^{137m}Ba (a daughter product of ^{137}Cs), ^{134}Cs, ^{214}Bi, ^{214}Pb, and ^{154}Eu.

The standard EPA risk assessment methodology assumes that the probability of a carcinogenic effect increases linearly with dose at low dose levels, i.e., there is no threshold for carcinogenic response. The EPA methodology also assumes that the combined effect of exposure to multiple carcinogens is additive without regard to target organ or cancer mechanism.

4.2.4.5.2 Hazardous Chemicals. Carcinogenic and noncarcinogenic health effects associated with the candidate chemicals of potential concern are summarized in Table 4-12. EPA has not derived toxicity criteria for many of these chemicals. Many of the chemicals that lack toxicity criteria have negligible toxicity or are necessary nutrients in the human diet. However; several of the chemicals have known toxic effects but no toxicity criterion is presently available. In some instances the criteria have been withdrawn by EPA pending review of the toxicological data and will be reissued at a future date. Chemicals with known chronic toxicity for which toxicity factors are presently not available include the following:

- Lead
- Uranium
- Tributyl phosphate
- Dibutyl phosphate.

4.2.4.6 Bioaccumulation potential. Contaminants may be of concern for exposure if they have a tendency to accumulate in plant or animal tissues at levels higher than those in the surrounding medium (bioaccumulation) or if their levels increase at higher trophic levels in the food chain (biomagnification). Contaminants may be bioaccumulated because of element-specific uptake mechanisms (e.g., incorporation of strontium into bone) or by passive partitioning into body tissue (e.g., concentration of organic chemicals in fatty tissues).

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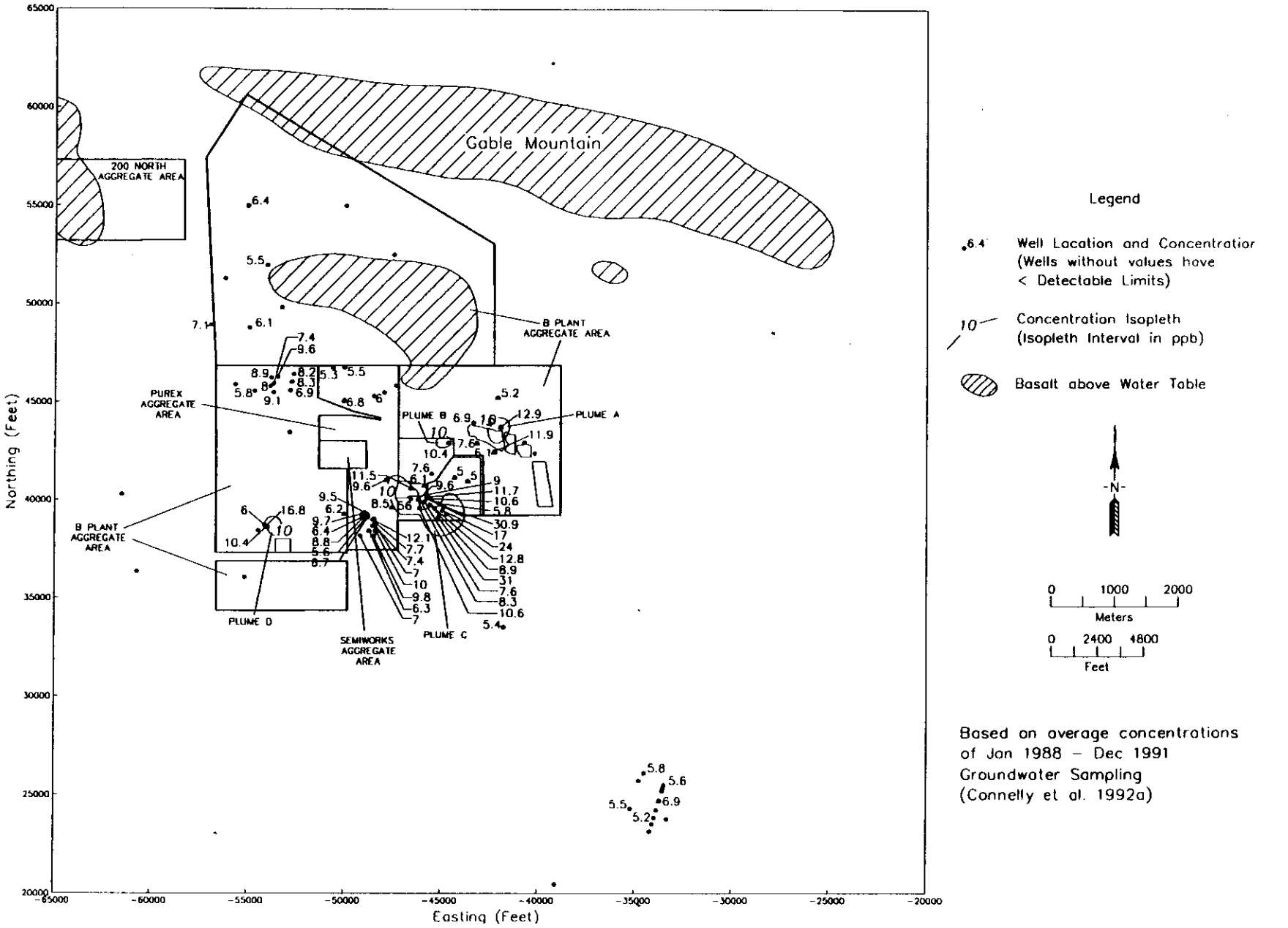

Figure 4-1. Arsenic Groundwater Plume Map.

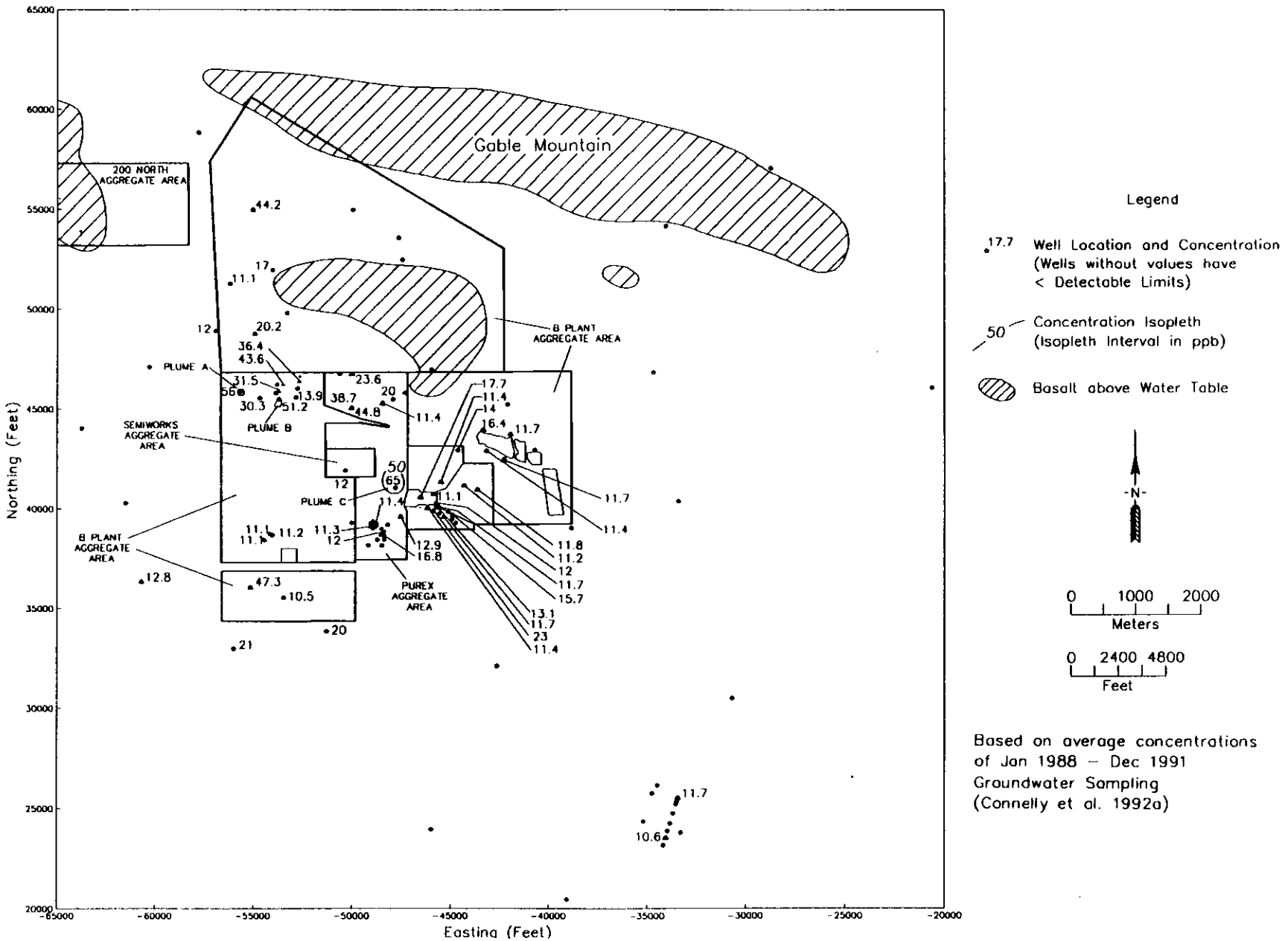

Figure 4-2. Chromium Groundwater Plume Map.

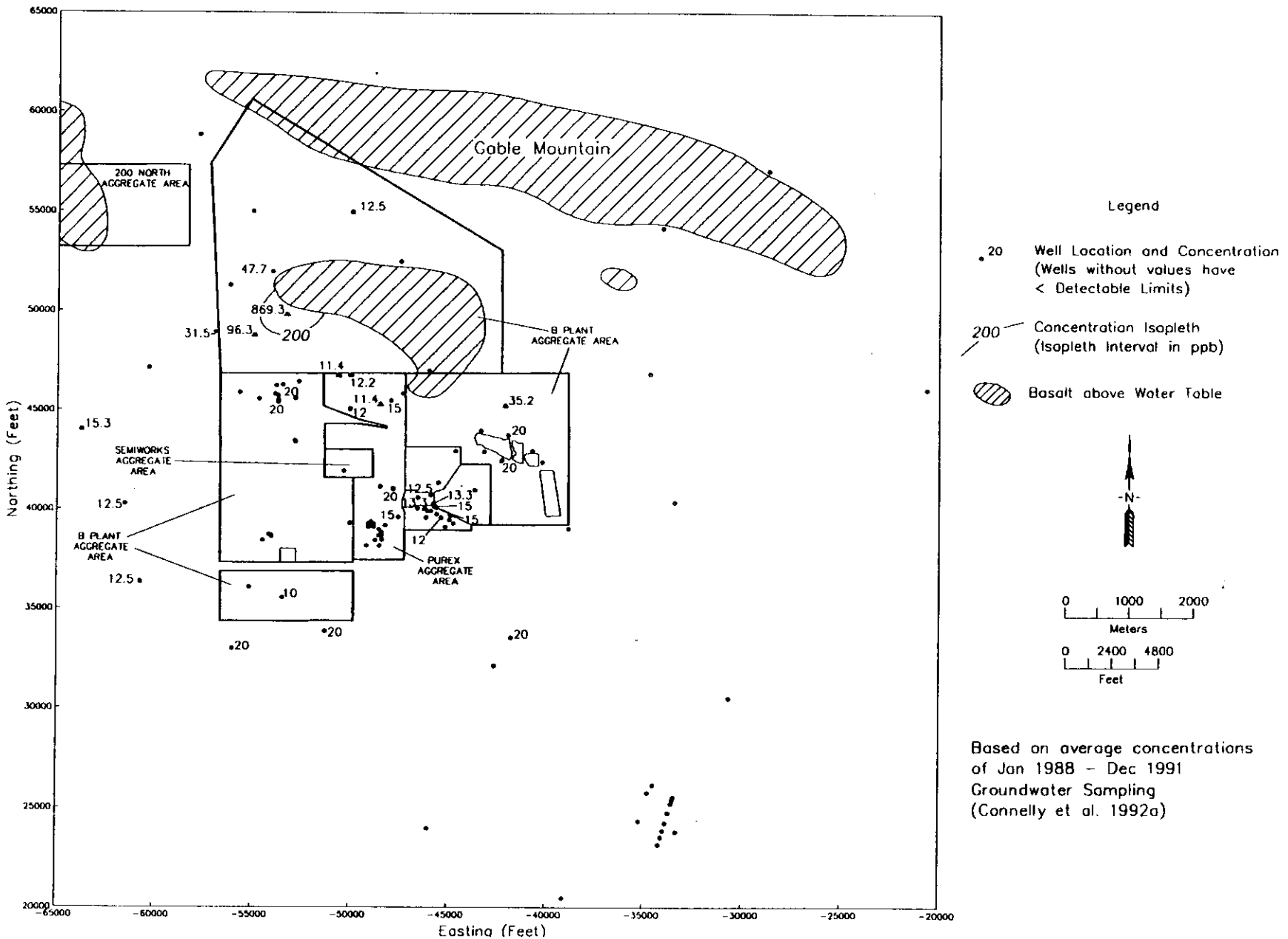

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Figure 4-3. Cyanide Groundwater Plume Map.

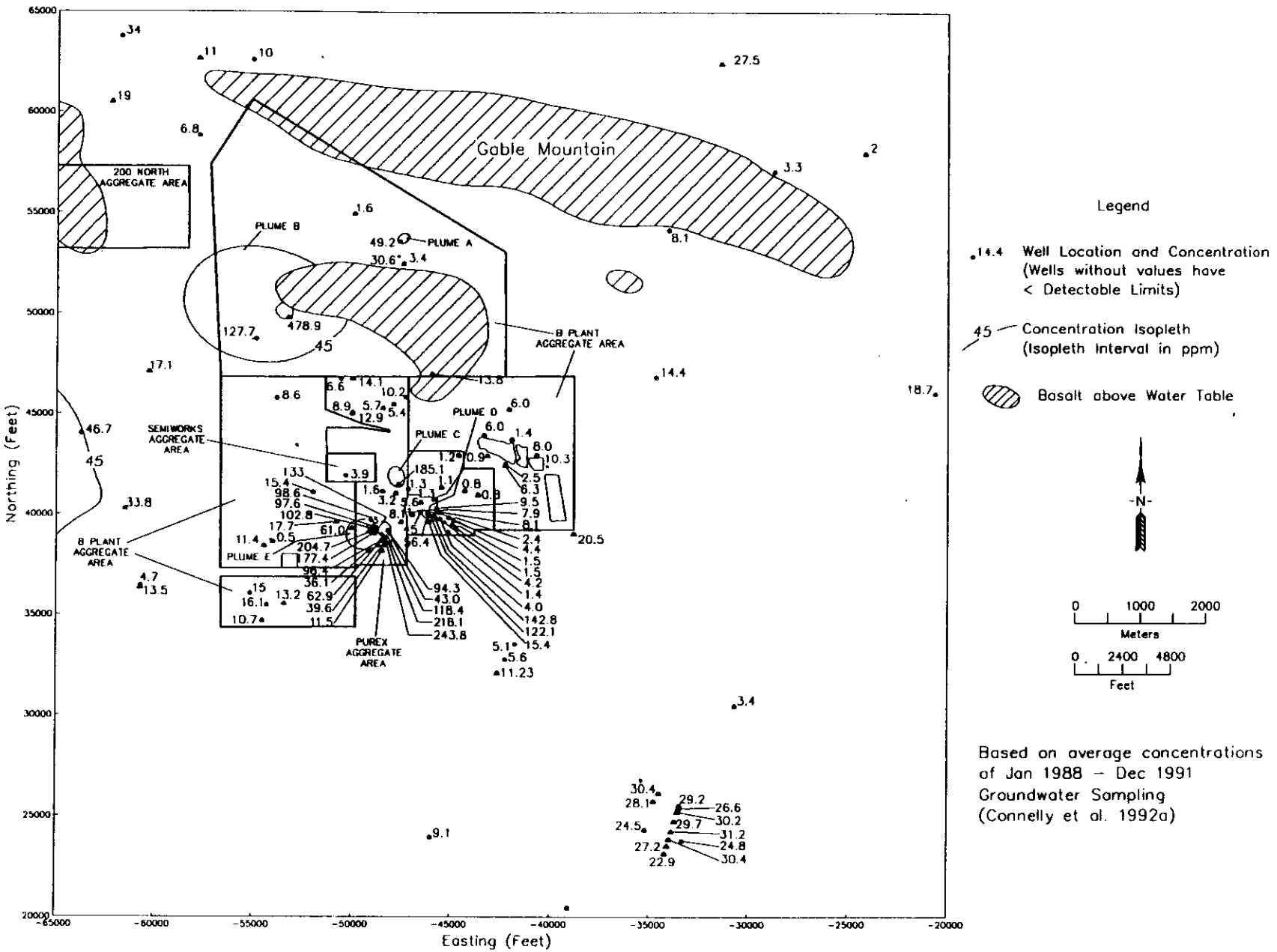

Figure 4-4. Nitrate Groundwater Plume Map.

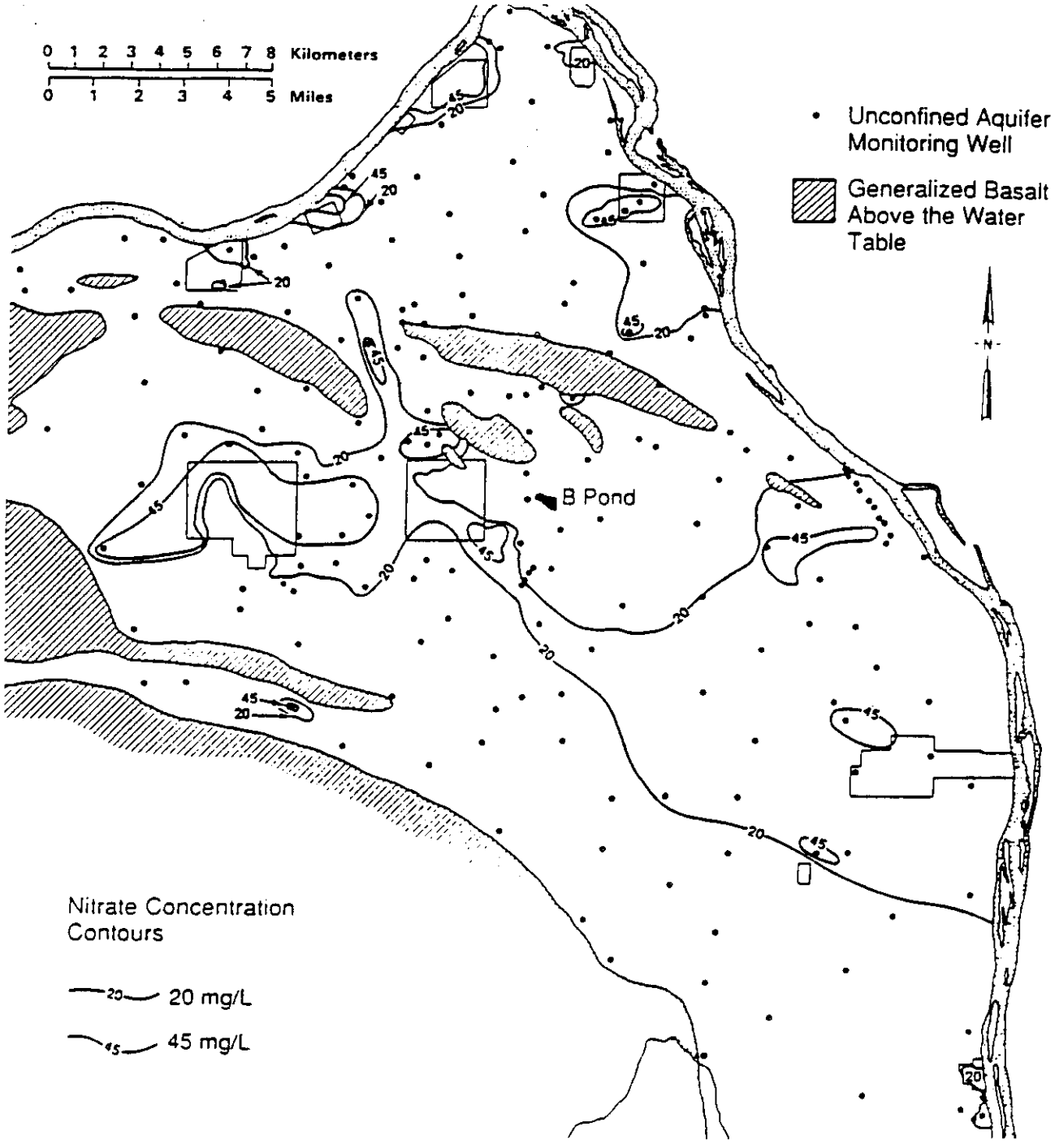

Figure 4-5. Distribution of Nitrate on the Hanford Site for 1989 (Evans et al. 1990).

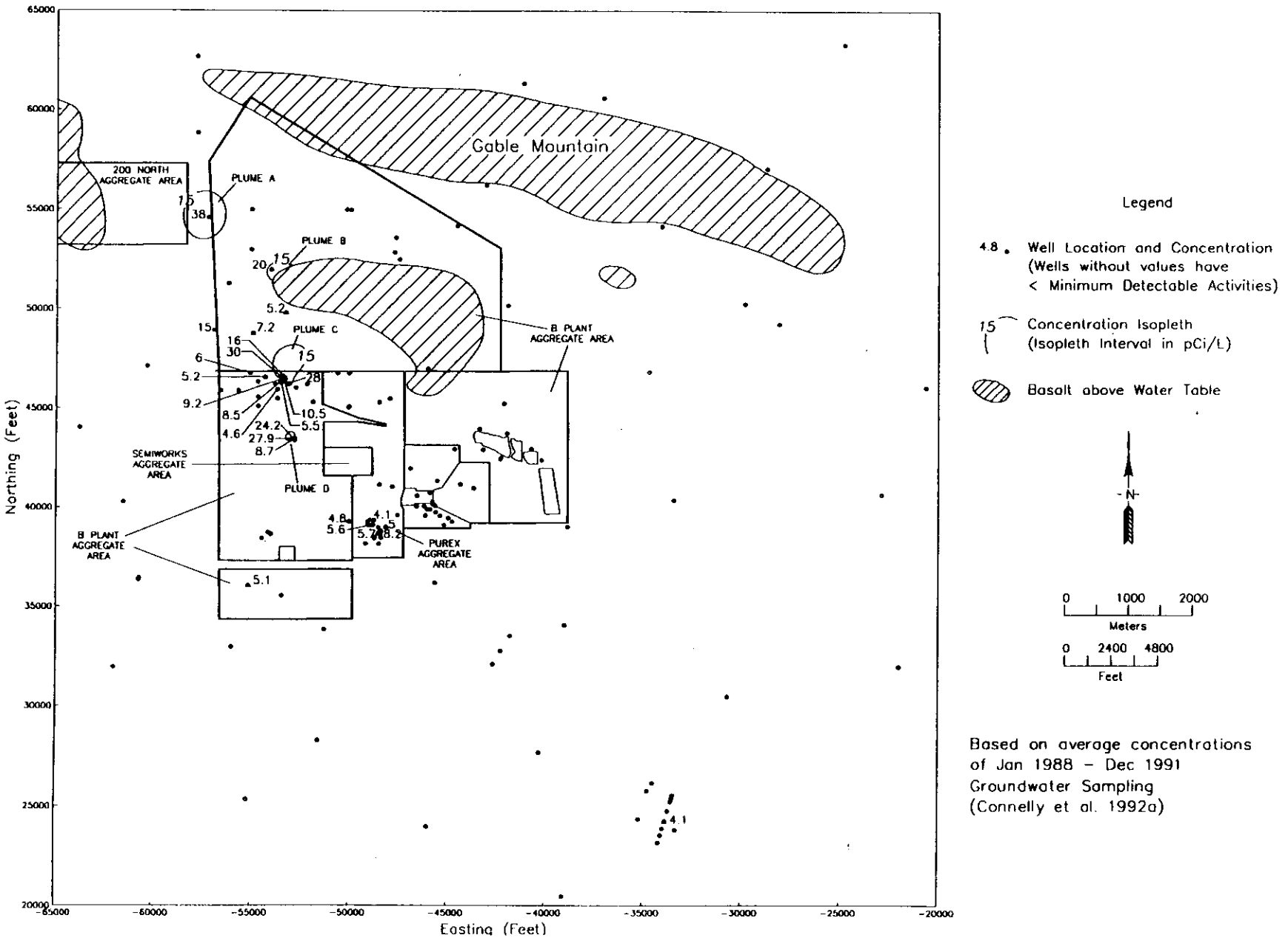

Figure 4-6. Gross Alpha Groundwater Plume Map.

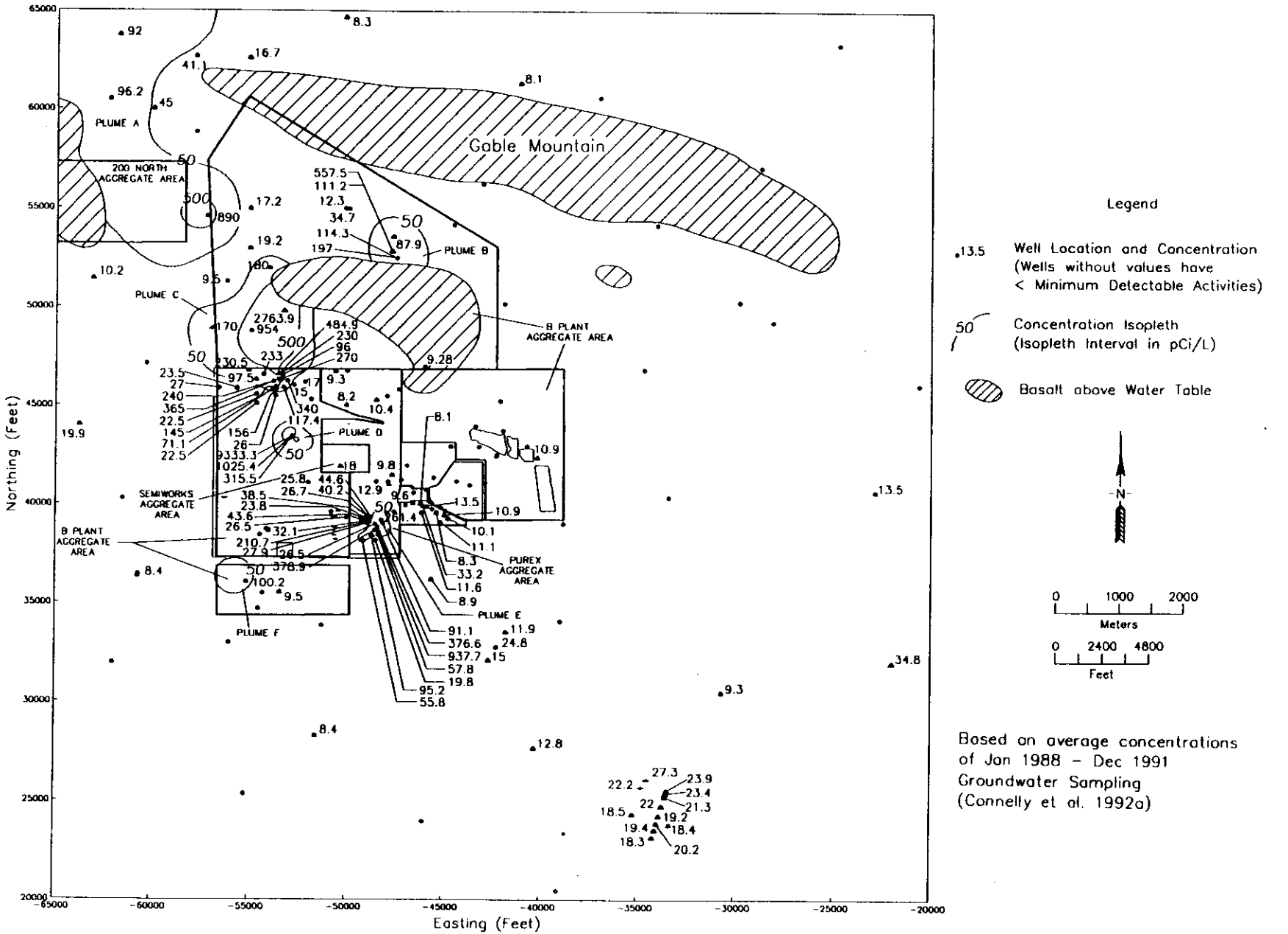

Figure 4-7. Gross Beta Groundwater Plume Map.

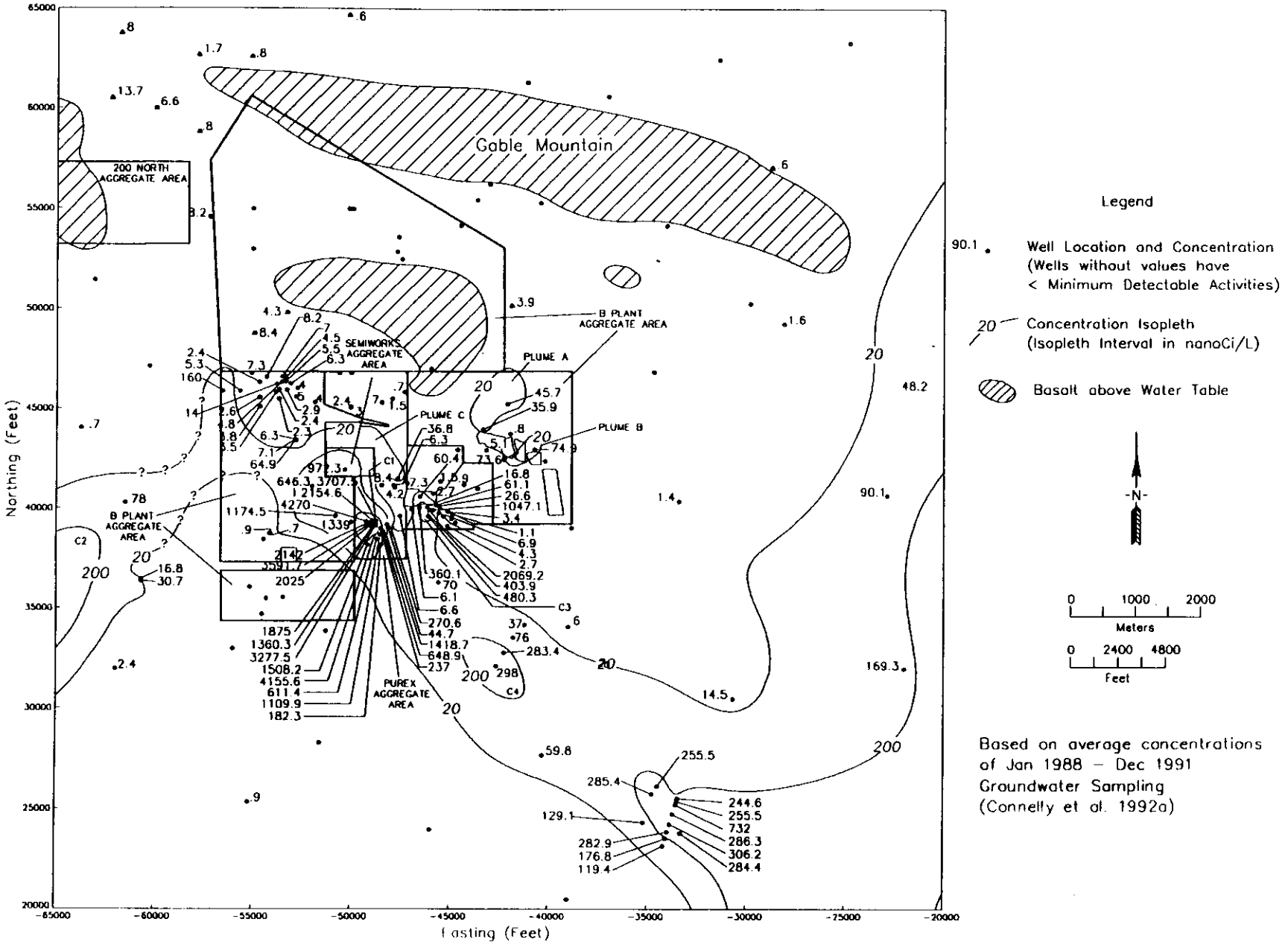

Figure 4-8. Tritium Groundwater Plume Map.

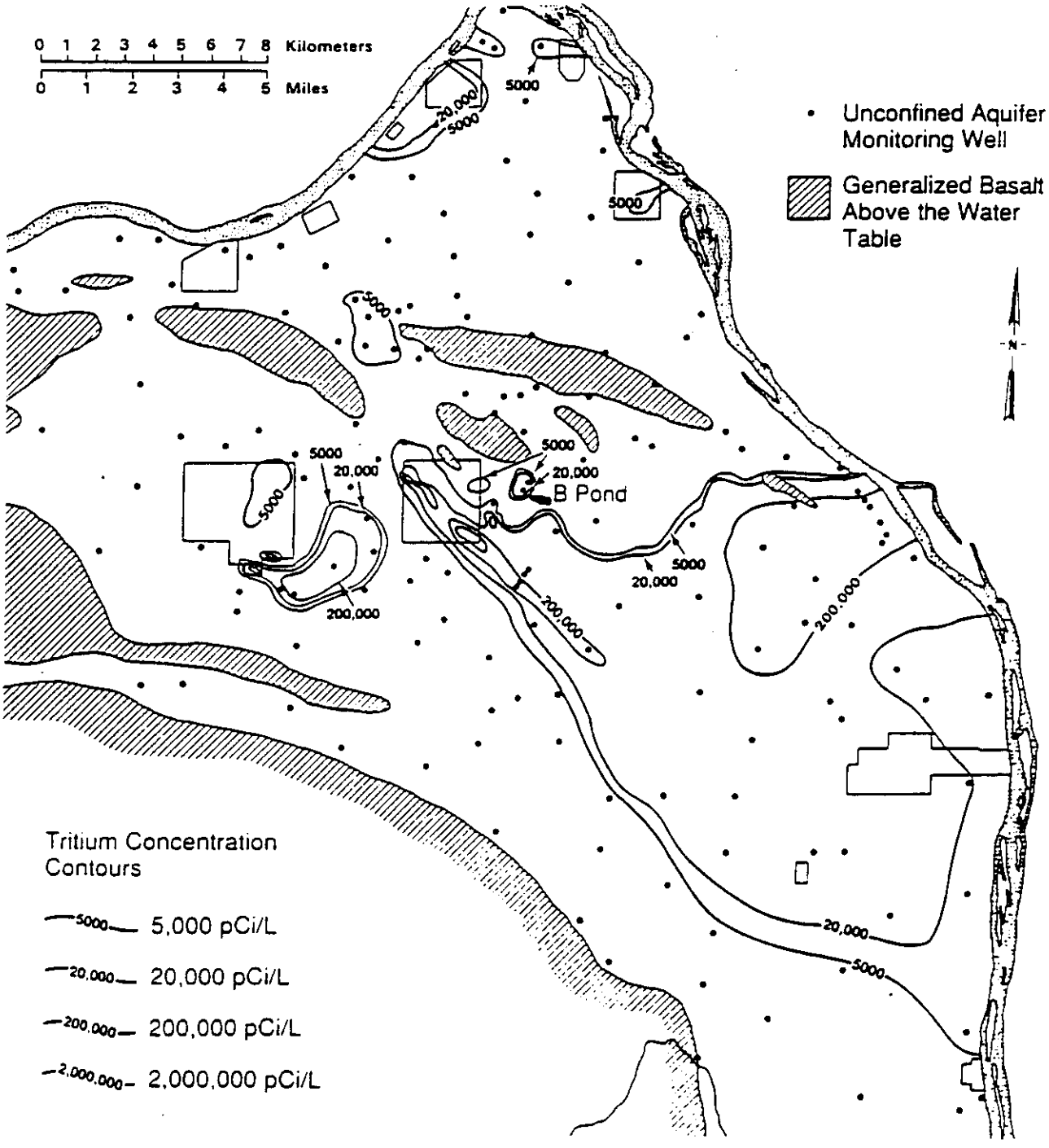

Figure 4-9. Distribution of Tritium on the Hanford Site for 1989 (Evans et al. 1990).

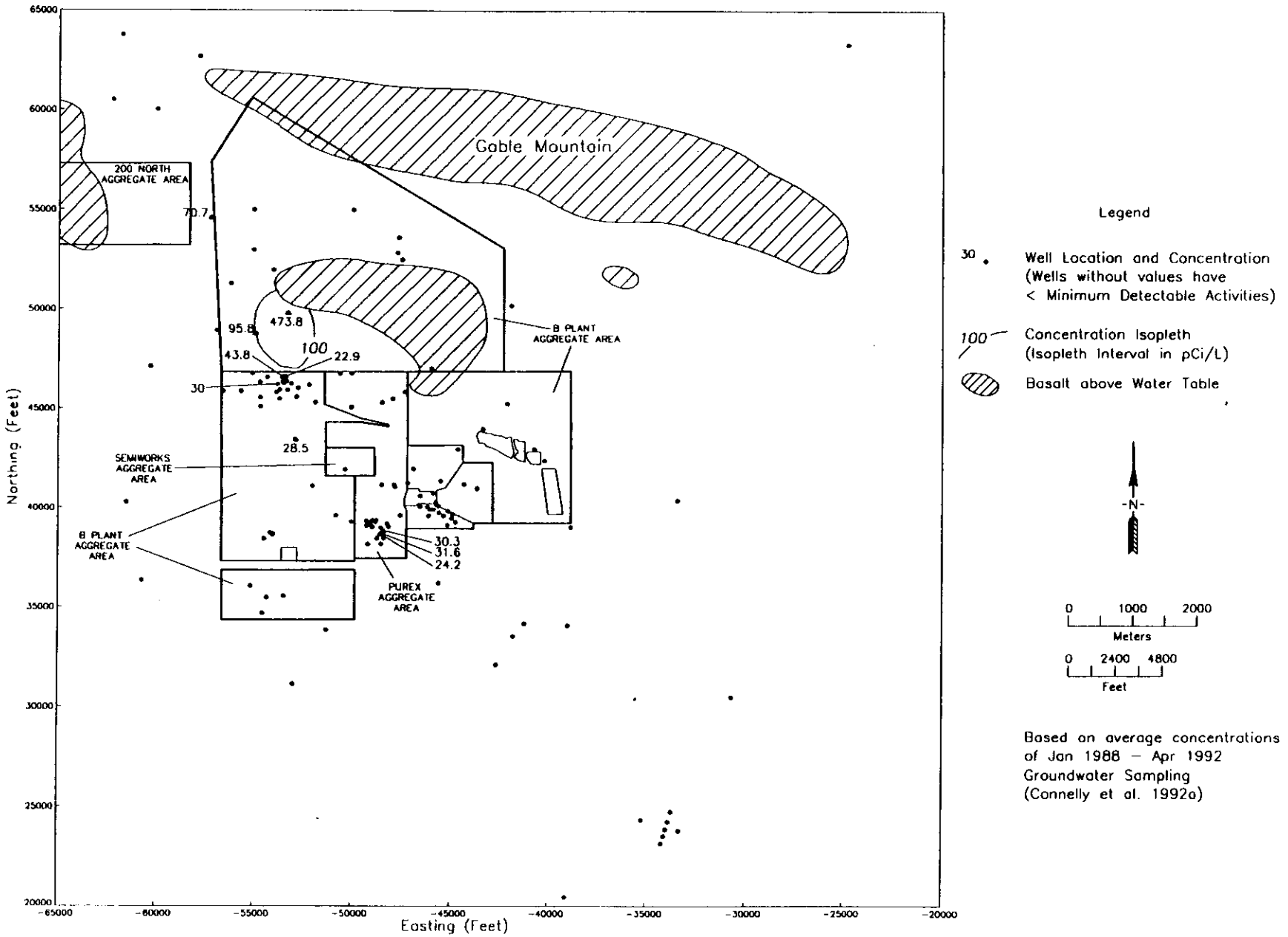

Figure 4-10. Cobalt-60 Groundwater Plume Map.

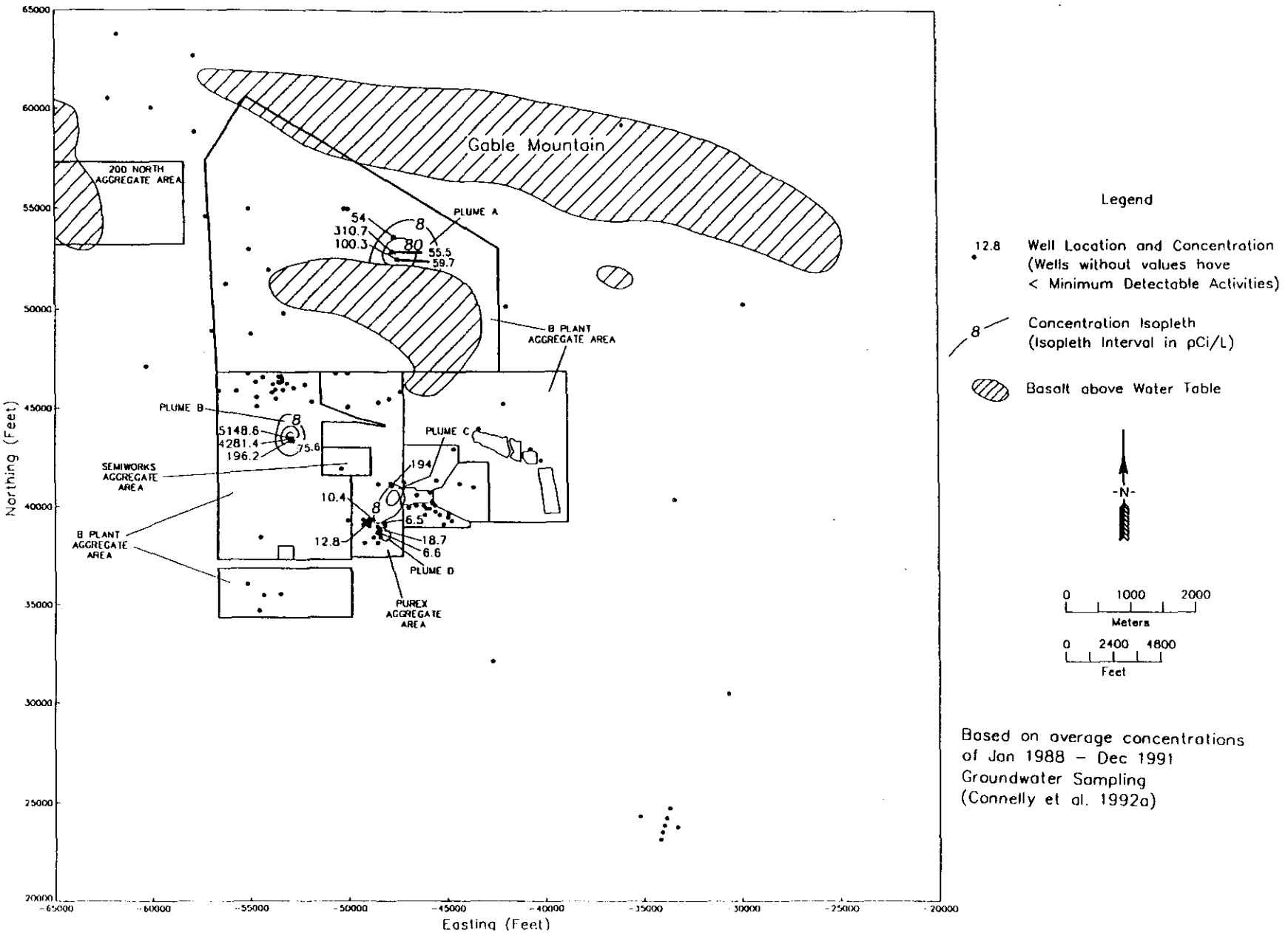

Figure 4-11. Strontium-90 Groundwater Plume Map.

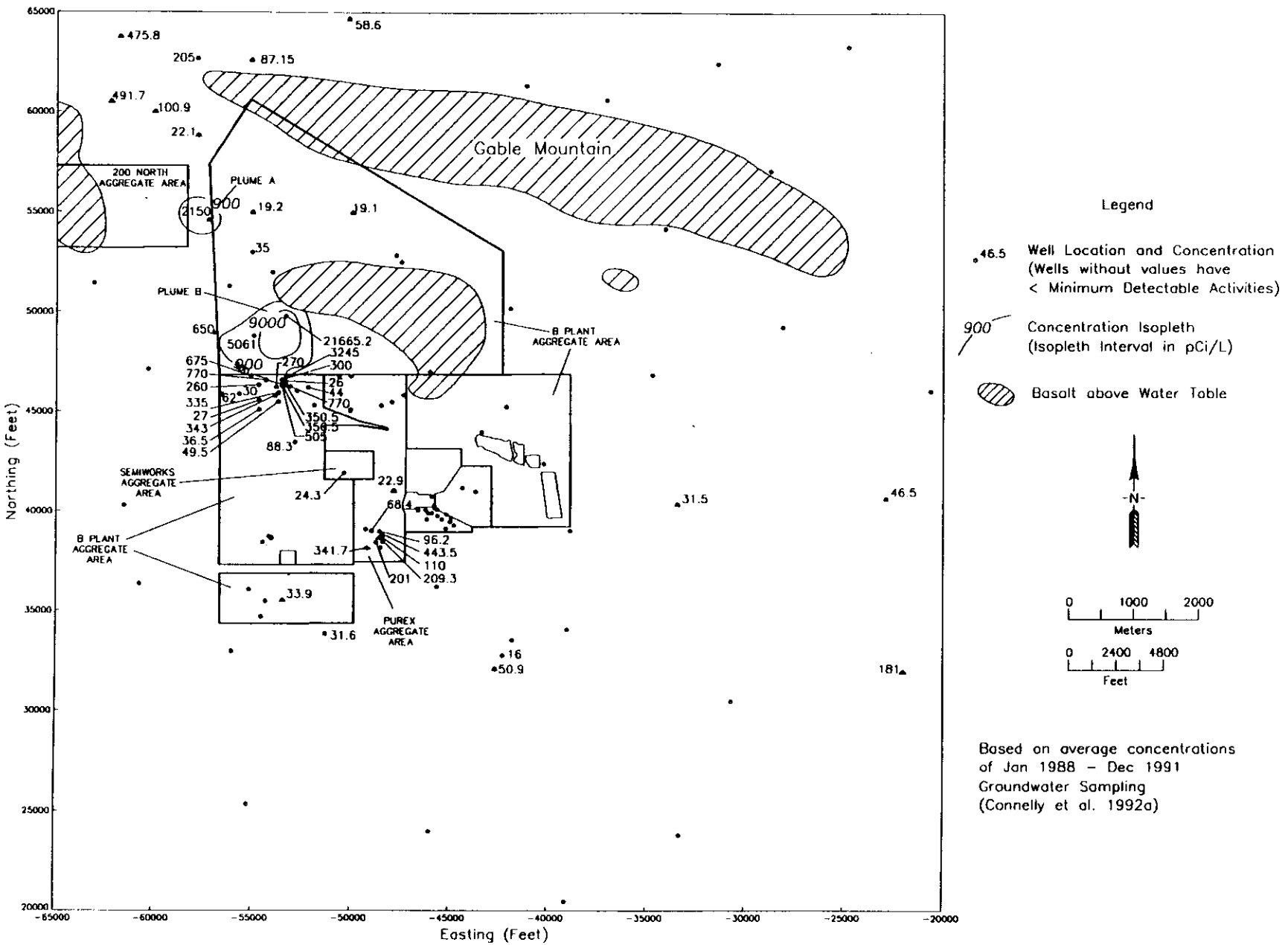

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Figure 4-12. Technetium-99 Groundwater Plume Map.

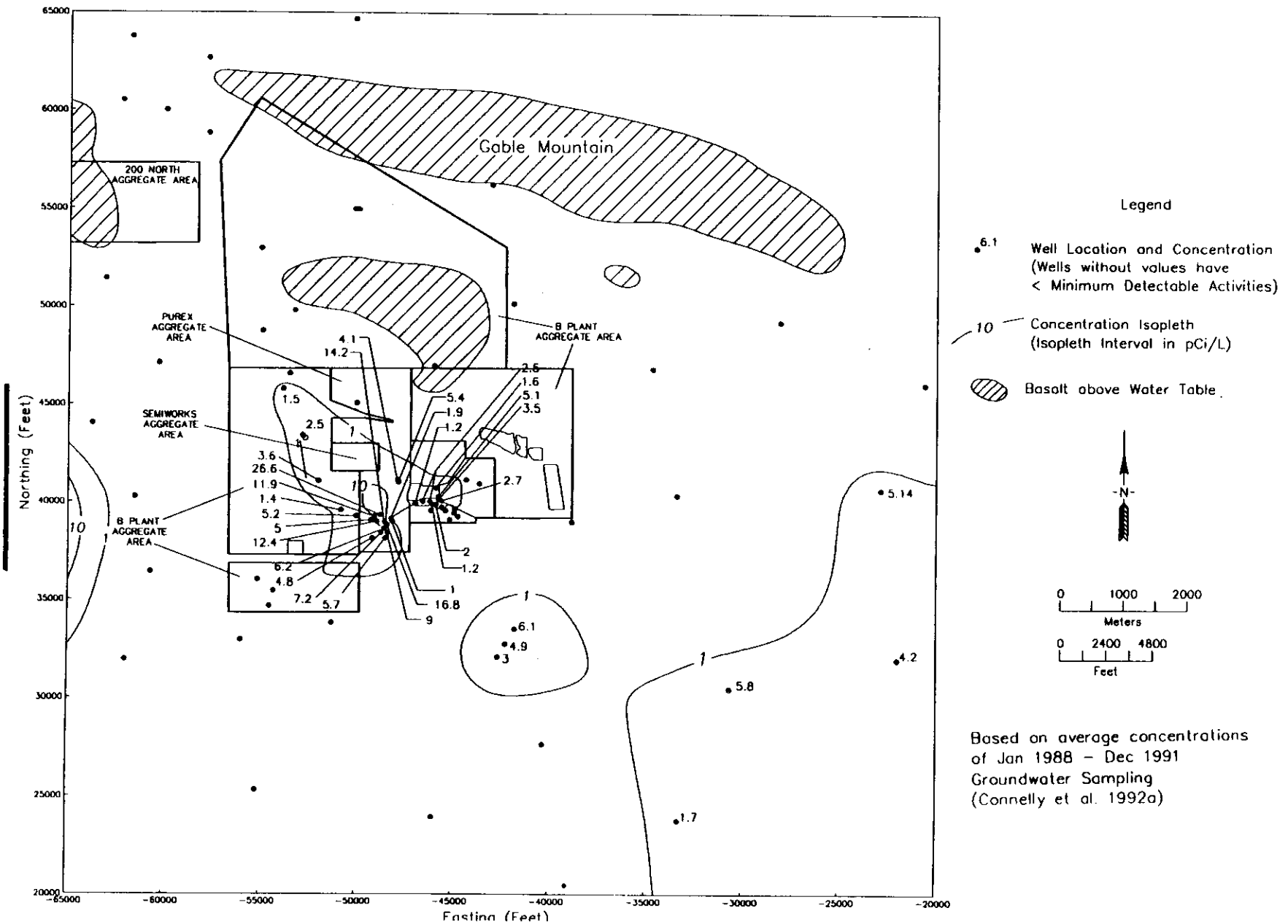

Figure 4-13. Iodine-129 Groundwater Plume Map.

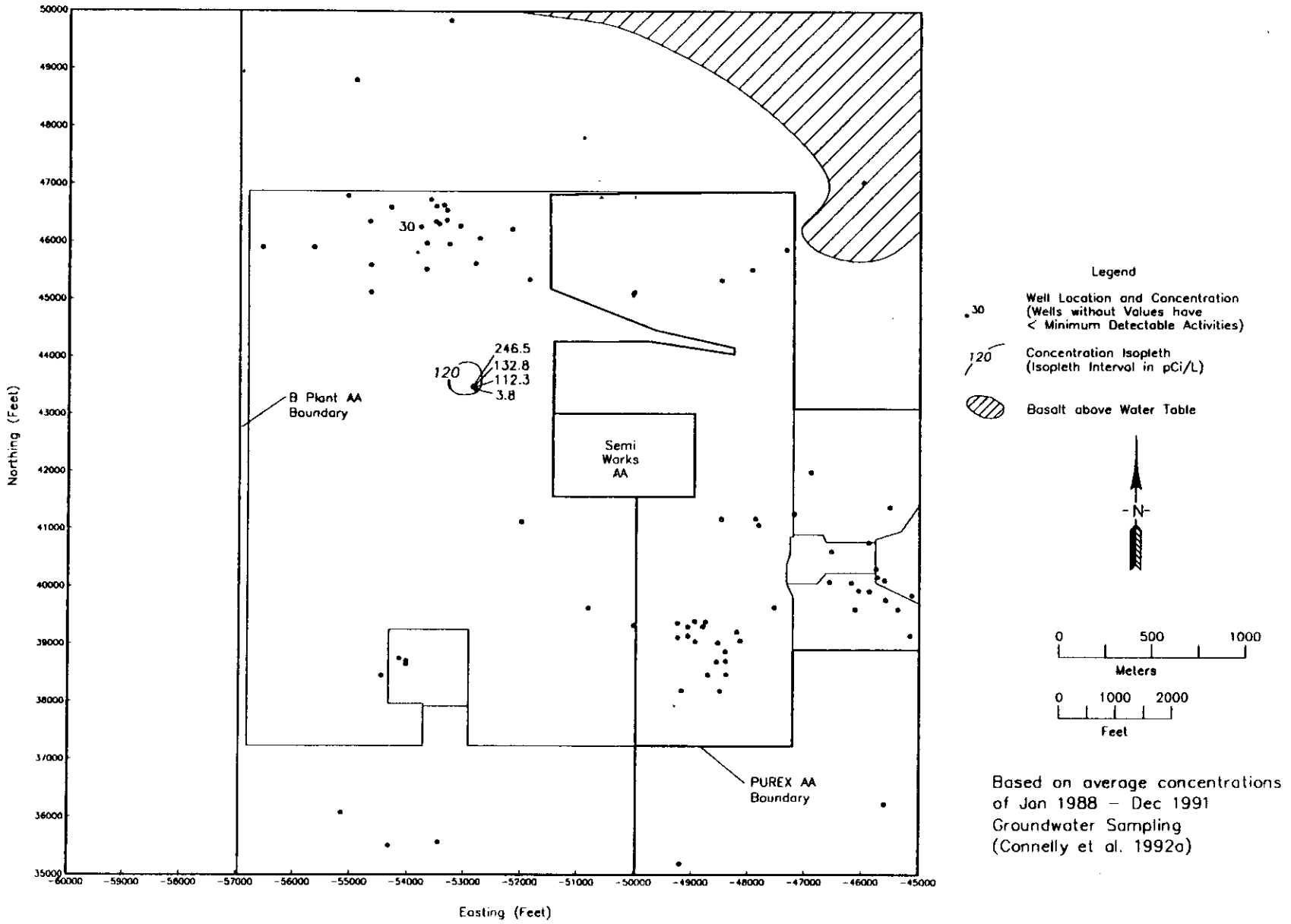

Figure 4-14. Cesium-137 Groundwater Plume Map.

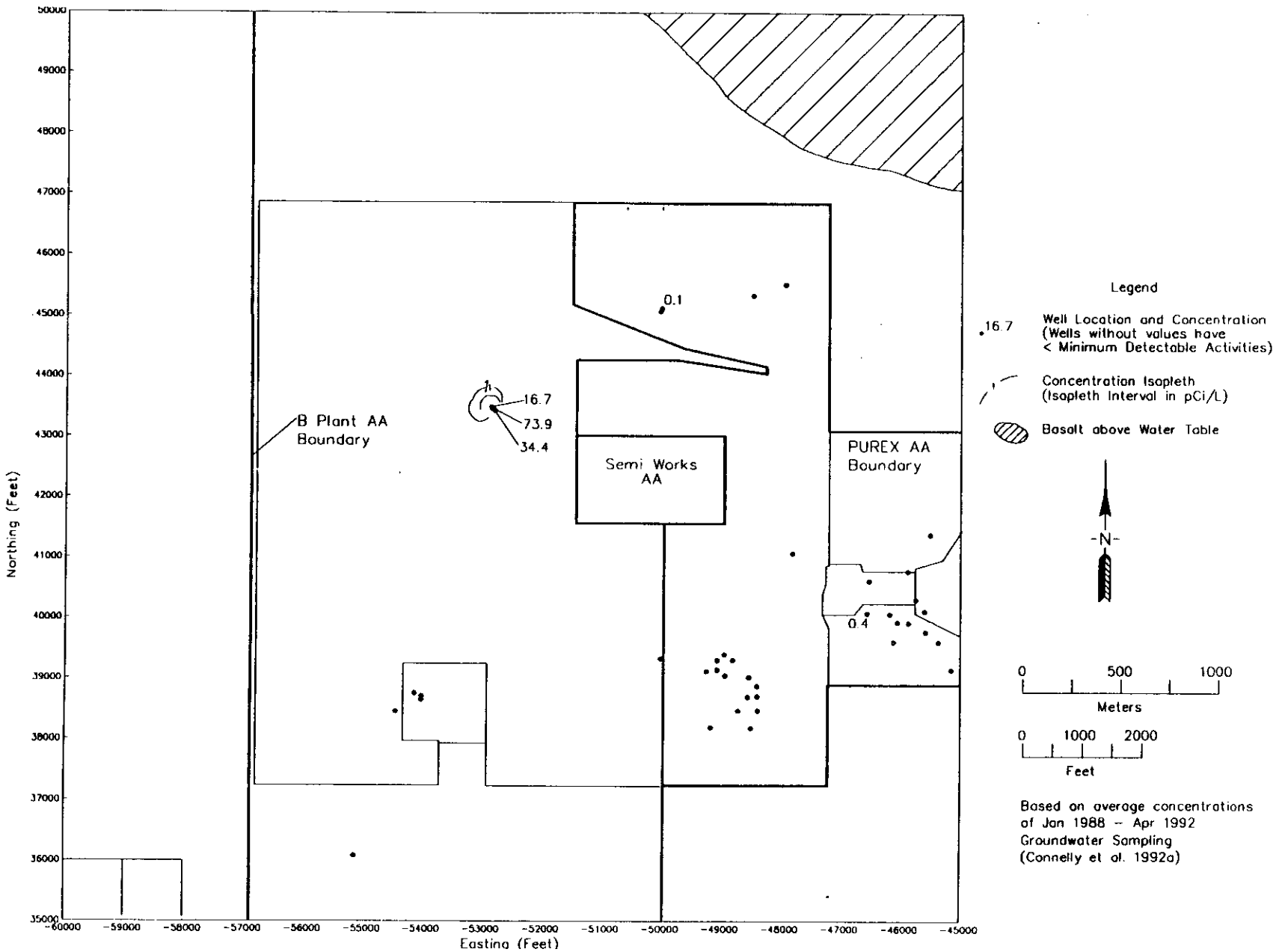

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Figure 4-15. Plutonium-239/240 Groundwater Plume Map.

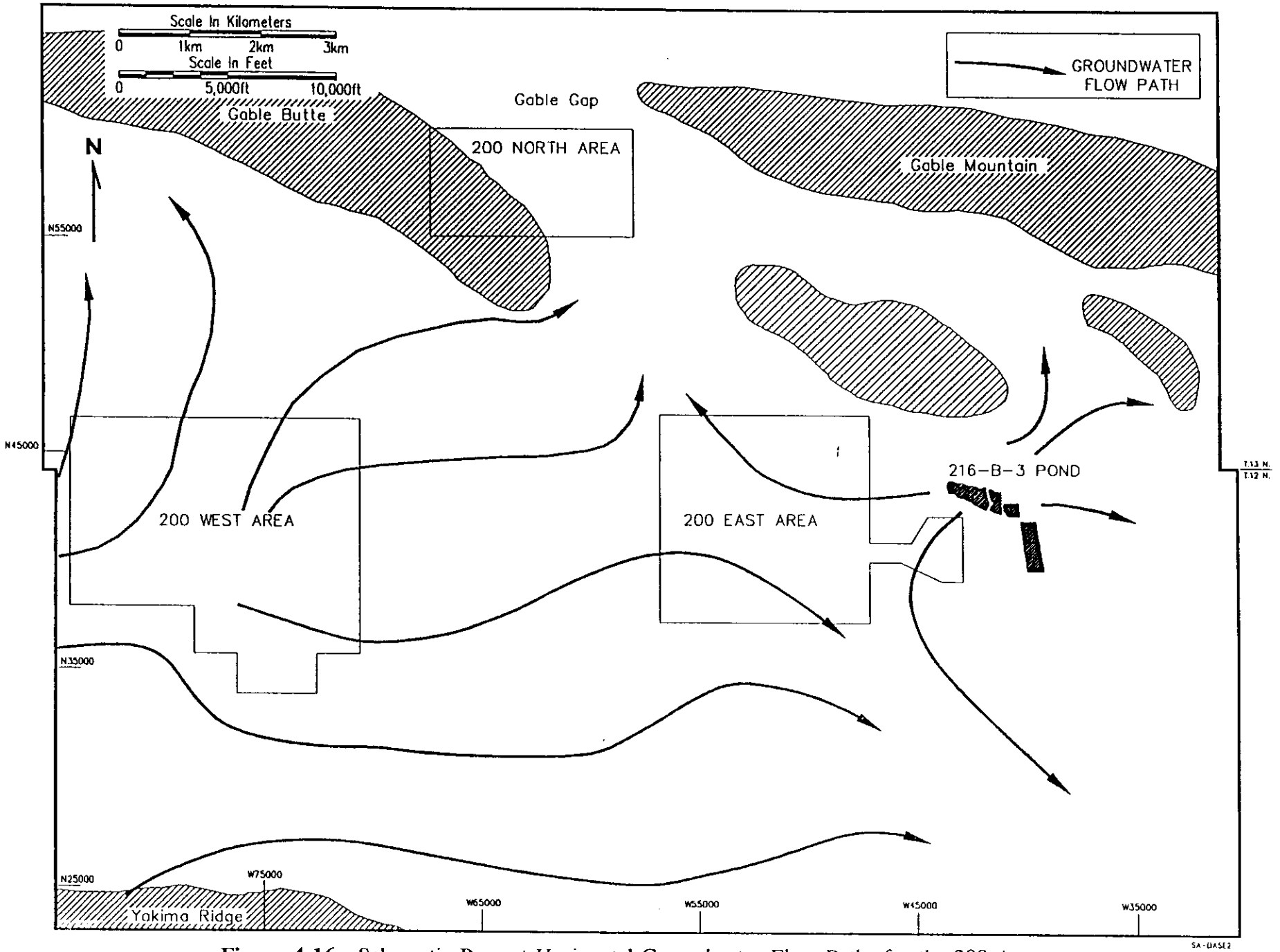

Figure 4-16. Schematic Present Horizontal Groundwater Flow Paths for the 200 Areas.

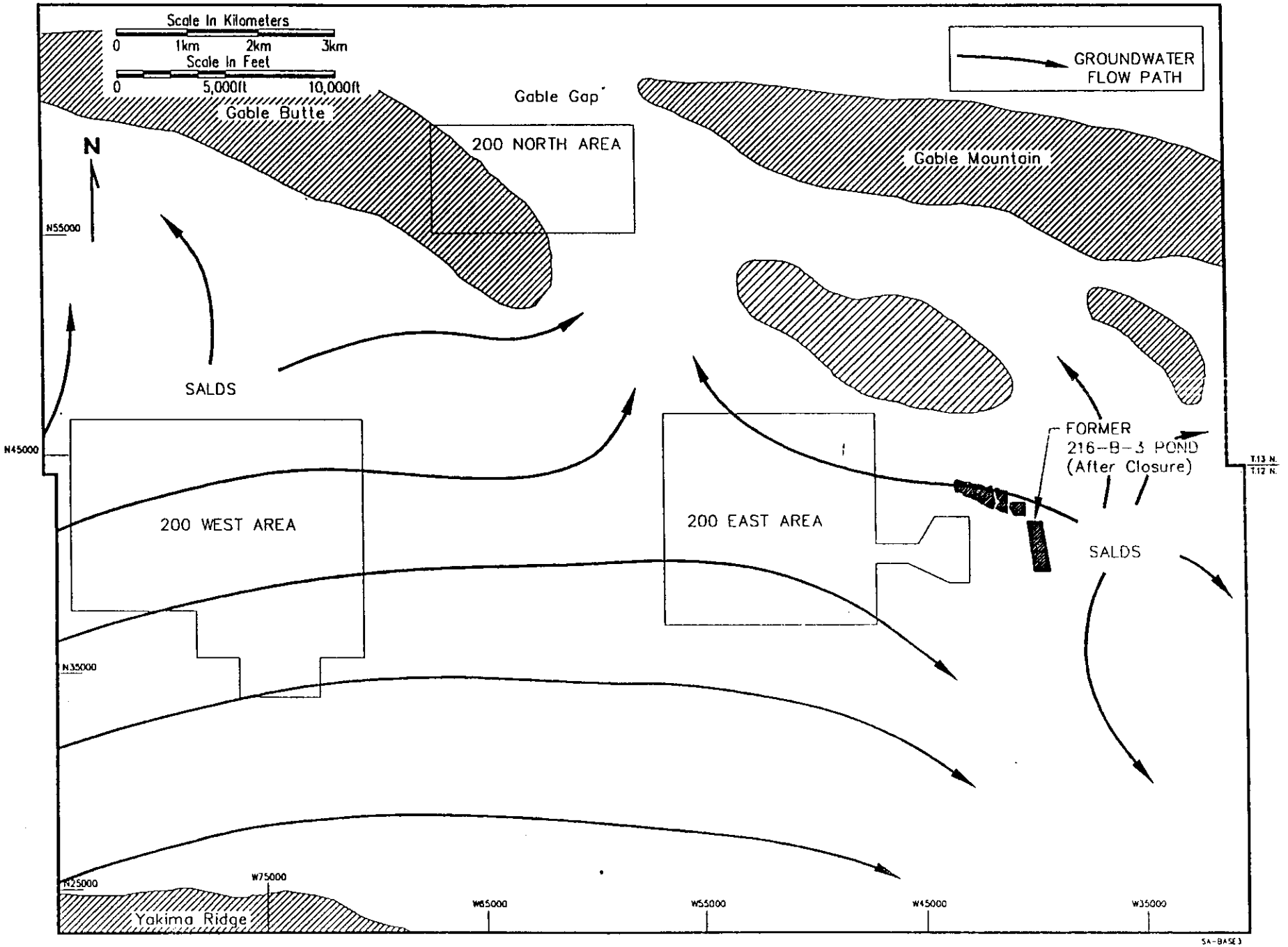

Figure 4-17. Estimated Near-Future Groundwater Flow Paths for the 200 Areas.

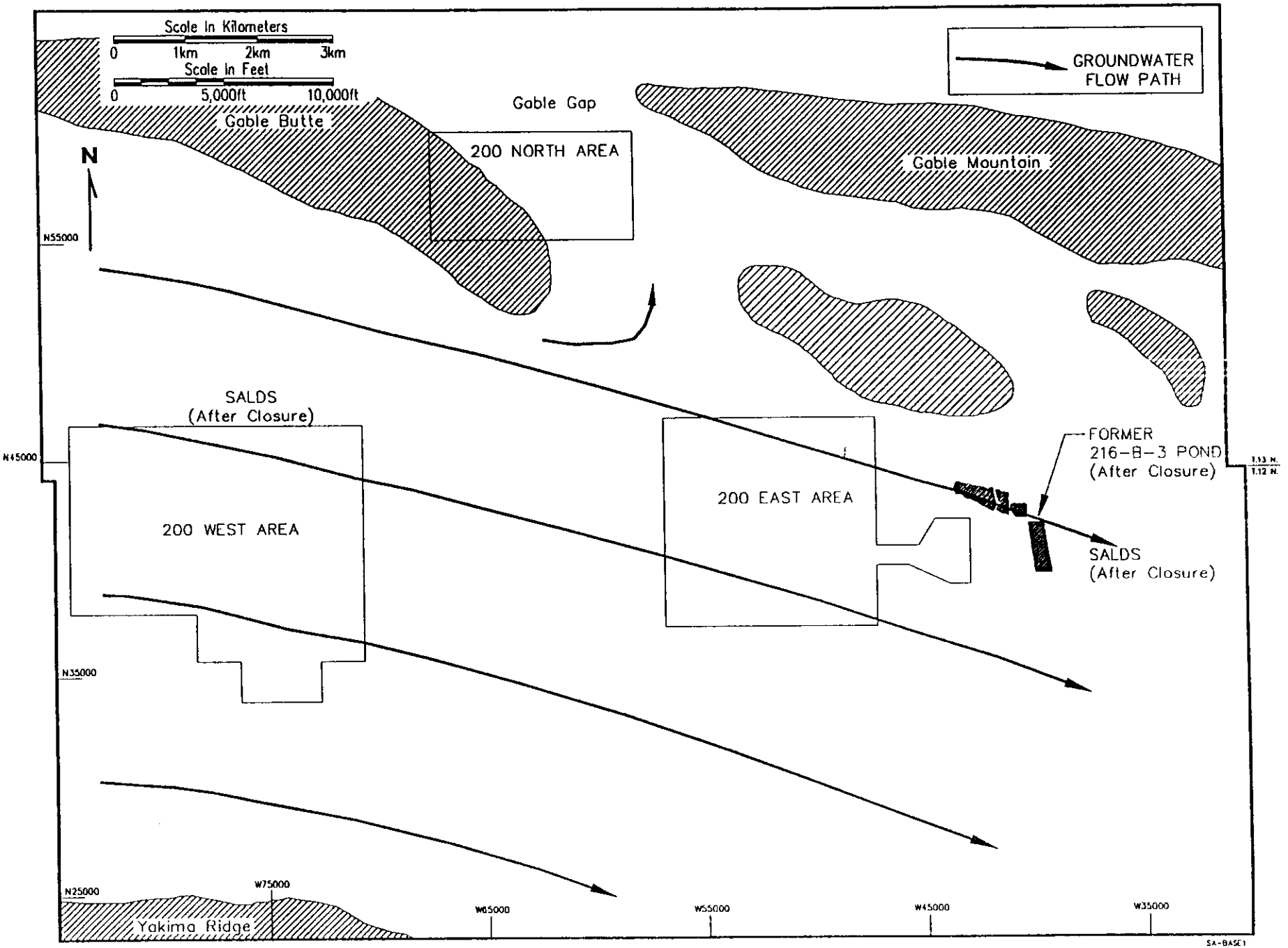

Figure 4-18. Estimated Future Groundwater Flow Paths for the 200 Areas.

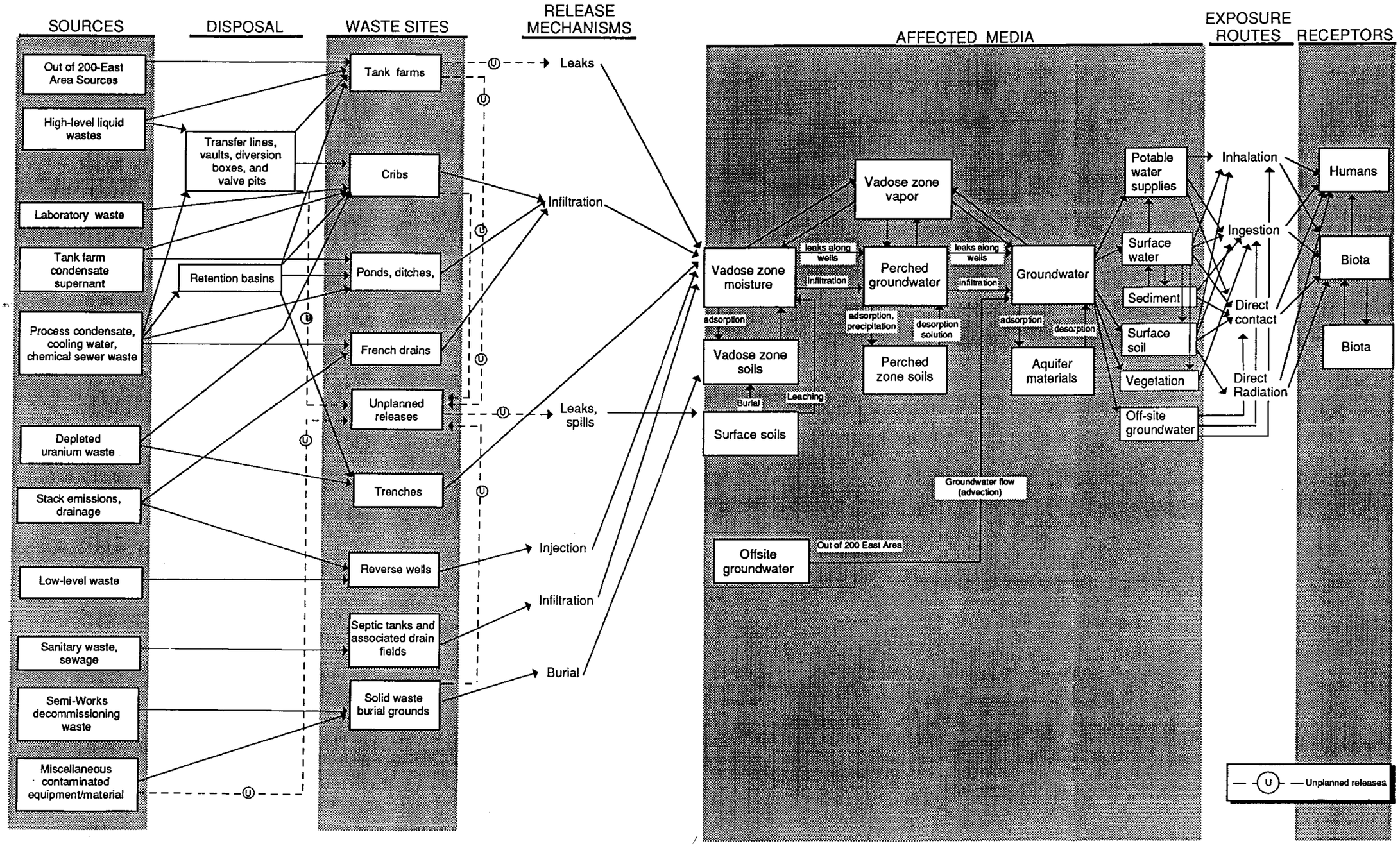

Figure 4-19. Conceptual Model of the 200 East Groundwater Aggregate Area.

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Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
ORGANIC COMPOUNDS (μg/L)									
Carbon Tetrachloride[a]	2-E27-8	4.48	0.8	0.8	1	7	1	667	7
Chloroform[a]	2-E18-3	8.33	25	25	1	5	0.5	670	10
Methylene Chloride[a]	2-E17-16	1286.00	6400	6400	1	4	1	672	48
1,1-Dichloroethane[a]	6-24-33	5.26	2.2	1.1	5	5	1	638	5
1,2-Dichloroethane[a]	6-24-34C	4.04	0.5	0.5	1	11	0.5	621	1
Cis-1,2-Dichloroethylene	6-24-34A	1.23	1.7	1.7	1	2	1	20	2
Trans-1,2 Dichloroethylene[a]	6-24-34A	4.73	2	2	1	10	1	637	2
1,1,1-Trichloroethane[a]	6-23-34	39.47	60	30	15	0	0.5	671	11
1,1,2-Trichloroethane[a]	6-24-34C	2.10	0.6	0.6	1	12	0.2	665	1
Trichloroethylene[a]	6-31-31P	12.00	12	12	1	0	0.5	670	8
Tetrachloroethylene[a]	6-24-34B	8.19	11	6.3	12	0	0.5	665	10
Pyrene	2-E33-3	8.50	13	13	1	1	3	83	1
Styrene	2-E25-23	9.50	14	5	2	0	4	95	2
Toluene	2-E23-1	30.00	30	30	1	0	2	603	10
2,4-Dinitrotoluene	2-E33-3	8.67	11	11	1	2	5	145	1

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
Phenol[a/]	2-E35-2	12.25	8	8	1	3	1	802	5
2,3,4,6-Tetrachlorophenol	6-40-40B	10.00	10	10	1	0	10	209	1
2,4-Dichlorophenol	2-E17-16	18.00	26	26	1	1	5	245	1
2,4-Dimethylphenol	2-E17-18	20.00	20	20	1	0	5	187	2
2,4-Dinitrophenol	6-42-41	120.00	120	120	1	0	10	246	2
2-Chlorophenol	2-E33-3	15.33	22	14	2	1	2	247	2
O-Nitrophenol	6-42-41	28.00	28	28	1	0	5	186	2
Pentachlorophenol	2-E33-29	66.67	50	50	1	5	4	322	1
Acetone	2-E28-7	140.00	140	140	1	0	1	457	25
Methyl Ethyl Ketone	2-E33-29	37.00	10	10	1	9	5	611	4
4-Methyl-2-Pentanone	2-E33-5	11.00	11	11	1	0	1	155	2
Cyclohexanone	6-50-53B	4.00	4	4	1	0	4	1	1
Aldrin	2-E25-33	0.74	1.8	1.7	2	3	0.05	312	5
DDD	2-E25-33	0.17	0.3	0.23	2	3	0.1	312	4
DDT	2-E34-8	2.50	5	4.8	2	2	0.1	313	5
Dieldrin	2-E34-8	1.63	4.8	4.8	1	2	0.05	312	5
Endrin	2-E34-8	2.30	4.6	4.4	2	2	0.1	654	5
Endrin Aldehyde	2-E25-32P	0.33	0.6	0.6	1	2	0.2	211	4
Gamma-BHC	2-E34-8	0.67	1.9	1.9	1	2	0.05	653	5

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
Heptachlor	2-E34-8	0.63	1.8	1.8	1	2	0.05	312	5
Bis(2-ethylhexyl) Phthalate	2-E32-5	56.00	56	56	1	0	1	151	13
Diethyl Ether	2-E34-5	10.00	10	10	1	0	9	3	3
Dimethoate	2-E25-31	5242.75	20600	349	2	2	0.48	99	4
Ethyl Cyanide	2-E25-32P	5003.00	7	7	1	3	5	152	1
P-Chloro-m-Cresol	2-E33-3	14.67	21	13	2	1	5	247	2
Phorate	6-43-42J	11.00	11	11	1	0	2	62	2
Trichloromonofluoromethane	2-E17-17	10.75	13	13	1	3	5	244	2
Triethyleneglycol	2-E33-35	10.00	10	10	1	0	10	1	1
Unknown	2-E25-31	841.60	4100	14	5	0	1	41	31
Unknown Aliphatic Hydrocarbon	2-E32-4	6.00	6	6	1	0	2	2	2
Unknown Halogenated Hydrocarbon	2-E25-32P	14.00	14	14	1	0	14	1	1
CONVENTIONAL CONSTITUENTS (μg/L)									
Ammonium Ion	6-49-55A	1109.40	1490	800	5	0	50	664	45
Bromide	2-E25-25	861.54	200	200	1	12	500	827	4
Chloride	2-E28-24	193000.00	193000	193000	1	0	430	1033	217
Fluoride[a]	2-E28-24	2200.00	2200	2200	1	0	100	1174	175

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
RADIONUCLIDES (pCi/L)									
Gross Alpha[a/]	2-E28-24	166.80	1250	0.34	5	3	-0.774	1648	242
Gross Beta	2-E28-23	10254.44	12900	7660	9	0	-2.65	1945	273
Tritium	2-E24-11	4270000.00	8070000	2250000	7	0	-371	1671	233
Beryllium-7	6-50-42	222.00	222	222	1	0	-242	85	5
Carbon-14	2-E24-1	38.26	58.8	27.9	5	0	-2.52	33	5
Potassium-40	2-E33-35	240.35	469	469	1	1	4.13	87	45
Cobalt-60	6-50-53A	473.78	532	352	9	0	-13.7	1046	86
Zinc-65	2-E13-14	7.46	7.46	7.46	1	0	-17.9	87	4
Strontium-90	2-E28-25	5148.57	6270	3150	7	0	-3.67	845	45
Zirconium/Niobium-95	6-36-46R	81.40	81.4	81.4	1	0	-32	87	2
Technetium-99	6-50-53A	21665.17	32700	391	6	0	-11.2	546	129
Ruthenium-106	2-E17-15	300.63	885	87.2	4	2	-96.9	978	37
Antimony-125	2-E34-8	7.89	11.9	10.9	2	1	-48.1	153	15
Iodine-129[a/]	6-35-70	30.05	87.8	10.3	7	0	-0.409	298	110
Cesium-134	2-E17-1	3.65	3.65	3.65	1	0	-7.42	87	3
Cesium-137	2-E28-23	1328.40	1800	844	10	0	-9.94	1047	46
Cerium/Praseodymium-144	2-E34-2	28.65	34.7	34.7	1	1	-39.1	87	2
Europium-154	6-36-46R	12.20	12.2	12.2	1	0	-38.1	87	11
Europium-155	2-E27-16	9.35	9.35	9.35	1	0	-13.4	97	4

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
Lead-212	2-E33-35	12.60	12.6	12.6	1	0	9.56	4	4
Radium	2-E25-17	1.65	1.65	1.65	1	0	-0.094	667	108
Uranium	2-E28-26	21.23	28.5	15.9	6	0	0.0132	363	123
Uranium-234	2-E28-21	33.07	70.8	12	3	0	0.0645	72	10
Uranium-235	2-E28-21	1.57	3.21	0.554	3	0	-0.00785	72	9
Uranium-238	2-E28-21	31.40	67.2	11.7	3	0	0.0769	72	10
Plutonium-238	2-E28-23	0.36	2.13	0.0407	7	0	-0.0167	254	6
Plutonium-239/40	2-E28-23	73.86	449	7.21	7	0	-0.00938	255	19
Americium-241	2-E33-35	0.04	0.085	0.085	1	1	-0.00708	55	11
INORGANIC COMPOUNDS (μg/L)									
Aluminum	2-E16-2	11195.00	14000	8390	2	0	150	551	50
Aluminum, filtered	6-40-33A	485.00	485	485	1	0	150	659	26
Antimony	2-E33-31	129.75	19	19	1	3	100	789	20
Antimony	2-E33-32	129.75	19	19	1	3	100	789	20
Antimony, filtered	2-E33-28	114.88	19	19	1	7	100	745	21
Arsenic	2-E25-17	56.00	56	56	1	0	2	856	127
Arsenic, filtered	2-E25-30P	23.68	34	15	4	0	2	772	119
Barium	2-E25-17	343.00	343	343	1	0	6	932	162
Barium, filtered	6-40-39	113.20	120	108	5	0	6	841	169

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
Beryllium	2-E32-4	4.75	10	10	1	11	1	790	5
Beryllium, filtered	2-E27-10	5.33	7	7	1	5	1	746	8
Boron	2-E32-5	182.00	182	182	1	0	10	424	111
Boron, filtered	2-E32-5	168.00	168	168	1	0	10	456	128
Cadmium	2-E25-17	211.00	211	211	1	0	2	811	22
Cadmium, filtered	2-E17-14	4.22	12	4	2	7	2	754	18
Cadmium, filtered	2-E17-15	4.22	6	6	1	8	2	754	18
Calcium	2-E28-12	80700.00	80700	80700	1	0	11000	970	169
Calcium, filtered	6-50-53A	240666.67	254000	222000	9	0	10600	879	172
Chromium	6-40-40B	395.00	770	770	1	1	3	986	123
Chromium, filtered	2-E24-19	65.00	65	65	1	0	3	771	52
Cobalt	2-E25-17	30.00	30	30	1	0	4	628	4
Copper	2-E17-17	92.70	798	11	5	5	7	837	82
Copper, filtered	2-E33-34	26.00	32	32	1	1	7	759	28
Cyanide	6-50-53A	869.33	1690	422	15	0	5	497	9
Hydrazine[a/]	2-E25-17	38.00	38	38	1	0	30	249	2
Iron	2-E25-17	592000.00	592000	592000	1	0	20	1016	165
Iron, filtered	6-54-34	3370.00	3370	3370	1	0	20	816	120
Lead	2-E25-17	52.00	52	52	1	0	2	761	68
Lead, filtered	2-E33-28	6.56	16	8	2	7	2	724	20

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
Lithium	2-E16-2	19.00	19	19	1	0	10	341	9
Lithium, filtered	6-40-33A	16.00	16	16	1	0	10	372	8
Magnesium	6-50-53A	89900.00	89900	89900	1	0	870	981	169
Magnesium, filtered	6-50-53A	67388.89	71100	63000	9	0	2880	877	172
Manganese	2-E25-17	6240.00	6240	6240	1	0	2	918	142
Manganese, filtered	6-52-57	295.00	295	295	1	0	2	768	79
Mercury	2-E27-15	0.44	0.92	0.92	1	2	0.1	736	2
Mercury, filtered	2-E27-15	0.21	0.23	0.23	1	2	0.1	702	3
Nickel	6-50-53A	590.00	590	590	1	0	7	953	108
Nickel, filtered	2-E24-19	60.00	60	60	1	0	7	769	43
Nitrate[a/]	6-50-53A	503215.59	625000	665	17	0	200	1887	239
Nitrite	6-26-35C	1080.00	1400	1400	1	4	200	688	2
Phosphate	2-E25-30P	9465.71	24500	1100	7	0	400	991	4
Potassium	6-50-53A	16800.00	16800	16800	1	0	2190	1004	168
Potassium, filtered	6-50-53A	14522.22	15400	13500	9	0	2380	886	172
Selenium	6-50-53A	33.00	33	33	1	0	1	765	34
Selenium, filtered	6-50-53A	23.50	27	19	4	0	1	735	28
Silicon	2-E25-17	73600.00	73600	73600	1	0	3830	437	112
Silicon, filtered	2-E25-23	31600.00	31600	31600	2	0	836	470	129
Silver	2-E33-10	12.50	15	15	1	1	4	806	2

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
Silver, filtered	6-24-34A	12.13	27	27	1	7	4	748	1
Sodium	2-E25-30P	88042.86	107000	66400	7	0	3540	961	168
Sodium, filtered	2-E25-30P	74900.00	91600	62600	7	0	3770	880	171
Strontium	2-E17-14	388.00	488	313	8	0	78	604	116
Strontium, filtered	6-50-53A	1009.00	1150	944	9	0	81	744	146
Sulfate	6-50-53A	404818.18	434000	386000	11	0	500	1043	215
Thallium	6-49-57A	50.00	50	50	1	0	5	154	1
Thallium, filtered	6-49-57A	50.00	50	50	1	0	5	137	1
Titanium	2-E16-2	1120.00	1120	1120	1	0	60	340	10
Total Carbon	6-24-34B	56560.83	91000	65	6	0	18	651	160
Uranium, chemical	2-E28-18	38.01	58.5	9.06	15	0	-313	337	110
Vanadium	2-E25-17	656.00	656	656	1	0	5	921	143
Vanadium, filtered	2-E25-23	135.40	145	123	5	0	5	837	152
Zinc	6-40-40B	547.00	1000	94	2	0	3	914	149
Zinc, filtered	6-54-34	358.00	358	358	1	0	3	811	122
MISCELLANEOUS									
Total Dissolved Solids (ppb)	2-E25-35	444000.00	444000	444000	1	0	130	86	51
Total Organic Carbon (ppb)	2-E25-31	1550.00	3790	1000	13	16	133	1652	46
Total Organic Halogen (ppb)	2-E17-14	2416.84	19300	10	5	20	-5.8	2082	90
COD (ppb)	6-43-41E	101.00	178	24	2	0	[b/]	3	2

Table 4-1. Average Reported Constituent Concentrations/Maximums and Minimums--200 East Groundwater Aggregate Area (January 1988 to April 1992).

Constituent	Well-Specific Data						All Wells		
	Well Number	Average of Reported Values	Maximum of Detections	Minimum of Detec-tions	Number of Detections	Number of < D.L.	Minimum Reported D.L.	Total Number of Analyses	Total Number of Wells with Detections
Alkalinity (ppb)	6-23-34	219885.38	593000	250	13	0	66	307	93
pH, Field Measurement (pH)	6-50-48B	9.98	9.98	9.98	1	0	7	2140	245
Conductivity, Laboratory (μmho/cm)	2-E25-13	1490.00	1490	1490	1	0	142	1115	157
Specific Conductance (μmho/cm)	6-50-53A	1459.75	1621	1295	4	0	80	2228	245
Turbidity (NTU)	2-E16-2	200.00	200	200	1	0	0.1	545	135
Turbidity (NTU)	2-E25-17	200.00	200	200	1	0	0.1	545	135
Turbidity (NTU)	2-E25-6	200.00	200	200	1	0	0.1	545	135
Coliform (Membrane Filter) (ppb)	2-E33-30	2.75	8	8	1	3	1	154	4
Coliform Bacteria (MPN)	2-E25-29P	268.22	2400	2400	1	8	1	505	12

Notes:

a/ Chemical data combined from two chemical constituent data codes or from more than one analytical method. Chemical constituent data codes from Hanford Site Groundwater Database provided by WHC.

b/ No minimum detection limit for reported constituent.

μg/L Micrograms per liter

pCi/L Picocuries per liter

Average reported value for some constituents exceeds the maximum detection. This is the result of the reported detection level(s) for the well exceeding the detection result.

D.L. Detection Limit

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Table 4-2. Comparison of Average Reported Concentrations of Selected Chemical Constituents for the Unconfined and Confined Aquifers (January 1988 to April 1992).[d/]

	Radionuclides (pCi/L)									Inorganic Compounds (μg/L)			
Well Aquifer	Gross Alpha	Gross Beta	Tritium	^{60}Co	^{90}Sr	^{99}Tc	^{129}I	^{137}Cs	$^{239/240}Pu$	Arsenic	Chromium	Cyanide	Nitrate
2-E26-8 Confined	0.34[a/]	9.37	ND	--	ND	ND	ND	--	--	--	--	--	ND
2-E26-4 Unconfined	3.52	6.23	23487.50	--	0.46	--	1.27	--	--	--	--	--	2144.58[a/]
2-E33-12 Confined[b/]	29.15	286.90	497.50	10.48	ND	704.97	--	ND	--	--	--	--	ND
2-E33-13 Unconfined	28.00	340.00	6300.00	ND	ND	770.00	--	ND	--	--	--	--	--
2-E33-39 Unconfined	--	--	--	--	--	--	--	--	--	8.20	3.70	ND	--
2-E33-3 Unconfined	9.20	177.15	4066.00	13.76	ND	57.75	2.39	ND	0.04	10.00	ND	12.33	40776.35
6-42-40C Confined	3.11	11.58	2612.50	--	0.59	4.84	0.11	--	--	--	--	--	ND
6-42-40A Unconfined	0.81	4.29	169.78	-2.38[a/]	ND	--	--	0.11[a/]	ND	ND	ND	ND	1920[a/]
6-42-40B Unconfined	1.10	10.88	573.84	1.01[a/]	0.29[a/]	ND	--	0.72[a/]	--	5.00	--	ND	ND
6-43-41E Unconfined	2.82	6.20	74910.73	ND	ND	--	--	ND	ND	ND	--	ND	7980.00
6-47-50 Confined	2.19	7.68	230.83[a/]	ND	1.07	153.43	0.01	ND	ND	2.70	--	ND	6472.86
2-E34-6 Unconfined	2.43	9.29	315.63	1.60[a/]	0.01[a/]	2.36	--	ND	ND	5.29	--	ND	6600.00
2-E34-5 Unconfined	3.09	7.28	208.39	ND	0.09	ND	--	ND	ND	5.53	9.44	ND	14125.00

Table 4-2. Comparison of Average Reported Concentrations of Selected Chemical Constituents for the Unconfined and Confined Aquifers (January 1988 to April 1992).[d/]

	Radionuclides (pCi/L)									Inorganic Compounds (μg/L)			
Well Aquifer	Gross Alpha	Gross Beta	Tritium	^{60}Co	^{90}Sr	^{99}Tc	^{129}I	^{137}Cs	$^{239/240}Pu$	Arsenic	Chromium	Cyanide	Nitrate
6-49-55B Confined	2.68	6.08	ND	ND	ND	13.14	ND	ND	--	ND	20.80	ND	ND
6-49-55A Unconfined	6.35	929.82	8443.64	95.78	ND	5061.00	0.06	ND	--	6.10	8.70	96.32	138083.81
6-49-57B Confined	2.90	ND	--	ND	ND	ND	--	ND	--	ND	9.80	ND	--
6-49-57A Unconfined	15.00	170.00	--	ND	ND	650.00	--	ND	--	7.10	26.4	31.50	--
6-50-45 Confined	1.95	6.31	ND	--	ND	ND	-0.02[a/]	--	--	--	--	--	ND
6-50-42 Unconfined	1.20	6.02	3947.14	ND	ND	ND	0.32	ND	ND	--	--	--	5000.00
6-50-48B Confined	ND	12.00	ND	--	ND	5.30	-0.0002[a/]	--	--	--	--	--	ND
6-51-46 Confined	ND	17.66	ND	--	ND	ND	0.0005[a/]	--	--	--	--	--	ND
6-52-46A Confined	1.92	8.76	677.24	--	ND	ND	-0.01[a/]	--	--	--	--	--	3560.00
6-52-48 Confined	0.97[a/]	10.09	ND	--	ND	ND	0.01[a/]	--	--	--	--	--	ND
6-53-47A Unconfined	1.59	114.32	--	1.18[a/]	59.69	2.59	--	1.48[a/]	ND	ND	--	ND	3445.00
6-53-47B Unconfined	4.31	197.00	ND	1.39[a/]	100.30	--	--	ND	--	--	--	--	30600.00
6-53-50 Confined	0.82	6.31	ND	--	ND	ND	0.04[a/]	--	--	--	--	--	ND

Table 4-2. Comparison of Average Reported Concentrations of Selected Chemical Constituents for the Unconfined and Confined Aquifers (January 1988 to April 1992).[d/]

	Radionuclides (pCi/L)									Inorganic Compounds (μg/L)			
Well Aquifer	Gross Alpha	Gross Beta	Tritium	^{60}Co	^{90}Sr	^{99}Tc	^{129}I	^{137}Cs	$^{239/240}Pu$	Arsenic	Chromium	Cyanide	Nitrate
6-54-49 Unconfined	1.00	48.48	ND	--	22.44	--	--	--	--	--	--	--	4950.00
6-50-53B Confined	3.20	7.00	--	ND	ND	ND	--	ND	--	ND	--	ND	--
6-50-53A Confined	4.92[a/]	2763.89	4314.00	473.78	ND	21665.17	0.15	ND	--	2.90	10.00	869.33	503215.59
6-54-57 Confined	1.97[a/]	9.67	146.40[a/]	ND	0.37[a/]	20.16	ND	ND	--	--	--	--	ND
6-55-57 Unconfined	38.00	890.00	8200.00	70.65	ND	2150.00	--	ND	--	--	--	--	--
6-56-53 Confined	ND	11.55	ND	--	ND	ND	0.03	--	--	--	--	--	ND
2-E28-1 Semi-confined to Confined	--	--	6636.67	ND	ND	28.90	2.55	ND	0.05	--	--	--	4825.00
2-E28-7 Semi-confined to Confined	1.94	148.00	7142.50	2.29[a/]	75.59	92.43	1.04	3.75	0.02	ND	--	ND	7576.00
2-E28-5 Shallow Unconfined	--	--	2180.00	--	--	--	--	--	--	--	--	--	3100.00
2-E16-2 Semi-confined to Confined	2.29[a/]	11.09	2705.11	0.60[a/]	ND	ND	0.17	ND	ND	31.00	--	ND	2403.68[a/]

Table 4-2. Comparison of Average Reported Concentrations of Selected Chemical Constituents for the Unconfined and Confined Aquifers (January 1988 to April 1992).[d/]

	Radionuclides (pCi/L)									Inorganic Compounds (μg/L)			
Well Aquifer	Gross Alpha	Gross Beta	Tritium	^{60}Co	^{90}Sr	^{99}Tc	^{129}I	^{137}Cs	$^{239/240}Pu$	Arsenic	Chromium	Cyanide	Nitrate
2-E25-23 Shallow Unconfined	0.57[a/]	10.08	259.83[a/]	ND	ND	2.14	0.06	ND	ND	24.00	ND	ND	1998.00[a/]
2-E25-24 Shallow Unconfined	0.97[a/]	10.85	418.14	0.07[a/]	ND	ND	ND	ND	ND	17.00	ND	ND	1958.46[a/]
2-E24-11 Semi-confined to Confined	--	23.77	4270000.00	ND	1.08	--	--	ND	--	--	--	--	123573.60
2-E24-12 Shallow Unconfined	5.67	261.40	270591.67	4.94[a/]	6.46	--	1.91	ND	--	--	--	ND	111676.92
6-34-41B Semi-confined to Confined	--	--	36971.43	3.14[a/]	--	--	--	ND	--	--	--	--	5745.89
6-33-42 Shallow Unconfined	3.29	24.80	283375.00	--	--	16.00	4.90	--	--	--	--	--	22585.71
6-34-42 Shallow Unconfined	3.29	11.90	75850.00	7.00	--	13.73	6.13	0.43	--	5.35	--	ND	8305.00
6-26-35C Semi-confined to Confined	1.67	20.96	52450.00	--	--	--	--	--	--	ND	--	ND	21342.86
6-26-35A Shallow Unconfined	2.09	22.22	285400.00	--	--	--	--	--	--	5.00[a/]	--	ND	28112.50

Table 4-2. Comparison of Average Reported Concentrations of Selected Chemical Constituents for the Unconfined and Confined Aquifers (January 1988 to April 1992).[d/]

	Radionuclides (pCi/L)									Inorganic Compounds (μg/L)			
Well Aquifer	Gross Alpha	Gross Beta	Tritium	^{60}Co	^{90}Sr	^{99}Tc	^{129}I	^{137}Cs	$^{239/240}Pu$	Arsenic	Chromium	Cyanide	Nitrate
6-60-57 Semi-confined to Confined	--	6.47	370.43	--	--	--	ND	--	--	--	--	ND	2574.29
6-59-58 Shallow Unconfined	ND	7.20	754.50	--	ND	22.10	ND	--	--	--	--	ND	3366.67
6-54-45A Semi-confined to Confined	6.09	7.78	ND	--	--	--	--	--	--	--	--	--	ND
6-55-40 Shallow Unconfined	--	--	203.59[a/]	--	--	--	--	--	--	--	--	--	7000.00
6-54-48 Shallow Unconfined	1.51	87.91	ND	ND	54.04	--	--	ND	--	--	--	--	492000.00
2-E24-1 Deep Unconfined	3.97	44.64	3707500.00	ND	10.35	--	26.60	ND	--	--	--	--	154505.89
2-E24-16 Shallow Unconfined	3.40	40.23	1875000.47	2.68	--	--	--	-0.16[a/]	ND	8.91	--	ND	96557.14
2-E24-4 Deep Unconfined	0.73	5.26	8361.43	1.32[a/]	ND	--	--	ND	--	--	ND	ND	2360.20[a/]
2-E24-13 Shallow Unconfined	--	6.59	6273.33	1.01	ND	--	4.07	ND	--	--	--	--	2860.00

Table 4-2. Comparison of Average Reported Concentrations of Selected Chemical Constituents for the Unconfined and Confined Aquifers (January 1988 to April 1992).[d/]

	Radionuclides (pCi/L)									Inorganic Compounds (μg/L)			
Well Aquifer	Gross Alpha	Gross Beta	Tritium	^{60}Co	^{90}Sr	^{99}Tc	^{129}I	^{137}Cs	$^{239/240}Pu$	Arsenic	Chromium	Cyanide	Nitrate
2-E25-25 Deep Unconfined	0.86[a/]	5.20	300.62	ND	ND	0.73[a/]	0.32	ND	ND	5.07	30.52	ND	756.31
2-E26-5 Deep Unconfined	--	--	--	--	--	--	--	--	--	8.00	ND	ND	1490.00
6-28-52A[c/]	2.30	8.41	ND	--	--	--	--	--	--	--	--	--	ND
2-E17-6[c/]	1.38	33.22	30713.36	ND	ND	ND	ND	4.58	--	ND	ND	ND	24240.00
2-E33-40[c/]	6.40	20.00[a/]	ND	ND	ND	3.20	--	ND	--	2.30	39.00	ND	--
6-28-40[c/]	3.55	12.83	59816.67	--	--	--	0.17	--	--	--	--	--	16350.00
6-32-62[c/]	1.94	7.28	2383.33	--	--	--	0.04	--	--	--	--	--	26450.00

Confined Aquifer: Rattlesnake Ridge interbed.
Semiconfined to Confined Aquifer: Ringold unit A gravels beneath Ringold lower mud sequence.

μg/L Micrograms per liter.
pCi/L Picocuries per liter.
ND All reported values below reported detection limit for well.
a/ Average reported value exceeds the maximum detection limit for constituent in listed well.
b/ Originally open borehole into Rattlesnake Ridge interbed. Grouted in 1982 to isolate screened interval in Rattlesnake Ridge interbed, but poor well seal currently suspected.
c/ Screened interval across multiple aquifers or hydrostratigraphic units.
d/ For source of data see Table A-1.
"--" No information available.

Table 4-3. Background Concentrations in Hanford Site Groundwater. Page 1 of 2

Constituent	Background Concentration	Units
Inorganics		
Aluminum	<200 [a]	ppb (μg/L)
Ammonium	120	ppb (μg/L)
Arsenic	10	ppb (μg/L)
Barium	68.5	ppb (μg/L)
Beryllium	<5 [a]	ppb (μg/L)
Bismuth	<5 [a]	ppb (μg/L)
Boron	<100 [a]	ppb (μg/L)
Cadmium	<10 [a]	ppb (μg/L)
Calcium	63,600	ppb (μg/L)
Chloride: low [b] high [c]	8,690 28,500	ppb (μg/L) ppb (μg/L)
Chromium	<30 [a]	ppb (μg/L)
Copper	<30 [a]	ppb (μg/L)
Fluoride	1,340 (775[c])	ppb (μg/L)
Iron: low [b] mid [b] high [b]	86 291 818	ppb (μg/L) ppb (μg/L) ppb (μg/L)
Lead	<5 [a]	ppb (μg/L)
Magnesium	16,480	ppb (μg/L)
Manganese: low [b] high [b]	24.5 163.5	ppb (μg/L) ppb (μg/L)
Mercury	<0.1 [a]	ppb (μg/L)
Nickel	<30 [a]	ppb (μg/L)
Nitrate	12,400	ppb (μg/L)
Phosphate	<1,000 [a]	ppb (μg/L)
Potassium	7,975	ppb (μg/L)
Selenium	<5 [a]	ppb (μg/L)
Silicon	26,500	ppb (μg/L)

9 3 1 2 9 7 1 4 9 4

Table 4-3. Background Concentrations in Hanford Site Groundwater.

Constituent	Background Concentration	Units
Silver	<10 [a]	ppb (μg/L)
Sodium	33,500	ppb (μg/L)
Strontium	264.1	ppb (μg/L)
Sulfate	90,500	ppb (μg/L)
Vanadium	15	ppb (μg/L)
Zinc: low [b] high [b]	<50 [a] 673	ppb (μg/L) ppb (μg/L)
Parameters		
Alkalinity (field) (lab)	215,000 210,000	ppb (μg/L) ppb (μg/L)
pH (field) (lab)	6.90 - 8.24 7.25 - 8.25	pH units pH units
TOC	2,610 (1,610 [c])	ppb (μg/L)
Conductivity (field) (lab)	539 530	μmho/cm μmho/cm
TOX	60.8 (37.6 [c])	[ppb (μg/L)]
Carbon (total)	50,100	ppb (μg/L)
Radionuclides/Radioactivity Parameters		
Gross alpha	63 (5.79 [c])	pCi/L
Gross beta	35.5 (12.62 [c])	pCi/L
Radium	0.23	pCi/L
Uranium	3.43	pCi/L

Background concentrations are "Provisional Threshold Values" from Table 5-9 of DOE/RL 1992d.

a/ Detection limit.
b/ Low, mid, high refer to separate concentration groupings which appeared in the sample population but apparently cannot be identified spatially on the Hanford Site.
c/ Reanalysis of background with potential outliers removed.

Table 4-4. Estimated Areas, Volumes, and Masses of Plumes, 200 East Groundwater Aggregate Area

Inorganic and Organic Compounds:

Chemical Compound	Plume	Max. Conc. (μg/L)	Monitoring Well	Bounding Contour Interval (μg/L)	Area (m^2)	Groundwater Volume (m^3) Porosity (n) = n = 0.1	n = 0.2	n = 0.3	Mass (kg)
Arsenic	A	13	699-44-42						
	B	10	699-43-45						
	C	24	299-E25-30P						
	D	12	299-E18-3						
				10	740,000	740,000	1,500,000	2,200,000	22.8
Chromium	A	56	299-E33-30						
	B	51	299-E33-32						
	C	65	299-E24-19						
				50	120,000	120,000	240,000	360,000	13.5
Cyanide		869	699-50-53A	200	850,000	850,000	1,700,000	2,550,000	985
Nitrate	A	492,000	699-54-48						
	B	503,000	699-50-53A						
	C	142,000	299-E25-13						
	D	150,000	299-E25-20						
	E	244,000	299-E17-15						
				45,000	2,100,000	2,100,000	4,300,000	6,400,000	740,000

Table 4-4. Estimated Areas, Volumes, and Masses of Plumes, 200 East Groundwater Aggregate Area

Radionuclides:						Groundwater Volume (m^3) Porosity (n) =			
Chemical Compound	Plume	Max. Activity (pCi/L)	Monitoring Well	Bounding Contour Interval (pCi/L)	Area (m^2)	n = 0.1	n = 0.2	n = 0.3	Activity (Ci)
Gross Alpha	A	38	699-55-57						
	B	20	699-52-54						
	C	30	299-E33-7						
	D	166	299-E28-24						
				15	660,000	660,000	1,300,000	2,000,000	0.03
Gross Beta	A	890	699-55-57						
	B	558	699-53-48B						
	C	2,760	699-50-53A						
	D	10,300	299-E28-23						
	E	937	299-E17-15						
	F	100	299-E13-14						
				50	1,000,000	1,100,000	2,300,000	3,400,000	5.2
Tritium	A	45,700	699-45-42						
	B	74,900	699-43-41E						
	C1	4,270,000	299-E24-11						
	C2	1,130,000	699-35-66						
	C3	2,069,200	299-E25-19						
	C4	298,000	699-32-43						
				20,000	42,000,000	42,000,000	85,000,000	130,000,000	16,400
Co-60		474	699-50-53A	100	750,000	750,000	1,500,000	2,200,000	0.43

Table 4-4. Estimated Areas, Volumes, and Masses of Plumes, 200 East Groundwater Aggregate Area

Radionuclides:						Groundwater Volume (m^3) Porosity (n) =			
Chemical Compound	Plume	Max. Activity (pCi/L)	Monitoring Well	Bounding Contour Interval (pCi/L)	Area (m^2)	n = 0.1	n = 0.2	n = 0.3	Activity (Ci)
Sr-90	A	311	699-53-48B						
	B	5150	299-E28-25						
	C	194	299-E24-19						
	D	19	299-E17-14						
				8	1,100,000	1,100,000	2,100,000	3,200,000	0.17
Tc-99	A	2150	699-55-57						
	B	21700	699-50-53A						
				900	1,500,000	1,500,000	2,900,000	4,400,000	21.9
I-129		26.6	299-E24-1	1	29,000,000	29,000,000	58,000,000	87,000,000	0.24
Cs-137		1330	299-E28-23	120	22,000	22,000	44,000	66,000	0.014
Pu-239/240		73.9	299-E28-23	1	19,000	19,000	37,000	56,000	0.0006

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Table 4-5. Summary of Waste-Producing Processes Potentially Contributing Contaminants to Groundwater Beneath the 200 East Area.

Process	Waste Generated	Major Chemical Constituents	Waste Disposal Methods	Waste Management Units Potentially Affecting Groundwater	Years In Service
		U Plant Aggregate Area			
Uranium recovery	Process waste	Nitric acid, bismuth phosphate, NAOH	Crib, french drain, pond, ditch	216-U-1, 216-U-2, 216-U-10	1952 - 1958
	Wastewater	Nitrates	Crib, french drain, pond, ditch	216-U-1, 216-U-2, 216-U-10	1952 - 1958
UO_3 conversion	Wastewater	Nitrates	Pond, crib, ditch	216-U-10, 216-U-1, 216-U-2, 216-U-12	1944 - present
Solvent treatment	Spent solvents	Tributyl phosphate, normal paraffin hydrocarbons	Crib	various	1952 - 1958
	Carbonate scrub solution	Carbonate, tributyl phosphate, normal paraffin hydrocarbons	Crib	various	1952 - 1958
Analytical laboratory	Laboratory process waste	Unknown	Reverse well, french drain	216-U-4	1947 - 1972
	Used or discarded reagents	Unknown	Reverse well, french drain	216-U-4	1947 - 1972
	Wastewater	Unknown	Reverse well, french drain	216-U-4	1947 - 1972

Table 4-5. Summary of Waste-Producing Processes Potentially Contributing Contaminants to Groundwater Beneath the 200 East Area.

Process	Waste Generated	Major Chemical Constituents	Waste Disposal Methods	Waste Management Units Potentially Affecting Groundwater	Years In Service
Tank farm condensate	Wastewater	Unknown	French drain	None	1954 - 1957
		Z Plant Aggregate Area			
Plutonium Finishing Plant (PFP)	Process waste	Nitric acid, nitrate salts, fluoride	Cribs until 1973, tanks after 1973	216-Z-3, 216-Z-12	1949 - 1973
	Wastewater	Sodium, fluoride, sulfate	Ponds, ditches, seepage basin	216-U-10, 216-Z-21	1949 - 1973
RECUPLEX	Aqueous process waste	Nitric acid, fluorides, nitrates, phosphate	Ditch, pond	216-U-10	1955 - 1962
	Organic solvent waste	CCl_4, TBP, DBBP	Trench	216-Z-9	1955 - 1962
	Spent silica gel	Silica gel, Pu	French drain	216-Z-8	1955 - 1962
Plutonium Reclamation Facility (PRF)	Aqueous process waste	Nitric acid, fluorides, nitrates, phosphate	Crib, tile field	216-Z-1, 216-Z-2, 216-Z-1A, 216-Z-18	1964 - 1978 1984 - 1991
	Organic process waste	CCl_4, TBP, DBBP	Crib, tile field	216-Z-1, 216-Z-2, 216-Z-1A, 216-Z-18	1964 - 1978
Americium recovery	Spent ion exchange resin	^{241}Am, resin	Ditches, pond	216-U-10	1964 - 1976
Analytical laboratory	Laboratory process wastes	Unknown	Crib	216-Z-3, 216-Z-12	1955? - present
	Used or discarded reagents	Unknown	Crib	216-Z-3, 216-Z-12	1955 - present

Table 4-5. Summary of Waste-Producing Processes Potentially Contributing Contaminants to Groundwater Beneath the 200 East Area.

Process	Waste Generated	Major Chemical Constituents	Waste Disposal Methods	Waste Management Units Potentially Affecting Groundwater	Years In Service
Plutonium Isolation Facility (PIF)	Wastewater	Sanitary and lab water	Crib	216-Z-3, 216-Z-12	1955 - present
	Process waste	Nitric acid	Trench, crib, reverse well	216-Z-5, 216-Z-7 216-Z-10	1945 - 1949
	Wastewater	Unknown			
S Plant Aggregate Area					
Feed preparation	Jacket dissolution	Fission products, jacket constituents (alloy) sodium hydroxide, sodium aluminate	Tank	None	1951 - 1967
	Slug dissolution	Sodium hydroxide, ferrous sulfamate, zirconium, niobium	Tank	None	1951 - 1967
Extraction cycles	Aqueous process waste	Sodium aluminate, fission products, sodium hydroxide	Crib	Various	1951 - 1967
	Organic process waste	Hexone	Crib	Various	1951 - 1967
Solvent recovery	Aqueous waste	Sodium hydroxide, sodium carbonate	Crib	Various	1951 - 1967

Table 4-5. Summary of Waste-Producing Processes Potentially Contributing Contaminants to Groundwater Beneath the 200 East Area.

Process	Waste Generated	Major Chemical Constituents	Waste Disposal Methods	Waste Management Units Potentially Affecting Groundwater	Years In Service
Analytical laboratory	Laboratory waste	Sodium hydroxide, organics, fission products	Tank	None	1951 - present
		T Plant Aggregate Area			
Bismuth phosphate	Process waste	Nitric acid	Tank, crib, trench	Various	1944 - 1956
	Aqueous process waste	Phosphoric acid, nitrate solution, uranium, plutonium	Tank, crib, trench	Various	1944 - 1956
Lanthanum fluoride	Process waste	Plutonium, sodium bismuthate, phosphoric acid, nitric acid, hydrogen fluoride, lanthanum salts	Tank, crib, trench	Various	1944 - 1956
	Aqueous process waste	Plutonium, sodium bismuthate, phosphoric acid, nitric acid, hydrogen fluoride, lanthanum salts	Tank, crib, trench	Various	1944 - 1956
"Hot" Semi-Works	Aqueous process waste	Ammonium silico-fluoride	Tank, crib, trench	Various	1944 - 1956
Decontamination and equipment refurbishment	Wastewater	Bismuth phosphate	Crib	216-T-28	1944 - 1956

Table 4-5. Summary of Waste-Producing Processes Potentially Contributing Contaminants to Groundwater Beneath the 200 East Area.

Process	Waste Generated	Major Chemical Constituents	Waste Disposal Methods	Waste Management Units Potentially Affecting Groundwater	Years In Service
Containment Systems Test Facility (CSTF)	NA	NA	NA	NA	NA
Analytical laboratory	Aqueous process waste	Sodium, lithium, sodium iodine	Crib	216-T-28	1944 - 1956
Analytical laboratory	Aqueous process waste	Cesium, manganese, zinc, lithium, sulfate, iodine and hydrogen iodine	Crib	216-T-28	1944 - 1956

NA = No information available.

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Table 4-6. Candidate Contaminants of Potential Concern for the 200 East Groundwater Aggregate Area.

TRANSURANICS

Americium-241
Americium-242*
Americium-242m
Americium-243
Curium-242*
Curium-244
Curium-245
Neptunium-237
Neptunium-239
Plutonium-238
Plutonium-239
Plutonium-240
Plutonium-241

URANIUM

Uranium (total)
Uranium-233
Uranium-234
Uranium-235
Uranium-236
Uranium-238

FISSION PRODUCTS

Actinium-225
Actinium-227
Antimony-125
Antimony-126
Antimony-126m
Astatine-217*
Barium-133
Barium-137m
Bismuth-210
Bismuth-211
Bismuth-213
Bismuth-214
Carbon-14
Cerium,-144
Cesium-134
Cesium-135
Cesium-137
Cobalt-60
Europium-154
Francium-221
Francium-223*
Iodine-129
Krypton-85
Lead-209
Lead-210
Lead-211
Lead-214
Nickel-59
Nickel-63
Polonium-214
Polonium-215*
Polonium-218
Potassium-40
Protactinium-231
Protactinium-233*
Protactinium-234*
Niobium-93m
Niobium-95*
Niobium-95m*
Palladium-107*
Polonium-210
Polonium-211*
Polonium-213*
Protactinium-234m*
Radium-223
Radium-225
Radium-226
Radium-228
Radon-219*
Radon-222
Rhodium-106
Ruthenium-106
Samarium-151
Selenium-79
Silver-110*
Silver-110m*
Strontium-89*
Strontium-90
Technetium-99
Thallium-207
Thorium-227
Thorium-229
Thorium-230
Thorium-231
Thorium-232
Thorium-234
Tin-126*
Tritium
Yttrium-90
Zirconium-93
Zirconium-95*

METALS

Aluminum
Barium
Beryllium
Cadmium
Chromium
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Nickel
Radium
Selenium
Silver
Strontium
Titanium
Uranium
Vanadium
Zinc

OTHER INORGANICS

Ammonia
Ammonium nitrate
Arsenic
Boron
Calcium
Chloride
Cyanide
Ferrocyanide
Fluoride
Hydrofluoric acid
Nitrate
Nitrite
Nitric acid
Phosphate
Potassium
Selenium
Silica
Sodium
Sodium nitrite
Sodium aluminate
Sodium dichromate
Sodium metasilicate
Sodium hydroxide
Sodium nitrate
Sulfate
Sulfuric acid

VOLATILE ORGANICS

Acetone
Carbon tetrachloride
Chloroform
Dibutyl phosphate
1,2-Dichloroethane
Methylene chloride
Methyl isobutyl ketone (MIBK)
Methyl isopropyl ketone
Tetrachloroethylene
Toluene
Tributyl phosphate
1,1,1-Trichloroethane
Trichloroethylene
Xylenes

SEMIVOLATILE ORGANICS

Bis(2-ethylhexyl) phthalate
DDT
Dibutyl butyl phosphonate
Methyl isobutyl carbinol
n-Nitrosodimethylamine
Sodium oxalate

* The radionuclide has a half-life of < 1 year and, if it a daughter product, the parent has a half-life of < 1 year, and the buildup of the short-lived daughter would result in an activity of < 1% of the parent radionuclide's initial activity.

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Table 4-7. Chemicals of Potential Concern for the 200 East Groundwater Aggregate Area.

TRANSURANICS	FISSION PRODUCTS (cont.)	OTHER INORGANICS	SEMIVOLATILE ORGANICS
Americium-241		Ammonia	
Americium-242m	Polonium-210	Ammonium carbonate	Aldrin
Americium-243	Polonium-214	Ammonium nitrate	gamma-BHC
Curium-244	Polonium-218	Arsenic	Bis(2-ethylhexyl) phthalate
Curium-245	Potassium-40	Boron	Butyl phosphate
Neptunium-237	Promethium-147	Cyanide	p-Chloro-m-cresol
Neptunium-239	Protactinium-231	Ferrocyanide	2-Chlorophenol
Plutonium-238	Radium-223	Fluoride	DDD
Plutonium-239	Radium-225	Hydrofluoric acid	DDT
Plutonium-240	Radium-226	Nitrate	Dibutyl phosphate
Plutonium-241	Radium-228	Nitrite	2,4-Dichlorophenol
	Radon-222	Nitric acid	Dieldrin
URANIUM	Rhodium-106	Selenium	Dimethoate
	Ruthenium-106	Sodium dichromate	2,4-Dimethylphenol
Uranium (total)	Samarium-151		2,4-Dinitrophenol
Uranium-233	Selenium-79	VOLATILE ORGANICS	2,4-Dinitrotoluene
Uranium-234	Strontium-90		Endrin
Uranium-235	Technetium-99	Acetone	Heptachlor
Uranium-236	Thallium-207	Carbon tetrachloride	Hydrazine
Uranium-238	Thorium-227	Chloroform	Pentachlorophenol
	Thorium-229	Cyclohexanone	Phenol
FISSION PRODUCTS	Thorium-230	1,1-Dichloroethane	Pyrene
	Thorium-231	1,2-Dichloroethane	2,3,4,5-Tetrachlorophenol
Actinium-225	Thorium-234	cis-1,2-Dichloroethene	Tributyl phosphate
Actinium-227	Tritium	trans-1,2-Dichloroethene	
Antimony-125	Yttrium-90	Methylene chloride	
Antimony-126	Zirconium-93	Methyl ethyl ketone (MEK)	
Antimony-126m		Methyl isobutyl ketone	
Barium-137m	METALS	(MIBK)	
Bismuth-210		Styrene	
Bismuth-211	Antimony	Tetrachloroethylene	
Bismuth-213	Barium	Toluene	
Bismuth-214	Beryllium	1,1,1-Trichloroethane	
Carbon-14	Cadmium	1,1,2-Trichloroethane	
Cesium-134	Chromium	Trichloroethylene	
Cesium-135	Copper	Trichloromonofluoromethane	
Cesium-137	Lead		
Cobalt-60	Manganese		
Europium-154	Mercury		
Europium-155	Nickel		
Francium-221	Silver		
Iodine-129	Thallium		
Lead-209	Titanium		
Lead-210	Uranium		
Lead-211	Vanadium		
Lead-214	Zinc		
Nickel-63			
Niobium-93m			

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Table 4-8. Soil-Water Distribution Coefficients (K_d) for Candidate Radionuclides[a/] and Inorganics of Potential Concern for the 200 East Groundwater Aggregate Area. Page 1 of 3

Element or Chemical	Range of K_{ds} for Hanford Site Cantrell and Serne 1992 (Serne and Wood 1990) in mL/g	Probable K_d[b/] Cantrell and Serne 1992 (Serne and Wood 1990) in mL/g	MEPAS Default K_d pH 6-9[c/] (Strenge and Peterson 1989) in mL/g	Mobility Class
Actinium	–	–	228	Low
Aluminum	–	–	35,300	Low
Americium	(100 to 1,000) (<1 at pH 1-3)	(100)	82	Low
Ammonia	–	–	–	NA
Antimony	–	–	2	High
Arsenic	–	(0)	5.86	High
Barium	–	(50)	530	Moderate
Beryllium	–	–	70	Moderate
Bismuth	500-19,000	1,000	–	Low
Boron	–	–	0.19	High
Cadmium	–	(15)	14.9	Moderate
Calcium	–	(10)	70	Moderate
Carbon (^{14}C)	–	–	0	High
Cesium	500 to 1,000 (1 to 200 (acidic waste))	500	51	Low
Chloride	<1	0	–	High
Chromium (VI)	–	0	16.8	Moderate -High
Cobalt	1,000 to 10,000	2,000	1.9	Low
Copper	–	(15)	41.9	Moderate
Cyanide ion[e/]	–	0.1	–	High[d/]
Curium	(100 to >2,000)	(100)	82	Low
Europium	–	(50)	228	Moderate
Fluoride	–	–	0	High
Francium	–	–	–	NA
Iodine	(<1)	0	0	High
Iron	–	(20)	15	Moderate

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Table 4-8. Soil-Water Distribution Coefficients (K_d) for Candidate Radionuclides[a/] and Inorganics of Potential Concern for the 200 East Groundwater Aggregate Area. Page 2 of 3

Element or Chemical	Range of K_{ds} for Hanford Site Cantrell and Serne 1992 (Serne and Wood 1990) in mL/g	Probable K_d[b/] Cantrell and Serne 1992 (Serne and Wood 1990) in mL/g	MEPAS Default K_d pH 6-9[c/] (Strenge and Peterson 1989) in mL/g	Mobility Class
Krypton	–	–	0	High
Lead	–	(30)	234	Moderate
Lithium	–	–	0	High
Magnesium	–	–	70	Moderate
Manganese	–	(20)	16.5	Moderate
Mercury	–	–	322	Low
Neptunium	(<1 to 5)	(3)	3	High
Nickel	–	(15)	12.2	Moderate
Nitrate/nitric acid	–	–	0	High
Niobium	–	–	50	Moderate
Phosphate	20 to 100	50	50	Moderate
Plutonium	(100 to 1,000) (< 1 at pH 1 to 3)	(100)	10	Low
Polonium	–	–	5.9	Moderate
Potassium	–	–	0	High
Protactinium	–	–	0	High
Radium	–	(20)	24.3	Moderate
Radon	–	–	–	NA
Rhodium	–	–	–	NA
Ruthenium	(20 to 700) (<2 at >1 M nitrate)	–	274	Low-Moderate
Samarium	–	(50)	228	Moderate
Selenium	–	(0)	5.91	High
Silica	–	–	5.0	High
Silver	–	(20)	0.4	Moderate
Sodium	–	(3)	0	High

Table 4-8. Soil-Water Distribution Coefficients (K_d) for Candidate Radionuclides[a/] and Inorganics of Potential Concern for the 200 East Groundwater Aggregate Area. Page 3 of 3

Element or Chemical	Range of K_{ds} for Hanford Site Cantrell and Serne 1992 (Serne and Wood 1990) in mL/g	Probable K_d[b/] Cantrell and Serne 1992 (Serne and Wood 1990) in mL/g	MEPAS Default K_d pH 6-9[c/] (Strenge and Peterson 1989) in mL/g	Mobility Class
Strontium	5 to 100 0 to 20 (acidic conditions) (200 to 500 (w/phosphate or oxalate))	20	24.3	Moderate
Sulfate	--	(0)	0	High
Technetium	0 to 1	0	3	High
Thallium	--	--	0	High
Thorium	--	(50)	100	Moderate
Titanium	--	--	--	NA
Tritium	0	0	0	High
Uranium	0 to 3	1	0	High
Vanadium	--	--	50	Moderate
Yttrium	--	--	278	Low
Zinc	--	(15)	12.7	Moderate
Zirconium	--	(30)	50	Moderate

a/ Radionuclides with half-lives of greater than one year or short-lived products of long-lived precursors.
b/ Average K_ds for low salt and organic solutions with neutral pH.
c/ Default values for pH 6-9 and soil content of [clay + organic matter + metal oxyhydroxides] < 10% (Strenge and Peterson 1989).
d/ Mobility classes are defined as: High (K_d < 5); Moderate (5 < K_d < 100); Low (K_d > 100).
e/ Cyanide mobility is highly dependent on identity of complexing agent. Simple cyanides (e.g., HCN) are more mobile than complex (e.g., metallic) cyanides.
-- Value was not provided for this element in this reference.
NA K_d value was not provided from sources cited in this table.

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Table 4-9. Physical/Chemical Properties of Candidate Organic Compounds of Potential Concern for the 200 East Groundwater Aggregate Area.

Compound	Molecular Weight in g/mole	Water Solubility in mg/L	Vapor Pressure in mm Hg	Henry's Law Constant in atm-m^3/mole	Soil/Organic Matter Partition Coef. K_{oc} in mL/g
Acetone	58.0	miscible	270	2.1×10^{-5}	2.2
Aldrin	365	0.18	6.0×10^{-6}	1.6×10^{-5}	96,000
gamma-BHC	290.8	7.8	1.6×10^{-4}	7.8×10^{-6}	1,100
Bis(2-ethylhexyl) phthalate	391.0	0.40	2.0×10^{-7}	4.4×10^{-7}	87,000
Carbon tetrachloride	154.0	758	90	2.4×10^{-2}	110
Chloroform (trichloromethane)	119	8,200	150	2.9×10^{-3}	31
p-Chloro-m-cresol	142.6	3,900	0.008	4.3×10^{-7}	780
2-Chlorophenol	128.6	29,000	1.8	1.0×10^{-5}	73
Cyclohexanone	98.2	50,000	4.5	1.3×10^{-5}	4
DDD	320	0.1	1.9×10^{-6}	8.0×10^{-6}	770,000
DDT	354.5	0.005	5.5×10^{-6}	5.1×10^{-4}	240,000
Dibutyl phosphate	210.2	"insoluble"[a]	1[a]		
1,1-Dichloroethane	98.96	5,500	180	4.3×10^{-3}	30
1,2-Dichloroethane	98.96	8,500	64	9.8×10^{-4}	14
cis/trans-1,2-Dichloroethene	96.94	6,300	320	6.6×10^{-3}	59
2,4-Dichlorophenol	163	4,600	0.059	2.8×10^{-6}	380
Dieldrin	381	0.19	1.8×10^{-7}	4.6×10^{-7}	1,700
Diethyl ether	74.12[a]	8,000[a]	440[a]	1.35×10^{-3}[a]	73[a]
Dimethoate	229.3	> 5,000[a]	1.6×10^{-6}[a]	2.9×10^{-7}[a]	17[a]

Table 4-9. Physical/Chemical Properties of Candidate Organic Compounds of Potential Concern for the 200 East Groundwater Aggregate Area.

Compound	Molecular Weight in g/mole	Water Solubility in mg/L	Vapor Pressure in mm Hg	Henry's Law Constant in atm-m^3/mole	Soil/Organic Matter Partition Coef. K_{oc} in mL/g
2,4-Dimethylphenol	122.2	590	0.026	1.8×10^{-5}	96
2,4-Dinitrophenol	184.1	5,600	1.5×10^{-5}	6.5×10^{-10}	17
2,4-Dinitrotoluene	182.1	2,400	0.0051	5.1×10^{-6}	45
EDTA	292.2	61,000	1.4×10^{-8}	3.0×10^{-7}	0.73
Endrin	380.9	0.20	2.7×10^{-7}	1.0×10^{-6}	11,000
Endrin aldehyde	380.89	0.25[a]	2×10^{-7}[a]	2.9×10^{-9}[a]	8,500 to 45,000[a]
Ethyl cyanide	55.08	118,000[a]	40[a]	3.7×10^{-5}[a]	1.2[a]
HEDTA	278.3	"soluble"[a]			
Heptachlor	373.5	0.056	3.0×10^{-4}	2.9×10^{-3}	6,000
Hydrazine	32.05	300,000	14	2.0×10^{-6}	0.0053
Methylene chloride	84.9	20,000	360	2×10^{-3}	8.8
Methyl ethyl ketone	72.1	270,000	78	2.7×10^{-5}	4.5
Methyl isobutyl ketone	100.2	19,000	6.0	4.2×10^{-5}	19
o-Nitrophenol	139.1	16,000[b]	2.2[b]	3.0×10^{-4}[b]	50[b]
Normal paraffin hydrocarbons		"insoluble"[a]			
Pentachlorophenol	266.0	14	1.1×10^{-4}	2.8×10^{-6}	53,000
Phenol	94.1	93,000	0.34	4.5×10^{-7}	14
Phorate	260.4		8.4×10^{-4}		
Pyrene	202.3	0.13	2.5×10^{-6}	5.0×10^{-6}	38,000

Table 4-9. Physical/Chemical Properties of Candidate Organic Compounds of Potential Concern for the 200 East Groundwater Aggregate Area.

Compound	Molecular Weight in g/mole	Water Solubility in mg/L	Vapor Pressure in mm Hg	Henry's Law Constant in atm-m^3/mole	Soil/Organic Matter Partition Coef. K_{oc} in mL/g
Styrene	104.2	320	100	4.7×10^{-3}	550
2,3,4,6-Tetrachlorophenol	231.89	1,000	9.1×10^{-4}	3.1×10^{-7}	17,000
Tetrachloroethylene	165.85	150	18	2.6×10^{-2}	360
Toluene	92.2	1,550	28.4	6.4×10^{-3}	300
Tributyl phosphate	266.3	280	15	1.9×10^{-2}	6,000
Tributyl phosphonate					
1,1,1-Trichloroethane	133.4	1,500	120	1.4×10^{-2}	150
1,1,2-Trichloroethane	133.4	4,500	30	1.2×10^{-3}	56
Trichloroethylene	131.3	1,100	58	9.1×10^{-3}	130
Trichloromonofluoromethane	137.4	1,100	670	0.11	160
Triethylene glycol	150.18	1.4×10^{6}	8.7×10^{-4}	1.3×10^{-10}	0.0051

Sources: Strenge and Peterson 1989, except as noted in footnotes.

a/ Values listed in Hazardous Substance Data Base (HSDB), National Library of Medicine database (HSDB 1991).

b/ Data for o-nitrophenol was not located, values for p-nitrophenol are listed.

Blank indicates value not available from above sources.

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Table 4-10. Radiological Properties of Candidate Radionclides of Potential Concern for the 200 East Groundwater Aggregate Area. Page 1 of 2

Radionuclide	Half-Life	Specific Activity[a] in Ci/g	Radiation of Concern[b]
^{225}Ac	10 day	5.8×10^{4}	α
^{227}Ac	21.8 yr	7.2×10^{1}	β, α
^{110}Ag	24.6 sec	4.2×10^{9}	β
^{110m}Ag	249.85 day	4.7×10^{3}	β, γ
^{241}Am	432 yr	3.4×10^{0}	α
^{242}Am	16 hr	8.1×10^{5}	β
^{242m}Am	152 yr	9.7×10^{0}	α
^{243}Am	7,380 yr	2.0×10^{-1}	α
^{217}At	0.032 sec	1.6×10^{12}	α
^{133}Ba	10.5 yr	2.5×10^{2}	γ [c]
^{137m}Ba	2.6 min	5.3×10^{8}	γ
^{210}Bi	5.01 day	1.2×10^{5}	β
^{211}Bi	2.13 min	4.2×10^{8}	α, β
^{213}Bi	45.6 min	1.9×10^{7}	β, α
^{214}Bi	19.9 min	4.4×10^{7}	β, γ
^{14}C	5,730 yr	4.5×10^{0}	β
^{242}Cm	163.2 day	3.3×10^{3}	α
^{244}Cm	18.1 yr	8.1×10^{1}	α
^{245}Cm	8,500 yr	1.7×10^{-1}	α, γ
^{60}Co	5.3 yr	1.1×10^{3}	γ
^{134}Cs	2.06 yr	1.3×10^{3}	γ
^{135}Cs	2.3×10^{6} yr	1.2×10^{-3}	β
^{137}Cs	30 yr	8.7×10^{1}	γ [c]
^{154}Eu	8.8 yr	2.7×10^{2}	β, γ [c]
^{221}Fr	4.8 min	1.8×10^{8}	α
^{223}Fr	21.8 min	3.9×10^{7}	β
^{3}H	12.3 yr	9.7×10^{3}	β
^{129}I	1.6×10^{7} yr	1.7×10^{-4}	β
^{40}K	1.3×10^{9} yr	6.7×10^{-6}	β, γ [c]
^{85}Kr	10.7 yr	3.9×10^{2}	β
^{93m}Nb	14.6 yr	2.8×10^{2}	γ [c]
^{95}Nb	34.97 day	3.9×10^{4}	β, γ
^{95m}Nb	90 hr	3.7×10^{5}	γ[c]
^{59}Ni	75,000 yr	7.6×10^{4}	γ [c]
^{63}Ni	100.1 yr	6.2×10^{1}	β
^{237}Np	2.14×10^{6} yr	7.0×10^{-4}	α, γ
^{239}Np	2.35 day	2.3×10^{5}	β
^{231}Pa	32,800 yr	4.7×10^{-2}	α
^{233}Pa	27 day	2.1×10^{4}	β, γ[c]
^{234}Pa	6.8 hr	2.0×10^{-6}	β
^{234m}Pa	1.17 min	6.9×10^{8}	β
^{209}Pb	3.25 hr	4.5×10^{6}	β
^{210}Pb	22.3 yr	7.6×10^{1}	β
^{211}Pb	36.1 min	2.5×10^{7}	β
^{214}Pb	26.8 min	3.3×10^{7}	β, γ [c]
^{107}Pd	6.5×10^{6} yr	5.1×10^{-4}	β
^{210}Po	128 day	4.9×10^{3}	α

9 3 1 2 9 7 1 5 1 2

Table 4-10. Radiological Properties of Candidate Radionclides of Potential Concern for the 200 East Groundwater Aggregate Area. Page 2 of 2

Radionuclide	Half-Life	Specific Activity[a] in Ci/g	Radiation of Concern[b]
^{211}Po	0.52 sec	1.0×10^{11}	α, γ
^{213}Po	4.2×10^{-6} sec	1.3×10^{16}	α
^{214}Po	6×10^{-5} sec	8.8×10^{14}	α
^{215}Po	7.8×10^{-4} sec	2.9×10^{13}	α
^{218}Po	3.05 min	2.8×10^{8}	α
^{238}Pu	87.7 yr	1.7×10^{1}	α
^{239}Pu	24,400 yr	6.2×10^{-2}	α
^{240}Pu	6,560 yr	2.3×10^{-1}	α
^{241}Pu	14.4 yr	1.0×10^{2}	β
^{223}Ra	11.43 day	5.1×10^{4}	α
^{225}Ra	14.8 day	3.9×10^{4}	β
^{226}Ra	1,600 yr	9.9×10^{-1}	α
^{228}Ra	5.75 yr	2.3×10^{2}	β
^{187}Re	5×10^{10} yr	3.8×10^{8}	β
^{106}Rh	30 sec	3.5×10^{9}	β, γ
^{219}Rn	4.0 sec	1.3×10^{10}	α
^{222}Rn	3.8 day	1.5×10^{5}	α, γ
^{106}Ru	1.0 yr	3.4×10^{3}	β, γ [c]
^{126}Sb	12.4 day	8.4×10^{4}	β, γ [c]
^{126m}Sb	19 min	7.85×10^{7}	β, γ[c]
^{79}Se	<65,000 yr	7.0×10^{-2}	β
^{151}Sm	90 yr	2.6×10^{1}	β
^{126}Sn	1×10^{5} yr	2.8×10^{-2}	γ
^{89}Sr	50.55 day	2.9×10^{4}	β, γ[c]
^{90}Sr	28.5 yr	1.4×10^{2}	β
^{99}Tc	213,000 yr	1.7×10^{-2}	β
^{227}Th	18.7 day	3.1×10^{4}	α
^{229}Th	7,340 yr	2.1×10^{-1}	α
^{230}Th	77,000 yr	2.1×10^{-2}	α
^{231}Th	25.5 hr	5.3×10^{5}	β
^{232}Th	1.4×10^{10} yr	1.1×10^{-7}	α
^{234}Th	24.1 day	2.3×10^{-4}	β
^{207}Tl	4.77 min	1.9×10^{8}	β, γ
^{233}U	159,000 yr	9.7×10^{-3}	α
^{234}U	244,500 yr	6.2×10^{-3}	α
^{235}U	7.0×10^{8} yr	2.2×10^{-6}	α, γ
^{236}U	2.3×10^{7} yr	6.5×10^{-5}	α
^{238}U	4.5×10^{9} yr	3.4×10^{-7}	α
^{90}Y	6.41 hr	5.4×10^{5}	β
^{95}Zr	64 day	2.1×10^{4}	β

[a] Source: DOE 1990.
[b] α - alpha decay; β - negative beta decay; γ - release of gamma rays.
[c] Gamma radiation due to daughter product activity.

Table 4-11. Relative Risks for Radionuclides of Potential Concern for the 200 East Groundwater Aggregate Area. Page 1 of 3

Radionuclide	Half-Life[a/]	Air Unit Risk[b/] in $(pCi/m^3)^{-1}$	Drinking Water Unit Risk[c/] in $(pCi/L)^{-1}$	Soil Ingestion Unit Risk[d/] in $(pCi/g)^{-1}$	External Exposure Unit Risk[e/] in $(pCi/g)^{-1}$
^{225}Ac	10 day	1.2×10^{-3}	8.7×10^{-7}	4.6×10^{-8}	9.4×10^{-6}
^{227}Ac	21.8 yr	4.2×10^{-2}	1.8×10^{-5}	9.5×10^{-7}	1.3×10^{-7}
^{241}Am	433 yr	2.1×10^{-2}	1.6×10^{-5}	8.4×10^{-7}	1.6×10^{-5}
^{242m}Am	152 yr	NA	NA	NA	NA
^{243}Am	7,380 yr	2.1×10^{-2}	1.5×10^{-5}	8.1×10^{-7}	3.6×10^{-5}
^{133}Ba	10.5 yr	NA	NA	NA	NA
^{137m}Ba	2.6 min	3×10^{-10}	1.2×10^{-10}	6.5×10^{-12}	3.4×10^{-4}
^{210}Bi	5.01 day	4.1×10^{-5}	9.7×10^{-8}	5.1×10^{-9}	0
^{211}Bi	2.13 min	9.7×10^{-8}	6.1×10^{-10}	3.2×10^{-11}	2.8×10^{-5}
^{213}Bi	45.6 min	1.6×10^{-7}	1.2×10^{-8}	6.2×10^{-10}	8.1×10^{-5}
^{214}Bi	19.9 min	1.1×10^{-6}	7.2×10^{-9}	3.8×10^{-10}	8.0×10^{-4}
^{14}C	5,730 yr	3.2×10^{-9}	4.7×10^{-8}	2.5×10^{-9}	0
^{244}Cm	18.1 yr	1.4×10^{-2}	1.0×10^{-5}	5.4×10^{-7}	5.9×10^{-7}
^{245}Cm	8,500 yr	NA	NA	NA	NA
^{60}Co	5.3 yr	8.1×10^{-5}	7.8×10^{-7}	4.1×10^{-8}	1.3×10^{-3}
^{134}Cs	2.06 yr	1.4×10^{-5}	2.1×10^{-6}	1.1×10^{-7}	8.9×10^{-4}
^{135}Cs	2.3×10^{6} yr	1.4×10^{-6}	2.1×10^{-7}	1.1×10^{-8}	0
^{137}Cs	30 yr	9.6×10^{-6}	1.4×10^{-6}	7.6×10^{-8}	0
^{154}Eu	8.8 yr	7.2×10^{-5}	1.5×10^{-7}	8.1×10^{-9}	6.8×10^{-4}
^{221}Fr	4.8 min	4.7×10^{-7}	3.0×10^{-9}	1.6×10^{-10}	1.9×10^{-5}
^{3}H	12.3 yr	4.0×10^{-8}	2.8×10^{-9}	1.5×10^{-10}	0
^{129}I	1.6×10^{7} yr	6.1×10^{-5}	9.6×10^{-6}	5.1×10^{-7}	1.5×10^{-5}
^{40}K	1.3×10^{9} yr	4.0×10^{-6}	5.7×10^{-7}	3.0×10^{-8}	7.8×10^{-5}
^{85}Kr	10.7 yr	NA	NA	NA	NA
^{93m}Nb	14.6 yr	NA	NA	NA	NA
^{59}Ni	75,000 yr	3.5×10^{-7}	4.4×10^{-9}	2.3×10^{-10}	3.4×10^{-7}
^{63}Ni	100.1 yr	8.7×10^{-7}	1.2×10^{-8}	6.2×10^{-10}	0
^{237}Np	2.14×10^{6} yr	1.8×10^{-2}	1.4×10^{-5}	7.3×10^{-7}	1.8×10^{-5}
^{239}Np	2.35 day	7.7×10^{-7}	4.8×10^{-8}	2.5×10^{-9}	1.1×10^{-4}
^{231}Pa	32,800 yr	2.0×10^{-2}	9.7×10^{-6}	5.1×10^{-7}	2.0×10^{-5}
^{209}Pb	3.25 hr	3.6×10^{-8}	4.3×10^{-9}	2.3×10^{-10}	0
^{210}Pb	22.3 yr	8.7×10^{-4}	3.4×10^{-5}	1.8×10^{-6}	1.8×10^{-6}
^{211}Pb	36.1 min	1.5×10^{-6}	9.2×10^{-9}	4.9×10^{-10}	2.9×10^{-5}

9 3 1 2 9 7 1 5 1 4

Table 4-11. Relative Risks for Radionuclides of Potential Concern for the 200 East Groundwater Aggregate Area. Page 2 of 3

Radionuclide	Half-Life[a/]	Air Unit Risk[b/] in $(pCi/m^3)^{-1}$	Drinking Water Unit Risk[c/] in $(pCi/L)^{-1}$	Soil Ingestion Unit Risk[d/] in $(pCi/g)^{-1}$	External Exposure Unit Risk[e/] in $(pCi/g)^{-1}$
^{214}Pb	26.8 min	1.5×10^{-6}	9.2×10^{-9}	4.9×10^{-10}	1.5×10^{-4}
^{210}Po	128 day	8.7×10^{-4}	3.4×10^{-5}	1.8×10^{-6}	1.8×10^{-6}
^{214}Po	6×10^{-5} sec	1.4×10^{-13}	5.1×10^{-16}	2.7×10^{-17}	4.7×10^{-8}
^{215}Po	7.8×10^{-4} sec	2.9×10^{-12}	1.4×10^{-14}	7.6×10^{-16}	8.7×10^{-8}
^{218}Po	3.05 min	3.0×10^{-7}	1.4×10^{-9}	7.6×10^{-11}	0
^{238}Pu	87.7 yr	2.1×10^{-2}	1.4×10^{-5}	7.6×10^{-7}	5.9×10^{-7}
^{239}Pu	24,400 yr	2.6×10^{-2}	1.6×10^{-5}	8.4×10^{-8}	2.6×10^{-7}
^{239}Pu oxide	24,400 yr	2.6×10^{-2}	1.6×10^{-6}	8.4×10^{-8}	2.6×10^{-7}
^{240}Pu	6,560 yr	2.1×10^{-2}	1.6×10^{-5}	8.4×10^{-8}	5.9×10^{-7}
^{240}Pu oxide	6,560 yr	2.1×10^{-2}	1.6×10^{-6}	8.4×10^{-8}	5.9×10^{-7}
^{241}Pu	14.4 yr	1.5×10^{-4}	2.5×10^{-7}	1.3×10^{-8}	0
^{223}Ra	11.4 day	1.6×10^{-3}	4.1×10^{-6}	2.2×10^{-7}	8.4×10^{-5}
^{225}Ra	14.8 day	8.2×10^{-4}	3.4×10^{-6}	1.8×10^{-7}	8.0×10^{-6}
^{226}Ra	1,600 yr	1.5×10^{-3}	6.1×10^{-6}	3.2×10^{-7}	4.1×10^{-6}
^{228}Ra	5.75 yr	3.4×10^{-4}	5.1×10^{-6}	2.7×10^{-7}	5.6×10^{-13}
^{106}Rh	30 sec	NA	NA	NA	NA
^{222}Rn	3.8 day	3.7×10^{-7}	NA	NA	2.2×10^{-7}
^{106}Ru	1.0 yr	2.3×10^{-4}	4.9×10^{-7}	2.6×10^{-8}	0
^{125}Sb	2.73 yr	NA	NA	NA	NA
^{126m}Sb	19 min	NA	NA	NA	NA
^{79}Se	<65,000 yr	NA	NA	NA	NA
^{151}Sm	90 yr	NA	NA	NA	NA
^{90}Sr	28.5 yr	2.8×10^{-5}	1.7×10^{-6}	8.9×10^{-8}	0
^{99}Tc	213,000 yr	4.2×10^{-6}	6.6×10^{-8}	3.5×10^{-9}	3.4×10^{-10}
^{227}Th	18.72 day	2.5×10^{-3}	2.5×10^{-7}	1.3×10^{-8}	6.6×10^{-6}
^{229}Th	7,340 yr	3.9×10^{-2}	2.0×10^{-6}	1.1×10^{-7}	5.8×10^{-5}
^{230}Th	77,000 yr	1.6×10^{-2}	1.2×10^{-6}	6.5×10^{-8}	5.9×10^{-7}
^{231}Th	25.5 hr	2.5×10^{-7}	2.0×10^{-8}	1.1×10^{-9}	1.1×10^{-5}
^{232}Th	1.4×10^{10} yr	1.6×10^{-2}	1.1×10^{-6}	5.9×10^{-8}	4.5×10^{-7}
^{234}Th	24.1 day	1.6×10^{-5}	2.0×10^{-7}	1.1×10^{-8}	5.6×10^{-6}
^{207}Tl	4.77 min	2.3×10^{-9}	6.6×10^{-10}	3.5×10^{-11}	1.2×10^{-6}
^{233}U	159,000 yr	1.4×10^{-2}	7.2×10^{-6}	3.8×10^{-7}	3.2×10^{-7}
^{234}U	244,500 yr	1.4×10^{-2}	7.2×10^{-6}	3.8×10^{-7}	5.6×10^{-7}
^{235}U	7.0×10^{8} yr	1.3×10^{-2}	6.6×10^{-6}	3.5×10^{-7}	9.7×10^{-5}

Table 4-11. Relative Risks for Radionuclides of Potential Concern for the 200 East Groundwater Aggregate Area. Page 3 of 3

Radionuclide	Half-Life[a/]	Air Unit Risk[b/] in $(pCi/m^3)^{-1}$	Drinking Water Unit Risk[c/] in $(pCi/L)^{-1}$	Soil Ingestion Unit Risk[d/] in $(pCi/g)^{-1}$	External Exposure Unit Risk[e/] in $(pCi/g)^{-1}$
^{236}U	2.3×10^7 yr	NA	NA	NA	NA
^{238}U	4.5×10^9 yr	1.2×10^{-2}	6.6×10^{-6}	3.5×10^{-7}	4.5×10^{-7}
^{90}Y	64.1 hr	2.8×10^{-6}	1.6×10^{-7}	8.6×10^{-9}	0
^{93}Zr	1.53×10^6 yr	NA	NA	NA	NA

a/ Source: DOE 1990
b/ Excess cancer risk associated with lifetime exposure to 1 pCi/m^3 (10^{-12} Ci) per day in air (EPA 1991a).
c/ Excess cancer risk associated with lifetime exposure to 1 pCi (10^{-12} Ci) per day in drinking water (EPA 1991a).
d/ Excess cancer risk associated with lifetime exposure to 1 pCi/g (10^{-12} Ci/g) per day in soil (EPA 1991a).
e/ Excess cancer risk associated with lifetime exposure to surface soils containing 1 pCi/g of gamma-emitting radionuclides (EPA 1991a).

NA No information available.

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Table 4-12. Potential Chronic Health Effects of Candidate Chemicals of Potential Concern for the 200 East Groundwater Aggregate Area. Page 1 of 3

Chemical	Tumor Site Inhalation Route; Oral Route [Weight of Evidence Group[a/]]	Noncarcinogenic Chronic Health Effects Inhalation Route; Oral Route
INORGANIC CHEMICALS		
Aluminum	--	--
Ammonia	--	decreased pulmonary function, degrades odor; taste of water
Ammonium nitrate	(see ammonia and nitrate)	(see ammonia and nitrate)
Arsenic	respiratory tract [A]; skin [a]	NA; keratosis, hyperpigmentation
Barium	--	fetotoxicity; increased blood pressure
Beryllium	lung [B2]; total tumors [B2]	none observed
Boron	--	NA; testicular lesions
Cadmium	respiratory tract [B1]; NA	cancer; renal damage
Calcium	--	--
Chloride	--	--
Chromium	lung [A] - Cr(VI) only; NA	Nasal mucosa atrophy (Cr (III) and (VI)); hepatotoxicity (Cr (III))
Copper	--	NA; gastrointestinal irritation
Cyanide	--	NA; weight loss, thyroid effects, myelin degeneration
Ferrocyanide	(see cyanide)	(see cyanide)
Fluoride	--	NA; dental fluorosis at high levels
Iron	--	--
Lead	[B2][c/]; [B2]	central nervous system (CNS) effects[c/]; CNS effects
Lithium	--	--
Magnesium	--	--
Manganese	--	respiratory, psychomotor symptoms; no effect
Mercury	--	neurotoxicity; kidney effects
Nickel	respiratory tract [A]; NA	cancer; reduced weight gain
Nitrate/Nitrite	--	NA; methemoglobinemia in infants[d/]

Table 4-12. Potential Chronic Health Effects of Candidate Chemicals of Potential Concern for the 200 East Groundwater Aggregate Area. Page 2 of 3

Chemical	Tumor Site Inhalation Route; Oral Route [Weight of Evidence Group[a/]]	Noncarcinogenic Chronic Health Effects Inhalation Route; Oral Route
Nitric acid	(see nitrate)	(see nitrate)
Phosphate	--	--
Potassium	--	--
Selenium	NA[D]; NA[D]	NA; selenosis
Silica	--	--
Silver	--	NA; argyria
Sodium	--	--
Sodium aluminate	(see sodium and aluminum)	(see sodium and aluminum)
Sodium dichromate	(see sodium and chromium(VI))	(see sodium and chromium(VI))
Sodium metasilicate	(see sodium and silica)	(see sodium and silica)
Sodium hydroxide	--	--
Sodium nitrate	(see sodium and nitrate)	(see sodium and nitrate)
Sodium nitrite	(see sodium and nitrite)	(see sodium and nitrite)
Sulfate	--	--
Sulfuric acid	--	respiratory; NA
Strontium	--	--
Titanium	--	--
Uranium (soluble salts)	--	NA; body weight loss, nephrotoxicity
Vanadium	--	NA; none observed
Zinc	--	NA; anemia
	--	--
ORGANIC CHEMICALS	--	--
Acetone	--	NA; kidney and liver effects
Bis(2-ethylhexyl)phthalate	NA [B2]; liver [B2]	NA; increased liver weight
Carbon tetrachloride	liver [B2]; liver [B2]	NA; liver lesions
Chloroform	liver [B2]; kidney [B2]	NA; liver lesions
DDT	liver [B2]; liver [B2]	NA; liver lesions
Dibutyl butyl phosphonate	--	--
Dibutyl phosphate	--	NA; respiratory irritation[b/]

Table 4-12. Potential Chronic Health Effects of Candidate Chemicals of Potential Concern for the 200 East Groundwater Aggregate Area. Page 3 of 3

Chemical	Tumor Site Inhalation Route; Oral Route [Weight of Evidence Group[a/]]	Noncarcinogenic Chronic Health Effects Inhalation Route; Oral Route
1,2-Dichloroethane	circulatory system [B2]; circulatory system [B2]	--
Methylene chloride	lung, liver [B2]; liver [B2]	NA; liver toxicity
Methyl isobutyl carbinol	--	--
Methyl isobutyl ketone (MIBK, "Hexone")	--	liver and kidney effects; liver and kidney effects
Methyl isopropyl ketone	--	--
n-Nitrosodimethylamine	liver [B2]; liver [B2]	--
Sodium oxalate	--	--
Tetrachloroethene	leukemia, liver [B2]; liver [B2]	NA; hepatotoxicity
Toluene	--	CNS effects, eye irritation; change in liver and kidney weights
Tributyl phosphate	--	respiratory irritant; kidney damage[b/]
1,1,1-Trichloroethane	--	liver toxicity; liver toxicity
Trichloroethylene	lung [B2]; liver [B2]	--

[a/] Weight of Evidence Groups for carcinogens: A - Human carcinogen (sufficient evidence of carcinogenicity in humans); B -Probable Human Carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence of carcinogenicity in animals with inadequate or lack of data in humans); C - Possible Human Carcinogen (limited evidence of carcinogenicity in animals and inadequate or lack of human data); D - Not Classifiable as to Human Carcinogenicity (inadequate or no evidence).
[b/] Verified toxicity information was not available from EPA 1991 or 1992. Toxicity information was obtained from EPA Registry of Toxic Effects of Chemical Systems (RTECS). A blank space means that no information was available from the above sources.
[c/] Lead is considered by EPA to have both neurotoxic and carcinogenic effects; however, no toxicity criteria are available for lead at the present time.
[d/] Toxic effect is considered to occur from exposure to nitrite; nitrate can be converted to nitrite in the body by intestinal bacteria.
[e/] Toxic effect of untritiated naphthylamine.
NA No information available.

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5.0 GROUNDWATER CONTAMINANT SCREENING AND PRIORITIZATION

This preliminary qualitative evaluation of groundwater contaminants is intended to provide input to the 200 East Area recommendation process (Section 9.0). That process requires evaluation of groundwater contaminants and contaminant plumes in the context of their near and long-term significance to human health and the environment.

The approach that has been taken in this evaluation of 200 East Area groundwater contaminants is as follows:

- Contaminants of potential concern are identified within the 200 East Area. As discussed in Section 4.2, contaminants of potential concern were selected from the list of candidate contaminants of potential concern presented in Table 4-6. The subset of those contaminants that were detected in the unconfined aquifer beneath the 200 East Area during 1988 through 1992 are listed in Table 5-1.

- Relative-significance rankings are developed for the currently measured groundwater contaminant concentrations, and the contaminant concentrations projected to occur offsite following transport within the Hanford unconfined aquifer.

- The relative-significance rankings for collocated contaminants are combined, as appropriate, to construct overall significance rankings for contaminant plumes or portions of plumes within the groundwater. These overall rankings are used, in conjunction with other factors, to identify regions of the contaminated aquifer for the review and possible redefinition of groundwater operable units.

In the data evaluation process presented in Section 9.0, "higher" priority sites are evaluated for the potential implementation of an interim remedial measure (IRM). "Lower" priority sites are evaluated to determine what type of additional investigation is necessary to establish a final remedy. Further detail is presented in Section 9.0.

The data used for this evaluation of contaminant significance based on human health considerations are presented in the earlier sections of this report. The types of data that have been assessed include site histories and physical descriptions (Section 2.0), descriptions of the physical environment of the study area (Section 3.0) and a summary of the available chemical and radiological data for the 200 East Area aquifer (Section 4.0).

The quality and sufficiency of these data are assessed in Section 8.0. This information is also used to identify applicable or relevant and appropriate requirements (ARARs) (Section 6.0).

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5.1 CONCEPTUAL FRAMEWORK FOR RISK-BASED SCREENING

The range of potential human health exposure pathways associated with the 200 East Area groundwater was summarized in Section 4.2. The U.S. Environmental Protection Agency (EPA; 1989a) considers a human exposure pathway to consist of four elements: (1) a source and mechanism for contaminant release; (2) a retention or transport medium (or media); (3) a point of potential human contact; and (4) an exposure route (e.g., ingestion) at the contact point. The probability of the existence of a particular pathway is dependent upon the physical and institutional controls affecting site access and use. In the absence of site access controls and other land use restrictions, the identified potential exposure pathways can all occur. For example, it can be hypothesized that an individual may establish a residence within the boundaries of the Hanford Site, drill a well and withdraw contaminated water for drinking water and crop irrigation. However, within the five- to ten-year period of interest associated with identification and prioritization of remedial actions associated with the 200 East Area, unrestricted access and ability to drill a well have a negligible probability of occurrence. Until future land use of the Hanford Site is defined, U.S. Department of Energy (DOE) policy is that the Hanford Site will remain under DOE management, which includes control over beneficial use of the land and any uses of groundwater at least until the year 2018 as agreed upon in the Tri-Party Agreement.

Public exposure to groundwater contaminants can also occur following contaminant transport through the unconfined aquifer to offsite locations. The distances separating current 200 East Area groundwater plumes from offsite locations are significant.

To provide input to the prioritization of remediation actions for the 200 East Area, groundwater contaminants were evaluated on the basis of: (1) their currently measured levels and (2) their theoretical levels estimated to occur offsite following transport through the unconfined aquifer. It is important to note that this contaminant screening process does not evaluate potential risks associated with the Hanford Site and potential exposure to contaminated groundwater. The assessment of health risks associated with a contaminated site typically follows a four step process involving (1) site/contaminant characterization, (2) exposure assessment, (3) toxicity assessment, and (4) risk characterization. A quantitative risk assessment requires detailed site-specific data for each step in this process resulting in numerical estimates of potential risk to individuals. The risk-based screening evaluation used here for the purpose of prioritizing sites encompasses these same four analytical steps. However, with the exception of initial contaminant concentration data, other site-specific data were not used. Instead, the screening process used reasonable default values in place of site-specific data, resulting in a consistent semiquantitative evaluation of the various contaminants in the aquifer and potential future contaminant concentrations offsite, for their relative significance to human health. This screening process does not consider, nor suggest for consideration, any specific scenario for exposure to groundwater contaminants. Formal quantitative evaluations of potential human health risks will ultimately be conducted in

accordance with the M-29 milestone report, *Hanford Site Baseline Risk Assessment Methodology* (DOE/RL 1991e).

5.2 SCREENING PROCESS

The objective of the 200 East Area groundwater contaminant screening process is to provide risk-based input to the process of: (1) establishing groundwater remedial action priorities; and (2) defining groundwater "operable units" that focus and ensure the effectiveness of remedial actions. This risk-based input consists of relative-significance rankings developed for the currently measured groundwater contaminant concentrations, and the contaminant concentrations projected to occur offsite following transport within the Hanford unconfined aquifer.

The Multimedia Environmental Pollutant Assessment System (MEPAS), developed by the Pacific Northwest Laboratory (PNL), was used to calculate semiquantitative indices of contaminant relative-risk significance. These relative-risk indices integrate the various contaminant characteristics (toxicity, mobility, persistence, quantity, etc.) into a single prioritization value, thereby providing comprehensive input to the recommendation process. The MEPAS computer software is an enhanced version of the Remedial Action Priority System (RAPS) (Whelan et al. 1987).

5.2.1 Multimedia Environmental Pollutant Assessment System

The MEPAS is a computer-based system developed for the U.S. Department of Energy's Office of Environmental, Safety and Health to provide a management tool for assistance in prioritizing environmental restoration funding and resource allocations. It uses empirical, analytical, and semi-analytical mathematical algorithms and pathway analyses to estimate the following processes:

- Potential release of contaminants into the environment
- Transport of contaminants through and between four major environmental transport elements: groundwater, surface water, overland flow, and atmospheric
- Exposure to surrounding human populations (i.e., food chain considerations, inhalation, ingestion, dermal contact, and external dose)
- Human health effects associated with exposure to chemicals and radionuclides.

Detailed descriptions of the MEPAS formulations are given in Droppo et al. (1989) and Whelan et al. (1987) as well as comparisons with EPA's Hazard Ranking System (HRS), and the modified Hazard Ranking System (mHRS) developed by PNL. The MEPAS was developed to calculate semiquantitative indices of health risks associated with long-term (hundreds to thousands of years) environmental conditions resulting from the release of contaminants from a hazardous waste site. Potential health impacts are evaluated for multiple, sequential 70-yr exposure increments, with average concentrations defined for each increment.

The MEPAS groundwater component computes (or takes as input) contaminant concentrations at wells and calculates solute fluxes from the groundwater environment to the surface water environment. The groundwater pathway solution algorithms are based on Green's functions (Whelan et al. 1987).

The MEPAS is capable of addressing nontidal rivers and wetlands. A three-dimensional, steady-state, vertically integrated mass balance equation for contaminant transport in a river environment (where longitudinal advection dominates longitudinal dispersion) forms the basis for the river water solution algorithm (Codell et al. 1982). Contaminants released into a river are transported through the system by the processes of advection and dispersion, with dispersion being considered in both the lateral and vertical directions.

Overland flow is that portion of precipitation that ultimately appears as flowing water on the ground surface. The driving mechanism transporting contaminants through the overland pathway is this overland flow. Estimation techniques for the overland pathway are based on the curve number technique of the U.S. Department of Agriculture's Soil Conservation Service (SCS 1972, 1982). The overland transport pathway can interact with the surface water pathway or directly supply the exposure component with contaminant levels.

The MEPAS atmospheric component considers release mechanisms and characteristics, dilution and transport, washout by cloud droplets and precipitation, and deposition on the underlying surface cover. The prediction of contaminant movement through the atmospheric pathway therefore involves modeling components that address atmospheric suspension/emission, transport, diffusion, and deposition. Contaminant transport is assumed to occur fast enough to allow chemical transformations to be neglected. Atmospheric transport and dispersion are computed in terms of sector-averaged values using Gaussian dispersion principles. Deposition is calculated as the sum of wet and dry deposition.

The results from each of the four transport pathways are used in the exposure assessment component of MEPAS to calculate the hazard potential for each contaminant. The transport and exposure pathways considered in the MEPAS calculations performed here are graphically depicted in the right-hand portion of Figure 4-19, Conceptual Model of the

200 East Groundwater Aggregate Area. As shown in that figure, groundwater contaminants are transferred to potable water supplies, vegetation and other farm products, and the surface soil through direct groundwater withdrawal. Groundwater discharges to surface water lead to contamination of that water body and subsequent transfer of contaminants to potable water supplies, vegetation and other farm products, and the surface of soil through surface water withdrawal. As further depicted in Figure 4-19, the exposure assessment component considers potential exposure of the surrounding population through the following exposure routes:

- Dermal contact with chemicals
- External dose from radiation
- Inhalation of airborne contaminants
- Ingestion of contaminated drinking water, soil, crops, animal products, and aquatic foods.

Based on the air, water, and soil contaminant levels provided by the transport pathway analyses, an estimate is made of the average daily human exposure to each contaminant. The daily exposure rate is next converted to an average individual relative health risk index (RRI) using mathematical models for radionuclides, carcinogenic chemicals, and noncarcinogenic chemicals. Some chemicals have both carcinogenic and toxic effects and are therefore considered in both categories. The RRI indicates the level of potential health impact to an average member of the exposed population. For radionuclides, the RRI is based on cancer risk estimates of the National Academy of Sciences Committee on Biological Effects of Ionizing Radiation (NAS 1980). The risks from chemical carcinogens are based on cancer potency factors defined by the EPA (1982). Because the EPA routinely updates its health risk data, the data contained in the MEPAS database were reviewed and specific necessary changes made as detailed below. A complete revision of the MEPAS database to incorporate the more recent sources was determined to be prohibitive, and unnecessary for the purpose of these screening evaluations. In general, however, data precedence is given to the Integrated Risk Information System (IRIS) (EPA 1991b) followed by the Health Effects Assessment Tables (HEAST) (EPA 1992). For noncarcinogens, RRIs represent the ratio of estimated dose to reference dose multiplied by 1×10^{-6}. The factor of 1×10^{-6} is simply used to adjust the noncarcinogen RRI numerical values to an order of magnitude similar to the carcinogenic RRIs. Because of their chemical nature, constituents such as 1,1-dichloroethane, beryllium, cadmium, chromium, and nickel are considered both as carcinogens and toxic noncarcinogens.

The MEPAS also provides a database of standardized values for many nonsite-specific parameters, including all chemical-specific values and the soil-water distribution coefficient (K_d) (Strenge and Peterson 1989). The values contained in this database were used in the

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relative-risk computations, with a few exceptions. The Cancer Potency Factors (CPF) for carcinogenic chemicals and the Reference Doses (RfD) for noncarcinogenic chemicals are often updated by EPA. Due to these updates, the values in the MEPAS database were reviewed and the following changes were made:

- **1,1,1-Trichloroethane.** The MEPAS database classifies this chemical as a carcinogen, however, EPA does not. Therefore, the chemical was flagged as a noncarcinogen in the MEPAS database.

- **Trichloroethylene.** The EPA retracted the oral CPF, so the MEPAS database does not present a value for this parameter. However, the *Health Effects Assessment Summary Tables* (HEAST) provide a value of 1.7E-02 $(mg/kg/day)^{-1}$, which was entered into the database.

- **Lead.** The EPA has retracted the RfDs for lead which, therefore, should not be used in this assessment. While the MEPAS database currently includes the old values, the relative risk from this chemical is discussed qualitatively.

- **Uranium.** The oral and inhalation RfDs in MEPAS are based on an inhalation Threshold Limit Value (TLV) based on negative findings in an occupational study. This value is questionable and was not used. However, a proposed maximum contaminant level (MCL) has been derived, based on an RfD of 3.0E-03 mg/kg/day (Federal Register, Vol. 56, No. 138, Thursday, July 18, 1991). This value has instead been used for the oral toxicity value of uranium.

- **Aluminum, boron, cobalt, magnesium, sulfate, zinc, and diethyl ether**. The oral and inhalation RfDs in MEPAS are based on an inhalation TLV, based on negative findings in an occupational study. Since the EPA has not developed exposure criteria for the chemicals, the relative risk will not be quantified.

As described in Section 4.2.4.3, the soil-water distribution coefficient, K_d, is used to predict the mobility of inorganic contaminants in groundwater. The default K_d values contained in the MEPAS data libraries were not used in the ranking of groundwater contaminants. Instead, the values for K_d contained in column three of Table 4-8 were used with preference given to values provided by Cantrell and Serne (1992) when available. The MEPAS default values were only used in those instances where the alternative values (column three) were not available.

5.2.2 Evaluation of Current Plumes

For the evaluation of current concentrations of groundwater contaminants, unit concentrations (i.e., 1 pCi/mL, 1 g/mL) of the contaminants listed in Table 5-1 were input to MEPAS. These represent the subset of contaminants of potential concern from Table 4-6 that were detected in samples of 200 East Area groundwater collected during 1989 and 1990. Contaminants of potential concern that were not detected, or were only detected in a single sample during this period, are not included. For each of the contaminant unit concentrations, MEPAS calculated unit RRI values. The unit RRI values represent semiquantitative measures of relative human health risk, normalized to a level of 10^{-6}.

The calculated unit RRI values are combined with the Geographical Information System (GIS) database of measured 200 East Area groundwater concentrations for the individual contaminants, resulting in a GIS database of contaminant RRI values. Contaminant RRI data for both chemical and radiological carcinogens are combined to produce total RRI values for the unconfined aquifer and plotted to allow visual identification and ranking. Noncarcinogenic contaminant RRI values are summed and plotted separately.

5.2.3 Potential Future Offsite Contaminant Levels

The second screening evaluation examined potential future offsite concentrations of contaminants that may result from 200 East Area groundwater contaminant transport and discharge into the Columbia River. The calculations were based on present measured concentrations and plume volumes that were combined to estimate the inventory of contaminants within the unconfined aquifer. These calculations could only be performed for contaminants with sufficient detection data to enable estimation of plume volume and contaminant inventory. The contaminants addressed in this second screening evaluation were ^{137}Cs, ^{60}Co, ^{129}I, $^{239/240}Pu$, ^{90}Sr, ^{99}Tc, ^{3}H, arsenic, chromium, cyanide, and nitrate.

The MEPAS was used to calculate contaminant transport within the aquifer and discharge into the river, as described in Section 5.2.1. The resulting RRI values, based on potential offsite concentrations, provide a secondary relative ranking of 200 East Area groundwater contaminants.

5.3 SUMMARY OF SCREENING RESULTS

As described in the preceding sections, the MEPAS computer code was used to evaluate the contaminants detected in groundwater beneath the 200 East Area, and generate relative significance rankings for (1) the currently measured contaminant concentrations and (2) contaminant concentrations projected to occur offsite following transport within the Hanford unconfined aquifer. While these relative significance rankings are based on human

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health risk considerations, the screening process did not evaluate potential risks associated with the Hanford Site or potential exposure to contaminated groundwater. Rather, the screening process provided a consistent semiquantitative evaluation of the various contaminants for their relative intrinsic significance to human health.

The ranking values described in the sections that follow provide risk-related bases for prioritizing plume-specific or contaminant-specific remedial actions. The role of these risk-related values in the overall recommendation process is described in Section 9.0.

5.3.1 Current Plumes

The unit RRI values for the evaluation of current plumes, calculated as described in Section 5.2.2, are listed in Table 5-2. The unit RRI values were multiplied by the concentration in the groundwater at a well (and by a constant to adjust units) to give the RRI for that constituent at that point. The maximum value of this constituent RRI value in the 200 East Area is also shown in Table 5-2. The RRI values are also serially ranked in Table 5-2 for radiological and chemical carcinogens combined and chemical noncarcinogens separately. Carcinogens were ranked from 1 (for highest RRI) to 23 (for lowest). Noncarcinogens were ranked from 1 (for highest RRI) to 24 (for lowest RRI). Some ranks were repeated because of ties, where RRI values are essentially the same (i.e., within 10%). Also, some contaminants were ranked as "L," since the unit RRI was computed by MEPAS to be zero. The contaminants for which an "L" ranking was applied are those that are chemical carcinogens by the inhalation exposure pathway only and are not volatile (i.e., beryllium, cadmium, and chromium). Also, some detections were considered questionable and were therefore not ranked, as indicated on Table 5-2 by the notation "NR." The highest ranked radionuclide, chemical carcinogen, and chemical noncarcinogen are ^{90}Sr, arsenic, and cyanide, respectively.

The calculated constituent RRI values have been combined for chemical and radiological carcinogens and separately for chemical noncarcinogens to produce a total carcinogenic contaminant RRI and a total noncarcinogenic contaminant RRI for each well. The total RRI values were then contoured and plotted to allow visual identification and ranking. Plates 4 and 5 depict contours of the carcinogenic RRI and the noncarcinogenic RRI for the 200 East Area, respectively.

The carcinogenic RRI plume depicted in Plate 4 exhibits an area of high RRI values, generally greater than about 300 with three separate areas above 1,000. This region of high carcinogenic RRI snakes through the 200 East Area, starting north of the northwest corner of the 200 East Area (with the highest levels, an area with values greater than 3,000), moving southeast through the 200 East Area to the southeast corner of the 200 East Area, with two knots of high RRI values (>1,000) along this section. The 300 contour continues from this corner northeast to the 216-B-3 Pond System.

This feature can be explained by the distribution of contamination, mainly radionuclides, in the 200 East Area. The highest area, north of the 200 East northern fence, represents the high levels of ^{99}Tc (plume B on Figure 4-12) and ^{60}Co (Figure 4-10) which are found in this area. The next knot, in the northwest quadrant of the 200 East Area, is due to the contamination around the 216-B-5 Reverse Well, including ^{90}Sr (Figure 4-11, plume B), ^{137}Cs (Figure 4-14), and $^{239,240}Pu$ (Figure 4-15). The third knot, in the southeast quadrant of the 200 East Area, is mainly due to tritium (Figure 4-8), but with contributions from ^{90}Sr (Figure 4-11, plumes C and D), and ^{99}Tc. The approximately 300 contour shows some of the features of the tritium plume (Figure 4-8), including a branch to the southwest which appears to be emanating from the 200 West Area. An isolated area some distance to the southeast (highest at Well 699-25-348) is due to detections of the carcinogens trichloroethylene and tetrachloroethylene near the Central Landfill. There are also a few other isolated locations (wells) with high RRI values (>1,000) which are not indicated as within a 1,000 contour because of the smoothing associated with the contouring process. These include Well 699-53-48B, northeast of Gable Mountain Pond, which has high ^{90}Sr levels and Well 699-55-57, near the 200 North Aggregate Area, with ^{99}Tc.

The noncarcinogenic RRI plume map, Plate 5, shows the highest area (within the only 100 contour) to the northwest of the 200 East Area, in the same place as one of the highest levels of carcinogenic RRI. This high-RRI area is mainly due to the nitrate plume (Figure 4-4, plume B) and cyanide plume (Figure 4-3). Lower levels emanate from this center, mainly in two directions: to the southwest and east as outlined by the 3 contour. These generally high areas appear to be attributable to several metals, mainly antimony, and chromium. An area in the southeast corner of the 200 East Area is mainly due again to nitrate (Figure 4-4, plume E). An isolated area of especially high levels, at the southeast edge of the map, are attributable to detections of 1,1,1-trichloroethane near the Central Landfill.

5.3.2 Potential Future Offsite Contaminant Levels

The RRI values for the evaluation of potential future offsite contaminant levels were calculated as described in Section 5.2.3. The input parameters used for the evaluation are provided in Appendix A. The results of these computations are listed in Table 5-3 for each contaminant of concern evaluated. The RRIs were only computed for contaminants of concern with known groundwater plumes as described in Section 4.2 and listed in Table 5-3. The RRI values are also ranked on Table 5-3 from 1 for highest to 4 for lowest (3 for noncarcinogens). Several contaminants resulted in RRI values of zero, based on their low mobility characteristics (these are noted in Table 5-2 by a ranking of "L"). The RRI values for the remaining contaminants ranged from 1E-12 to 3E-09, with chromium, nitrate, and ^{99}Tc ranking the highest.

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Table 5-1. Contaminants Evaluated Based on Current Plume Contaminant Levels.

Radionuclides	Inorganics	Organics
Americium-241	Aluminum	1,1,1-Trichloroethane
Antimony-125	Antimony	1,1,2-Trichloroethane
Beryllium-7	Arsenic	1,1-Dichloroethane
Carbon-14	Barium	1,2-Dicholorethane
Cerium-144	Beryllium	1,2-Dichloroethylene
Cesium-134	Boron	2,3,4,6-Tetrachlorophenol
Cesium-137	Cadmium	2,4-Dichlorophenol
Cobalt-60	Chromium	2,4-Dimethylphenol
Europium-154	Cobalt	2,4-Dinitrophenol
Europium-155	Copper	2,4-Dinitrotoluene
Iodine-129	Cyanide	2-Chlorophenol
Lead-212	Fluoride	4-Methyl-2-Pentanone
Niobium-95	Iron	Acetone
Plutonium-238	Lead	Aldrin
Plutonium-239/240	Lithium	Bis(2-ethylhexyl)phthalate
Potassium-40	Magnesium	Carbon tetrachloride
Radium-226)	Mangenese	Chloroform
Ruthenium-106	Mercury	Cyclohexanone
Strontium-90	Nickel	DDD
Technetium-99	Nitrate/Nitrite	DDT
Tritium	Phosphate	Dieldrin
Uranium-234	Potassium	Diethyl ether
Uranium-235	Selenium	Endrin
Uranium-238	Silver	Gamma-BHC
Zinc-65	Sodium	Heptachlor
	Strontium	Hydrazine
	Sulfate	Methyl ethyl ketone
	Thallium	Methylene chloride
	Uranium	p-Chloro-m-cresol
	Vanadium	Pentachlorophenol
	Zinc	Phenol
		Pyrene
		Styrene
		Tetrachloroethylene
		Toluene
		Trichloroethylene
		Trichloromonofluoromethane
		Triethylene glycol

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Table 5-2. Unit RRIs Computed for Current Plume Contaminant Levels.

Constituents	Unit RRI	Groundwater Concentration	RRI	Ranking
Radionuclides				**Carcinogens**
Americium-241	1.0E-01	4.0E-02	4.0E+00	21
Antimony-125	7.0E-05	7.9E+00	5.5E-01	23
Beryllium-7	2.4E-06	2.2E+02	5.3E-01	NR[b]
Carbon-14	5.5E-04	3.8E+01	2.1E+01	16
Cerium-144	4.4E-04	2.9E+01	1.3E+01	NR
Cesium-134	3.1E-04	3.7E+00	1.1E+01	17
Cesium-137	2.1E-03	1.3E+03	2.8E+03	5
Cobalt-60	6.4E-04	4.7E+02	3.0E+02	10
Europium-154	2.2E-04	1.2E+01	2.7E+00	NR
Europium-155	3.5E-05	9.4E+00	3.3E-01	NR
Iodine-129	1.5E-02	3.0E+01	4.5E+02	7[a]
Lead-212	2.9E-04	1.3E+01	3.7E+00	NR
Niobium-95	5.1E-05	8.1E+01	4.2E+00	NR
Plutonium-238	8.7E-02	3.6E-01	3.1E+01	15
Plutonium-239/240	8.7E-02	7.4E+01	7.2E+03	3
Potassium-40	2.0E-03	2.4E+02	4.8E+02	7[a]
Radium (as Ra-226)	3.6E-02	1.7E+00	5.9E+01	14
Ruthenium-106	5.9E-04	3.0E+02	1.8E+02	12[a]
Strontium-90	7.0E-03	5.1E+03	3.6E+04	1
Technetium-99	5.8E-04	2.2E+04	1.3E+04	2
Tritium	1.3E-06	4.3E+06	5.6E+03	4
Uranium-234	6.1E-03	3.3E+01	2.0E+02	11
Uranium-235	5.9E-03	1.6E+00	9.3E+00	18[a]
Uranium-238	5.6E-03	3.1E+01	1.8E+02	12[a]
Zinc-65	1.7E-03	7.5E+00	1.3E+01	NR
Chemical Carcinogens				
1,1,2-Trichloroethane	4.9E+03	2.1E+00	1.0E+01	NR
1,1-Dichloroethane	8.9E+04	5.3E+00	4.7E+02	7[a]
1,2-Dichloroethane	1.0E+04	4.0E+00	4.0E+01	NR
cis-1,2-Dichloroethylene	3.3E+00	1.2E+00	4.0E-03	NR
trans-1,2-Dichloroethylene	3.3E+00	4.7E+00	1.6E-02	NR
2,4-Dinitrotoluene	1.5E+05	8.7E+00	1.3E+03	NR
Aldrin	3.7E+06	7.4E-01	2.7E+03	NR
Arsenic	9.3E+04	2.4E+01	2.2E+03	6
Beryllium	0.0E+00	5.3E+00	0.0E+00	L[c]
Bis(2-ethylhexyl)phthalate	3.1E+06	5.6E+01	1.7E+05	NR
Cadmium	0.0E+00	4.2E+00	0.0E+00	L
Carbon tetrachloride	8.0E+03	4.5E+00	3.6E+01	NR
Chloroform	1.1E+03	8.3E+00	9.1E+00	18[a]
Chromium	0.0E+00	6.5E+01	0.0E+00	L

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Table 5-2. Unit RRIs Computed for Current Plume Contaminant Levels.

Constituents	Unit RRI	Groundwater Concentration	RRI	Ranking
Chemical Carcinogens (continued)				**Carcinogens (continued)**
DDD	1.7E+04	1.7E-01	2.9E+00	NR
DDT	3.9E+04	2.5E+00	9.8E+01	NR
Dieldrin	2.1E+06	1.6E+00	3.4E+03	NR
Heptachlor	3.6E+05	6.3E-01	2.3E+02	NR
Hydrazine	7.8E+07	3.8E+01	3.0E+06	NR
Methylene chloride	3.8E+02	1.3E+03	4.9E+02	NR
Nickel	0.0E+00	6.0E+01	0.0E+00	L
Tetrachloroethylene	3.8E+02	8.2E+00	3.1E+00	22
Trichloroethylene	8.4E+02	1.2E+01	1.0E+01	18[a]
Chemical Noncarcinogens				**Noncarcinogens**
1,1,1-Trichlorethane	3.4E+09	4.0E+01	1.3E+02	2
1,1-Dichloroethane	9.1E+04	5.3E+00	4.8E-04	24
2,3,4,6-Tetrachlorophenol	1.4E+06	1.0E+01	1.4E-02	NR
2,4-Dichlorophenol	3.2E+07	1.8E+01	5.8E-01	NR
2,4-Dimethylphenol	5.1E+06	2.0E+01	1.0E-01	NR
2,4-Dinitrophenol	1.9E+08	1.2E+02	2.3E+01	NR
2-Chlorophenol	3.4E+07	1.5E+01	5.2E-01	12[a]
4-Methyl-2-pentanone	1.7E+07	1.1E+01	1.9E-01	NR
Acetone	1.1E+06	1.4E+02	1.5E-01	NR
Antimony	1.3E+08	1.1E+02	1.5E+01	5[a]
Barium	9.3E+05	1.1E+02	1.1E-01	16
Beryllium	1.9E+11	5.3E+00	1.0E+03	NR
Cadmium	3.0E+08	4.2E+00	1.3E+00	8
Chromium	1.0E+07	6.5E+01	6.5E-01	10[a]
Copper	3.4E+06	2.6E+01	8.8E-02	17
Cyanide	1.7E+08	8.7E+02	1.5E+02	1
Cyclohexanone	1.5E+05	4.0E+00	6.0E-04	NR
Endrin	1.2E+08	2.3E+00	2.8E-01	NR
Fluoride	1.6E+06	2.2E+03	3.5E+00	7
Gamma-BHC	2.8E+08	6.7E-01	1.9E-01	NR
Iron	4.6E+04	3.4E+03	1.6E-01	15
Lithium	4.7E+04	1.6E+01	7.5E-04	23
Manganese	2.5E+05	3.0E+02	7.4E-02	18[a]
Mercury	1.6E+09	2.1E-01	3.4E-01	NR
Methyl ethyl ketone	6.4E+06	3.7E+01	2.4E-01	NR
Nickel	3.3E+06	6.0E+01	2.0E-01	14
Nitrate	4.4E+04	5.0E+05	2.2E+01	4
p-Chloro-m-cresol	3.1E+06	1.5E+01	4.6E-02	20

Table 5-2. Unit RRIs Computed for Current Plume Contaminant Levels.

Constituents	Unit RRI	Groundwater Concentration	RRI	Ranking
Chemical Noncarcinogens (continued)				**Noncarcinogens (continued)**
Pentachlorophenol	6.3E+09	6.7E+01	4.2E+02	NR
Phenol	6.4E+05	1.2E+01	7.9E-03	NR
Potassium	4.3E+02	1.5E+04	6.2E-03	22
Pyrene	1.9E+06	8.5E+00	1.6E-02	NR
Selenium	2.0E+09	2.4E+01	4.7E+01	3
Silver	7.7E+07	1.2E+01	9.3E-01	NR
Sodium	9.7E+02	7.5E+04	7.3E-02	18[a/]
Strontium	6.3E+05	1.0E+03	6.4E-01	10[a/]
Styrene	1.5E+09	9.5E+00	1.4E+01	5[a/]
Thallium	4.2E+09	5.0E+01	2.1E+02	NR
Toluene	3.8E+05	3.0E+01	1.1E-02	21
Trichloromonofluoromethane	1.9E+05	1.1E+01	2.1E-03	NR
Triethylene glycol	8.9E+07	1.0E+01	8.9E-01	NR
Uranium (chemical)	1.5E+07	3.8E+01	5.7E-01	12[a/]
Vanadium	7.2E+06	1.4E+02	9.7E-01	9

a/ Some rankings are repeated due to a tie in maximum relative risk index (less than 10% difference).
b/ NR = Not ranked because of questionable detection.
c/ L = Lower than was calculable by MEPAS.

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Table 5-3. Contaminants Evaluated for Future Offsite Plume Contaminant Levels.

Constituent	RRI	Ranking
Radionuclides		**Carcinogens**
Cesium-137	0.0E+00	L[a/]
Cobalt-60	0.0E+00	L
Iodine-129	2.1E-11	3
Plutonium-239/240	0.0E+00	L
Strontium-90	0.0E+00	L
Technetium-99	1.1E-10	1
Tritium	1.3E-12	4
Chemical Carcinogens		
Arsenic	3.3E-11	2
Chromium	0.0E+00	L
Chemical Noncarcinogens		**Noncarcinogens**
Chromium	2.7E-09	1
Cyanide	5.8E-18	3
Nitrate	3.0E-10	2

a/ L = Lower than was calculable by MEPAS.

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6.0 POTENTIALLY APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

6.1 INTRODUCTION

The Superfund Amendments and Reauthorization Act (SARA) of 1986 amended the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to require that all applicable or relevant and appropriate requirements (ARARs) be employed during implementation of a hazardous waste site cleanup. "Applicable" requirements are defined by the U.S. Environmental Protection Agency (EPA) in "CERCLA Compliance with Other Laws Manual" (OSWER Directive 9234.1-01, August 8, 1988) as:

> cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

A separate set of "relevant and appropriate" requirements that must be evaluated include:

> cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under federal or state law that while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

"To-be-Considered Materials" (TBCs) are nonpromulgated advisories or guidance issued by federal or state governments that are not legally binding and do not have the status of potential ARARs. However, in many circumstances, TBCs will be considered along with potential ARARs and may be used in determining the necessary level of cleanup for protection of health or the environment.

The following sections identify potential ARARs to be used in developing and assessing various remedial action alternatives at the 200 East Groundwater Aggregate Area. Specific requirements pertaining to hazardous and radiological waste management, remediation of contaminated soils, surface water protection, and air quality will be discussed.

The potential ARARs focus on federal or state statutes, regulations, criteria, and guidelines. The specific types of potential ARARs evaluated include the following:

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- Contaminant-specific
- Location-specific
- Action-specific.

Potential contaminant-specific ARARs are usually health or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical contaminant values that are generally recognized by the regulatory agencies as allowable to protect human health and the environment. In the case of the 200 East Groundwater Aggregate Area, potential contaminant-specific ARARs address chemical constituents and/or radionuclides. The potential contaminant-specific ARARs that were evaluated for the 200 East Groundwater Aggregate Area are discussed in Section 6.2.

Potential location-specific ARARs are restrictions placed on the concentration of hazardous substances, or the conduct of activities, solely because they occur in specific locations. The potential location-specific ARARs that were evaluated for the 200 East Groundwater Aggregate Area are discussed in Section 6.3.

Potential action-specific ARARs apply to particular remediation methods and technologies, and are evaluated during the detailed screening and evaluation of remediation alternatives. The potential action-specific ARARs that were evaluated for the 200 East Groundwater Aggregate Area are discussed in Section 6.4.

The TBC requirements are other federal and state criteria, advisories, and regulatory guidance that are not promulgated regulations, but are to be considered in evaluating alternatives. Potential TBCs include U.S. Department of Energy (DOE) Orders that carry out authority granted under the Atomic Energy Act. All DOE Orders are potentially applicable to operations at the 200 East Groundwater Aggregate Area. Specific potential TBC requirements are discussed in Section 6.5.

Potential contaminant- and location-specific ARARs will be refined during the aggregate area management study (AAMS) process. Potential action-specific ARARs are briefly discussed in this section, and will be further evaluated upon final selection of remedial alternatives. The points at which these potential ARARs must be achieved and the timing of the ARARs evaluations are discussed in Sections 6.6 and 6.7, respectively.

6.2 CONTAMINANT-SPECIFIC REQUIREMENTS

A contaminant-specific requirement sets concentration limits in various environmental media for specific hazardous substances, pollutants, or contaminants. Based on available information, some of the currently known or suspected contaminants that may be present in

the 200 East Groundwater Aggregate Area are outlined in Table 4-6. The currently identified potential federal and state contaminant-specific ARARs are summarized below.

6.2.1 Federal Requirements

Federal contaminant-specific requirements are specified in several statutes, codified in the U.S. Code (USC), and promulgated in the Code of Federal Regulations (CFR), as follows:

- **Safe Drinking Water Act (42 U.S.C. 300 (f)).** Drinking water criteria are established by EPA pursuant to the federal Safe Drinking Water Act (SDWA) (42 U.S.C. 300 (f)) and are promulgated in 40 CFR Parts 141 and 143. These regulations present water quality standards (contaminant levels) for water used for drinking, cooking, bathing, and similar uses. Maximum contaminant levels (MCLs) are enforceable for public water systems, usually at the point of water usage. Secondary maximum contaminant levels (SMCLs) are established for contaminants in drinking water that may adversely affect odor, color, or public welfare. Maximum contaminant level goals (MCLGs) are non-enforceable, health-based goals that do not take cost or feasibility into account. The EPA may consider MCLGs where multiple exposure pathways exist, highly sensitive populations are involved, or a greater degree of protection is otherwise required.

  Currently, the EPA applies MCLs as potential ARARs for groundwater contaminants at CERCLA sites where groundwater could be used as a drinking water source. The federal MCLs and SMCLs are presented in Table 6-1 for the potential contaminants of interest. The MCLGs have not been included as potential ARARs because they are not enforceable, their application would be subject to negotiation with the agencies, and their application would depend on the remedial alternatives being considered.

- **Resource Conservation and Recovery Act (42 U.S.C. 6901, 40 CFR 260 to 271).** The Resource Conservation and Recovery Act (RCRA) addresses the generation and transportation of hazardous waste, and waste management activities at facilities that treat, store, or dispose of hazardous wastes. Subtitle C of RCRA (Hazardous Waste Management) mandates the creation of a cradle-to-grave management and permitting system for hazardous wastes. The RCRA defines hazardous wastes (40 CFR 261) as "solid wastes" (even though the waste is often liquid in physical form) that may cause or significantly contribute to an increase in mortality or serious illness; or that poses a substantial hazard to human health or the environment when

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improperly managed. In Washington State, RCRA is implemented by EPA and the authorized state agency, the Washington State Department of Ecology (Ecology).

The CERCLA sections 121 (d) and 121 (e) respectively require that CERCLA activities, including remedial actions, comply with substantive requirements and not administrative requirements such as permitting. Therefore, hazardous waste activities conducted on site at the 200 East Groundwater Aggregate Area will comply with the substantive requirements of RCRA, and not the permitting requirements of RCRA, which are deemed to be potential ARARs.

Two key potential contaminant-specific ARARs have been adopted under the federal hazardous waste regulations: the Toxicity Characteristic Leaching Procedure (TCLP) designation limits promulgated under 40 CFR Part 261; and the hazardous waste land disposal restrictions (LDRs) for constituent concentrations promulgated under 40 CFR Part 268.

The TCLP designation limits define when a waste is hazardous, and are used to determine when more stringent management standards apply than would be applied to typical solid wastes. Thus, the TCLP potential contaminant-specific ARARs can be used to determine when RCRA waste management standards may be required. The TCLP limits are presented in Table 6-1.

The LDRs are numerical limits derived by EPA by reviewing available technologies for treating hazardous wastes. Until a prohibited waste can meet the numerical limits, it can be prohibited from land disposal. Two sets of limits have been promulgated: limits for constituent concentrations in waste extract, which use the TCLP test to obtain a leached sample of the waste; and limits for constituent concentrations in waste, which address the total contaminant concentration in the waste. The latter concentrations are generally applied to wastewaters (e.g., groundwater, leachate). Applicability to CERCLA actions is based on determinations of waste "placement/disposal" during a remediation action. According to OSWER Directive 9347.3-05FS, EPA concludes that Congress did not intend in situ consolidation, remediations, or improvement of structural stability to constitute placement or disposal. The land disposal numerical limits can be used to determine if generated cleanup wastes can be redisposed of onsite without further treatment, or must be subject to certain treatment practices prior to land disposal. The LDR limits are presented in Table 6-1 (see Section 6.4.1 for a further discussion on applying the land disposal restriction limits).

- **Clean Air Act (42 U.S.C. 7401).** The Clean Air Act (42 U.S.C. 7401) establishes National Primary and Secondary Ambient Air Quality Standards (NAAQS) (40 CFR Part 50), National Emission Standards for Hazardous Air Pollutants (NESHAP)(40 CFR Part 61), and New Source Performance Standards (NSPS)(40 CFR Part 60). These standards would not, in most cases, be potential contaminant-specific ARARs for the 200 East Groundwater Aggregate Area. However, it is possible that unique circumstances, or instances where groundwater remediation alternatives result in emissions to air, could require consideration of air quality standards as potential contaminant-specific ARARs. The applicability or relevance and appropriateness of potential air quality ARARs in such situations would be subject to negotiation with the agencies and may depend on the remedial alternatives being considered.

  In general, new and modified stationary sources of air emissions must undergo a pre-construction review to determine whether the construction or modification of any source, such as a CERCLA remedial program, would interfere with attaining or maintaining NAAQS or fail to meet other new source review requirements including NESHAP and NSPS. However, the process applies only to "major" sources of air emissions (defined as emissions of 250 tons/yr). The 200 East Groundwater Aggregate Area would not constitute a major source.

  Section 112 of the Clean Air Act directs EPA to establish standards at the level that provides an ample margin of safety to protect the public health from hazardous air pollutants. The NESHAP standards for radionuclides are directly applicable to DOE facilities under Subpart H of Section 112 that establishes a 10 mrem/yr standard for total exposure to an offsite receptor. Further, if the maximum individual dose during remediation exceeds 1% of the NESHAP standard (0.1 mrem/yr), a report meeting the substantive requirements of an application for approval of construction must be prepared.

6.2.2 State of Washington Requirements

Potential state contaminant-specific requirements are specified in several statutes, codified in the Revised Code of Washington (RCW) and promulgated in the Washington Administrative Code (WAC).

- **Water Quality Standards.** Washington State has adopted various numerical standards under the state Water Pollution Control Act (Chapter 90.48 RCW)

related to surface and groundwater contaminants. These are included principally in the following regulations:

- **Public Water Supplies (Chapter 248-54 WAC).** This regulation establishes drinking water standards for public water supplies. The standards essentially parallel the federal drinking water standards (40 CFR Parts 141 and 143).

- **Water Quality Standards for Groundwaters of the State of Washington (RCW 90.48, Chapter 173-200 WAC).** This regulation establishes contaminant standards for protecting existing and future beneficial uses of groundwater through the reduction or elimination of the discharge of contaminants to the state's groundwater.

The state drinking water quality standards would be evaluated as potential ARARs in essentially the same manner as the federal drinking water standards would be considered. Because the numerical standards are identical for both federal and state contaminants, the state drinking water standards are already addressed in Table 6-1 under the federal MCL and SMCL columns.

The state groundwater standards are not applicable to cleanup actions approved by Ecology under Washington's Model Toxics Control Act (MTCA) or by EPA under CERCLA [(WAC 173-200-010(3)(c)]. Groundwater cleanup standards are to be developed under MTCA procedures. Nevertheless, the state groundwater standards may be considered relevant and appropriate as potential ARARs for contaminants in groundwater (e.g., where no other potential ARARs exist for particular constituents) and for selected remedial actions that could result in discharges to groundwater (e.g., if treated wastewaters are discharged to the soil column). Determining ARARs for treated discharges would depend on the type of remediation performed and would have to be established on a case-by-case basis as remedial actions are defined.

- **Model Toxics Control Act (RCW 70.105D, Chapter 173-340 WAC).** The MTCA (RCW 70.105D, Chapter 173-340 WAC) (Ecology 1991b) authorized Ecology to adopt cleanup standards for remedial actions at hazardous waste sites. These regulations are considered potential ARARs for soil, groundwater, and surface water cleanup actions. The processes for identifying, investigating, and cleaning up hazardous waste sites are defined and cleanup standards are set for groundwater, soil, surface water, and air in Chapter 173-340 WAC.

Under MTCA regulations, cleanup standards may be established by one of three methods:

- Method A may be used if a routine cleanup action, as defined in WAC 173-340-200, is being conducted at the site or relatively few hazardous substances are involved for which cleanup standards have been specified by Tables 1, 2, or 3 of WAC 173-340-720 through 173-340-745.

- Under Method B, a risk level of 10^{-6} is established and a risk calculation based on contaminants present is determined.

- Method C cleanup standards represent concentrations that are protective of human health and the environment for specified site uses. Method C cleanup standards may be established where it can be demonstrated that such standards comply with applicable state and federal laws, that all practical methods of treatment are used, that institutional controls are implemented, and that one of the following conditions exist: (1) Method A or Method B standards are below background concentrations; (2) Method A or Method B results in a significantly greater threat to human health or the environment; (3) Method A or Method B standards are below technically possible concentrations; or (4) the site is defined as an industrial site for purposes of remediation.

Table 1 of Method A addresses groundwater and is considered to be a potential ARAR for the 200 East Groundwater Aggregate Area. Table 2 of Method A is intended for nonindustrial site soil cleanups and Table 3 of Method A is intended for industrial site soil cleanups. Since soil cleanup is being addressed in other source unit aggregate area management study reports (AAMSRs), Table 6-1 presents as potential ARARs only the cleanup standards from Table 1 of Method A for preliminary contaminants of concern.

In addition to Method A, Method B and Method C cleanup standards may also be considered potential ARARs for the 200 East Groundwater Aggregate Area. Method B and Method C cleanup standards can be calculated on a case-by-case basis in concert with Ecology. Method B and Method C should be used where Method A standards do not exist or cannot be met, or where routine cleanup actions cannot be implemented at a specific contaminated site.

- **State Hazardous Waste Management Act and Dangerous Waste Regulations (Chapter 173-303 WAC).** The state of Washington is a RCRA-authorized state for hazardous waste management, and has developed state-

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specific hazardous waste regulations under the authority of the State Hazardous Waste Management Act. Generally, state hazardous waste regulations (WAC 173-303) parallel the federal regulations. The state definition of a hazardous waste incorporates the EPA designation of hazardous waste that is based on the compound being specifically listed as hazardous, or on the waste exhibiting the properties of reactivity, ignitability, corrosivity, or toxicity as determined by the TCLP.

In addition, Washington State identifies other waste as hazardous. Three unique criteria are established: toxic dangerous waste; persistent dangerous waste; and carcinogenic dangerous waste. These additional designation criteria may be imposed by Ecology as potential ARARs, for purposes of determining acceptable cleanup standards and appropriate waste management standards.

- **Washington State Air Quality Requirements.** Washington State air quality standards would not, in most cases, be potential contaminant-specific ARARs for the 200 East Groundwater Aggregate Area. However, it is possible that unique circumstances, or instances where groundwater remediation alternatives result in emissions to air, could require consideration of air quality standards as potential contaminant-specific ARARs. The applicability or relevance and appropriateness of potential air quality ARARs in such situations would be subject to negotiation with the agencies and may depend on the remedial alternatives being considered.

  Ambient Air Quality Standards and Emission Limits for Radionuclides (Chapter 173-480 WAC), implemented by Ecology, specify maximum accumulated dose limits to members of the public. Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides (WAC 246-247-040), implemented by the Washington Department of Health (Health), adopt the Ecology standards for maximum accumulated dose limits to members of the public. Controls for New Sources of Toxic Air Pollutants (Chapter 173-460 WAC), implemented by Ecology, establish allowable acceptable source impact levels (ASILs) for hundreds of organic and inorganic compounds. Ecology's ASILs may be potential ARARs for cleanup activities that could affect air, but they would have to be established on a case-by-case basis as remedial actions are defined.

6.2.3 Surface Water Quality Standards

This section describes federal and state contaminant-specific requirements that generally apply only to surface water contaminants. These standards are discussed because the agencies may rely on them as potential ARARs if the following:

- 200 East Groundwater Aggregate Area groundwater is discharging or will be discharged to surface waters (e.g., Columbia River)

- No other potential contaminant-specific ARARs for protection of human consumption are readily identifiable from groundwater requirements for particular contaminants.

The applicability or relevance and appropriateness of potential surface water ARARs will be subject to negotiation with the agencies and may depend on the remedial alternatives being considered.

- **Clean Water Act.** Federal Water Quality Criteria (FWQC) are developed under the authority of the Clean Water Act to assist the states in protecting surface water quality. Different FWQC are derived for protection of human health and protection of aquatic life. The human health FWQC are subdivided according to how people are expected to use the water: drinking the water and consuming aquatic organisms (e.g., fish, clams) living in the water; or consuming the organisms and not drinking the water. The aquatic life FWQC are subdivided into saltwater and freshwater, and further subdivided into criteria for protecting against acute and chronic effects in aquatic organisms.

  Section 121(d)(2)(B)(i) of SARA states that the designated or potential use of the surface or groundwater, the environmental media affected, the purposes for which the criteria were developed, and the latest available information must be considered when determining whether or not water quality criteria under the Clean Water Act are relevant and appropriate under the circumstances of a release or threatened release. Thus, although the FWQC may be considered as potential ARARs at the 200 East Groundwater Aggregate Area, they will likely be subject to negotiation with the agencies and may depend on the remedial alternatives being considered.

- **National Pollutant Discharge Elimination System and Water Quality Standards (RCW 90.48, WAC 173-220, and 40 CFR 122).** National Pollutant Discharge Elimination System (NPDES) regulations govern point source discharges into navigable waters. Limits on the concentrations of contaminants and volumetric flowrates that may be discharged are determined

on a case-by-case basis and permitted under this program. In addition, NPDES regulations establish water quality standards for discharges from various industrial classifications. The EPA currently implements this program in Washington State for federal facilities; however, assumption of the NPDES program by the state is likely within five years. Although no point source discharges have been identified for 200 East Groundwater Aggregate Area remedial actions at this time, the agencies may evaluate contaminant-specific limits under the NPDES program as potential ARARs when remediation alternatives are developed. These potential ARARs will have to be negotiated on a case-by-case basis.

- **Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201 WAC and Proposed Chapter 173-201A WAC).** Ecology has adopted numerical ambient water quality criteria for six conventional pollutant parameters (defined at WAC 173-201-025): (1) fecal coliform bacteria; (2) dissolved oxygen; (3) total dissolved gas; (4) temperature; (5) pH; and (6) turbidity. In addition, toxic, radioactive, or deleterious material concentrations are required to be below those of public health significance or which may cause acute or chronic toxic conditions to the aquatic environment or which may adversely affect any water use. The current Chapter 173-201 WAC has promulgated numerical water quality criteria for a limited number of compounds; these criteria generally are identical to the FWQC. Ecology has initiated rulemaking to expand and incorporate the remaining FWQC numerical criteria for toxic chemicals. Currently, only the current Chapter 173-201 WAC could be considered a potential ARAR; the proposed Chapter 173-201A WAC could only be a potential TBC. Since the FWQC and promulgated state water quality criteria are essentially identical, the state standards are already addressed by the FWQC.

  Under the state Water Quality Standards, the criteria and classifications do not apply inside an authorized mixing zone surrounding a wastewater discharge. Ecology is presently developing additional guidance and regulations for defining mixing zones; in the past, Ecology has generally followed guidelines contained in "Criteria for Sewage Works Design." Although water quality standards can be exceeded inside a mixing zone, state regulations will not permit discharges that cause mortalities of fish or shellfish within the zone or that diminish aesthetic values.

6.3 LOCATION-SPECIFIC REQUIREMENTS

Potential location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are in specific locations. Some examples of special locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats.

Table 6-2 lists various location-specific standards and indicates which of these may be potential ARARs. Potential ARARs have been identified as follows:

- **Floodplains.** Requirements for protecting floodplains are not necessarily potential ARARs for the 200 East Groundwater Aggregate Area as there are none in the 200 East Area or vicinity (see Section 3.3.3). However, remedial actions selected for cleanup may require projects in or near floodplains (e.g., construction of a treatment facility outfall at the Columbia River). In such cases, location-specific floodplain requirements may be potential ARARs.

- **Wetlands, Shorelines, and Rivers and Streams.** Requirements related to wetlands, shorelines, and rivers and streams are not necessarily potential ARARs for the 200 East Groundwater Aggregate Area. However, remedial actions selected for cleanup may require projects on a shoreline or wetland, or discharges to wetlands, rivers, or streams (e.g., construction of a treatment facility outfall at the Columbia River). In such cases, location-specific shoreline and wetlands requirements may be potential ARARs.

- **Threatened and Endangered Species Habitats.** As discussed in Section 3.6, various threatened and endangered species (e.g., American peregrine falcon, bald eagle, white pelican, and sandhill crane) inhabit portions of the Hanford Site and may occur in the 200 East Groundwater Aggregate Area. Therefore, critical habitat protection for these species may constitute potential ARARs.

- **Wild and Scenic Rivers.** The Columbia River Hanford Reach is currently undergoing study pursuant to the federal Wild and Scenic Rivers Act. Pending results of this study, actions that may impact the Hanford Reach may be restricted. This requirement would not necessarily be an ARAR for the 200 East Groundwater Aggregate Area. However, Wild and Scenic Rivers Act requirements may be ARARs for actions taken as a result of 200 East Groundwater Aggregate Area cleanup efforts that could affect the Hanford Reach.

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6.4 ACTION-SPECIFIC REQUIREMENTS

Potential action-specific ARARs are requirements that are triggered by specific remedial actions at the site. These remedial actions will not be fully defined until a remedial approach has been selected. However, the universe of potential action-specific ARARs defined by a preliminary screening of potential remedial action alternatives will help focus the selection process. Potential action-specific ARARs are outlined below. (Note that potential contaminant- and location-specific ARARs discussed above will also include provisions for potential action-specific ARARs to be applied once the remedial action is selected.)

6.4.1 Federal Requirements

- **Comprehensive Environmental Response, Compensation, and Liability Act (42 USC 9601).** The CERCLA (including SARA) and regulations adopted pursuant to CERCLA, as contained in the National Contingency Plan (40 CFR 300), include selection criteria for remedial actions. Under the criteria, onsite treatment options are more highly favored when available. Emphasis is placed on alternatives that permanently treat or immobilize contamination. Selected alternatives must be protective of human health and the environment, which implies that federal and state ARARs be met. However, a remedy may be selected that does not meet all ARARs if the requirement is technically impractical, if its implementation would produce a greater risk to human health or the environment, if an equivalent level of protection can otherwise be provided, if state standards are inconsistently applied, or if the remedy is only part of a complete remedial action which attains potential ARARs.

  The CERCLA gives state cleanup standards essentially equal importance as federal standards in guiding cleanup measures in cases where state standards are more stringent. State standards pertain only if they are generally applicable, passed through formal means, adopted on the basis of hydrologic, geologic, or other pertinent considerations, and do not preclude the option of land disposal by a state-wide ban. Most importantly, CERCLA provides that cleanup of a site must ensure that public health and the environment are protected. Selected remedies should meet all ARARs, but issues such as cost-effectiveness must be weighed in the selection process.

- **Resource Conservation and Recovery Act (42 U.S.C. 6901, 40 CFR 260 to 271).** The RCRA (42 U.S.C. 6901), and regulations adopted pursuant to RCRA, describe numerous action-specific requirements that may be potential ARARs for cleanup activities. The primary regulations are promulgated under

40 CFR Parts 262 (standards for generators), 264, and 265 (standards for owners and operators of hazardous waste treatment, storage, and disposal facilities), and include such action-specific requirements as follows:

- Packaging, labeling, placarding, and manifesting of offsite waste shipments
- Inspecting waste management areas to ensure proper performance and safe conditions
- Preparation of plans and procedures to train personnel and respond to emergencies
- Management standards for containers, tanks, incinerators, and treatment units
- Design and performance standards for land disposal facilities
- Groundwater monitoring system design and performance.

Many of these requirements will depend on the particular remediation activity undertaken, and will have to be identified as remediation proceeds.

One key area of potential action-specific RCRA ARARs are the 40 CFR Part 268 LDRs. In addition to the contaminant-specific constituent concentration limits established in the LDRs (as previously discussed in Section 6.2.1), EPA has identified best demonstrated available treatment technologies (BDATs) for various waste streams. The EPA could require the use of BDATs prior to allowing land disposal of wastes generated during remediation of the 200 East Groundwater Aggregate Area. The EPA's imposition of the LDRs and BDAT requirements will depend on various factors.

Applicability to CERCLA actions is based on determinations of waste "placement/disposal" during a remediation action. According to OSWER Directive 9347.3-05FS, EPA concludes that Congress did not intend in situ consolidation, remediations, or improvement of structural stability to constitute placement or disposal. Placement or disposal would be considered to occur if the following:

- Wastes from different units are consolidated into one unit (other than a land disposal unit within an area of contamination)

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- Waste is removed and treated outside a unit and redeposited into the same or another unit (other than a land disposal unit within an area of contamination)

- Waste is picked up from a unit and treated within the area of contamination in an incinerator, surface impoundment, or tank and then redeposited into the unit (except for in situ treatment).

Consequently, the requirement to use BDAT would not apply under the land disposal restrictions standards unless placement or disposal had occurred. However, remediation actions involving excavation, groundwater extraction, and/or treatment could trigger the requirements to use BDAT for wastes subject to the LDR standards. In addition, the agencies could consider BDAT technologies to be relevant and appropriate when developing and evaluating potential remediation technologies.

Two additional components of the LDR program should be considered with regard to an excavate and treat remedial action. First, a national capacity variance was issued by EPA for contaminated soil and debris for a two-year period ending May 8, 1992 (54 FR 26640). The agency extended that variance for an additional year through May 8, 1993. The EPA recently issued proposed rules on January 9, 1992 (57 FR 958) for LDR on contaminated debris for review and comment. Second, a series of variances and exemptions may be applied under an excavate and treat scenario. These include the following:

- A no-migration petition

- A case-by-case extension to an effective date

- A treatability variance

- Mixed waste provisions of a federal Facilities Compliance Act (when enacted).

The applicability and relevance of each of these options will vary based on the specific details of 200 East Groundwater Aggregate Area remedial actions. An analysis of these variances can be developed once engineering data on remedial options becomes available.

The effect of the LDR program on mixed waste management is significant. Currently, limited technologies are available for effective treatment of these

waste streams and no commercially available treatment facilities exist except for liquid scintillation counting fluids used for laboratory analysis and testing. The EPA recognized that inadequate capacity exists and issued a national capacity variance until May 8, 1992, to allow for the development of such treatment capacity. The agency is considering extension of that variance for an additional year, and in the interim, will apply the mixed waste storage enforcement policy described below.

Lack of treatment and disposal capacity also presents implications for storage of these materials. Under 40 CFR 268.50, mixed wastes subject to LDRs may be stored for up to one year. Beyond one year, the owner/operator has the burden of proving such storage is for accumulating sufficient quantities for treatment. On August 29, 1991, EPA issued a mixed waste storage enforcement policy providing some relief from this provision for generators of small volumes of mixed wastes. However, the policy was limited to facilities generating less than 28 m^3 (1,000 ft^3) of land disposal-prohibited waste per year. Congress is considering amendments to RCRA postponing the storage prohibition for another five years; however, final action on these amendments has not occurred.

- **Clean Water Act (33 USC 1251).** Regulations adopted pursuant to the Clean Water Act (33 USC 1251) under the NPDES mandate use of best available treatment technologies (BAT) prior to discharging contaminants to surface waters. The NPDES requirements for use of BAT would not be ARARs for actions conducted only within the 200 East Groundwater Aggregate Area. However, these requirements could constitute potential ARARs for cleanup actions which would result in discharge of treated wastewaters to the Columbia River, and associated treatment systems could be required to utilize BAT.

- **Department of Transportation Standards (49 CFR 171 to 177).** The Department of Transportation standards contained in 49 CFR 171-177 specify the requirements for packaging, labeling, and placarding for offsite transport of hazardous materials. These standards ensure that hazardous substances and wastes are safely transported using adequate means of transport and with proper documentation.

6.4.2 State of Washington Requirements

- **Hazardous Waste Management (WAC 173-303).** As discussed in Section 6.4.1, there are various requirements addressing the management of hazardous wastes that may be potential action-specific ARARs. Pertinent Washington

regulations appear in Chapter 173-303 WAC (under the authority of RCW 70.105) and generally parallel federal management standards. Determination of potential ARARs will be on a case-by-case basis as cleanup actions proceed.

- **Solid Waste Management (WAC 173-304).** Washington State regulations describe management standards for solid waste in Chapter 173-304 WAC (under the authority of RCW 70.95). Some of these management standards may be potential ARARs for disposal of cleanup wastes within the 200 East Groundwater Aggregate Area. Solid waste standards include such requirements as the following:

  - Inspecting waste management areas to ensure proper performance and safe conditions

  - Management standards for incinerators and treatment units

  - Design and performance standards for landfills

  - Groundwater monitoring system design and performance.

  Many of these requirements will depend on the particular remediation activity undertaken, and will have to be identified as remediation proceeds.

- **Water Quality Management.** Chapter 90.48 RCW, the Washington State Water Pollution Control Act (WPCA), requires use of all known, available, and reasonable treatment technologies (AKART) for treating contaminants prior to discharge to waters of the state. Implementing regulations appear principally at Chapters 173-216, 173-220, and 173-240 WAC.

  The WPCA requirements for groundwater could be potential ARARs for actions conducted within the 200 East Groundwater Aggregate Area if such actions would result in discharge of liquid contaminants to the soil column, reinjection of withdrawn groundwater, or other actions that could introduce or return contaminants to the groundwater. In this event, Ecology would require use of AKART to treat the liquid discharges prior to soil disposal.

  The WPCA requirements for surface water would not necessarily be potential ARARs for the 200 East Groundwater Aggregate Area. However, these requirements could constitute potential ARARs for cleanup actions which would result in discharge of treated wastewaters to the Columbia River and associated treatment systems could be required to demonstrate they meet AKART.

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- **Air Quality Management (RCW 70.94).** Under the authority of the Washington Clean Air Act (RCW 70.94) the Toxic Air Pollutant regulations for new air emission sources, promulgated in Chapter 173-460 WAC, require use of best available control technology for air toxics (T-BACT). The Toxic Air Pollutant regulations may be potential ARARs for cleanup actions at the 200 East Groundwater Aggregate Area that could result in emissions of toxic contaminants to the air. Ecology may require the use of T-BACT to treat such air emissions.

- **Water Well Construction (RCW 18.104).** This regulation establishes authority for Ecology to require the licensing of water well contractors and operators and for the regulation of water well construction.

- **Nuclear Energy and Radiation (RCW 70.98).** Chapter 70.98 RCW establishes a program to establish procedures for assumption and performance of certain regulatory responsibilities with respect to byproduct, source, and special nuclear materials.

- **Washington Monitoring and Enforcement of Air Quality and Emission Standards for Radionuclides (WAC 246-247-040).** This regulation is implemented by the Washington Department of Health (Health). It adopts the Ecology standards for maximum accumulated dose limits to members of the public.

- **Washington Standards for Protection Against Radiation (WAC 402-24 and 426-221).** Washington State standards for radiation exposure to individuals in restricted and unrestricted access areas are not applicable, but are potentially relevant and appropriate.

- **Pollution Disclosure Act (RCW 90.52).** Chapter 90.52 RCW describes the authority of the state to regulate reports for any commercial or industrial discharge, other than sanitary sewage, into waters of the state.

- **Water Resources Act (RCW 90.54).** Chapter 90.54 RCW gives the state authority to implement water related resources programs.

- **Minimum Standards for Construction and Maintenance of Wells (Chapter 173-160 WAC).** Well construction regulations establish minimum standards for water well construction and require the preparation of construction reports.

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- **Rules and Regulations Governing the Licensing of Well Contractors and Operators (Chapter 173-162 WAC).** Chapter 173-162 WAC establishes requirements for licensing of well drillers.

- **State Waste Discharge Permit Program (Chapter 173-216 WAC).** Chapters 173-216 WAC establishes a permit system for discharges of wastewater to groundwater and surface water via the municipal sewage system.

- **Underground Injection Control Program (Chapter 173-218 WAC).** Chapter 173-218 WAC pertains to the injection of wastes into aquifers that are used for drinking water.

- **Incinerators (Chapter 173-303-170 WAC).** If incinerators are used for a remedial technology this regulation would be applicable.

6.5 OTHER CRITERIA AND GUIDANCE TO BE CONSIDERED

In addition to the potential ARARs presented, other federal and state criteria, advisories, guidance, and similar materials are TBC in determining the appropriate degree of remediation for the 200 East Groundwater Aggregate Area. A myriad of resources may be potentially evaluated. The following represents an initial assessment of pertinent potential TBC provisions.

6.5.1 Health Advisories

The EPA Office of Drinking Water publishes advisories identifying contaminants for which health advisories have been issued.

6.5.2 International Commission of Radiation Protection/National Council on Radiation Protection

The International Commission of Radiation Protection and the National Council on Radiation Protection have a guidance standard of 100 mrem/yr whole body dose of gamma radiation. These organizations also issue recommendations on other areas of interest regarding radiation protection.

6.5.3 Environmental Protection Agency Proposed Corrective Actions for Solid Waste Management Units

In the July 27, 1990, Federal Register (55 FR 30798), EPA published proposed regulations for performing corrective actions (cleanup activities) at solid waste management units associated with RCRA facilities. The proposed 40 CFR Part 264 Subpart S includes requirements that would be potential TBCs for determining an appropriate level of cleanup at the 200 East Groundwater Aggregate Area. In particular, EPA included an appendix, "Appendix A - Examples of Concentrations Meeting Criteria for Action Levels," which presented recommended contaminant concentrations warranting corrective action. These contaminant-specific TBCs for water are included in Table 6-1 for the preliminary contaminants of concern.

6.5.4 Department of Energy Standards for Radiation Protection

A number of DOE Orders exist which could be TBCs. The DOE Orders that establish potential contaminant-specific or action-specific standards for the remediation of radioactive wastes and materials are discussed below.

- **DOE Order 5400.5 - DOE Standards for Radiation Protection of the Public and Environment.** The DOE Order 5400.5 establishes the requirements for DOE facilities to protect the environment and human health from radiation including soil and air contamination. The purpose of the Order is to establish standards and requirements for operations of the DOE and DOE contractors with respect to protection of members of the public and the environment against undue risk from radiation.

  The Order mandates that the exposure to members of the public from a radiation source as a consequence of routine activities shall not exceed 100 mrem from all exposure sources due to routine DOE activities. In accordance with the Clean Air Act, exposures resulting from airborne emissions shall not exceed 10 mrem to the maximally exposed individual at the facility boundary. The DOE Order 5400.5 provides Derived Concentration Guide values for releases of radionuclides into the air or water. Derived Concentration Guide values are calculated so that, under conditions of continuous exposure, an individual would receive an effective dose equivalent of 100 mrem/yr. Because dispersion in air or water is not accounted for in the Derived Concentration Guide, actual exposures of maximally exposed individuals in unrestricted areas are considerably below the 100 mrem/yr level.

The DOE Order 5400.5 also provides for establishment of soil cleanup levels through a site-specific pathway analysis such as the allowable residual contamination level method. The calculation of allowable residual contamination level values for radionuclides is dependent on the physical characteristics of the site, the radiation dose limit determined to be acceptable, and the scenarios of human exposure judged to be possible and to result in the upper-bound exposure.

- **DOE Order 5820.2A - Radioactive Waste Management.** The DOE Order 5820.2A applies to all DOE contractors and subcontractors performing work that involves management of waste containing radioactivity. This Order requires that wastes be managed in a manner that assures protection of the health and safety of the public, operating personnel, and the environment. The DOE Order 5820.2A establishes requirements for management of high-level, transuranic (TRU), and low-level wastes as well as wastes containing naturally occurring or accelerator produced radioactive material, and for decommissioning of facilities. The requirements applicable to the 200 East Groundwater Aggregate Area remediation activities include those related to TRU waste and low-level radioactive waste. These are summarized below.

  - **Management of Transuranic Waste.** The TRU waste resulting from the 200 East Groundwater Aggregate Area remedial action must be managed to protect the public and worker health and safety, and the environment, and performed in compliance with applicable radiation protection standards and environmental regulations. Practical and cost-effective methods must be used to reduce the volume and toxicity of TRU waste.

    The TRU waste must be certified in compliance with the Waste Isolation Pilot Plant (WIPP) Acceptance Criteria, placed in interim storage, if required, and sent to the WIPP. Any TRU waste that the DOE has determined, with the concurrence of the EPA Administrator, does not need the degree of isolation provided by a geologic repository or TRU waste that cannot be certified or otherwise approved for acceptance at the WIPP must be disposed of by alternative methods. Alternative disposal methods must be approved by DOE Headquarters and comply with NEPA requirements and EPA/state regulations.

  - **Management of Low-Level Radioactive Waste.** The requirements for management of low-level radioactive waste presented in DOE Order 5820.2A are relevant to the remedial alternative of removal and disposal of 200 East Groundwater Aggregate Area wastes.

Performance objectives for this option shall ensure that external exposure to the radioactive material released into surface water, groundwater, soil, plants, and animals does not result in an effective dose greater than 25 mrem/yr to the public. Releases to the environment shall be at levels as low as reasonably achievable. An inadvertent intruder after the institutional control period of 100 years is not to exceed 100 mrem/yr for continuous exposure or 500 mrem for a single acute exposure. A performance assessment is to be prepared to demonstrate compliance with the above performance objectives.

Other requirements under DOE Order 5820.2A which may affect remediation of the 200 East Groundwater Aggregate Area include waste volume minimization, waste characterization, waste acceptance criteria, waste treatment, and shipment. The low-level radioactive waste may be stored by appropriate methods prior to disposal to achieve the performance objectives discussed above. Disposal site selection, closure/post-closure, and monitoring requirements are also discussed in this Order.

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6.6 POINT OF APPLICABILITY

A significant factor in the evaluation of remedial alternatives for the 200 East Groundwater Aggregate Area will be the determination of the point at which compliance with identified ARARs must be achieved (i.e., the point of a specific ARAR's applicability). These points of applicability are the boundaries at which the effectiveness of a particular remedial alternative will be assessed.

For most individual radioactive species transported by either water or air, Ecology and Health standards generally require compliance at the boundaries of the Hanford Site (e.g., Clean Air Act, Section 6.2.1). The assumed point of compliance for radioactive species is the point where a member of the public would have unrestricted access to live and conduct business, and, consequently, to be maximally exposed. Although Health is responsible for monitoring and enforcing the air standards promulgated by Ecology, and generally recognizes the site boundary as the point of applicability, Ecology has recently indicated that compliance may be required at the point of emission.

Ecology's MTCA regulations require that contaminant-specific ARARs be met in groundwater:

- Throughout the site from the uppermost level of the saturated zone extending vertically to the lowest most depth that could potentially be affected by the site, to the outer boundary of the hazardous substance plume

- For sites where sources of hazardous substances will remain after all practicable methods of treatment have been utilized, from a conditional point of compliance established as close as possible to the source of hazardous substances, not to exceed the property boundary, to the outer boundary of the hazardous substance plume.

The points at which the various ARARs are to be applied will need to be determined in a manner consistent with state and federal regulations and agency guidance.

6.7 POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS EVALUATION

Evaluation of ARARs is an iterative process that will be conducted at multiple points throughout the remedial process:

- When the public health evaluation is conducted to assess risks at the 200 East Groundwater Aggregate Area, the potential contaminant-specific ARARs and the potential location-specific ARARs will be identified more comprehensively and used to help determine the cleanup goals

- During detailed analysis of alternatives, all the potential ARARs for each alternative will be examined to determine what is needed to comply with other laws and to be protective of public health and the environment.

Following completion of the investigation, the remedial alternative selected must be able to attain all ARARs unless one of the six statutory waivers provided in Section 121 (d)(4)(A) through (F) of CERCLA is invoked. Finally, during remedial design, the technical specifications of construction must ensure attainment of ARARs. The six reasons ARARs can be waived are as follows:

- The remedial action selected is only part of a total remediation that will attain ARARs upon completion

- Compliance with ARARs at that facility will result in greater risk to human health and the environment than will other options

- Compliance with ARARs is technically impracticable from an engineering perspective

- The remedial action selected will attain a standard of performance that is equivalent to that required under ARARs through use of another method or approach

- With respect to state ARARs, the state has not consistently applied (or demonstrated the intention to consistently apply) the ARAR in similar circumstances at other remedial actions within the state

- For CERCLA-financed actions under Section 104, compliance with the ARAR will not provide a balance between the need for protecting public health, welfare, and the environment at the facility, and the need for fund money to respond to other sites (this waiver is not applicable at the Hanford Site).

Once investigations have been completed and final remedies have been selected, the ARARs that must be met will be formally identified in the Record of Decision (ROD). Compliance with those ARARs specified in the ROD will be achieved through the remedial action. The ARARs may need to be reevaluated if unanticipated circumstances are encountered during remediation which prevent the ability to satisfy the identified ARARs.

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Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic Organic, and Radionuclides of Concern.

	SDWA		RCRA	RCRA	MTCA	RCRA	DOE Order 5400.5	DOE Order 5400.5
	Drinking Water Standards		TCLP Designation Limit	LDR Limits For Wastewaters	Groundwater Cleanup Levels	Proposed Corrective Action Levels	Ingested Water	4% Ingested Water[k]
	MCL in mg/L	SMCL in mg/L	in mg/L	CCW in mg/L	Method A µg/L	Water in mg/L	DCG pCi/L	DCG pCi/L
INORGANIC COMPOUNDS								
Aluminum	--	--	--	--	--	--	--	--
Antimony	0.006[a]	--	--	--	--	--	--	--
Arsenic	0.05	--	5	5	2	--	--	--
Barium	2[b]	--	100	100	--	1	--	--
Beryllium	0.004[a]	--	--	0.82	--	0.000008	--	--
Boron	--	--	--	--	--	--	--	--
Cadmium	0.005[a]	--	1	1	2	0.01	--	--
Calcium	--	--	--	--	--	--	--	--
Chromium	0.1	--	5	5	50	0.1[c]	--	--
Cobalt	--	--	--	--	--	--	--	--
Copper	TT[d]	1	--	1.3	1000	--	--	--
Cyanide	0.2[a]	0.3	--	1.9	--	0.7	--	--
Iron	--	--	--	--	--	--	--	--
Lead	0.05/TT[d]	--	5	5	5	0.05	--	--
Lithium	--	--	--	--	--	--	--	--
Magnesium	--	--	--	--	--	--	--	--
Manganese	--	0.05	--	--	--	--	--	--
Mercury	0.002	--	0.2	0.2	2	0.002	--	--
Nickel	0.1[a]	--	--	0.55	--	0.7	--	--
Potassium	--	--	--	--	--	--	--	--

Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic Organic, and Radionuclides of Concern.

	SDWA		RCRA	RCRA	MTCA	RCRA	DOE Order 5400.5	DOE Order 5400.5
	Drinking Water Standards		TCLP Designation Limit	LDR Limits For Wastewaters	Groundwater Cleanup Levels	Proposed Corrective Action Levels	Ingested Water	4% Ingested Water[k]
	MCL in mg/L	SMCL in mg/L	in mg/L	CCW in mg/L	Method A µg/L	Water in mg/L	DCG pCi/L	DCG pCi/L
Selenium	0.05	--	1	1	--	--	--	--
Silicon	--	--	--	--	--	--	--	--
Silver	--	0.1	5	5	--	0.05	--	--
Sodium	--	--	--	--	--	--	--	--
Strontium	--	--	--	--	--	--	--	--
Thallium	0.002[a]	--	--	--	--	--	--	--
Titanium	--	--	--	--	--	--	--	--
Uranium	--	--	--	--	--	--	--	--
Vanadium	--	--	--	0.042	--	--	--	--
Zinc	--	5	--	1	5000	--	--	--
ORGANIC COMPOUNDS								
Chloroform	0.1 (THM)	--	6	0.046[a]	--	0.006	--	--
Carbon Tetrachloride	0.005	--	0.5	0.057[a]	--	0.0003	--	--
Methylene Chloride	0.005[a]	--	--	0.44	5	0.005	--	--
1,1-Dichloroethane	--	--	--	0.059[a]	--	--	--	--
1,2-Dichloroethane	0.005	--	0.5	0.21[a]	1	0.005	--	--
Cis-1,2-Dichloroethylene	0.07	--	--	--	--	--	--	--
Trans-1,2 Dichloroethylene	0.1	--	--	--	--	--	--	--
1,1,1-Trichloroethane	0.2	--	--	0.054[a]	200	3	--	--
1,1,2-Trichloroethane	0.005[a]	--	--	0.03	--	--	--	--

Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic Organic, and Radionuclides of Concern.

	SDWA		RCRA	RCRA	MTCA	RCRA	DOE Order 5400.5	DOE Order 5400.5
	Drinking Water Standards		TCLP Designation Limit	LDR Limits For Wastewaters	Groundwater Cleanup Levels	Proposed Corrective Action Levels	Ingested Water	4% Ingested Water[k]
	MCL in mg/L	SMCL in mg/L	in mg/L	CCW in mg/L	Method A µg/L	Water in mg/L	DCG pCi/L	DCG pCi/L
Trichloroethylene	0.005	--	0.5	0.54[e]	5	0.005	--	--
Tetrachloroethylene	0.005	--	0.4	0.56[e]	1	0.0007	--	--
Pyrene	--	--	--	--	--	--	--	--
Styrene	0.1	--	--	--	--	--	--	--
Toluene	1	--	--	0.08[e]	40	10	--	--
2,4-Dinitrotoluene	--	--	0.13	0.32[e]	--	--	--	--
Phenol	--	--	--	0.039	--	--	--	--
2,3,4,6-Tetrachlorophenol	--	--	--	--	--	--	--	--
2,4-Dichlorophenol	--	--	--	0.044[e]	--	0.1	--	--
2,4-Dimethylphenol	--	--	--	--	--	--	--	--
2,4-Dinitrophenol	--	--	--	0.12[e]	--	0.07	--	--
2-Chlorophenol	--	--	--	0.044[e]	--	0.2	--	--
o-Nitrophenol	--	--	--	--	--	--	--	--
Acetone	--	--	--	--	--	--	--	--
Methyl Ethyl Ketone	--	--	200	0.28	--	2	--	--
4-Methyl-2-Pentanone	--	--	--	--	--	--	--	--
Cyclohexanone	--	--	--	--	--	--	--	--
Aldrin	--	--	--	0.21[e]	--	--	--	--

Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic Organic, and Radionuclides of Concern.

	SDWA		RCRA	RCRA	MTCA	RCRA	DOE Order 5400.5	DOE Order 5400.5
	Drinking Water Standards		TCLP Designation Limit	LDR Limits For Wastewaters	Groundwater Cleanup Levels	Proposed Corrective Action Levels	Ingested Water	4% Ingested Water[k]
	MCL in mg/L	SMCL in mg/L	in mg/L	CCW in mg/L	Method A µg/L	Water in mg/L	DCG pCi/L	DCG pCi/L
DDD	--	--	--	0.023	--	0.0001	--	--
DDT	--	--	--	0.0039[e]	0.12	0.0001	--	--
Dieldrin	--	--	--	0.017[e]	--	0.000002	--	--
Endrin	.0002/0.002[f]	--	0.02	0.0028[e]	--	0.0002	--	--
Endrin Aldehyde	--	--	--	--	--	--	--	--
Gamma-BHC	--	--	--	--	--	--	--	--
Heptachlor	0.0004	--	0.003	0.0012[e]	--	0.000008	--	--
Bis(2-ethylhexyl) phthalate	0.006	--	--	0.54[g]	--	--	--	--
Diethyl Ether	--	--	--	--	--	--	--	--
Dimethoate	--	--	--	--	--	0.7	--	--
Ethyl Cyanide	--	--	--	0.24[e]	--	--	--	--
Hydrazine	--	--	--	--	--	--	--	--
P-chloro-m-cresol	--	--	--	--	--	--	--	--
Phorate	--	--	--	--	--	--	--	--
Trichloromonofluoromethane	--	--	--	0.02[e]	--	--	--	--
Triethylene Glycol	--	--	--	--	--	--	--	--
CONVENTIONAL CONSTITUENTS								
Ammonium Ion	--	--	--	--	--	--	--	--
Bromide	--	--	--	--	--	--	--	--

Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic Organic, and Radionuclides of Concern.

	SDWA		RCRA	RCRA	MTCA	RCRA	DOE Order 5400.5	DOE Order 5400.5
	Drinking Water Standards		TCLP Designation Limit	LDR Limits For Wastewaters	Groundwater Cleanup Levels	Proposed Corrective Action Levels	Ingested Water	4% Ingested Water[k]
	MCL in mg/L	SMCL in mg/L	in mg/L	CCW in mg/L	Method A µg/L	Water in mg/L	DCG pCi/L	DCG pCi/L
Chloride	--	250	--	--	--	--	--	--
Fluoride	4	2	--	35	--	--	--	--
Nitrate (as N)	10	--	--	--	--	--	--	--
Nitrite (as N)	1[d]	--	--	--	--	--	--	--
Phosphate	--	--	--	--	--	--	--	--
Sulfate	--[h]	250	--	--	--	--	--	--
Total Dissolved Solids	--	500	--	--	--	--	--	--
Coliform Bacteria	--	--	--	--	--	--	--	--
RADIONUCLIDES								
Gross Alpha	15 pCi/L[i]	--	--	--	--		NS	NS
Gross Beta	4 mrem/yr[j]	--	--	--	--	--	NS	NS
Tritium	20,000 pCi/L[j]	--	--	--	--	--	2,000,000	80,000
Beryllium-7	--	--	--	--	--	--	1,000,000	40,000
Carbon-14	--	--	--	--	--	--	70,000	2,800
Potassium-40	--	--	--	--	--	--	7,000	280
Cobalt-60	--	--	--	--	--	--	5,000	200
Zinc-65	--	--	--	--	--	--	9,000	360
Strontium-90	8 pCi/L[j]	--	--	--	--	--	1,000	40
Zirconium/Niobium-95	--	--	--	--	--	--	40,000	1,600
Technetium-99	--	--	--	--	--	--	100,000	4,000

Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic Organic, and Radionuclides of Concern.

	SDWA		RCRA	RCRA	MTCA	RCRA	DOE Order 5400.5	DOE Order 5400.5
	Drinking Water Standards		TCLP Designation Limit	LDR Limits For Wastewaters	Groundwater Cleanup Levels	Proposed Corrective Action Levels	Ingested Water	4% Ingested Water[k]
	MCL in mg/L	SMCL in mg/L	in mg/L	CCW in mg/L	Method A µg/L	Water in mg/L	DCG pCi/L	DCG pCi/L
Ruthenium-106	--	--	--	--	--	--	6,000	240
Antimony-125	--	--	--	--	--	--	50,000	2,000
Iodine-129	--	--	--	--	--	--	500	20
Cesium-134	--	--	--	--	--	--	2,000	80
Cesium-137	--	--	--	--	--	--	3,000	120
Cerium/Praseodymium-144	--	--	--	--	--	--	7,000	280
Europium-154	--	--	--	--	--	--	20,000	800
Europium-155	--	--	--	--	--	--	100,000	4,000
Lead-212	--	--	--	--	--	--	3,000	120
Radium	5 pCi/L[j]	--	--	--	--	--	100	4
Uranium	--	--	--	--	--	--	NS	NS
Uranium-234	--	--	--	--	--	--	500	20
Uranium-235	--	--	--	--	--	--	600	24
Uranium-238	--	--	--	--	--	--	600	24

Table 6-1. Potential Contaminant-Specific ARARs and TBCs for Preliminary Inorganic Organic, and Radionuclides of Concern.

	SDWA		RCRA	RCRA	MTCA	RCRA	DOE Order 5400.5	DOE Order 5400.5
	Drinking Water Standards		TCLP Designation Limit	LDR Limits For Wastewaters	Groundwater Cleanup Levels	Proposed Corrective Action Levels	Ingested Water	4% Ingested Water[k/]
	MCL in mg/L	SMCL in mg/L	in mg/L	CCW in mg/L	Method A µg/L	Water in mg/L	DCG pCi/L	DCG pCi/L
Plutonium-238	--	--	--	--	--	--	40	1.6
Plutonium-239/40	--	--	--	--	--	--	30	1.2
Americium-241	--	--	--	--	--	--	30	1.2

a/ = Effective Date January 17, 1994.
b/ = Effective Date - January 1, 1993, current MCL = 1.0 mg/L.
c/ = Effective Date - July 30, 1992.
d/ = Treatment technique requirement in effect. Effective Date - December 7, 1992.
e/ = Based on analysis of composite samples.
f/ = Revised MCL effective January 17, 1994.
g/ = Treatment standards based upon incineration in units operated in accordance with the technical requirements of 40 CFR Part 264 Subpart 0, or based upon combustion in fuel substitution units operating in accordance with applicable technical requirements.
h/ = Sulfate was proposed for an MCL of 400-500 mg/L, but this regulation has been deferred (57 FR 31776, July 17, 1992).
i/ = "Picocurie (pCi)" means the quantity of radioactive material producing 2.22 nuclear transformations per minute.
j/ = To use the DCGs for comparison with the DOE drinking water systems criterion of 4 mrem/yr, use the 4 percent DCG values for ingestion.
k/ = "Rem" means the unit of dose equivalent from ionizing radiation to the total body of any internal organ or organ system. A "millirem (mrem)" is 1/1000 of a rem.

Abbreviations:

CCW = Constituent Concentration in Waste
DCG = Derived Concentration Guide
DOE = Department of Energy
LDR = Land Disposal Restrictions
MCL = Maximum Contaminant Level
MTCA = Washington State Model Toxic Control Act
NS = Not Specified
RCRA = Federal Resource Conservation and Recovery Act
SDWA = Federal Safe Drinking Water Act
SMCL = Secondary Maximum Contaminant Level
TCLP = Toxicity Characteristics Leaching Procedure
THM = Trihalomethanes

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Table 6-2. Potential Location-Specific ARARs.

Location	Requirement	Prerequisite	Citation	ARAR
GEOLOGICAL:				
Within 154 m (500 ft) of a fault displaced in Holocene time.	New treatment, storage or disposal of hazardous waste prohibited.	Hazardous waste management near Holocene fault.	40 CFR 264.18; WAC 173-303-282	Not ARAR. No Holocene fault.
Holocene faults and subsidence areas.	New solid waste disposal facilities prohibited over faults with displacement in Holocene time, and in subsidence areas.	New solid waste management activities near Holocene fault.	WAC 173-304-130	Not ARAR. No Holocene fault.
Unstable slopes.	New solid waste disposal areas prohibited from hills with unstable slopes.	New solid waste disposal on an unstable slope.	WAC 173-304-130	Not ARAR. No unstable slope.
100-year floodplains.	Solid and hazardous waste disposal facilities must be designed, built, operated, and maintained to prevent washout.	Solid or hazardous waste disposal in a 100-year floodplain.	40 CFR 264.18; WAC 173-303-282; WAC 173-304-460	Potential ARAR.
	Avoid adverse effects, minimize potential harm, restore/preserve natural and beneficial values in floodplains.	Actions occurring in a floodplain.	40 CFR Part 6 Subpart A; 16 USC 661 et seq; 40 CFR 6.302	Potential ARAR.
Salt dome and salt bed formations, underground mines, and caves.	Placement of non-containerized or bulk liquid hazardous wastes is prohibited.	Hazardous waste placement in salt dome, salt bed, mine, or cave.	40 CFR 264.18	Not ARAR. None of these units.

Table 6-2. Potential Location-Specific ARARs.

Location	Requirement	Prerequisite	Citation	ARAR
SURFACE WATER:				
Wetlands.	New hazardous waste disposal facilities prohibited in wetlands (including within 61 m [200 ft] of shoreline).	Hazardous waste disposal within 154 m (500 ft) of surface water (0.25 mi for land-based facilities).	WAC 173-303-282	Potential ARAR.
	New solid waste disposal facilities prohibited within 61 m (200 ft) of surface water (stream, lake, pond, river, salt water body).	Solid waste disposal within 61 m (200 ft) of surface water.	WAC 173-304-130	Potential ARAR.
	New solid waste disposal facilities prohibited in wetlands (swamps, marshes, bogs, estuaries, and similar areas).	Solid waste disposal in a wetland (swamp, marsh, bog, estuary, etc.).	WAC 173-304-130	Not ARAR. No wetlands present.
	Discharge of dredged or fill materials into wetlands prohibited without a permit.	Discharges to wetlands and navigable waters.	40 CFR Part 230; 33 CFR Parts 303, and 320 to 330	Potential ARAR.
	Minimize potential harm, avoid adverse effects, preserve and enhance wetlands.	Construction or management of property in wetlands.	40 CFR Part 6 Appendix A	Not ARAR. No wetlands present.
Shorelines.	Actions prohibited within 200 ft of shorelines of statewide significance unless permitted.	Actions near shorelines.	Chapter 90.58 RCW; Chapter 173-14 WAC.	Potential ARAR.

Table 6-2. Potential Location-Specific ARARs.

Location	Requirement	Prerequisite	Citation	ARAR
Rivers and streams.	Avoid diversion, channeling or other actions that modify streams or rivers, or adversely affect fish or wildlife habitats and water resources.	Actions modifying a stream or river and affecting fish or wildlife.	40 CFR 6.302	Potential ARAR.
GROUNDWATER:				
Sole source aquifer.	New solid and hazardous waste land disposal facilities prohibited over a sole source aquifer.	Disposal over a sole source aquifer.	WAC 173-303-402; WAC 173-304-130	Not ARAR. No sole source aquifer.
Uppermost aquifer.	Bottom of lowest liner of new solid waste disposal facility must be at least 10 ft above seasonal high water in uppermost aquifer (5 ft if hydraulic gradient controls installed).	New solid waste disposal.	WAC 173-304-130	Not ARAR. Groundwater is deeper than 10 ft.
Aquifer Protection Areas.	Activities restricted within designated Aquifer Protection Areas.	Activities within an Aquifer Protection Area.	Chapter 36.36 RCW.	Not ARAR. Not an Aquifer Protection Area.
Groundwater Management Areas.	Activities restricted within Ground Water Management Areas.	Activities within a Groundwater Management Area.	Chapter 90.44 RCW; Chapter 173-100 WAC	Not ARAR. Not a Groundwater Management Area.

Table 6-2. Potential Location-Specific ARARs.

Location	Requirement	Prerequisite	Citation	ARAR
DRINKING WATER SUPPLY:				
Drinking water supply well.	New solid waste disposal areas prohibited within 1,000 ft upgradient, or 90 days travel time, of drinking water supply well.	New solid waste disposal within 1,000 ft of drinking water supply well.	WAC 173-304-130	Not ARAR. No drinking water supply wells.
Watershed.	New solid waste disposal areas prohibited within a watershed used by a public water supply system for municipal drinking water.	New solid waste disposal in a public watershed.	WAC 173-304-130	Not ARAR. Not a public watershed.
AIR:				
Non-attainment areas.	Restrictions on air emissions in areas designated as non-attainment areas under state and federal air quality programs.	Activities in a designated non-attainment area.	Chapter 70.94 RCW; Chapters 173-400 and 173-403 WAC.	Not ARAR. Not a non-attainment area.
SENSITIVE ENVIRONMENTS:				
Endangered/threatened species habitats.	New solid waste disposal prohibited from areas designated by U.S. Fish and Wildlife Service as critical habitats for endangered/threatened species.	New solid waste disposal in critical habitats.	WAC 173-304-130	Not ARAR. Not a critical habitat.

Table 6-2. Potential Location-Specific ARARs.

Location	Requirement	Prerequisite	Citation	ARAR
	Actions within critical habitats must conserve endangered/threatened species.	Activities where endangered or threatened species exist.	50 CFR Parts 200 and 402.	Potential ARAR.
Parks.	No new solid waste disposal areas within 1,000 ft of state or national park.	New solid waste disposal near state/national park.	WAC 173-304-130	Not ARAR. No state/national park.
	Restrictions on activities in areas that are designated state parks, or recreation/ conservation areas.	Activities in state parks or recreation/conservation areas.	Chapter 43.51 RCW; Chapter 352.32 WAC	Not ARAR. None of these state areas.
Wilderness areas.	Actions within designated wilderness areas must ensure area is preserved and not impaired.	Activities within designated wilderness areas.	16 USC 1131 et seq; 50 CFR 35.1 et seq	Not ARAR. Not a wilderness area.
Wildlife refuge.	Restrictions on actions in areas that are part of the National Wildlife Refuge System.	Activities within designated wildlife refuges.	16 USC 668dd et seq; 50 CFR Part 27	Not ARAR. Not a wildlife refuge.
Natural areas preserves.	Activities restricted in areas designated as having special habitat value (Natural Heritage Resources).	Activities within identified Natural Area Preserves.	Chapter 79.70 RCW; Chapter 332-650 WAC	Not ARAR. Not a Natural Area Preserve.
Wild, scenic, or recreational rivers.	Avoid actions that would have adverse effects on designated wild, scenic, or recreational rivers.	Activities near wild, scenic, and recreational rivers.	16 USC 1271 et seq; 40 CFR 6.302; Chapter 79.72 RCW	Potential ARAR.

Table 6-2. Potential Location-Specific ARARs.

Location	Requirement	Prerequisite	Citation	ARAR
Columbia River Gorge	Restrictions on activities that could affect resources in the Columbia River Gorge.	Activities within the Columbia River Gorge.	Chapter 43.97 RCW	Not ARAR. Not in Columbia River Gorge.
UNIQUE LANDS AND PROPERTIES:				
Natural resource conservation areas.	Restrictions on activities within designated Conservation Areas.	Activities within designated Conservation Areas.	Chapter 79.71 RCW	Not ARAR. Not a Conservation Area.
Forest lands.	Activities restricted within state forest lands to minimize fire hazards and other adverse impacts.	Activities within state forest lands.	Chapter 76.04 RCW; Chapter 332-24 WAC	Not ARAR. Not a forest land.
	Restrictions on activities in state and federal forest lands.	Activities within state and federal forest lands.	16 USC 1601; Chapter 76.09 RCW	Not ARAR. Not a forest land.
Public lands.	Activities on public lands are restricted, regulated, or proscribed.	Activities on state-owned lands	Chapter 79.01 RCW	Not ARAR. Not a state land.
Scenic vistas.	Restrictions on activities that can occur in designated scenic areas.	Activities in designated scenic vista areas.	Chapter 47.42 RCW	Not ARAR. Not a scenic area.

Table 6-2. Potential Location-Specific ARARs.

Location	Requirement	Prerequisite	Citation	ARAR
Historic areas.	Actions must be taken to preserve and recover significant artifacts, preserve historic and archaeologic properties and resources, and minimize harm to national landmarks.	Activities that could affect historic or archaeologic sites or artifacts.	16 UST 469, 470 et seq; 36 CFR Parts 65 and 800; Chapters 27.34, 27.53, and 27.58 RCW.	Not ARAR. No historic or archaeologic sites.
LAND USE:				
Neighboring properties.	No new solid waste disposal areas within 100 ft of the facility's property line.	New solid waste disposal within 100 ft of facility property line.	WAC 173-304-130	Not ARAR. Not near facility boundary.
	No new solid waste disposal areas within 250 ft of property line of residential zone properties.	New solid waste disposal within 250 ft of property line of residential property.	WAC 173-304-130	Not ARAR. No residential property near.
Proximity to airports.	Disposal of garbage that could attract birds prohibited within 10,000 ft (turbojet aircraft)/5,000 ft (piston-type aircraft) of airport runways.	Garbage disposal near airport.	WAC 173-304-130	Not ARAR. No airports near.

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7.0 PRELIMINARY REMEDIAL ACTION TECHNOLOGIES

Previous sections identified contaminants of concern in the 200 East Groundwater Aggregate Area, potential routes of exposure, and potentially applicable or relevant and appropriate requirements (ARARs). Section 7.0 identifies preliminary remedial action objectives (RAOs) and develops preliminary remedial action alternatives consistent with reducing the potential hazards of this contamination and satisfying ARARs. The overall objective of this section is to identify viable and innovative remedial action alternatives for groundwater in the 200 East Groundwater Aggregate Area.

The process of identifying remedial action alternatives consists of several steps. In Section 7.1, RAOs are identified. Next, in Section 7.2, general response actions are identified along with general treatment, resource recovery, and containment technologies applicable to each general response action. Specific process options belonging to each technology are identified, and these process options are subsequently screened based on their effectiveness, implementability, and relative cost (Section 7.3). Process options are combined into alternatives in Section 7.4, which also includes descriptions and diagrams for the alternatives. Section 7.5 provides a brief discussion of the integration of innovative technologies into the process for selecting remedial action alternatives. Criteria are then identified in Section 7.6 for preliminary screening of alternatives that may be applicable to groundwater operable units identified in the 200 East Groundwater Aggregate Area. Figure 7-1 is a flowchart diagramming the development of the remedial action alternatives starting with media-specific RAOs.

Because of uncertainty regarding the nature and extent of contamination at the 200 East Groundwater Aggregate Area, recommendations for remedial alternatives are general and cover a broad range of actions. Remedial action alternatives will be considered and more fully developed in future focused feasibility studies. The *Hanford Site Past-Practice Strategy* (DOE/RL 1992a) is used to focus the range of remedial action alternatives that will be evaluated in future studies. The *Hanford Site Past-Practice Strategy* implements the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). Remedial Investigations (RIs)/Feasibility Studies (FSs) and RCRA Facility Investigation (RFI)/Corrective Measures Studies (CMS) are components of this strategy and are implemented through a combination of interim remedial measures (IRMs), limited field investigations (LFIs) for final remedy selection where interim actions are not clearly justified, and focused or aggregate area feasibility/treatability studies for further evaluation of treatment alternatives. After completion of an IRM, data will be evaluated including concurrent characterization and data monitoring to determine if a final remedy can be selected directly, without additional characterization.

With respect to evaluating remedial alternatives for the 200 East Groundwater Aggregate Area, it should be noted that several of the groundwater contamination problems are similar to engineering problems that have been encountered in previous Hanford Site facility effluent wastewater treatment and disposal studies. In particular, treatment of extracted groundwater may be similar in concept to Hanford Site wastewater treatment projects (C-018H Facility, N-Reactor Effluent, Project L-045H 300 Area Treated Effluent Disposal Facility) conducted under the guidance for *Best Available Technology (BAT) Guidance Document for the Hanford Site* (WHC 1988b). The general response action of containment of contaminated groundwater was evaluated in *Engineering Evaluation of Containment Alternatives for N-Springs Releases* (WHC 1991b). In another example, the *Expedited Response Action Proposal for 200 West Area Carbon Tetrachloride Plume* (DOE/RL 1991a) describes a feasible approach for disposal of secondary wastes generated during the potential air stripping of groundwater. These documents are recognized as important tools to guide both this initial screening and future selection of remedial alternatives.

A secondary purpose of the evaluation of preliminary remedial action alternatives is to identify additional information needed to complete the evaluation. This information may include field data needs, review of literature, validation of existing data, focused feasibility studies, or treatability tests of selected technologies. Alternatives involving proven technologies, identified in Sections 7.3 and 7.4, typically require detailed data delineating site conditions, as well as bench-scale and pilot-scale treatability studies. Innovative technologies, discussed in Section 7.5, are expected to require additional literature searches, research and development, and other studies. Thus, another purpose of this evaluation is to identify the treatability studies required to fully evaluate proven technologies and to scope the research necessary to evaluate promising technologies. Additional data will be developed for most sites or waste groups during future data gathering activities (e.g., LFIs, ERAs, or treatability studies). Data needs are summarized in Section 8.0. New data will be used to refine and supplement the RAOs and the proposed alternatives identified in this initial study. Conclusions regarding the feasibility of some individual technologies may change after new data become available.

The bias-for-action philosophy of addressing contamination at the Hanford Site requires an expedited process for implementing remedial actions. Implementation of general response actions may be accomplished using an observational approach in which the implementation is redirected as information is obtained. This observational approach is an iterative process of data acquisition and refinement of the conceptual model. Data needs are determined by the model, and data collected to fulfill these needs are used as additional input to the model. Use of the observational approach while conducting response actions in the source aggregate areas within the 200 East Area will allow integration of these actions with longer-range objectives of final remediation of similar areas and the entire 200 East Groundwater Aggregate Area. Site characterization and remediation data will be collected concurrently

with the use of LFIs, ERAs, and treatability testing. The knowledge gained through these different activities will be applied to similar areas. The overall goal of this approach is convergence on an appropriate response action as early as possible while continuing to obtain valuable characterization information during remediation phases.

7.1 PRELIMINARY REMEDIAL ACTION OBJECTIVES

The RAOs are remediation goals for protection of human health and the environment that specify the contaminants and media of concern, exposure pathways, and allowable contaminant levels. The RAOs discussed in this section are considered to be preliminary and may change or be refined as new data are acquired and evaluated.

The fundamental objective of the corrective action process at the 200 East Groundwater Aggregate Area is to protect environmental resources and human receptors from the potential threats that may exist because of known or suspected contamination in the groundwater. Specific interim and final RAOs will depend in part on current and reasonable potential future groundwater use in the 200 East Groundwater Aggregate Area. The RAOs also take into account the preference under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for isolation and permanent or significant reduction of volume, toxicity and mobility or the reduction of volume of hazardous substances.

To focus the corrective actions with a bias for action through implementing IRMs and ERAs, preliminary RAOs based on current use are identified for the 200 East Groundwater Aggregate Area. The potential final RAO and interim action objective is as follows:

> Reduce the risk of harmful effects to the environment and human users of the area by isolating and permanently reducing the toxicity, mobility, or volume of contaminants from the source areas to meet ARARs or risk-based levels that will allow industrial use of the area. (This is a potential final RAO, and an interaction objective based on current use of the 200 Area.

The RAOs are further developed in Table 7-1 for groundwater and applicable exposure pathways (see Sections 4.1 and 4.2) for the 200 East Groundwater Aggregate Area. The potential exposure pathways include the following:

- Contaminated water supplies, the use of which could result in inhalation, ingestion, direct contact, and/or direct radiation exposure to humans

- Contaminated groundwater that could migrate to surface waters (i.e., the Columbia River, Yakima River, or West Lake) resulting in inhalation, ingestion, direct contact, and/or direct radiation exposure to humans

- Biota uptake of contaminated groundwater

- Release of groundwater contaminants to soil and vadose zone via vadose zone vapors and offgassing into the air pathway.

The two pathways of biota uptake and soils/vadose zone vapors as an exposure medium are not addressed in this 200 East Groundwater Aggregate Area Management Study Report (AAMSR), but are addressed in each of the four source 200 East Area AAMSRs.

Preliminary contaminant concentration standards that are to be applied to media-specific RAOs are developed from the preliminary identification of potential ARARs in Section 6.0 or by numerical assessment of the expected exposures and associated risks for each contaminant.

RAOs are likely to differ based upon the proposed remedial action. Short-term actions (defined as ERAs and IRMs in Section 9.0) may have different goals than actions which focus on long-term solutions (defined as the final remedy in Section 9.0). Short-term RAOs will likely focus primarily on risk reduction to meet a stopping point based on either a concentration threshold (which is a multiple higher than a final threshold) or on reaching an asymptote on the remediation production curve (the point of diminishing returns).

7.2 PRELIMINARY GENERAL RESPONSE ACTIONS

General response actions represent broad classes of remedial measures that may be appropriate to achieve both interim and final RAOs at the 200 East Groundwater Aggregate Area, and are presented in Table 7-2. The following are the general response actions for the 200 East Groundwater Aggregate Area followed by general discussions of applicability:

- No action
- Institutional controls
- Groundwater removal, treatment, and disposal
- Groundwater containment
- In situ groundwater treatment
- Point-of-use treatment
- Point-of-discharge treatment
- Combinations of the above actions.

7.2.1 No Action and Institutional Control

No action is included for evaluations as required by the National Environmental Policy Act (NEPA) and National Contingency Plan (NCP) [40 CFR 300.68 (f)(l)(v)] to provide a baseline for comparison with other response actions. The no action alternative may be appropriate for some facilities and sources of contamination if risk assessments determine that acceptable natural resource or human health risks are posed by those sources or facilities and that no exceedences of contaminant-specific ARARs occur.

The general response actions focus on permanently reducing the volume, mobility, and toxicity of the contaminants. Active remedial measures to achieve these goals will be supplemented by institutional controls in many cases. Institutional controls involve the use of above-ground physical barriers, plume monitoring, well closures, modification of irrigation practices and source development, and a variety of groundwater use restrictions to reduce or eliminate public exposure to contaminated groundwater. Considering the nature of the 200 Areas as a whole, institutional controls will likely be an integral component of all interim remedial alternatives and will be combined with active groundwater treatment steps. Many groundwater use restrictions are currently in place at the Hanford Site and will remain in place during implementation of interim remedial measures. Long-term groundwater use at the 200 Areas will be restricted due to the institutional control measures necessary to support ongoing waste disposal activities in the 200 Areas.

Application of institutional control and no action alternatives to 200 East Groundwater Aggregate Area cleanup will be affected by many other factors as well. For example, the substantial quantity of groundwater potentially requiring treatment and/or containment may make timely treatment actions prohibitively costly. Risk and groundwater migration studies may conclude that natural attenuation, accompanied by appropriate institutional controls combined with, for example, point-of-use treatment is preferred over the adverse consequences of large-scale source treatment alternatives. Such adverse consequences include increased risks to human health and the environment due to construction activities, disposal of secondary wastes, increased disruption of existing groundwater use, and potential generation of large quantities of radiation-contaminated remediation equipment requiring offsite burial. Evaluation of potential adverse effects will play a vital role in establishing the appropriateness of institutional control and no action alternatives.

7.2.2 Extraction and Treatment (Pump and Treat) Technologies

Groundwater removal and treatment or disposal, commonly known as "pump and treat," involves the extraction of contaminated groundwater and above-ground treatment. Once extracted and treated, it is anticipated that the groundwater would be reinjected into the ground or disposed of to land or surface waters. An example is the planned discharge to soil

of 200 East Area liquid process wastes via the Liquid Effluent Retention Basin and proposed Treated Effluent Disposal Facility (Figure 2-2), as described in Section 2.7. Extraction, treatment, and reinjection options can be varied to achieve a variety of RAOs. For example, the large-scale extraction of groundwater, followed by treatment of contaminants and disposal of the groundwater to nonhydrogeologically related surface waters, treats the groundwater and hydraulically contains contaminated groundwater remaining in the aquifer. A second possible approach is small-scale extraction of isolated contamination plumes followed by removal of high risk contaminants and reinjection near the area of extraction, achieving a net reduction of risk without requiring offsite disposal of groundwater. Pump and treat actions can be used to achieve a wide variety of goals, but may not be needed, or may only be required on a small scale, to protect human health and the environment for the industrial uses of the 200 East Area.

Pump and treat technologies begin with groundwater extraction using techniques including extraction wells, drains, and trenches. Subsurface sediments at the 200 East Area consisting of mostly sand and gravel are well suited to efficient groundwater extraction using extraction wells. Before initiating pumping (especially large-scale pumping), a detailed understanding of the site's groundwater system including the presence of confined and unconfined aquifers, radius-of-influence, permeability, recharge rates, and preferential flow paths, is used to predict how pumping will alter system hydraulics to move and potentially mix contaminant plumes. Based on these site-specific conditions, a network of extraction wells is installed to effect the desired removal of groundwater.

Following extraction, treatment of extracted groundwater will vary in scope and complexity according to the variety of chemical constituents present in the groundwater and level of removal required by applicable ARARs and RAOs. Because 200 East Area groundwater contains a variety of chemical constituents, treatment of extracted groundwater may involve the use of a combination of biological, physical, or chemical technologies to achieve treatment goals. Typical options for treatment of extracted contaminants likely to be present in 200 Areas groundwater include vapor extraction, UV oxidation, reverse osmosis, chemical precipitation, and ion exchange. For the unique radiochemical tritium, treatment options are limited because of tritiated water's near chemical identity to water.

It is expected that a treatment system for extracted groundwater will be designed in accordance with Hanford BAT guidance (WHC 1988b) to facilitate the beneficial transfer of prior experience with potentially applicable technologies acquired on other similar projects (such as C-018H Facility, N-Reactor Effluent, and 300 Area TEDF). Interaction with innovative technology development programs at the Hanford Site (see Section 7.5) may also play a viable role in design of the treatment process. Because of the wide variety of chemicals present (both introduced and natural) in 200 Areas groundwater, bench and possibly pilot treatability tests are likely to be required to obtain critical design and proof-of-principal information for applicable technologies. These tests will be critical to fully evaluate feasible approaches for groundwater treatment in the 200 East Area.

Once treated, the groundwater must be disposed of in accordance with applicable regulations. Disposal may include discharge to uncontaminated soils and water. Disposal may alternatively include reinjection of the treated groundwater into the contaminated source from which it came. In all cases, determination of applicable regulations and standards will be necessary.

A limitation of the groundwater pump-and-treat alternative is that its success may require years to decades of operation and treatment of voluminous quantities of water. Key factors in evaluating the time to completion are the site-specific mobility of chemicals detected in groundwater, soil characteristics, and hydrogeologic conditions. Chemicals such as some metals and radionuclides, which adsorb strongly to soil, are more difficult to extract by pumping groundwater. Site-specific mobility is a result of partitioning between dissolved and adsorbed phases of chemicals. The DNAPLs can adsorb to soils or be held in residual saturation forming long-term sources that may dissolve into groundwater for a long time. Silts and fine sands may adsorb many chemicals more readily and also have a low permeability, thereby increasing the time and effort required to remove contaminants. Hydrogeologic characteristics like fissures, lenses, confining layers, and preferential flow paths can divert groundwater and inhibit the uniform extraction of constituents from target zones.

In many cases, groundwater pump and treat programs have reported a significant decrease in contaminant concentrations after only a short operating period, particularly when the initial contaminant concentrations are relatively high. However, the reduction of chemical concentrations with time tends to follow an asymptotic function, with low concentrations of contaminants persisting over a very long time. Further operations result in the extraction of large volumes of water which must be treated to remove increasingly smaller amounts of contaminants. Thus, the efficiency of the pump and treat operation continues to decrease. Because the 200 East Groundwater Aggregate Area is characterized as containing large volumes of water with relatively low levels of many chemical and radionuclide contaminants, operations are not expected to achieve dramatic reductions initially, and the achievement of specified cleanup levels will likely require a lengthy operation during which the rate of contaminant reductions are expected to be low.

During the extended operating period, using the pump and treat system for plumes in the 200 East Area (estimated 300,000 to 20,000,000 m^3 for contaminant plumes identified in Section 4.1.1) would result in treating millions of gallons of water. If long-term success of the groundwater treatment is potentially questionable, secondary effects such as by-product wastes and economic considerations may overshadow the benefits of installing a pump and treat system.

Even with the limitations discussed, pump-and-treat technologies are considered the primary, proven technology available to remove and treat contaminants in groundwater. Detailed knowledge of the extractability of target chemicals, groundwater treatability RAOs

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applicable to discharges, and potentially adverse secondary effects are keys to understanding the applicability of pump-and-treat systems in 200 East Groundwater Aggregate Area remedial actions.

7.2.3 Containment Technologies

Groundwater containment includes the use of technologies to minimize, divert, or prevent the movement of contaminated groundwater. Containment technologies can be used to reach RAOs for groundwater remediation in a variety of ways. Containment can be implemented to stop groundwater flow and hence isolate contaminants. Alternatively, containment can be used to divert groundwater, increasing migration time before it reaches a receptor, and hence allow for increased natural attenuation. Typically, containment is achieved by installing either impermeable barriers (either vertical or horizontal) or by using dynamic hydraulic pumping and/or injection systems. Impermeable barriers (cutoff walls) can be constructed with metal, grouts, or soil freezing. Dynamic systems are based on the removal or injection of sufficient quantities of water to affect groundwater flow.

The 200 East Groundwater Aggregate Area consists of large volumes of groundwater located about 37 to 104 m (121 to 341 ft) below ground surface. In addition, potentially contaminated confined groundwater extends to depths of 170 m (558 ft). These depths will pose new challenges for the implementation of containment technologies. For example, cutoff walls are typically a moderate cost option. However, when installed at the depth required to contain the unconfined aquifer and especially the deeper confined aquifer, relative costs may rise disproportionately compared to other alternatives. Monitoring the effectiveness of cutoff walls at these depths requires innovative solutions.

Similarly, dynamic hydraulic systems can often be straightforward and efficient to implement, but the operation of a containment system may be complicated in the 200 East Groundwater Aggregate Area because of the large volumes of water involved. Management options for the large volumes of extracted water will present technical treatment challenges and regulatory complications. Furthermore, pumping and/or injection may change overall groundwater flow directions and gradients, which requires that the changes be considered and monitored.

Containment technologies have proven effective in groundwater remediation. Because they are based on physical installation, they achieve the desired goal relatively quickly. They can be used to achieve isolation of groundwater, or partial hydrogeologic flow modification, and with proper evaluation, could be a valuable tool in designing remedial alternatives for the 200 East Groundwater Aggregate Area.

7.2.4 In Situ Groundwater Technologies

In situ groundwater technologies include chemical, physical, and biological treatments to remove, immobilize, or destroy groundwater contaminants in the subsurface. Examples of process options include chemical additions to pump and treat systems to assist flushing or precipitation of contaminants, oxygenating groundwater to enhance natural biological degradation, or sparging to strip chemical contaminants from groundwater.

In situ technologies may be low cost or may have minimal adverse effects, but their dependencies on geological conditions, site-specific chemical/biological background conditions, and time are not well known. Successful in situ treatment has been simulated in the laboratory and tested in the field for a few chemicals in a limited range of site-specific conditions. These studies have demonstrated the potential benefits of in situ treatment. However, they have also revealed that improved understanding of subsurface mixing, effects of existing background conditions, hazards associated with by-product production, and other failure/success modes is needed before in situ technologies can be recommended and implemented successfully.

The relatively high permeability of much of the saturated subsurface soil column in the 200 East Area fulfills a key prerequisite for successful in situ remediation. High permeability soils help overcome the poor mixing and reagent delivery which typically hamper in situ treatments. The effectiveness and implementability of in situ technologies to the range of chemicals and site conditions at the Hanford Site is currently the subject of research and development through innovative technology development programs. The role of in situ treatment technology in the 200 East Groundwater Aggregate Area will depend on the outcome of these programs.

7.2.5 Treatment at Point-of-Use and Point-of-Discharge Locations

Groundwater treatment at point-of-use and point-of-discharge locations is a variation of pump-and-treat technologies that attempt to mitigate groundwater problems by treating only the portion of groundwater directly associated with an exposure pathway. These technologies address the limitations of general pump and treat and containment technologies by treating only the groundwater extracted to which humans or environmental receptors may be exposed, rather than all contaminated groundwater regardless of its potential use or discharge. Point-of-use and point-of-discharge response actions are applicable to sites where use and discharge points of the groundwater are limited and can be effectively controlled. In the case of the 200 East Groundwater Aggregate Area, future use and discharge points will likely continue to consist of a few wells and discharge points along the Columbia River.

Several advantages are gained by this approach. First, only contaminants present in the groundwater at the point of use or discharge must be treated. By limiting treatment to those

contaminants associated with actual exposure pathways, less treatment is necessary. Allowing groundwater to remain in the ground during its migration from the source to the receptor allows time for natural decay of radionuclides, natural precipitation and adsorption of inorganic metals, and natural biodegradation of organic chemicals before its discharge or use. The natural loss mechanisms potentially simplify treatment and minimize adverse impacts. A second advantage is that if natural attenuation is effective, the volume of water requiring treatment is significantly reduced, which improves the economics and efficiency of treatment. The third advantage is that remedial action alternatives can be customized for the known human or environmental exposure at each point of use or point of discharge. This allows flexibility in the goals of the treatment train design based on actual exposure.

Remedial actions that rely on treatment at the point of use or point of discharge have several potential limitations. These actions only address exposure pathways concerning human use, and may have to be combined with other remedial technologies to be acceptable. If natural attenuation is ineffective, allowing the groundwater to migrate to the point of discharge may result in an increase in the volume of groundwater which requires treatment. It may also be impractical to build the required treatment facilities at the point of discharge or point of use due to physical, legal, or political restrictions. For example, if the point of use is a relatively small private well, and the groundwater contains a recalcitrant chemical, it may be physically difficult to build a suitably small treatment unit. In another example, if the point of discharge occurs in near a community, the regional politics may prevent the construction of a large-scale treatment plant to treat groundwater. Another potential disadvantage of point of use technology includes frequent testing and maintenance of the treatment facility as system malfunction could create a direct contaminant pathway to receptors.

Like the other alternatives, remedial actions that rely on treatment at the point of use or point of discharge have specific advantages and limitations. Because of the size and complexity of the 200 East Groundwater Aggregate Area, point-of-use and point-of-discharge alternatives that take advantage of natural attenuation processes to reduce contaminant concentrations in situ may play a role in the final remedy.

7.2.6 Combinations of General Response Actions

The above broad classes of response actions may be combined into additional remedial alternatives. As discussed in the above sections, each general response action has particular advantages and disadvantages when applied to the site-specific conditions located at a 200 East Area location. No single action may be able to achieve all RAOs, but a combination of actions may be successful.

For example, containment actions which mitigate hazards resulting from groundwater movement, but are limited in implementability due to the large size of the 200 East

Groundwater Aggregate Area and the great depth to groundwater, could be used in combination with pump-and-treat actions to effectively control a highly contaminated source area. In situ treatment may be combined with pump-and-treat actions to decrease the time required to achieve cleanup goals. Containment could be combined with in situ treatment to contain and reduce contamination. In all cases, institutional controls (i.e., fences and deed restrictions) may be a required component to prevent disruption of the containment system and reduce the risk to human health and the environment until other classes of response actions are effective.

In the next section, specific process options within each general response action are evaluated.

7.3 TECHNOLOGY SCREENING

In this section, potentially applicable technology types and process options for each general response action are identified. These process options are then screened using effectiveness, implementability, and relative cost as criteria to eliminate those process options that would not be feasible at the site. Consideration of innovative technologies is maintained throughout the screening process. When applicable, technologies that have high potential benefits, but failed screening due to lack of development, are retained as innovative technologies. The selected process options are then grouped into viable remedial alternatives in Section 7.4. A limited discussion of innovative technologies is presented in Section 7.5.

7.3.1 Screening Criteria

The effectiveness criterion focuses on: (1) the potential effectiveness of process options in handling the estimated areas or volume of groundwater and meeting the RAOs; (2) the potential impacts to human health and the environment during the construction and implementation phase; and (3) how proven and reliable the process is with respect to the contaminants and conditions at the site. This criterion also concentrates on the ability of a process option to treat a contaminant type (organic, inorganic, metals, radionuclides, etc.) rather than a specific contaminant (nitrate, cyanide, chromium, plutonium, etc.).

The implementability criterion places greater emphasis on the institutional aspects of implementability, such as the ability to obtain necessary permits for offsite actions; the availability of treatment, storage, and disposal services; and the availability of necessary equipment and skilled workers to implement the technology. This criterion also focuses on the process option's developmental status, whether it is an experimental or established technology.

The relative cost criterion is an estimate of the overall cost of a process, including capital and operating costs. At this stage in the process, the cost analysis is made on the basis of engineering judgment, and each process is evaluated as to whether costs are high, medium, or low relative to other process options.

A process option is rated effective if it can handle the amount of area or media required, if it does not adversely impact human health or the environment during the construction and implementation phases, and if it is a proven or reliable process with respect to the contaminants and conditions at the site. Also, a process option is considered more effective if it treats a wide range of contaminants rather than a specific contaminant.

An easily implemented process option is an established technology; uses readily available equipment and skilled workers; uses treatment, storage, and disposal services that are readily available; and has few regulatory constraints. Preference is given to technologies that are easily implemented. Preference is also given to lower cost options, but a process option is not eliminated based on cost alone.

7.3.2 Screening of Technologies

Technologies are identified, organized by general response actions, and presented in Table 7-2. Results of the screening process for each identified technology are then shown in Table 7-3. To help clarify the numerous variety of pump-and-treat groundwater technologies identified, a summary of retained groundwater technologies is presented in Table 7-4.

Results of the screening process are shown in Table 7-3. Brief descriptions of the process options are given, followed by comments regarding the three evaluation criteria defined in Section 7.3.1. The effectiveness and implementability criteria comments formed the primary basis for evaluating each option. Cost criteria comments are very general and did not play a primary role in evaluating options. The last column of the table indicates whether the process option is rejected, retained but recognized as an innovative technology, or carried forward for possible alternative formation. Each of the technologies presented in the table addresses RAOs for both surface water and groundwater exposure routes discussed previously in this groundwater.

The "conclusions" column of Table 7-3 indicates that in addition to no action and monitoring, 31 process options were retained as potentially applicable. Of these, 9 were classified as innovative (for separate discussion); the remaining 22 options were retained for further development of alternatives. These options are carried forward into the development of preliminary alternatives.

Table 7-4 summarizes the 16 technologies retained from the screening process for use as a quick reference. Footnotes are provided on the table to highlight specific aspects of each technology.

7.4 PRELIMINARY REMEDIAL ACTION ALTERNATIVES

This section develops and describes several remedial alternatives applicable to 200 East Groundwater Aggregate Area radionuclides and hazardous organic and inorganic contaminants of concern (Sections 4.0 and 5.0). These alternatives are not intended as recommended actions for any particular contaminant, but are intended only to provide potential options. Selection of the actual remedial alternatives would be partly based on future expedited or interim actions and limited field investigations, as recommended in Section 9.0 of this report. Selection of final alternatives would be conducted within the framework of the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a), and the strategy outlined in Section 9.4.

The remedial alternatives are developed in Section 7.4.1. In Sections 7.4.2 through 7.4.7, the remedial action alternatives are described. Detailed evaluations and costs are not provided because site-specific conditions must be further investigated before meaningful technical and cost evaluations can be conducted.

7.4.1 Development of Remedial Alternatives

Potentially feasible remedial technologies were described and screened in Section 7.3. Some of those technologies were found to be proven, effective, and constructible, while other technologies are in the development or "innovative" stages. EPA guidance on feasibility studies (EPA 1989a) for uncontrolled waste management units recommends that a limited number of candidate technologies be grouped into "Remedial Alternatives." For this study, technologies were combined to develop remedial alternatives and provide at least one alternative for each of the general response actions previously discussed:

- No action
- Institutional controls
- Groundwater removal, above-ground treatment, and disposal (i.e., pump and treat)
- Containment of groundwater

- In situ treatment of groundwater
- Point-of-use treatment
- Point-of-discharge treatment
- Combination of the above actions.

The alternatives are intended to treat all or the highest risk portion of contaminants of the 200 East Groundwater Aggregate Area groundwater plumes. Consistent with the development of RAOs and technologies, alternatives were initially developed based on treating classes of compounds (radionuclides, heavy metals, inorganic, and organic) rather than specific contaminants. At a minimum, the alternative must be a complete package. For example, extraction of groundwater followed by treatment must be combined with either reinjection or disposal of the groundwater and treatment of secondary wastes.

Both no action and institutional control alternatives are evaluated as required by the CERCLA RI/FS guidance. The purpose of including these alternatives is to provide decision-makers with information on the entire range of available remedial actions. For the containment alternative, engineered frozen barriers and slurry walls are presented. Two alternatives are presented for pump and treat strategies. One alternative proposes large-scale extraction of groundwater followed by comprehensive treatment and disposal. The second alternative addresses limited-scale groundwater extraction followed by treatment for high-priority compounds. Finally, one example of point-of-use and one example of point-of-discharge options are presented. In situ technologies are addressed in the innovative technologies sections.

This evaluation does not include an exhaustive list of all possible combination of process options. However, the alternatives presented provide a reasonable range of remedial actions that are likely to be evaluated in future feasibility studies. The remedial alternatives presented in this report are summarized as follows:

- No action
- Institutional controls
- Containment via freeze or grout technologies or dynamic systems using clean water injection
- Extraction of groundwater, comprehensive treatment, and disposal
- Limited extraction of groundwater, treatment of high priority compounds, and reinjection in zone of extraction

- Treatment at point of use
- Treatment at point of discharge, followed by reinjection.

These alternatives, with the exception of no action and institutional controls, were created to satisfy a number of RAOs simultaneously and use technologies that are appropriate for a wide range of contaminant types. For example, installation of a comprehensive pump-and-treat system can effectively treat radionuclides, heavy metals, inorganic compounds, and organic compounds and provide a measure of hydraulic containment simultaneously. It satisfies the RAO of protecting human health and the environment from exposures to contaminated groundwater as well as reducing migration of contaminated groundwater to the Columbia River.

It is likely that groundwater will require a combination of treatment technologies to completely address all contaminants. Air stripping is highly effective for removing volatile organics present in groundwater, but has little effect on metals. Ion exchange is highly effective on most metals but is typically ineffective in treating volatile organics. Tritium, because of its near chemical identity to water, can currently only be treated by natural attenuation or unproven technologies such as selective membrane separation which has currently been demonstrated to be viable only on a bench scale. Because groundwater is likely to contain multiple classes of chemicals, and because it is likely that extraction well drawdown will enhance the mixing of contaminants from operable units, final alternatives will probably require a combination of treatment technologies.

The use of contaminant-specific remedial technologies was avoided because there appear to be few, if any, groundwater plumes where a single contaminant appears alone. It is possible to construct alternatives that include several contaminant-specific technologies, but the number of combinations of technologies required to address the contaminant mixtures would result in an unmanageable number of alternatives. Moreover, the possible presence of unidentified contaminants may render specific alternatives unusable. Alternatives can be refined as more contamination data are acquired. For now, the alternatives will be directed at remediating the major classes of compounds (radionuclides, heavy metals, inorganics, and organics).

In all action alternatives it is assumed that monitoring and institutional controls are required, although they may be temporary. These features are not explicitly mentioned, and details on monitoring programs and institutional controls are purposely omitted until a more detailed evaluation is performed in subsequent studies.

In the next sections, the preliminary remedial action alternatives (exclusive of the no action and institutional controls alternatives) are described in more detail.

7.4.2 Alternative 1--Containment

Alternative 1 consists of containment of contaminated groundwater. Screening of potential containment technologies indicated that containment of groundwater at the depth occurring at 200 East Groundwater Aggregate Area can be achieved by construction of physical barriers via subsurface freezing and grouting.

Figure 7-2 shows schematic examples of these technologies. Both barriers achieve the same goal, but have unique cost and implementability factors. Installation of either type of barrier to the depth of groundwater present at the site (over 200 ft) will challenge existing applications of these techniques. The feasibility of these technologies for unconfined aquifers at depth was previously evaluated in the *Engineering Evaluation of Containment Alternatives for N-Springs Releases* (WHC 1991b). Although not directly analogous to the 200 East Groundwater Aggregate Area, the analyses presented in the report suggest that physical barriers may be successfully installed at great depths. However, the use of this technology may be especially challenging for confined aquifers.

Another means of containment would be the use of extraction and injection wells to effect changes in groundwater flow patterns to form a dynamic hydraulic barrier. These changes could be engineered to exert control on further contaminant migration, even though clean groundwater is being extracted and reinjected. The advantages of this strategy are that it utilizes currently available technology at relatively low to moderate cost, and has been successfully implemented elsewhere for plume control. The implementation of this strategy, however, would depend on the availability of a clean-water extraction source. Other potential limitations include:

- Probable plume dilution from reinjection of clean water
- Mounding from clean-water injection would induce changes to groundwater flow and gradients
- Effect on adjacent contaminant plumes and remediation efforts.

As discussed above for physical containment barriers achieved through grouting and freezing dynamic barriers may be most effective when implemented with other remedial technologies. A form of this hydraulic containment could be implemented by institutional controls to artificial recharge induced by irrigated agriculture upgradient and to the west of the 200 Areas.

Containment could be designed to achieve a variety of goals within the 200 East Area such as:

- Mitigate/delay flow of contaminated groundwater to the Columbia River
- Segregate operable units for treatment
- Block natural recharge pathways which accentuate mobility of contaminated groundwater.

Because of the large size of the 200 East Groundwater Aggregate Area, and the fact that no contaminant destruction occurs, engineered vertical barriers are not likely to be used as a single permanent solution, but will likely be included as a key component in a combined technology solution. Detailed evaluation of site hydrogeology, costs, feasibility, and adverse consequences is required to determine the best use of containment alternatives in remediation of 200 East Groundwater Aggregate Area groundwater.

7.4.3 Alternative 2--Groundwater Extraction, Comprehensive Treatment, and Disposal

Alternative 2, a pump-and-treat option, consists of extraction of groundwater, comprehensive treatment, and disposal. In this alternative, groundwater contaminated with one or more chemicals is treated using multiple treatment technologies to meet long-term RAOs established for the site. The treated groundwater is discharged to surface water, groundwater, or soil column. Additionally, extraction of groundwater followed by offsite discharge is assumed to result in a reversal of the groundwater flow gradient, resulting in hydraulic containment of the contaminant plume.

Figure 7-3 shows a schematic diagram of this alternative. Extraction wells would be installed and operated near the center of contamination within identified contaminant plumes. Pump tests on existing wells, aquifer characterization, analysis of sorption, and exchange properties of contaminants detected in groundwater and adsorbed in soils would be used to predict the spacing for new extraction wells, pumping rates, and operating time necessary to effect the desired hydraulic containment and treatment. If technically feasible and appropriate, existing monitoring wells or newly constructed dual purpose wells will be used for both monitoring purposes and water extraction.

A multi-technology wastewater treatment train would be employed to treat the groundwater to meet discharge limits. Depending on the contaminants located in the target plume, the treatment train would consist of one or more of treatment technologies such as chemical precipitation, filtration, coagulation, reverse osmosis, vapor extraction, ultraviolet (UV) oxidation, and/or ion exchange. Table 7-4 provides a preliminary screening of treatment technologies applicable to the chemicals detected in the 200 East Area groundwater. Technologies would be selected and combined in accordance with Hanford BAT guidance to create a reliable, effective, comprehensive treatment train. All secondary waste generated by the comprehensive treatment train would have to be disposed of or

treated accordingly. Detailed understanding of the variability in groundwater to be extracted, potential new chemicals introduced during future plume mixing caused by groundwater extraction, as well as effects of site-specific background chemicals (such as iron) would be required to design an effective treatment system. Some chemicals, such as tritium, have no current large-scale treatment technology, however, innovative technology such as selective membrane separation may prove to be feasible for some applications. For other chemicals, the known removal technology might not be able to achieve cleanup standards determined by potential ARARs and RAOs without additional research and development.

An appropriately permitted discharge site likely to be similar to the SALDS proposed for the C-018H and -049H effluents would be required to dispose of the groundwater. This site would be evaluated to ensure that hydrogeologic effects of the discharge on existing groundwater would be negligible. Discharge water could be potentially beneficial by providing an introduced gradient that enhances the containment of existing contaminated groundwater.

Alternative 2 would provide a combination of complete treatment of all contaminants and mitigation of groundwater movement, thus successfully addressing the most stringent RAOs. However, the alternative is limited by the inability of pump-and-treat systems to quickly achieve cleanup goals and potentially require treatment of excessive quantities of water. A detailed feasibility study is needed to evaluate the performance, costs, and potential adverse effects associated with this alternative. Other recognized limitations of the pump-and-treat system should be evaluated in the feasibility study, such as remediation of plumes where chemicals have adsorbed to soils, or where DNAPLs or zones of low hydraulic conductivity are present.

7.4.4 Alternative 3--Limited Extraction of Groundwater, Treatment of High Priority Compounds, and Reinjection in Zone of Extraction

Under Alternative 3, groundwater would be extracted from a contaminant plume, and partially treated to remove the compounds which represent the highest risk to human health. After treatment, the groundwater would be reinjected to the same groundwater regime for management by other technologies (such as containment or institutional controls). The treatment technology selected would depend on the contaminants identified as posing the highest risk in the operable unit. The reinjected groundwater could be used to hydraulically contain and enhance the removal of the target high-risk contaminants. Discharge of the treated groundwater to surface water, as in Alternative 2, would not be possible due to the presence of trace nontarget chemicals.

The partial treatment of groundwater described in this alternative (rather than the comprehensive treatment described in Alternative 2) may be appropriate because plume definition and technology screening indicate that groundwater contains a sufficient variety of

chemicals to potentially mandate the use of multiple, linked, treatment technologies (see Table 7-4). This multiplicity could lead to the delay, or possible prevention, of the implementation of both short-term and long-term remedies. For example, the treatability programs required to effectively link several technologies may be long when compared to the treatability program required for the single technology that addresses the highest risk chemical. It also may be found that the groundwater contains isolated chemical(s) for which treatment is not available in the near future (such as tritium). To allow the timely implementation of existing, effective technologies, partial treatment of extracted groundwater may be recognized as a viable option.

A key issue raised by Alternative 3 is the feasibility and/or regulatory acceptability of reinjecting groundwater that still contains untreated or partially treated chemical groups. Although the groundwater is being reinjected into the area from which it originated, thereby reducing the risk and improving local groundwater quality, long-term ARARs or RAOs for groundwater quality may not be met. As a result, Alternative 3 may require that location-specific reinjection standards be developed recognizing that the reinjected contaminants will be managed by alternative methods.

For example, Figure 7-4 shows a schematic of this alternative applied to removing volatile organics from groundwater that also contains chemicals such as tritium for which treatment is not effective. Technology screening indicates that air stripping is an effective technology for removing volatile organics identified in the 200 East Groundwater Aggregate Area, including the chlorinated solvent chemicals (trichloroethylene, trichlorethane, tetrachloroethylene, etc.) found near the central landfill. Extraction wells and reinjection wells are placed to effect the desired groundwater removal and containment. An appropriately sized air stripping unit, with off-gas treatment potentially based on experience being gained in the *Expedited Response Action Proposal for the 200 West Area Carbon Tetrachloride Plume* (DOE/RL 1991a), would be installed. Its design would consider potential side effects associated with the contaminant plume. Quantities of tritium and ^{129}I, both of which have significant vapor pressures, would be evaluated to determine if they would co-strip with the volatile organics. Iron and other metals, occurring naturally, would be evaluated to determine pretreatment required to avoid fouling the stripping unit. Other recognized limitations of the pump and treat systems, such as adsorption of chemicals to soils or the presence of DNAPLs, should be evaluated to determine the ability of Alternative 3 to effectively remove the target volatile organic chemicals.

In another example, Figure 7-5 shows a schematic of this alternative as applied to groundwater which has a variety of inorganic metals, as well as trace organic chemicals for which natural biodegradation has been determined to be effective. Technology screening indicates that chemical precipitation is an effective technology to remove many inorganic metals identified in the 200 East Groundwater Aggregate Area *(Project L-045H 300 Area TEDF,* WHC 1991c). As in the previous example, extraction and reinjection wells are

designed and installed to effect the desired extraction, hydraulically contain the contaminant plume, and potentially assist in the removal of metal ions remaining in the groundwater. The side effects of all trace, nontarget chemicals on chemical precipitation would be evaluated before implementing the system. All secondary waste would be evaluated and disposed of properly. Once treated the groundwater would be returned to the plume where the trace organics would biodegrade at their natural rate.

Similar systems could be devised for other technologies such as ion exchange, reverse osmosis, UV oxidation, and other process options identified in Table 7-4. Several technologies could be combined if required. It is important to recognize that the selectivity of available technologies is likely to be limited to chemical groups rather than specific chemicals; however, some chemical-specific technologies may be identified in future work. As with the previous two examples, bench-scale testing should be performed to ensure compatibility with other trace, nontarget chemicals contained in groundwater plumes being treated. For each class of chemical contaminant, treatability studies with extracted groundwater should be conducted to evaluate potential interference reactions and pretreatment requirements. Secondary wastes must also be evaluated and secondary treatment tested. The recognized limitations of pump and treat systems, such as the potentially long time to completion and the cost and secondary waste production associated with long-term operation of treatment facilities may limit the net effectiveness of Alternative 3.

Identification of target high priority classes of chemicals that would warrant use of this alternative should be based on evaluation of plume maps, risk analysis, the selectivity of available treatment technologies, and application of ARARs and RAOs.

7.4.5 Alternative 4—Treatment of Groundwater at the Point of Use

This alternative proposes remediation of only the portion of groundwater that actually will be used. Because of the depth of the groundwater on the site and the lack of natural surface connections such as springs or seeps, present or future points of use would likely be defined by the presence of a water supply well.

Figure 7-6 shows a schematic of this alternative. Depending on the location of the point of use, a different range of contaminants would be present. Low mobility contaminants would not migrate far from their source, whereas high mobility contaminants could affect wells located downgradient. As the groundwater travels from sources to the point of use, natural attenuation through decay of radionuclides, precipitation and adsorption of metals, and possible biodegradation of organic compounds can reduce contaminant levels. Point-of-use treatment has the significant advantage of focusing on only those contaminants that pose risks to receptors.

During installation of a water supply well at the point of use, a treatment train would be installed. The treatment train would be designed in accordance with Hanford BAT to meet the required water quality standards for consumer use. Because natural attenuation can reduce the number and concentration of contaminants at the point of use, the treatment train design may be a simplified version of those proposed in source-related alternatives (Alternatives 2 and 3). The treatment train would be properly maintained to ensure sufficient quality and quantity of water for the duration of end-user needs.

The point-of-use remedial alternative has two important disadvantages. First, point-of-use treatment will only address the potential routes of groundwater exposure to humans. Alone, it is not likely to achieve RAOs. Many regulatory programs reflected in the RAOs require protection of the environment and other factors in addition to protection of human consumption. Point of use may not effectively address these other regulatory concerns. Second, point-of-use treatment requires that a water treatment system be constructed relatively near the point of use. Depending on the chemical composition of groundwater at the point of use, the water quality required, and the volume of water being treated, construction of a treatment system adjacent to the point of use may not be practical. Point-of-use treatment may be a viable alternative for certain limited operable units, but prior to its use, chemical characteristics and potential volumes need to be thoroughly evaluated.

7.4.6 Alternative 5--Treatment of Groundwater at Point of Discharge

Alternative 5 proposes treatment of only the portion of groundwater that is discharged. Because of the hydrogeology at the 200 East Groundwater Aggregate Area, points of discharge are expected to include the Columbia River, West Lake, or the Yakima River. As with the point-of-use alternative, the chemical composition of groundwater at the point of discharge will be substantially different than the chemical composition of groundwater near the source. Various mechanisms associated with natural decay of radionuclides, precipitation and adsorption of metals, and biological decay of organics will alter the composition of groundwater as it travels from the source to the point of discharge. Point-of-discharge treatment has the significant advantage of focusing on only those contaminants that pose a significant risk to receptors. In addition, because point of discharge exploits natural attenuation, it may be the only viable alternative for tritium.

The treatment of groundwater recovered at the point of discharge would be designed in accordance with Hanford BAT to meet the standards required to protect the discharge receptor. As discussed in Section 7.4.5, the treatment train at the point of discharge may be a modified version of the treatment train proposed in the other source-related treatment alternatives (Alternatives 2 and 3). Figure 7-7 depicts an example of this alternative.

The point-of-discharge remedial alternative has a number of disadvantages. First, point-of-discharge treatment focuses on protecting the discharge receptors' water quality

standards (such as the Columbia River surface water quality) and therefore is not likely to be acceptable alone in achieving site-wide RAOs. Many regulatory programs reflected in the RAOs require protection of the environment and other factors in addition to protection of discharge receptors. Point of discharge may not effectively address these other regulatory concerns. Second, if natural attenuation is insufficient in reducing contaminant levels, contamination may be diluted and spread over a considerable length of the Columbia River, factors that may make extraction and treatment more difficult and costly.

If available treatment technologies are unable to treat groundwater at the point of discharge to meet standards for the discharge receptor, it may be possible to discharge treated groundwater to an alternative location. Once reinjected, the groundwater would begin a second migration towards the point of discharge. This second migration would increase the time allowed for natural attenuation. For chemicals such as tritium, whose only known treatment is natural attenuation, this second migration may enable groundwater to meet treatment standards established at the point of discharge.

7.5 INNOVATIVE TECHNOLOGIES

All remedial alternatives presented in the previous section were composed of proven process options that passed the required screening criteria for effectiveness, implementability, and cost. Some technologies that did not meet these criteria were retained and identified as innovative technologies. Innovative technologies recognized to potentially play a key role in 200 East Groundwater Aggregate Area remediation are discussed in this section. Technology screening in Section 7.4 identified three types of innovative technologies applicable to groundwater.

First, in situ treatments may be especially suited for treatment of groundwater contamination in the 200 Areas. In situ treatments use the soil/groundwater matrix as a treatment bed and are facilitated by the potential for good mixing offered by the high permeability of the 200 Areas soils. Because in situ treatment conducts the treatment in soil/groundwater matrix, secondary waste generation can be minimized, adverse affects are diminished, and treatment costs are potentially reduced. In addition, for groundwater which cannot be successfully remediated by conventional technologies, in situ treatment may be the only viable solution. For example, low mobility compounds such as plutonium are not amenable to remediation through pump and treat technologies, since extraction of groundwater cannot completely remove the plutonium. In situ precipitation of the plutonium could render the plutonium essentially immobile. Alternatively, in situ solubilization could increase plutonium's mobility to allow pump and treat to effectively remove the plutonium in an acceptable time frame. Of course, increasing the mobility of toxic chemicals in groundwater would be performed only after evaluating the potential benefits and adverse effects. Also, precipitation of metals or other constituents could possibly fill interstitial void

spaces and substantially change local hydraulic properties in aquifers. This would modify flow paths and subsequent cleanup rates for other contaminants.

In another example of in situ technologies, air sparging may effectively remove volatile organics from groundwater. Sparging air is pumped into an injection well and released into groundwater. As the air expands and rises through the groundwater, small bubbles extract and transport volatile chemicals upward to the soil in the vadose zone. Once the bubbles reach the vadose zone, vacuum extraction wells would remove the air. The air would then be treated and either discharged or recycled for additional reinjection/extraction cycles. Air sparging can also be used to enhance natural degradation by adding oxygen, or if steam is used for sparging, by adding heat and increasing the speed of naturally occurring biodegradation.

A second area of innovative technologies to be explored is in wastewater treatment. Currently, each chemical class in the wide range of chemicals found in Hanford Site groundwater (organics, radionuclides, and metals) requires unique treatment technologies. These technologies must be linked to provide a successful comprehensive treatment. Additionally, although many of these technologies are effective in producing an effluent that meets cleanup standards, many produce large volumes of secondary waste. Innovative technologies such as supercritical extraction, oxidation, freeze crystallization, and membrane separation may be able to treat broader classes of compounds while providing low cost, effective secondary waste treatment. An example of this is that membrane fouling problems have traditionally prevented reverse osmosis' use for wastewater treatment including organic and inorganic classes of chemical compounds. However, if new anti-fouling, multi-chemical class membranes can be identified, membrane separation has the potential to treat the full range of chemicals in 200 Areas groundwater, simplifying the current multi-technology treatment trains that are required.

In another example of innovative wastewater treatments, freeze technologies may provide an energy efficient way to concentrate secondary waste generated from membrane technologies or ion exchange. These secondary wastes comprise up to 10% of influents entering these processes and can be a major impediment to their implementation. Freeze technologies can potentially concentrate the volumes of these secondary wastes, replacing the traditional method of evaporation, at a potential cost savings with fewer adverse effects.

The third area of innovative technologies which would warrant development is the installation of horizontal barriers at the depths of groundwater encountered in the 200 Areas. Because vertical flows of contaminants may further degrade groundwater quality, barriers that prevent vertical flows may be desired. However, large-scale installation of deep horizontal barriers is a developmental procedure, so technologies in grouting and freezing need to be evaluated to determine if blockage of vertical flows is possible. Application of these technologies would likely include right angle drilling and/or sophisticated grouting techniques which have not been proven for remediation applications.

A final area of innovative technology concerns the treatment of tritium. Because the structures of tritiated water and nontritiated water are nearly identical, treatment is difficult.

Some success in removing tritium from water has been obtained on a limited scale via electrolytic decomposition followed by selective physical separation of the resultant gases using membrane technology. The implementability of this process on a larger scale applicable to the Hanford Site has not been demonstrated, however, and current feasibility is questionable. The limitations of larger-scale application include the generation of large quantities of gases which may or may not have economic value and energy requirements for molecularly separating tritiated water. The process is retained as an innovative technology requiring further study as a potential remediation option at the Hanford Site. Soil columns and retention systems that retain tritium for sufficient periods to allow natural decay may be effective implementable options which need only to be proven through testing.

To encourage research and development of innovative technologies, the AAMS program personnel interface regularly with the DOE Office of Technology Development.

7.6 PRELIMINARY REMEDIAL ACTION ALTERNATIVES APPLICABLE TO GROUNDWATER OPERABLE UNITS

The purpose of this section is to discuss how preliminary remedial action alternatives could be used to remediate specific situations identified in 200 East Groundwater Aggregate Area operable units. The decision criteria are as follows:

- **Alternative 1--Containment.** Alternative 1 could be used on any chemical contaminant plume where restriction of groundwater flow is required to stop migration or to support the effectiveness of another alternative.

- **Alternative 2--Groundwater Extraction, Treatment with a Comprehensive System, and Disposal.** Alternative 2 could be used on any plume where all the contaminants identified could be extracted and treated with known technologies. The plume would have to be sufficiently large to justify the substantial cost associated with comprehensive treatment.

- **Alternative 3--Groundwater Extraction with Treatment to Remove a Single Chemical Class, and Reinjection.** Alternative 3 could be used on any operable unit for which a single class of contaminants poses significantly more risk than other classes and is amendable to pump and treat technologies. It can also be used on a plume that contains isolated chemical(s) for which pump and treat is not effective, but is required for treating the remaining chemicals. The more disproportionate the risk or treatment practicality between chemical groups in a

contaminant plume, the more advantageous is Alternative 3. However, the technology required to remove the target chemical group must be carefully evaluated for nontarget chemicals which could interfere with treatment or trigger regulatory reinjection hurdles. Additionally, this evaluation should determine if it is economically efficient to remove the target group selectively, rather than with the comprehensive treatment proposed in Alternative 2.

- **Alternative 4--Treatment at Point of Use.** Alternative 4 could be used for a contaminant plume where the RAOs can be focused on the groundwater ingestion exposure pathways alone. Because one of the primary benefits of point-of-use treatment is the natural attenuation time, contaminant plumes that benefit from natural attenuation are more appropriate candidates for Alternative 4.

- **Alternative 5--Treatment at Point of Discharge**. Alternative 5 could be used for contaminant plumes where the RAOs can be focused on exposure pathways associated with surface water alone. Since one of the primary benefits of point-of-discharge treatment is the large natural attenuation time allowed, contaminant plumes with chemicals such as tritium that will benefit from natural attenuation are candidates for Alternative 5.

Using these criteria, Table 7-5 was created showing possible preliminary action alternatives that could be used to remediate each of the contaminant plumes identified in Section 4.1. These criteria are not meant to be exclusive. The criteria and preliminary remedial alternatives are presented as an initial screening only. Operable units which may contain one or more contaminant plumes, may use one or several of these alternatives to achieve applicable RAOs. Also, more specific waste treatment alternatives could be identified and evaluated as more information concerning innovative technologies is acquired. Since the primary mechanism for groundwater treatment involves various forms of pump and treat, many alternatives overlap.

As mentioned previously, the selection of the treatment technologies for Alternatives 2 through 5, which involve treatment of extracted groundwater, is not straightforward. After using Table 7-5 to identify the appropriate remedial alternative, Table 7-4 should be used to identify the required treatment technologies, potential interferences, and limitations. However, Table 7-4 is not a complete reference nor is it completely accurate in cases where multiple contaminants are present. Interferences between chemical classes is common and often unpredictable. Treatments that are effective for one chemical may not work when a second chemical is present. Final treatment technologies for use in alternatives that depend on extraction and treatment of groundwater should be selected according to the Hanford BAT document (which seeks to facilitate technology transfer) to ensure reliable success in designs for water treatment.

Before selecting a remedial alternative for an operable unit, detailed feasibility studies, bench-scale, and pilot-scale treatment tests must be performed. These studies and tests should develop a better understanding of groundwater hydrogeology and chemical mobilities to successfully implement extraction alternatives. A more complete identification of RAOs is required to determine the applicability of point-of-use and point-of-discharge alternatives. Completion of these studies and the acquisition of additional site characterization data will focus the remedial action model and begin to narrow the range of potentially applicable technologies and alternatives. Finally, continuing efforts by the DOE Office of Technology Development, Westinghouse Integrated Programs and Demonstrations programs, and Battelle Pacific Northwest Laboratory to evaluate in situ treatments, advanced wastewater treatment, and the treatment of tritium will be important in arriving at remedial alternatives for the 200 East Groundwater Aggregate Area.

9 3 1 2 9 3 7 1 3 9 6

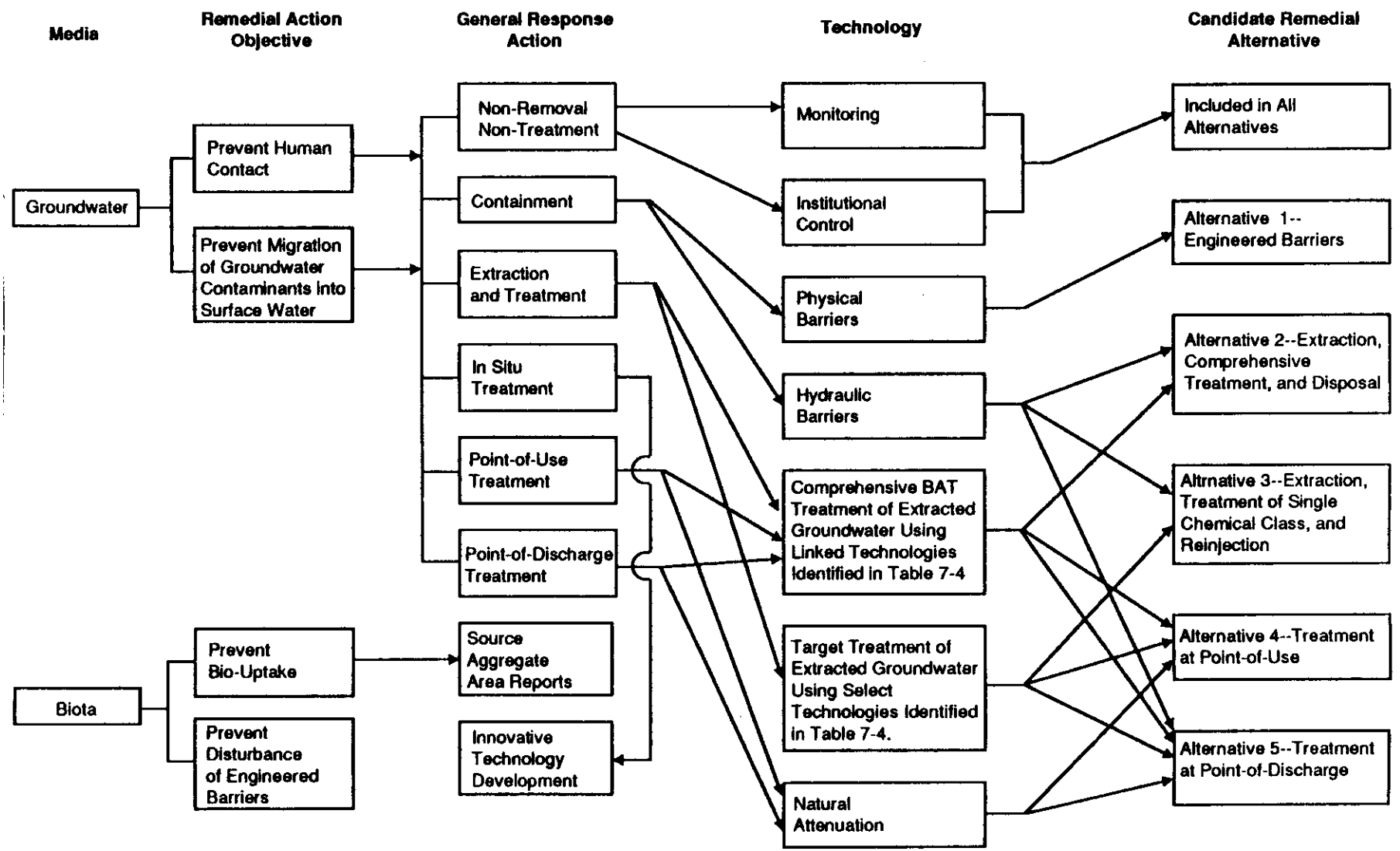
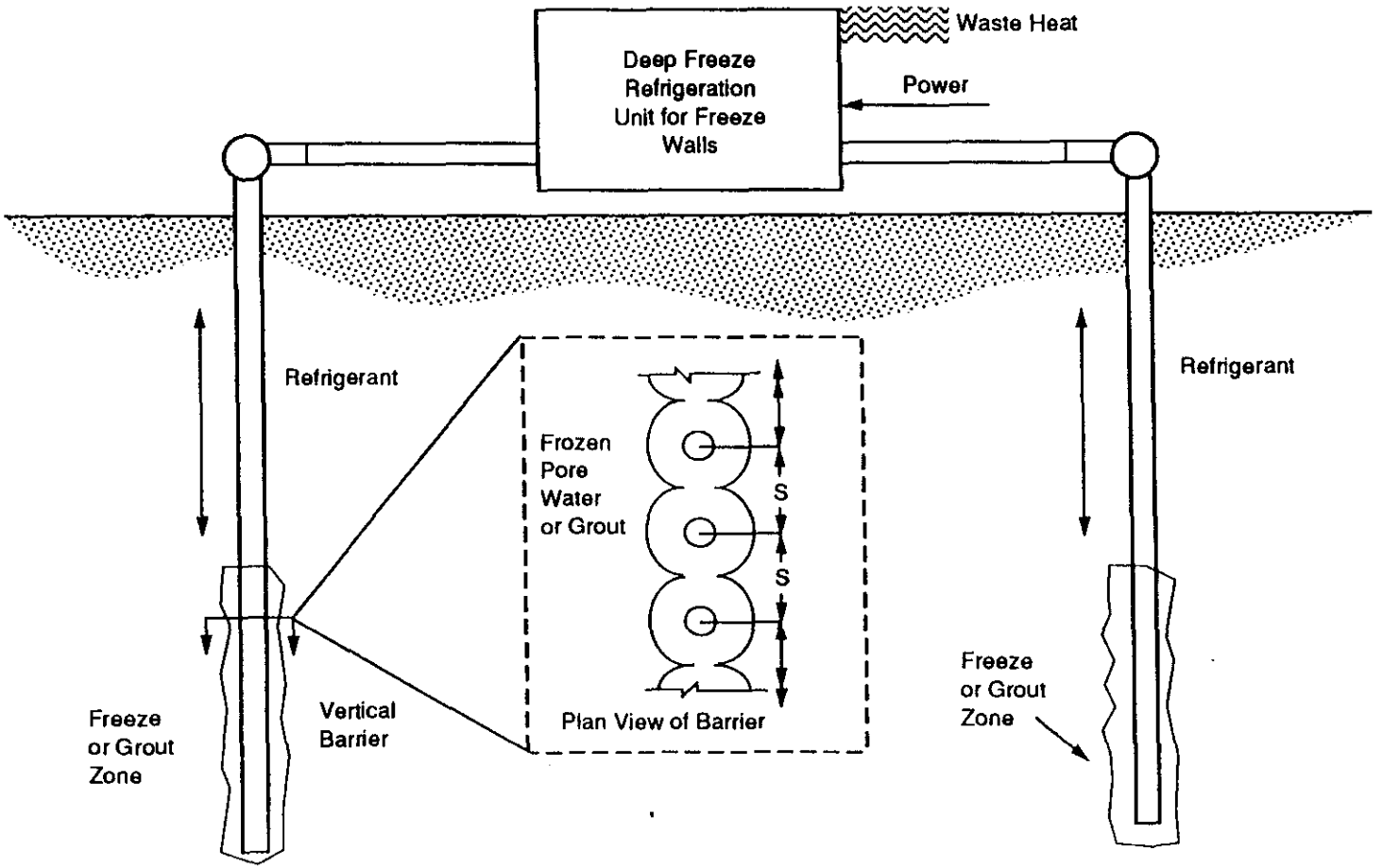


Figure 7-1. Development of Candidate Remedial Alternatives for 200 East Groundwater Aggregate Area.



S = Spacing required by hydrogeological conditions, based on field-scale tests

Figure 7-2. Alternative 1—Containment (via Engineered Vertical and/or Horizontal Barriers).

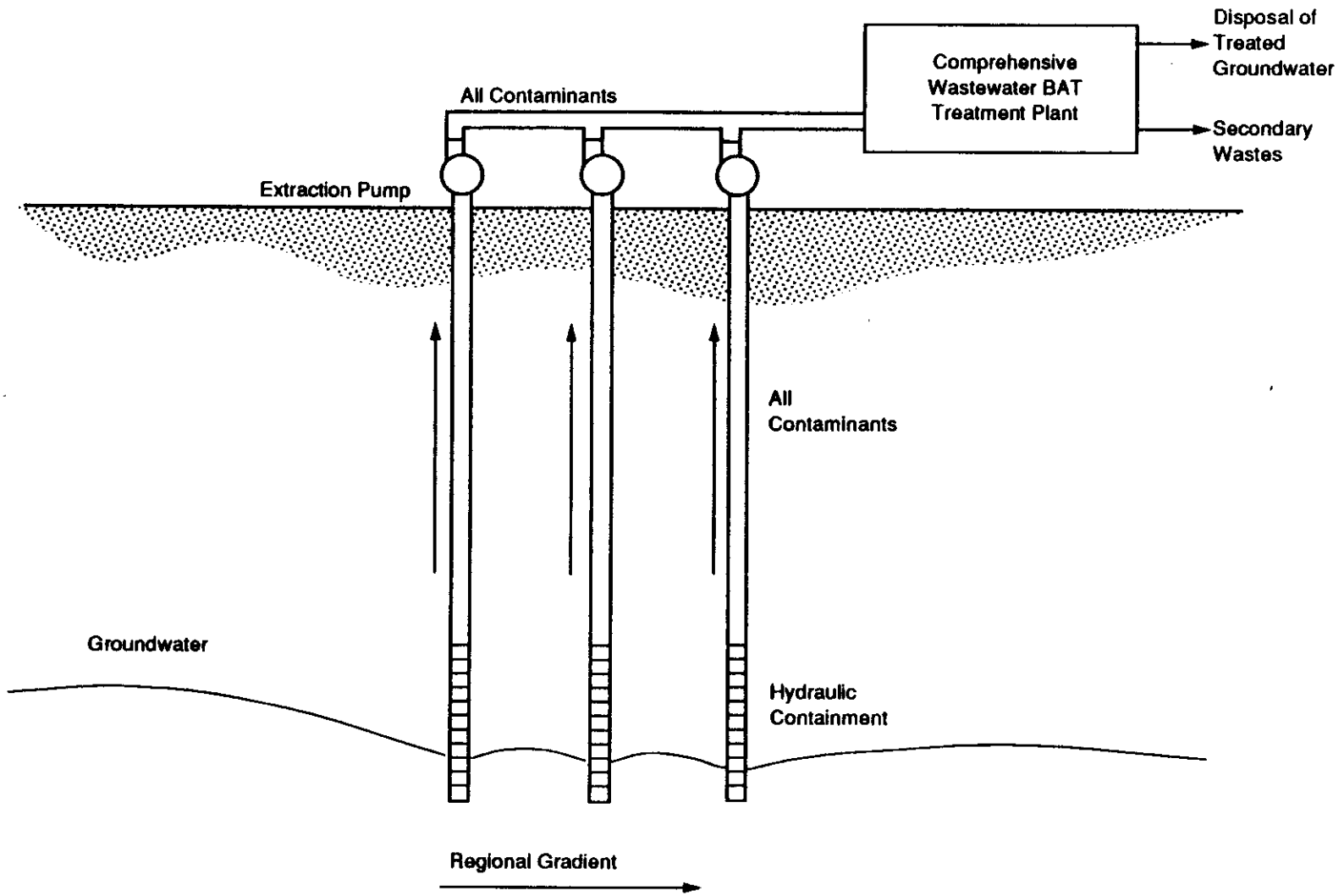


Figure 7-3. Alternative 2—Groundwater Extraction, Comprehensive Treatment, and Disposal.

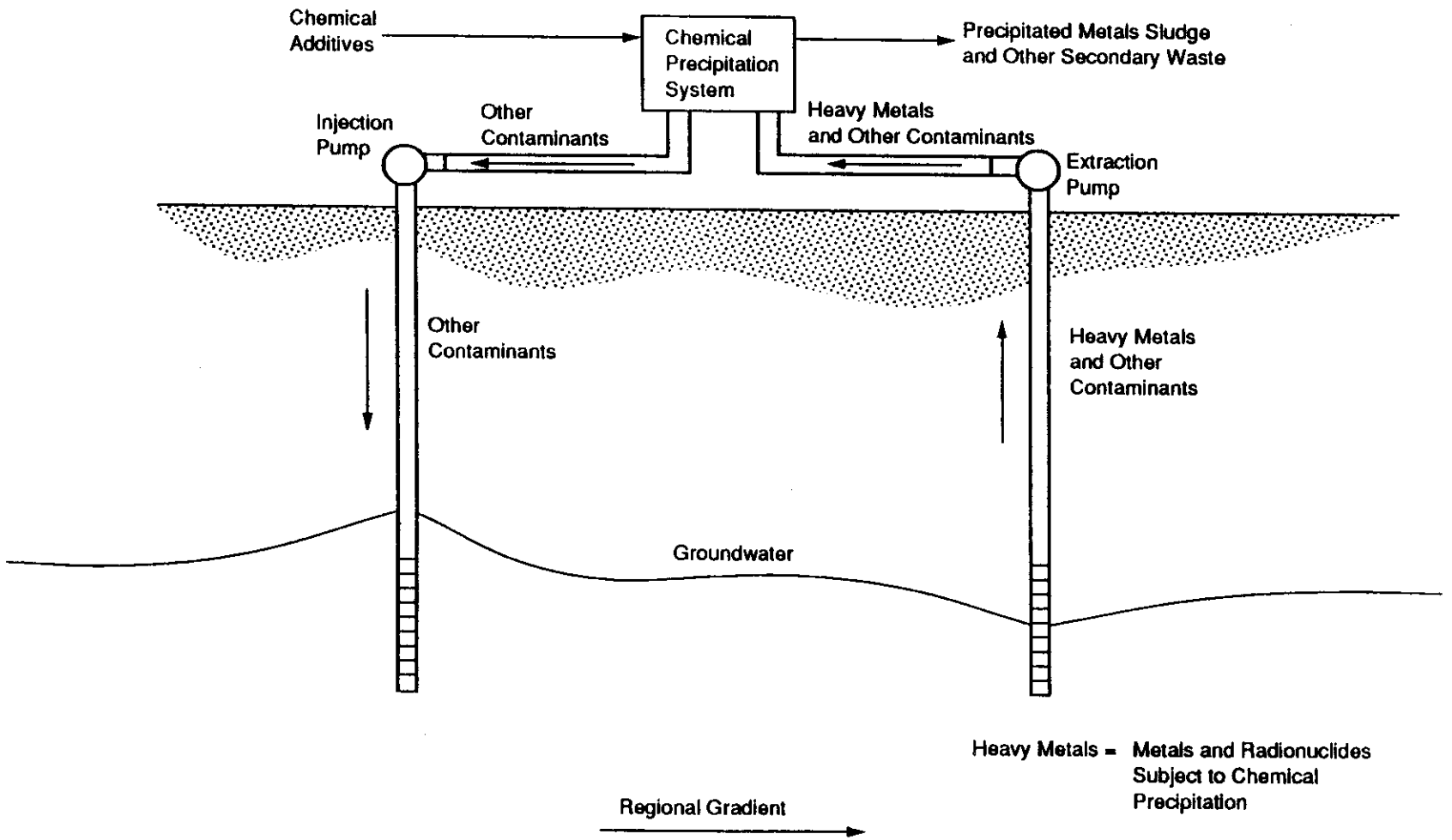


Figure 7-4. Alternative 3—Extraction of Groundwater, Treatment of Single Class Compounds (Inorganic Heavy Metals), and Reinjection in Zone of Extraction.

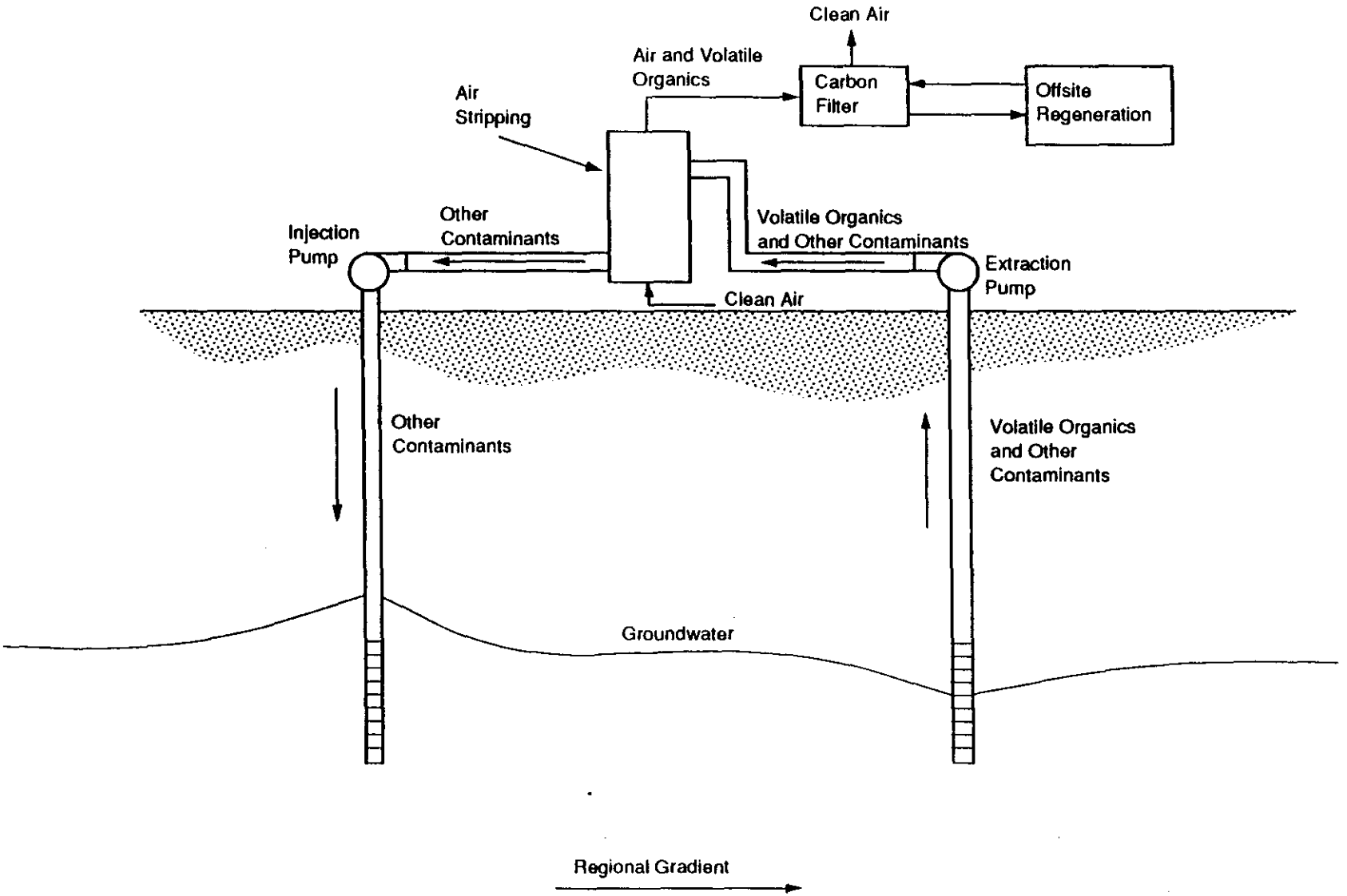


Figure 7-5. Alternative 3—Extraction of Groundwater, Treatment of Single Class Compounds (Volatile Organics), and Reinjection in Zone of Extraction.

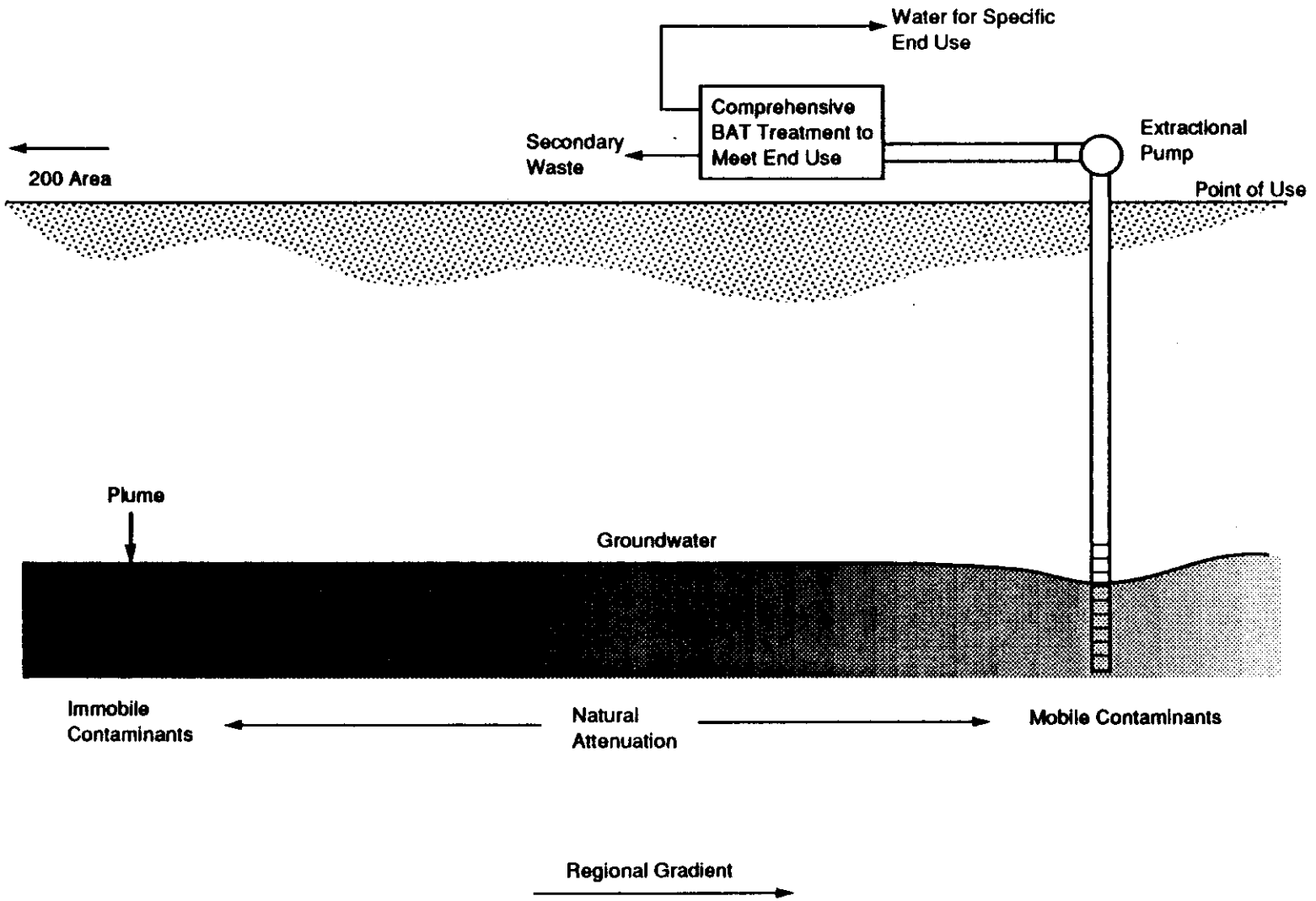


Figure 7-6. Alternative 4—Treatment of Groundwater at Point of Use.

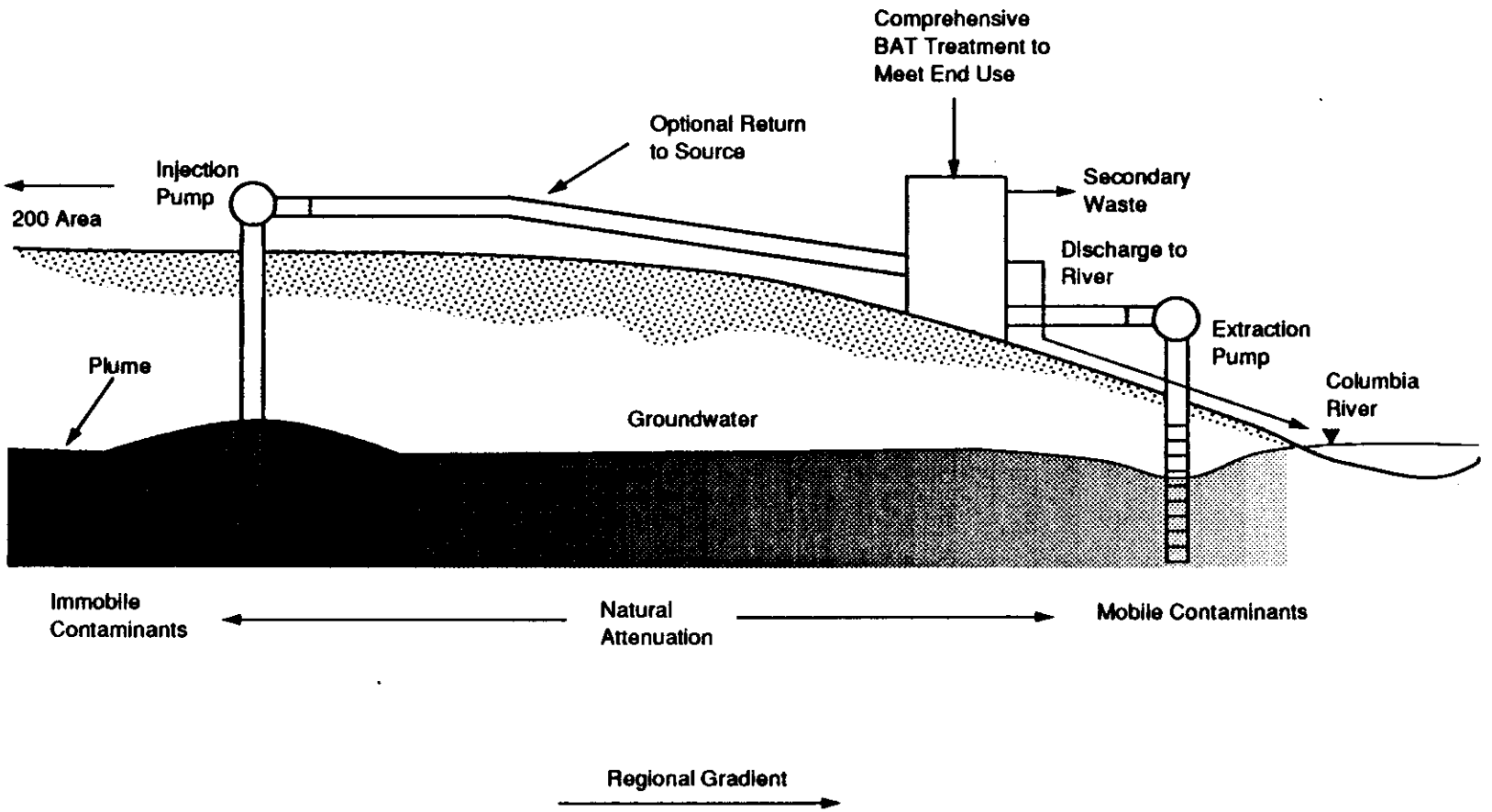


Figure 7-7. Alternative 5—Treatment of Groundwater at Point of Discharge.

Table 7-1. Preliminary Remedial Action Objectives and General Response Actions.

Remedial Action Objectives			
Environmental Media	Human Health	Environmental Protection	General Response Actions
Groundwater	• Prevent ingestion, inhalation, or direct contact with groundwater containing radioactive and/or hazardous constituents present at concentrations above MTCA and DOE standards for industrial sites (or subsequent risk-based standards). • Prevent discharge of groundwater to surface water or transmission of contaminants from groundwater to surface water that would cause surface water to exceed MTCA and DOE standards at the compliance point location	• Prevent migration of radionuclides and hazardous constituents that would result in surface water, air, or biota contamination with constituents at concentrations exceeding ARARs.	• No Action • Institutional Controls/Monitoring • Containment • Groundwater Removal and Treatment • In Situ Groundwater Treatment • Point-of-Use Treatment • Point-of-Discharge Treatment

Table 7-2. Preliminary Remedial Action Technologies for Groundwater.

General Response Action	Technology Type	Process Option	Contaminants Treated*
No Action	No Action	No Action	None
Institutional Controls	Groundwater Use Restrictions	Deed Restrictions	None
	Access Controls	Well Prohibitions Closures and Controls	None
		General Area Access Control	None
	Monitoring	Monitoring	None
Containment	Vertical Physical Barriers	Freeze Walls	I,M,R,O,V,S,T
		Slurry Walls	I,M,R,O,V,S,T
		Grout Curtains	I,M,R,O,V,S,T
		Sheet Piles	I,M,R,O,V,S,T
		Membrane installation	I,M,R,O,V,S,T
	Horizontal Physical Barriers	Block Displacement	I,M,R,O,V,S,T
		Capping	I,M,R,O,V,S,T
		Grouting	I,M,R,O,V,S,T
		Horizontal/Right Angle drilling with Freeze technologies	I,M,R,O,V,S,T

Table 7-2. Preliminary Remedial Action Technologies for Groundwater.

General Response Action	Technology Type	Process Option	Contaminants Treated*
		Horizontal/Right Angle Drilling with Grout Curtains	I,M,R,O,V,S,T
	Hydraulic Containment	Trenching	I,M,R,O,V,S,T
		Injection Wells	I,M,R,O,V,S,T
		Extraction Wells	I,M,R,O,V,S,T
		Drains	I,M,R,O,V,S,T
Extract and Treat	Chemical Treatment	Reduction	M
		Chemical Oxidation	O,V
		Supercritical Oxidation	O,V
		UV Oxidation	O,V
		Hydrolysis	I
		Precipitation	I,M,R
		Dechlorination	O,V (chlorinated only)
		Neutralization	I,M,R
Extract and Treat	Physical Treatment	Air Stripping	V
		Steam Stripping	V,O
		Filtration	R,S,M

Table 7-2. Preliminary Remedial Action Technologies for Groundwater.

General Response Action	Technology Type	Process Option	Contaminants Treated*
		Ion Exchange	I,M,R,O,V,S
		Reverse Osmosis	I,M,R,O,V,S
		Denitrification	I
		Solvent Extraction	I,M,R,O,V
		Supercritical Fluid Extraction	I,M,R,O,V
		Gravity Separation	R,S,O
		Alumina Adsorption	R,S,M
		Carbon Adsorption	O,V,M
		Flocculation	R,S,M
		Filtration	R,S,M
		Electrolytic Decomposition and Separation	T
Extract and Treat	Biological Treatment	Aerobic	O,V
		Anaerobic	O,V
Extract and Treat	Thermal Treatments	Solar Evaporation	I,M,R,O,S
		Distillation	I,M,R,O,S
		Destructive Incineration	I,M,R,O,V,S

Table 7-2. Preliminary Remedial Action Technologies for Groundwater.

General Response Action	Technology Type	Process Option	Contaminants Treated*
		Wet Air Oxidation	O,V
In Situ Treatment	Physical	Sparging	V
		Vapor Extraction	V
In Situ Treatment	Chemical	Precipitation	I,M,R
		Solubilization	I,M,R,O,V
		Degradation	O,V
In Situ Treatment	Biological	Aerobic	O,V
		Anaerobic	O,V

Target Chemical Code
I = Other Inorganics contaminants applicability
M = Heavy Metals contaminants applicability
R = Radionuclide contaminants applicability
O = Organic contaminants applicability
V = Volatile Organic contaminants applicability
S = Suspended Solid
T = Tritium
NA = Not Applicable
* Tritium is classified as a single chemical due to its unique chemical treatability characteristics

Table 7-3. Technology Screenings.

Technology			Evaluation Criteria			
Technology Type	Process Option	Description	Effectiveness	Implementability	Cost	Conclusions
No Action	None	Does nothing to cleanup contamination or reduce the exposure pathways	Not effective in reducing the contamination or exposure pathways	Easily implemented, but might not be acceptable to regulatory agencies, local governments, and the public	Low	Retained as a "baseline case"
Groundwater Use Restrictions	Deed Restrictions	Identify contaminated areas and prohibit groundwater usage though restriction of deed	Depends on continued implementation. Does not reduce contamination	Administrative decision is easily implemented	Low	Retained to be used in conjunction with other process options
Access Controls	Well Prohibitions Closures and Controls	Close all wells in area and prohibit installation by general ordinance	Effective if closure controls are maintained	Easily implemented. Restrictions of well installation and use	Low	Retained to be used in conjunction with other process options
	General Area Access Control	Restrict access to all land which may allow access to groundwater	Very effective in keeping people out of the contaminated areas	Equipment and personnel easily implemented and readily available	Low	Retained to be used in conjunction with other process options
Monitoring	Monitoring	Analyze groundwater to monitor movement of contamination	Does not reduce the contamination, but is very effective in tracking the contaminant levels	Easily implemented, standard technology	Low	Retained to be used in conjunction with other process options
Vertical Physical Barriers	Freeze Walls	Circulate refrigerant in pipes surrounding groundwater to create a frozen curtain of pore water	Effective in blocking lateral movement of all types of groundwater contamination. May be difficult to monitor effectiveness for deep contamination	Specialized engineering design required. Requires ongoing freezing	Medium	Retained because of effectiveness and implementability
	Slurry Walls	Trench around areas of groundwater and fill with soil/cement/bentonite slurry which solidifies to form impermeable barriers	Effective in blocking lateral movement of all types of groundwater contamination. May be difficult to monitor effectiveness for deep contamination	Commonly used practice but difficult to install at depth	Medium	Rejected due to implementability problems at depth
	Grout Curtains	Pressure inject grout in regular pattern of drilled holes	Effective in blocking lateral movement of all types of groundwater contamination. May be difficult to monitor effectiveness for deep contamination	Commonly used practice and easily implemented but depends on soil type. May be difficult to ensure continuous wall	Medium	Retained because of effectiveness and implementability
	Sheet Piles	Physically drive sheets of steel to form impermeable barriers	Effective in blocking lateral movement of all types of groundwater contamination	Commonly used practice but difficult to install at depth	Low	Rejected due to implementability problems at depth
	Impermeable Membrane installation	Trench around areas of groundwater contamination and install impermeable membranes prior to backfilling.	Effective in blocking lateral movement of all types of groundwater contamination	Difficult to install at depth	Medium	Rejected due to implementability problems at depth

Table 7-3. Technology Screenings.

Technology			Evaluation Criteria			
Technology Type	Process Option	Description	Effectiveness	Implementability	Cost	Conclusions
	Dynamic Systems	Formation of hydraulic barriers via injection of clean water	Potentially effective in blocking lateral movement of all types of groundwater contamination	Implementability constrained by potential contamination dilution issues, and long-term gradient control	Low	Retained because of potential effectiveness and implementability
Horizontal Physical Barriers	Capping	Construct impermeable cover over surfaces known to provide recharge to groundwater	Combined with proper runoff control, effective in preventing rainwater recharge to groundwater	Easily implemented. Restriction of future land use will be necessary	Low	Rejected because of limited applicability and/or implementability problems
	Block Displacement	Inject in multiple subsurface mono-planer locations, high pressure grout. Hydraulic pressure will lift soil, and form horizontal barrier of grout	Effective in restricting vertical movement of groundwater contamination. May not be effective for deep groundwater	Difficult to install at depth	Medium	Rejected because of limited applicability and/or implementability problems
	Grouting	Pressure inject grout at screened depths in regular pattern of drilled holes	Effective in restricting vertical movement of groundwater contamination. May not be effective for deep groundwater	Difficult to install at depth	Medium	Rejected because of limited applicability and/or implementability problems
	Horizontal/Right Angle Drilling with Freeze Technologies	Circulated refrigerant in pipes installed both horizontally and vertically	Effective in restricting vertical movement of groundwater contamination	Specialized right angle drilling and freeze engineering required	High	Retained as innovative technology
	Horizontal/Right Angle Drilling with Grout Curtains	Pressure inject grout in regular pattern of drilled holes installed both horizontally and vertically	Effective in restricting vertical movement of groundwater contamination	Specialized right angle drilling required	Medium	Retained as innovative technology
Hydraulic Containment	Trenching	Dig subsurface trenches to capture and divert groundwater flow	Effective in diverting near-surface groundwater flow. May not be effective for deep groundwater	Easily implemented for shallow groundwater. Difficult to implement for deep groundwater	Medium	Rejected due to implementability problems at depth
	Injection Wells	Inject water to alter gradient of groundwater	Effective if hydrogeology is known. Requires source of water to inject	Easy to implement providing adequate source of water is available	Medium	Retained because of effectiveness and implementability
	Extraction Wells	Extract water from deep wells to alter gradient of groundwater	Effective if hydrogeology is known	Easy to implement providing disposal options for extracted water are available	Medium	Retained because of effectiveness and implementability

Table 7-3. Technology Screenings.

Technology			Evaluation Criteria			
Technology Type	Process Option	Description	Effectiveness	Implementability	Cost	Conclusions
Extraction & Chemical Treatment	Reduction	Use Redox reactions to alter chemical form of contaminants	May be effective in treating some heavy metal groundwater contamination. Radioactivity will not be reduced	Implementable. Treatability tests are necessary. Well developed technology and commercially available	Medium	Retained for combination with chemical precipitation re: hexavalent chromium
	Chemical Oxidation	Use oxygenating chemicals such as peroxide to destroy chemicals through oxidation	May be effective in treating organic groundwater contaminants. Can be highly chemical matrix specific	Implementable. Treatability tests are necessary. Well developed technology and commercially available	Medium	Rejected because similar technologies have broader effectiveness
	Supercritical Oxidation	Use of supercritical fluids to destroy chemicals through oxidation	May be effective in treating organic groundwater contaminants. May be applicable to broad range of chemicals	May be implementable. Treatability tests are necessary. Relatively new technology, but commercially available	High	Rejected because similar technologies have broader effectiveness
	UV Oxidation	Use of ultraviolet light and appropriate catalysts to destroy chemicals through oxidation	May be effective in treating organic groundwater contaminants. May be applicable to broad range of chemicals	Implementable. Treatability tests are necessary. Well developed technology and commercially available	Medium	Retained because of effectiveness and implementability
	Hydrolysis	Use of water to destroy water reactive chemicals	Not effective on groundwater contaminants because of aqueous state	Not implementable on aqueous solution	Low	Rejected because of limited applicability and/or implementability problems
	Precipitation	Use of chemical additives to alter the solubility of chemicals, and cause their precipitation from solution	May be effective in treating inorganic groundwater contaminants. Applicable to a broad range of metals and radionuclides	Implementable. Treatability tests are necessary. Common technology, commercially available	Medium	Retained because of effectiveness and implementability
	Dechlorination	Use of strong reducing agents to remove chlorine from chemical and hence reduce their toxicity	May be effective on chlorinated organic contaminants in groundwater	May be difficult to implement. Most often used on organic matrixes. Treatability tests for aqueous matrixes required	Medium	Rejected because similar technologies have broader effectiveness
	Neutralization	Use of acids or bases to remove corrosivity from groundwater	Not applicable to chemicals identified in groundwater. May be effective as pretreatment for other options	Implementable. Common industrial practice. Commercially available	Low	Retained to be used in conjunction with other process options

Table 7-3. Technology Screenings.

Technology			Evaluation Criteria			
Technology Type	Process Option	Description	Effectiveness	Implementability	Cost	Conclusions
Extraction & Physical Treatment	Air Stripping	Use of air to remove chemicals from groundwater. Chemical must be volatile. Subsequent air containing chemicals must be treated.	Effective in removing many volatile organic groundwater contaminants. Ineffective for inorganics and radionuclides	Implementable. Requires emission treatment for organics and capture system for radionuclide and volatilized metals	Low	Retained because of effectiveness and implementability
	Steam Stripping	Use of steam to remove chemicals from groundwater. Chemical must be semivolatile or volatile. Subsequent steam containing chemicals must be treated.	Effective in removing many volatile, and some semivolatile organic groundwater contaminants. Ineffective for inorganics and radionuclides	Implementable. Requires emission treatment for organics and capture system for radionuclide and volatilized metals	Medium	Retained because of effectiveness and implementability
	Filtration	Use of sand or filters to separate chemical by particle size.	May be effective in removing groundwater contaminants absorbed to suspended solids. Not effective on dissolved chemicals	Implementable. Requires treatability study to determine specific filtration equipment. Commercially available	Low	Retained to be used in conjunction with other process options
	Ion Exchange	Use of special resin to exchange ionic chemical between groundwater and resin. Regeneration solution containing exchanged chemical must be treated.	Effective in removing ionic inorganic groundwater contaminants. Requires treatment of regeneration solutions	Implementable. Treatability studies required to determine specific resin required. Fouling by organic contaminants likely	Medium	Retained because of effectiveness and implementability
	Reverse Osmosis	Use of molecular size membranes and osmotic pressure to separate chemical from groundwater. Concentrated solution with chemical must be treated.	Effective in removing suspended soils, metals, and radionuclides from groundwater. Requires treatment of concentrated reject streams	Implementable. Treatability studies required to determine membrance required. Fouling by organic contaminants likely	High	Retained because of effectiveness and implementability
	Denitrification	Anaerobic biological process reducing nitrate and nitrate forms of nitrogen to nitrogen gas.	Highly specific to nitrogen removal	Implementable. Commonly used in wastewater treatment plants	Medium	Retained because of proven effectiveness and implementability
	Solvent Extraction	Use of special solvents to extract chemical from groundwater. Contaminated solvents must be treated.	May be effective in removing specific groundwater chemicals (such as plutonium or organics). Requires treatment of solvents	May be implementable. Treatability studies to determine suitable solvent. Target chemicals must be identified. Secondary solvents must be treated	Medium	Rejected because of limited applicability and/or implementability problems
	Gravity Separation	Use of differences in chemical density to separate chemical from groundwater. Includes settling, DAF, and centrifuging.	May be effective in removing groundwater contaminants absorbed to suspended solids. Not effective on dissolved chemicals	Implementable. Requires treatability study to determine which specific separation equipment will be most effective. Commercially available	Low	Retained to be used in conjunction with other process options

Table 7-3. Technology Screenings.

Technology			Evaluation Criteria			
Technology Type	Process Option	Description	Effectiveness	Implementability	Cost	Conclusions
	Activated Alumina	Use of activated alumina to absorb chemical from groundwater. Contaminated alumina must be disposed of.	May be effective for removing some radionuclides and suspended solids. Requires regeneration of alumina	Implementable. Commercially available data for effectiveness for many chemicals. Treatability tests will be required for other chemicals	Low	Rejected because similar technologies have broader effectiveness
	Coagulation/ Flocculation	Use of colloidal interactions to remove suspended solids and some dissolved phase chemicals.	May be effective for removing chemicals associated with suspended solids	Implementable. Commercial systems readily avaialable	Low	Retained for use with other options
	Carbon Absorption	Use of activated carbon to absorb chemicals from groundwater. Contaminated carbon must be disposed of.	Effective in removing organic and some inorganic groundwater contaminants. Treatment of spent carbon required	Implementable. Well documented effectiveness for many chemicals. Evaluation of treatment of spent carbon required	Medium	Retained because of effectiveness and implementability
	Freeze Separation	Use of liquid/solid	May be effective to remove most groundwater contaminants	May be implementable at this time. Occasionally used in other industries. Media-specific treatability tests required	Medium	Retained as innovative technology because of potential high benefits
	Electrolytic Decomposition and Separation	Membrane technology involving electrolytic decomposition of tritiated water followed by selective separation of hydrogen gas.	Effectiveness not demonstrated at large scale; specific to tritium removal	Difficult and expensive to implement at scale applicable to Hanford Site	High	Retained as innovative technology
Extraction & Biological Treatment	Aerobic	Use of oxygen breathing biological organisms to destroy chemicals	Effectiveness is very contaminant and concentration specific. Treatment has been identified for a variety of organic compounds. Not effective on inorganics or radionuclides	Potentially implementable. Various options are commercially available to produce contaminant degradation. Treatability tests required to determine site-specific conditions	Low	Rejected because of limited applicability and/or implementability problems
	Anaerobic	Use of nonoxygen breathing biological organisms to destroy chemicals	Effectiveness is very contaminant- and concentration-specific. Treatment has been identified for a variety of organic compounds. Not effective on inorganics or radionuclides	Potentially implementable. Various options are commercially available to produce contaminant degradation. Treatability tests required to determine site-specific conditions	n/a	Rejected because of limited applicability and/or implementability problems
Extraction & Thermal Treatments	Solar Evaporation	Use of solar energy to evaporate groundwater to air, leaving non-volatile chemical behind	Effective in concentrating non-volatile groundwater contaminants. Requires large spaces. May be difficult to control radionuclide trace emissions	Difficult to implement. Requires large spaces. Air emission controls difficult to implement over the large space. Air pollution permitting required	Low	Rejected because of limited applicability and/or implementability problems
	Distillation	Use of thermal energy to separate groundwater from chemical by differing vapor pressures	Effective for non-volatile groundwater contaminants. Energy intensive. Concentrated distillation bottoms require treatment	Implementable. Technology is well developed. Energy requirements and disposal of distillation bottoms should be addressed	High	Retained to be used in conjunction with other process options

Table 7-3. Technology Screenings.

Technology			Evaluation Criteria			
Technology Type	Process Option	Description	Effectiveness	Implementability	Cost	Conclusions
	Destructive Incineration	Use of thermal energy and oxidation to distil groundwater from nonvolatile chemical and oxidize at high temperature all remaining chemicals.	Effective in destroying organic groundwater contaminants, and concentration non-volatile groundwater contaminants. Air emissions and ash likely to require further treatment	Implementable. Technology is well developed. Mobile units are available for small volumes. Energy requirements and disposal of distillation bottoms should be addressed	High	Rejected because of limited applicability and/or implementability problems
	Wet Air Oxidation	Use of thermal energy and oxidation to force destruction of organic chemical while in aqueous phase.	Effective for organic groundwater contaminants. Applicable to broad range of organic chemicals	Implementable. Specialized industrial process. Commercially available. Treatability test required to determine media-specific effectiveness	High	Rejected because similar technologies have broader effectiveness
In Situ Physical Treatment	Sparging	Injection of air into groundwater zone to distribute chemicals or effect a stripping operation	May be effective in removing volatile organic chemicals or dispersing other in situ treatment chemicals	May be implementable. Detailed permeability of soil must be known. Treatability studies must be performed to evaluate site-specific effects	Low	Retained as innovative technology because of potential high benefits
In Situ Chemical Treatment	Precipitation	Injection of chemical designed to reduce mobility of contaminants in groundwater	May be effective in reducing mobility of metals and radionuclides	May be implementable. Techniques to enhance mixing of chemical additives and groundwater must be developed	Low	Retained as innovative technology because of potential high benefits
	Solubilization	Injection of chemical designed to increase mobility of contaminants in groundwater	May be effective in increasing mobility of metals and radionuclides. The increased mobility would enhance performance of pump and treat technologies	May be implementable. Techniques to enhance mixing of chemical additives and groundwater must be developed	Low	Retained as innovative technology because of potential high benefits
	Destruction	Injection of chemical designed to destroy contaminants in groundwater	May be effective in destroying organic chemical. Secondary by-products may be generated	Difficult to implement. Chemical with destructive potential, such as oxidizers, are affected by sand media. Techniques to enhance mixing required	Low	Retained as innovative technology because of potential high benefits
In Situ Biological Treatment	Aerobic	Use of oxygen breathing biological organisms to destroy chemicals	Effective for organic compounds under proper chemical conditions. Ineffective for inorganics and radionuclides	Difficult to implement. Treatability studies and thorough subsurface characterization required	Low	Retained as innovative technology because of potential high benefits
	Anaerobic	Use of non-oxygen breathing biological organisms to destroy chemicals	Effective for some volatile and complex organics. Not effective for inorganics and radionuclides	Difficult to implement. Anoxic groundwater conditions required. Treatability studies and thorough subsurface characterization required	Low	Retained as innovative technology because of potential high benefits

Table 7-4. Summary of Retained Groundwater Technologies.

Chemical Class	Proven Technologies											Innovative Technologies					
	Containment	Groundwater Treatments										Groundwater Treatments			In Situ		Containment
	Grout/freeze walls, or hydraulic barriers	UV oxidation	Precipitation and reduction**	Air stripping	Steam stripping	Coagulation and filtration	Reverse osmosis	Denitrification	Carbon absorbtion	Evaporation	Ion exchange	Freezing	Super-critical extraction	Electrolytic decomposition & separation	Air sparging and/or biodegradation	Flushing and/or precipitation	Horizontal grout and/or freeze walls
Organics	A	A	D	D	C	C	X,I	E	B	E	X	I,C	I	E	E,I	I	I
Volatile Organics	A	A	D	B	B	D	X,I	E	B	C,X	X	I,B	I	E	I	I	I
Inorganics	A	D,X	C	D,X	D,X	D	B,I	D***	C	B,X	B	I,B	I	E	E,I	I	I
Metals	A	D,X	A	D,X	D,X	C	A	E	C	A	A	I,A	I	E	E,I	I	I
Radio-nuclides	A	D	A	D,X	D,X	C	A	E	C,X	A	A	I,A	I	E	E,I	I	I
Suspended Solids	A	X	E	X	X	A	A	E	X	A	X	I,A	I	E	E,I	I	I
Tritium*	A	E	E	E	E	E	E	E	E	E	E	E	I	A	E,I	E,I	I

A= Applicable to most chemicals in class.
B= Applicable to many chemicals in class.
C= Applicable to some chemicals in class.
D= Applicable to few chemicals in class.
E= Not specifically applicable to chemicals in class.
X= Known to be susceptible to interference due to fouling, media contamination, or other uncontrollable effects.
I= Potential innovative application.
* Tritium is classified as a single chemical group due to its unique chemical characteristics
** Reduction required for hexavalent chromium prior to chemical precipitation.
*** Denitrification is highly specific to nitrate removal.

Table 7-5. Preliminary Remedial Action Alternative Applicable to Chemical Classes of Groundwater Operable Units.

Chemical Plume	Alternative 1 Containment	Alternative 2 Groundwater Extractions and Comprehensive Treatment	Alternative 3 Groundwater Extraction, Treatment of a Single Class, and Reinjection	Alternative 4 Treatment at Point-of-Use	Alternative 5 Treatment at Point-of-Discharge
Arsenic	A	B	B	E	E
Chromium	A	B	B	E	E
Cyanide	A	B	B	E	E
Fluoride	A	B	B	E	E
Nitrate	A	B	B	E	E
Co-60	A	B	B	E	E
Sr-90	A	B	B	E	E
Cs-137	A	B	B	E	E
Gross Alpha	A	F	F	FD	FD
Gross Beta	A	F	F	FD	FD
Tritium	A	X	X	D	D
Technetium-99	A	B	B	E	E
Plutonium	A	B	B	E	E
Iodine-129	A	B	B	E	E
Organics	A	BC	BC	E	E

A = Applicability.
B = Possible applicability but treatment interferences may be encountered if plumes overlap and long-term performance may be hampered by absorbed chemicals.
C = Long-term performance may be additionally hampered by presence of DNAPLS.
D = Possible applicability if natural attenuation time is sufficiently long.
E = Possible applicability.
F = Applicability depends on which chemicals are emitting alpha or beta.
X = Not likely to be effective.

8.0 DATA QUALITY OBJECTIVES

As described in Section 1.2.2, this aggregate area management study (AAMS) process, as part of the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a), is designed to focus the remedial investigation (RI)/feasibility study (FS) process toward comprehensive cleanup or closure of all contaminated areas at the earliest possible date and in the most effective manner. The fundamental principle of the *Hanford Site Past-Practice Strategy* is a "bias for action" which emphasizes the maximum use of existing data to expedite the RI/FS process as well as allow decisions about work that can be done at the site early in the process, such as expedited response actions (ERAs), interim remedial measures (IRMs), limited field investigations (LFIs), and focused feasibility studies (FFSs). The data have already been described in previous sections (2.0, 3.0, and 4.0). Remediation alternatives are described in Section 7.0. However, data, whether existing or newly acquired, can only be used for these purposes if it meets the requirements of data quality as defined by the data quality objective (DQO) process developed by the U.S. Environmental Protection Agency (EPA) for use at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites (EPA 1987). This section implements the DQO process for this, the scoping phase in the 200 East Groundwater Aggregate Area.

In the guidance document for DQO development (EPA 1987), the process is described as involving three stages which have been used in the organization of the following sections:

- Stage 1--Identify decision types (Section 8.1)
- Stage 2--Identify data uses and needs (Section 8.2)
- Stage 3--Design a data collection program (Section 8.3).

8.1 DECISION TYPES (STAGE 1 OF THE DQO PROCESS)

Stage 1 of the DQO process is undertaken to identify:

- The decision makers (thus the most important data users) relying on the data to be developed (Section 8.1.1)
- The data available to make these decisions (Section 8.1.2)
- The quality of these available data (Section 8.1.3)
- The conceptual model into which these data must be incorporated (Section 8.1.4)

- The objectives and decisions that must evolve from the data (Section 8.1.5).

These issues serve to define, from various sides, the types of decisions that will be made on the basis of the 200 East Groundwater AAMS.

8.1.1 Data Users

The data users for the 200 East Groundwater AAMS and subsequent investigations such as LFIs, RI/FSs, and Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFIs)/Corrective Measures Studies (CMSs) are the following:

- The decision makers for policies and strategies on remedial action at the Hanford Site. These are the signatories of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990) including the U.S. Department of Energy (DOE), EPA, and the Washington State Department of Ecology (Ecology).

Nominally these responsibilities are assigned to the heads of these agencies (the Secretary of Energy for DOE, the Administrator of EPA, and the Director of Ecology). However, the political process requires that more local policy-makers (e.g., the Regional Administrator of EPA and the head of the U.S. Department of Energy, Richland Operations Office [DOE/RL]) or technical and policy-assessment staff of these agencies to be involved in the decision-making process.

- Unit managers of Westinghouse Hanford and potentially other Hanford Site contractors who will implement remedial activities for the 200 East Groundwater Aggregate Area. Staff of these contractors will have to make the lower level (tactical) decisions about appropriate scheduling of activities and allocation of funding, personnel, and equipment to accomplish the recommendations of the AAMS.

- Concerned members of the wide community involved with the Hanford Site. These may include:

  - Other state (Washington, Oregon, and other states) and federal agencies
  - Affected Indian tribes
  - Special interest groups
  - The general public.

These groups will be involved in the decision process through the implementation of the Community Relations Plan (Ecology et al. 1989), and will apply their concerns through the "primary" data users, the signatories of the Tri-Party Agreement.

The needs of these users will have a pivotal role in issues of data quality. Some of this influence is already imposed by the guidance of the Tri-Party Agreement.

8.1.2 Available Information

The *Hanford Site Past-Practice Strategy* specifies a "bias for action" which intends to maximize use of existing data for initial decisions about remediation. This emphasis can only be implemented if the existing data are adequate for the purpose.

Available data for the 200 East Groundwater Aggregate Area are presented in Sections 2.0, 3.0, and 4.0 and in topical reports prepared for this study (see Section 1.2.2). The available data for this 200 East Groundwater Aggregate Area Management Study Report (AAMSR) are slightly different from those presented in the B Plant, PUREX, Semi-Works, and 200 North Area AAMSRs for waste management units in the 200 East and 200 North Areas. For many aspects of the site data, the source AAMSRs are given primacy and the 200 East Groundwater AAMSR simply summarizes the data developed in those studies. Only in regard to data about groundwater, the deeper geologic layers in which it is found, and the monitoring of this medium, does the 200 East Groundwater AAMSR present separately developed data. As described in Section 1.2.2, these data should address several issues:

- Issue 1: Facility and process descriptions and operational histories for waste sources (mainly in source AAMSRs, but summarized here in Sections 2.2, 2.3, and 2.4)

- Issue 2: Waste disposal records defining dates of disposal, waste types and waste quantities (also mainly in source AAMSRs, but again summarized here in Section 2.4)

- Issue 3: Sampling events of waste effluents and affected media (left strictly to the source AAMSRs)

- Issue 4: Site conditions including the site physiography, topography, geology, hydrology, meteorology, ecology, demography, and archaeology (Section 3.0)

- Issue 5: Environmental monitoring data for affected media--for this groundwater AAMSR, this is specifically groundwater (Section 4.1).

For the purposes of the 200 East Groundwater AAMSR, the most relevant data pertain to issues 4 and 5 and will be discussed further in the following paragraphs. Results of groundwater sampling and analysis (issue 5) reveal the nature and extent of groundwater contamination. Site characterization data (issue 4) on the other hand indicate the dynamics of the situation: where the contamination is likely to migrate, how it might be transformed in the process, and where potential receptors may be located.

Nature and Extent of Contamination. The data available about nature and extent (detections and concentrations) of contaminants in groundwater (Section 4.1.1) are relatively extensive and comprehensive, especially when compared to the data available for the waste management units in the individual source AAMSRs. There are gaps (particularly in the front end of plumes which have migrated into the 600 Areas where there are fewer wells but also in parts the southern portion of the 200 East Area) but the lateral extent of the plumes (and their constituents) appear to be well defined although there is a deficiency of data on the vertical extent of contamination. This AAMSR emphasizes the most recent data (1988 to 1991) because they are more complete than any earlier data set: more wells were sampled (including newer wells) at greater frequency and consistency, more constituents analyzed, and better methodology was used for both field procedures and laboratory methods (e.g., detection limits). While these data are not perfect, they provide a fairly consistent basis to compare concentrations across the site, and thereby delineate plumes. While the data base is adequate for this purpose, earlier data across the Hanford Site (including in the 200 East Area) have been deficient in analyzing groundwater samples for a wide enough range of constituents and at detection levels sensitive enough to delineate plumes in areas where they must have been present.

To a limited extent, these data are supported by the data regarding the sources of these plumes: contaminant releases from waste management units (Sections 2.3 and 4.1.2). These data include inventory (liquid waste volumes and contaminant quantities), and results of borehole logging for gross gamma radiation. The extent and limitations of this information are discussed more fully in the individual AAMSRs and are only summarized in this report. However, some inconsistencies between the reported releases and known groundwater contaminant plumes indicate that the inventories may be incomplete.

The inventory data are supplemented by the results of geophysical gross gamma logging in boreholes near the waste management units that indicate the depth to which gamma-emitting radionuclides have penetrated the subsurface. These data are limited in two ways: the boreholes are generally some distance away from the unit and thus may not observe contamination directly beneath the unit; and the method does not differentiate what

radionuclide species are actually present. These limitations may be removed with further field investigations in the source areas and the use of the Radionuclide Logging System (RLS), which can differentiate different radionuclides. Additional information on previous geophysical logging is given in the topical reports for the source aggregate areas (B Plant, PUREX, Semi-Works, and 200 North) (Chamness et al. 1992a; 1992b; 1992c; Teel et al. 1992). Further information on the RLS program will be presented in a 200 East Area borehole geophysics field characterization topical report.

Contaminant Transport Potential. Besides knowing the type and location of the contamination, it is also necessary to know its direction. In this respect the data for the 200 East Groundwater Aggregate Area are again fairly comprehensive.

Site characterization data relating to contaminant transport potential vary more than those on nature and extent. The stratigraphic constraints on groundwater flow (Section 3.5.2.1) are well known on a broad scale, and are limited mainly by the spacing of wells that have been drilled and the quality of the geologic logging; most of the earlier logs were compiled by the driller rather than a geologist, and generally display a limited understanding of important depositional and textural features. Stratigraphic data from the wells can be interpolated relatively inexpensively across the large spaces without wells by using seismic reflection or refraction geophysical surveys. However, the applications have been limited in the past. The main use of surface geophysics on the Hanford Site was for the Basalt Waste Isolation Project (BWIP), where features in the basalt were more important than those in the "suprabasalt" sediments. The results of the investigation reflect this need (DOE 1988).

Other data for understanding the potential for contaminant migration in groundwater include those describing the geohydrology of the aquifer(s) of concern. These data include information on recharge and discharge from the aquifer (Section 3.5.2.2); mappings of the potentiometric surface across the Hanford Site to determine groundwater flow directions and gradients (Section 3.5.2.3); and aquifer and vadose zone properties such as hydraulic conductivity (saturated and unsaturated), transmissivity, matric potential (capillary pressure/moisture relation), porosity, and storativity/specific yield (Sections 3.5.1 and 3.5.2). In addition to the data summarized in these sections, the topical reports *Unconfined Aquifer Hydrologic Test Data Package for the 200 East Area* and *Confined Aquifer Hydrologic Test Data Package for the 200 Areas Groundwater Aggregate Areas Management Studies* (Newcomer et al. 1992a and 1992c) contains more information. In spite of the complexity of the flow system and the uncertainties of future recharge to the aquifer, all these parameters are known to a reasonable degree of accuracy, which allows groundwater models to estimate the likely flow patterns and the advective component of contaminant transport which they determine.

Even to the extent that groundwater flow is known, however, contaminant-specific factors can cause the different constituents to move at different rates in relation to the groundwater and to change in concentration, phenomena known as retardation and attenuation. Because of the complexity of some of the potential chemical interactions, retardation is not as well understood as the groundwater flow system. Some aspects of attenuation such as radionuclide half-life are well understood while others, such as dispersion, are not. However, here again reasonable approximations to the parameters are possible (Section 4.2). In addition, the modeling process of calibration, i.e., fitting the model results to the known history of a physical process, can allow these parameters to be corrected to the conditions actually found in the aquifer. The main limitation to accomplishing such a calibration process is the long time frame during which these changes occur, usually requiring a longer record of data than is generally available. The errors in estimating retardation are multiplicative to those for groundwater advection, and the problem of other errors adds to the noise in the observed data being fitted.

Receptors. In assessing the significance of the groundwater contaminant concentrations and their likely transport, the final stage in the development of data is at the point of impact: are there receptors who may be affected by this contamination? This question is generally not a data issue, but rather a regulatory one. Because no one can predict future land use at the Hanford Site, a conservative approach may be required that specifies the point of compliance for applicable or relevant and appropriate requirements (ARARs) and the exposure point for risk assessment to be established on the site. Nevertheless, the data for present day land/water use, ecology, and demography are available (Sections 3.6, 3.7, and 3.8) and are reasonably complete.

Therefore, the data described above appears to be sufficient to carry out risk assessment and ARARs assessment for the 200 East Groundwater Aggregate Area.

8.1.3 Evaluation of Available Data

EPA (1987) has specified indicators of data quality, the five "PARCC" parameters (precision, accuracy, representativeness, completeness, and comparability), which can be used to evaluate the existing data and to specify requirements for future data collection.

- Precision--the reproducibility of the data

- Accuracy--the lack of a bias in the data

  Much of the existing data appears to be acceptably accurate and precise. The contamination concentration data were checked by comparing the range of the

detected concentrations (c_{max} : c_{min}) of a given constituent in a well. The range is a similar measure to other statistical estimates of accuracy, such as relative percent difference or relative standard deviation, which are used for comparison of laboratory duplicate samples. Because the samples in this test are not exact duplicates but simply other samples from the same well taken at another time, this measurement would be expected to be much higher than would be allowed in assessing quality assurance (QA) for an analytical lab. For example, in a worst case scenario, the steep front-end part of the contaminant plume may have passed through the well location during the period of record, at which time the concentration would have gone up by a large factor, possibly by several orders of magnitude. Nevertheless, for most of the analyses checked, the range was less than an order of magnitude for more than 90% of the wells (with two or more detections). This indicates that these concentration values can be considered to be accurate to about half an order of magnitude (i.e., plus or minus half the range). Some cases with ranges larger than this level appeared to be caused by isolated "outlier" data, caused perhaps by errors in transcription (some appeared to be off by three orders of magnitude, as if the results were thought to be in mg/L rather than μg/L). These data have generally not been checked thoroughly against lab documentation to assure that such errors have not occurred, but this is apparently only an occasional problem.

Accuracy is normally assured through the use of field and trip blanks and (in the laboratory) through matrix spikes which give estimates of percent recovery. These methods are becoming common for analyses of samples from the site.

Earlier groundwater contaminant data may be more suspect (the earlier they are the more suspect), because of the subsequent improvement in analytical methodologies and QA procedures since the time these samples were collected.

Other data for groundwater which mainly involve site characterization issues (e.g., aquifer properties and other parameters to predict transport of water and contaminants) also have some questions about precision and accuracy. Slug tests may not be accurate for highly transmissive aquifers such as the uppermost aquifer at the Hanford Site and may depend on factors of well construction such as filter pack grain size and screen slot size. This is also in part an issue of representativeness, see below. Even pump tests have been criticized because the well construction as partially penetrating the aquifer does not satisfy the assumptions of the most common analysis methods.

There is also an issue of accuracy in regard to aspects which are derived from boreholes (such as stratigraphic logging, grain size distribution, carbonate

content, porosity, and other material properties). These data are interpolated among a limited and widely spaced set of sampling locations.

The *Hanford Site Past-Practice Strategy* (DOE/RL 1992a) recommends that existing data be used to the maximum extent possible, at two levels: first to formulate the conceptual model, conduct a qualitative risk assessment, and prepare work plans, but also as an initial data set that can be the basis for a fully-qualified data set through a process of review, evaluation, and confirmation. The recently collected data, although not fully-qualified, appear to be acceptable to be such an initial data set.

- Representativeness--the degree to which the appropriate environmental parameters or media have been sampled.

  In most cases the data regarding groundwater meet the criterion of representativeness because the groundwater has been sampled directly. It is this groundwater that is transporting contamination toward potential offsite receptors. Well tests stress the aquifer zones where much of the contamination has been detected and where pump-and-treat remediation can be applied.

  Limitations of the data in regard to representativeness are generally minor. For example, slug tests sample the hydraulic conductivity in only a narrow zone around the well being tested, perhaps only the gravel pack. For this reason, the slug test data were excluded from recent hydraulic conductivity assessment for the uppermost aquifer (Connelly et al. 1992a), as discussed in Section 3.5. Also, wells are not always located exactly where they can give the most representative information--this is particularly true of the lack of wells at the down-gradient portions of the plumes and in some portions (particularly the southern part) of the 200 East Area. Even in regard to groundwater elevations, the location of wells near waste disposal facilities may result in unrepresentative sampling. Finally, soil moisture retention data for modeling moisture transport through the vadose zone may be a very important feature of the contaminant transport regime to be assessed, but these data have been obtained only from very few samples from boreholes in the 200-BP-1 Operable Unit of the B Plant Aggregate Area, B Pond area, and the area east of B Pond (Connelly et al. 1992a). For vadose zone transport modeling, the sampling methods used for the soil samples could be critical to maintaining the structure of the soil to assure that the sample is really representative of the soils in situ.

  In many cases it is necessary to use nonsite-specific data (i.e., from the vicinity of the 200 Areas or even elsewhere on the Hanford Site) rather than data specific

to the 200 East Area. For most purposes of characterization for transport mechanisms, this procedure is acceptable given the screening level of the present study.

- Completeness--the fraction of samples whose measurements are considered "valid."

  Only a small fraction of the previously gathered data on groundwater concentrations in the 200 East Groundwater Aggregate Area has been "validated" in the EPA Contract Laboratory Program (CLP) sense, although varying levels of quality control have been applied to the sampling and analysis procedures. The data are generally adequate for characterization purposes, but may not be suitable for use in a formal risk assessment. The best indication of the validity of the data is the reproducibility of the results, and this indicates that validity (completeness) is one of the less significant problems with the data.

- Comparability--the confidence that can be placed in the comparison to two data sets (e.g., separate samplings).

  Although varying levels of quality control and varying procedures for sample acquisition and analysis may have limited the comparability of early groundwater data, this problem has generally been eliminated for most recent data.

While these limitations cannot in most cases be quantified (and some such as representativeness are specifically only qualitative), most of the data gathered in the 200 East Groundwater Aggregate Area can be seen to satisfy the PARCC parameters to a reasonable degree. These data can be used for preliminary risk assessments (human health and ecological), planning of additional characterization studies, and FFSs for groundwater remediation.

In addition to these site-specific data, there are also a limited number of nonsite-specific sampling programs that are being developed to determine background levels of naturally occurring constituents (see Section 4.1.1.2). These data can be used to differentiate the effect of the environmental releases from naturally occurring background levels.

8.1.4 Conceptual Models

The initial conceptual model of the sites in the 200 East Groundwater Aggregate Area is presented and described in Section 4.2 (Figure 4-19). The model is based on best estimates of where contaminants were discharged and their potential for migration from

release points. The conceptual model is designed to be conservatively inclusive in the face of a lack of data. This migration pathway was included if there is any possibility of contamination travelling on it, historically or at present. In most cases there may not be a significant flux of such contamination for many of the pathways shown on the figure.

The one pathway on Figure 4-19 that has undoubtedly transported the largest amount of water through vadose zone soils to the uppermost aquifer is associated with releases from surface water bodies at the various ponds, ditches, and trenches in the 200 East Area. Contamination can be demonstrated to have been present at some of these waste management units based on results of sediment and surface water sampling. If significant levels of dissolved constituents were present in the surface water bodies, the large quantities of water would have contributed to their mobilization and transport through the vadose zone. However, there is little information confirming that large amounts of contamination actually have been transported along this pathway. The pathway from cribs, trenches, and reverse wells and especially from the 216-B-5 Reverse Well (west side of the B Plant Aggregate Area) to groundwater is possibly more significant since many of the waste streams discharged to cribs, trenches, and reverse wells are known to be contaminated. Most of the plumes that have been delineated in the unconfined aquifer can be traced back to releases from cribs and the reverse well (Section 4.1). These and other pathways can be traced on the conceptual model. All are possible; only a few are likely because of the conservatism inherent in including all conceivable pathways. More importantly, even if a pathway carries significant levels of a contaminant, it still may not have carried contamination to the ultimate receptors, human or ecological. This can only be assessed by sampling at the exposure point on this pathway, or sampling at some other point and extrapolation to the exposure point, to indicate the dosage to the receptors. To a great extent this can be demonstrated for groundwater contamination in the 200 East Area, as only tritium and nitrate plumes are known to have reached the Columbia River, and no plumes are known to have migrated to any water supply wells. For this area the conceptual model can best be used to estimate likely <u>future</u> impacts.

8.1.5 Aggregate Area Management Study Objectives and Decisions

The specific objectives of the 200 East Groundwater AAMS are listed in Section 1.3. They include the following:

- Assemble site data (as described in Section 8.1.2)
- Describe site conditions (see Section 3.0)
- Conduct limited new site characterization work (see separate topical reports)

- Develop a preliminary site conceptual model (see Section 8.1.4)
- Identify contaminants of concern and their distribution (Section 4.0)
- Identify potential ARARs (Section 6.0)
- Define preliminary remedial action objectives and screen potential remedial technologies to prepare preliminary remedial action alternatives (Section 7.0) and provide recommendations for focused FS (Section 9.4.1) and treatability studies (Section 9.5)
- Define data needs, establish general DQOs, and set priorities
- Recommend ERA, IRM, LFI, or other actions (Section 9.0)
- Redefine and prioritize, as data allow, operable units, their boundaries, and work plan activities with emphasis on supporting early cleanup actions and a Record of Decision (ROD)
- Integrate RCRA treatment, storage, or disposal (TSD) closure activities with past practices activities.

The decisions that will have to be made on the basis of this AAMS can best be described according to the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a) flow chart (Figure 1-2 in Section 1.0) that must be conducted on a site-by-site basis. Decisions are shown on the flow chart as diamond-shaped boxes, and include the following:

- Is an ERA justified?
- Is less than six months' response needed (is the ERA time critical)?
- Are data sufficient to formulate the conceptual model and perform a qualitative risk assessment?
- Is an IRM justified?
- Can the remedy be selected?
- Can additional required data be obtained by LFI?
- Are data (from field investigations) sufficient to perform risk assessment?

- Can an operable unit/aggregate area ROD be issued?

The last two questions will only be asked after additional data are obtained through field investigations, and so are DQO issues only in assessing scoping for those investigations.

Most of these decisions are actually a complicated mix of many smaller questions, and will be addressed in Section 9.0 in a more detailed flowchart for assessing the need for remediation or investigation.

Similarly, the tasks to be performed after the AAMS that will drive the data needs for the study are found in the rectangular boxes on the flow chart. These include the following:

- ERA (if justified)
- Definition of threshold contamination levels, and formulation of a conceptual model, performance of qualitative risk assessment and FS screening (IRM preliminaries)
- FFS for IRM selection
- Determination of minimum data requirements for IRM path
- Negotiation of Scope of Work, relative priority, and incorporation into integrated schedule, performance of LFI
- Determination of minimum data needs for risk assessment and final remedy selection (preparation of RI/FS pathway).

These stages of the investigation must be considered in assessing data needs (Section 8.2.1).

8.2 DATA USES AND NEEDS (STAGE 2 OF THE DQO PROCESS)

Stage 2 of the DQO development process (EPA 1987) defines data uses and specifies the types of data needed to meet the project objectives. These data uses and needs are based on the Stage 1 results, but must be more specific. The elements of this stage of the DQO process include:

- Identifying data uses (Section 8.2.1)
- Identifying data types (Section 8.2.2.1)

- Identifying data quality needs (Section 8.2.2.2)
- Identifying data quantity needs (Section 8.2.2.3)
- Evaluating sampling/analysis options (Section 8.2.2.4)
- Reviewing data quality parameters (Section 8.2.2.5)
- Summarizing data gaps (Section 8.2.3).

Stage 2 is developed on the basis of the conceptual model and the project objectives. The following sections discuss these issues in greater detail.

8.2.1 Data Uses

For the purposes of the remediation of 200 East Area groundwater, most data uses fall into one or more of four general categories:

- Site characterization
- Public health evaluation and human health and ecological risk assessments
- Evaluation of remedial action alternatives
- Worker health and safety.

Site characterization refers to a process that includes determination and evaluation of the physical and chemical properties of any wastes and contaminated media present at a site, and an evaluation of the nature and extent of contamination. This process normally involves the collection of basic geologic, hydrologic, and meteorologic data and data on specific contaminants and sources that can be incorporated into the conceptual model to indicate the relative significance of the various pathways. Site characterization is not an end in itself, as stressed in the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a), but rather the data must ultimately assess the need for remediation (according to risk assessment methods, either qualitative or quantitative, or compliance with ARARs) and provide appropriate means of remediation (through an FFS, FS, or CMS). A primary set of tools for assessing these issues is the group of groundwater models selected for use at the Hanford Site: UNSAT-H, PORFLO-3, VAM3D, and CFEST. These models in turn impose additional data requirements. The understanding of the site characterization, based on existing data, is presented in Sections 2.0, 3.0, and 4.0, and summarized in the conceptual model (Section 4.2).

Data required to conduct a public health evaluation, and human health and ecological risk assessments for groundwater in the 200 East Groundwater Aggregate Area include the following: input parameters for various performance assessment models (e.g., the Multimedia Environmental Pollutant Assessment System); site characteristics; and contaminant data required to evaluate the threat to public and environmental health and

welfare through exposure to the various media. These needs usually overlap with site characterization needs. An extensive discussion of risk assessment data uses and needs is presented in the *Risk Assessment Guidance for Superfund*, Vol. 1 (EPA 1989b) and *EPA Region 10 Supplemental Risk Assessment Guidance for Superfund dated August 16, 1991* (EPA 1991). The risk assessments will follow the guidance outlined in the M-29-03 milestone document, *Hanford Site Baseline Risk Assessment Methodology* (DOE/RL 1991e). The present understanding of site risks is presented in the selection of constituents of concern (Section 5.0). The data needs for quantitative risk assessments will be considered in developing sampling and analysis plans according to the *Hanford Site Past-Practice Strategy*.

Data collected to evaluate remedial action alternatives for ERAs, IRMs, FFSs, or the full RI/FS, include site screening of alternatives, feasibility-level design, and preliminary cost estimates. Once an alternative is selected, much of the data collected from field site investigations (LFI or RI) can also be used for the final engineering design. Generally, collection of data during the investigations specifically for use in the final design is not cost effective because many issues must be decided about appropriate technologies before effective data gathering can be undertaken. It is preferable to gather such specific information during a separate predesign investigation or at the time of remediation [i.e., the "observational approach" of the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a)]. Based on the existing data, broad remedial action technologies and objectives have been identified in Section 7.0.

The worker health and safety category includes data collected to establish the required level of protection for workers during various investigation activities. These data are used to determine if there is concern for the personnel working in the vicinity of the aggregate area. The results of these assessments are also used in the development of the various safety documents required for field work (see Health and Safety Plan, Appendix B).

It should be noted that each of these data use categories (site characterization, risk assessment needs, remedial actions, and health and safety) will be required at each decision point on the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a) flow chart, as discussed at the end of Section 8.1.5. Areas are prioritized and not all areas of possible contamination will be investigated to the same degree. In general, the existing data for groundwater are adequate to initiate efforts to all these uses.

8.2.2 Data Needs

The data needs for the 200 East Groundwater Aggregate Area are discussed in the following sections according to the categories of data type (Section 8.2.2.1), data quality

needs (8.2.2.2), data quantity needs (8.2.2.3), sampling and analysis options (8.2.2.4), and data quality parameters (8.2.2.5).

8.2.2.1 Data Types. Data use categories described in Section 8.2.1 define the general purpose of collecting additional data. Based on the intended uses, a concise statement regarding the data types needed can be developed. Types of data needed for characterization purposes in regard to the 200 East Groundwater Aggregate Area are quite varied. A major consideration is that the most important tools for characterization are models to address groundwater and vadose zone flow and contaminant transport. The data requirements for such models have been described (DOE/RL 1991f) to include climatic data, plant and vegetation data, precipitation recharge, flow domain characteristics, soil characteristics (the critical hydrologic parameters), contaminant distribution/transport parameters, and contaminant source characteristics (Table 8-1).

Risk assessment is supported by these same models, and so has the same needs, but adds other types of data required to determine exposure and impact (e.g., toxicity). Much of the latter data is imposed by regulatory agencies rather than being acquired by site investigation. Toxicity data are generally supplied from standardized databases such as the *Integrated Risk Information System* (IRIS) and the *Health Effects Assessment Summary Tables* (HEAST).

The data type requirements for the preliminary remedial action alternatives developed in Section 7.4 are summarized in Table 8-2. In addition, the same groundwater models discussed in regard to characterization and risk assessment uses will also be vital to the assessment of remedial alternatives. Capabilities of features such as barriers, pumping, and recharge, possible technologies used in remediation of the groundwater, should be built-in to the model in its development so that the success or failure of these remedial actions can be readily predicted.

Types of data required for human health and safety involve contaminant concentrations and radioactivities in site media (groundwater and soils) that could cause exposures to personnel conducting intrusive investigation work, and parameters to predict transport, exposure, and toxicity. These data include volatilization partial pressures, vapor density, explosivity, corrosivity, and acceptable levels of chemicals in breathing zones. These parameters are spelled out in health and safety guidance documents.

8.2.2.2 Data Quality Needs. The various tasks and phases of a CERCLA investigation may require different levels of data quality. Important factors in defining data quality include selecting appropriate analytical levels and validating and identifying contaminant levels of concern as described below. The Westinghouse Hanford document, *A Proposed Data Quality Strategy for Hanford Site Characterization,* will be used to help define these

levels (McCain and Johnson 1990). The Data Quality Objectives (DQOs) will also be developed and defined on an operable unit basis in the work plans and specifically in the Quality Assurance Project Plans (QAPjPs) which will guide investigation activities.

Chemical and radionuclide laboratory analysis will be one of the most important data types for many groundwater samples with various levels of contamination. In general, increased accuracy, precision, and lower detection limits are obtained with increased cost and time. Therefore, the analytical level used to obtain data should be commensurate with the intended use. Table 8-3 defines five analytical levels associated with different types of characterization efforts. While the bulk of the analysis during LFIs/RIs will be at the screening level (DQO Level I or II), these data will require confirmatory sampling and analysis to allow final remedial decisions through quantitative risk assessment methods. Individual DQO analytical PARCC parameters for Level III or IV analytical data associated with each contaminant anticipated in the 200 East Groundwater Aggregate Area (as developed in Section 5.0) are given in Table 8-4. These parameters will be used to develop site-specific sampling and analysis plans and quality assurance plans for investigations and remediations in the aggregate area.

Before laboratory or even field data can be used in the selection of the final remedial action, they must first be validated. Validation involves determining the usability and quality of the data. Exceptions are made for initial evaluations of the sites using existing data, which may not be appropriate for validation but will be used on a screening basis based on the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a). Other screening data (e.g., estimates of contaminant concentration inferred from field analyses) may also be excepted.

Once data are validated, they can be used to successfully complete the remedial action selection process. Activities involved in the data validation process include the following:

- Verification of chain-of-custody and sample holding times
- Confirmation that laboratory data meet Quality Assurance/Quality Control (QA/QC) criteria
- Confirmation of the usability and quality of field data, which includes geological logs, hydrologic data, and geophysical surveys
- Proper documentation and management of data so that they are usable.

Validation may be performed by qualified Westinghouse Hanford personnel from the Office of Sample Management (OSM), other Westinghouse Hanford organizations, or a qualified independent participant subcontractor. Data validation of laboratory analyses will

be performed in accordance with *A Proposed Data Quality Strategy for Hanford Site Characterization* (McCain and Johnson 1990) and standards set forth by Westinghouse Hanford.

To accomplish the second point, all laboratory data must meet the requirements of the specific QA/QC parameters as set up in the QAPjP for the project before it can be considered usable. The QA/QC parameters address laboratory precision and accuracy, method blanks, instrument calibration, and holding times.

The usability of field data must be assessed by a trained and qualified person. The project hydrogeologist/geophysicists will review the geologic logs, hydrologic data, geophysical surveys, and results of physical testing, and senior technical reviews will be conducted periodically throughout the project.

Data management procedures are also necessary for validation. Data management includes proper documentation of field activities, sample management and tracking, and document and inventory control. Specific consistent procedures are discussed in the Information Management Overview (Appendix D).

8.2.2.3 Data Quantity Needs. The number of samples that need to be collected during an investigation can be determined by using several approaches. In instances where data are lacking or are limited, a phased sampling approach may be appropriate. However, this approach is difficult for groundwater because of the expense in installing the sampling access (wells). In the absence of any available data, an approach or rationale must be developed to justify the sampling locations (wells), the number of them to be installed and sampled, and at what frequency. This will be accomplished and documented by Westinghouse Hanford in the production of work plans and field sampling plans, under the guidance and review of the Tri-Party Agreement participants. Specific locations for wells and numbers (frequency) of sampling will be determined based on data collected up to the time for the well placement. In situations where and when available data are more complete, geostatistical techniques may be useful in determining the additional data required.

Some locations are obvious as sites for proposed installation and sampling of new wells as indicated by the plume maps (Figures 4-1 to 4-15). For example, sampling data for ^{129}I and tritium are very sparse southeast of the 200 East Area, and the extent of these plumes and interconnection of plume lobes for each of these constituents is very uncertain because of the limited number of wells in this area. Other examples are easy to find, since many plumes are heading out of the 200 East Area into the 600 Area where well coverage is less complete. There are statistical packages available that not only interpolate the plume concentration in such areas, but also estimate the errors associated with this interpolation. One such package is Geostatistical Environmental Assessment Software (GEO-EAS) (Englund

and Sparks 1988). The relative risk interpretation methods discussed in Section 5.0 can be used in this method so that the placement of new wells can at the highest priority resolve the most significant issues regarding the risks associated with groundwater contamination.

8.2.2.4 Sampling and Analysis Options. Data collection activities are structured to obtain the needed data in a cost-effective manner. Developing a sampling and analysis approach that ensures that appropriate data quality and quantity are obtained with the resources available may be accomplished by using field screening techniques and focusing the higher DQO level analyses on a limited set of samples at each site. The groundwater investigations should take advantage of this approach for a comprehensive characterization of the site in a cost-effective manner.

A combination of lower level (Levels I and II) and higher level analytical data (Levels III and IV) should be collected. For instance, at least one of the samples collected from each well should be analyzed at DQO Level IV and validated to provide high quality data to confirm the less expensive but more extensive lower level analyses. This approach would provide the certainty necessary to determine contaminants present in plumes. Samples collected will be analyzed by *Test Methods for Evaluating Solid Wastes* ("SW-846," EPA 1986b), CLP (EPA 1988a, EPA 1989b), *Methods for Chemical Analysis of Water and Wastes* (EPA 1983), or *Prescribed Procedures for Measurement of Radioactivity in Drinking Water* (EPA 1980) or other standard methods.

8.2.2.5 Data Quality Parameters. The PARCC parameters indicate data quality. Ideally, the end use of the data collected should define the necessary PARCC parameters. Once the PARCC requirements have been identified, then appropriate analytical methods can be chosen to meet established goals and requirements. Definitions of the PARCC parameters are presented in Section 8.1.2.

In general the precision and accuracy objectives are governed by the capabilities of the available methodologies and in most cases these are more than adequate for the needs of the investigations. Chemical analyses can usually attain parts per billion detection range in soils and water, and this level is adequate to the needs of the risk assessment for most analytes. Radiological analyses can similarly reach levels of pCi/L. Table 8-4 shows detection levels, generally obtained from the method description or from experience with laboratory analysis. Some constituents (e.g., arsenic) would require analysis to much lower levels, but this is generally impossible because of the limitations of analytical methods and the effects of natural background levels of the analyte. In some cases, special analytical methods can be developed to obtain lower detection limits. In addition, risk assessment is conventionally computed only to a single digit of precision and uses conservative assumptions, which reduce the impact of measurements with lower accuracy.

For other measurements, such as physical parameters, the precision and accuracy capabilities of existing measurement technologies are sufficient for the evaluation methods used to produce characterization data, so the objectives are usually based on the limitations of the analysis methodologies.

Representativeness is maintained by fitting the sampling program to the governing aspects of the sources and transport processes of the site, as demonstrated in the site conceptual model (Section 4.2). Sampling for groundwater should concentrate on representative locations of all anticipated transport mechanisms. Moisture and contaminant transport through the vadose zone are especially poorly understood and are as such good candidates for sampling (this is more appropriately done during source investigations). If necessary, the following activities can focus on aspects or locations that were not anticipated but were demonstrated by the more general results.

Completeness is generally attained by specifying redundancy on critical samples and maintaining quality control on their acquisition and analysis. As with representativeness, the initial sampling program may lead to modifications of which samples should be considered critical during subsequent sampling activities.

Comparability will be met through the use of Westinghouse Hanford standard procedures generally incorporated into the *Environmental Investigation and Site Characterization Manual* (WHC 1988c).

8.2.3 Data Gaps

Considering the data needs developed in Section 8.2.2, and the data available to meet these needs as presented in Section 8.1.2, it is apparent that a number of data gaps can be identified. These should be the focus of LFIs conducted for groundwater. The data gaps have been gathered from the assessment of the data and a review of previous assessments of groundwater data needs (DOE/RL 1991f). These data gaps include the following:

- **Gaps in Plume Extents**--the extent of some plumes, especially those which have exited the 200 East Area, is not well defined. New wells will have to be placed in these areas which will better delineate the actual extents of contamination. Some wells (e.g. southeast of the 200 East Area) will be required to fill in gaps in the network. Of particular concern is the need to define the vertical extent of the plumes. Appropriate methodology for addressing this data gap is the installation of either clusters of wells drilled to different depths, or the drilling and casing of a well that can be sealed off and sampled at different depths, while maintaining an adequate seal between aquifer layers or portions of the aquifer.

- **Confined Aquifers**--the lower portion of the unconfined aquifer (Ringold gravel unit A) becomes locally confined by the Ringold lower mud sequence in the southern part of the 200 East Area and near the B Pond complex (See Section 3.5.2 and Figures 3-30 and 3-31). To date a limited number of wells have been screened in this confined zone, and therefore groundwater flow directions (Section 3.5.2), and the extent of contamination (Section 4.1.1) have been only partially evaluated. It will be necessary to construct new wells in this zone that are sufficient in number to determine gradients and possibly complicated groundwater flow patterns, and to allow for sampling and analysis and gather enough information to allow for modeling.

  Although the confined aquifers located in interbeds of the basalt are possible receptors of contaminant migration from the unconfined aquifer, they have generally been underrepresented in sampling and water level measurements in the 200 East Area. Existing wells should be checked for suitability, and additional wells should be installed to provide additional coverage of the Rattlesnake Ridge aquifer, and at least screening coverage of the Selah aquifer. Also, analytical results for some constituents were reported for wells installed in deeper, confined aquifers, but not for adjacent wells in the unconfined system. Future sampling should include both shallow and deep wells in a given area to allow a more-complete delineation of vertical contamination extent.

- **Analytical Data Limitations**--historic groundwater concentrations data vary in quality from very questionable to adequate. Different analytical methods and detection limits plus poor quality control compromise the results. Sampling methods, such as the use of a bailer instead of a pump, can affect the quality of the samples obtained.

  Some data in the present data set appear erroneous such as reports of concentrations three orders of magnitude different from other values in the same well; this may indicate a confusion between μg/L (ppb) and mg/L (ppm) units. Situations like these should be identified and wells resampled if necessary.

  The historical data should be reviewed in light of these issues, and compared to each other to limit the likelihood of erroneous results.

- **Background Concentrations of Inorganic Constituents**--while this data gap is already being addressed (Hoover and LeGore 1991, DOE/RL 1992d, see Section 4.1.1.2), it still impedes proper interpretation of the concentrations of inorganics being observed in sampling.

- **Detection Limits**--some contaminants which may be present at low concentrations have toxicities high enough to render these concentrations important to health and environment concerns. These include hydrazine, bis(2-ethylhexyl)phthalate, 2,4-

dinitrotoluene, beryllium, pentachlorophenol, thallium, antimony, styrene, and selenium. Methods may have to be developed to obtain lower detection limits to adequately delineate these possibly important constituents.

- **Single Detections of Chemicals**--some of the chemicals included in the list of detections (Table 4-1) were detected only once in a well and only in one well. These chemicals include pentachlorophenol, 1,2-dichloroethane, 1,1,2-trichloroethane, several other organic compounds, silver (filtered), and thallium (both filtered and unfiltered). These detections should be reviewed and validated, and the well resampled and reanalyzed to confirm or refute these potentially spurious results. Particularly when only one member of a chemical family requires analysis, the cost of the analysis goes up significantly. To continue analyzing throughout the site for chemicals that were misreported in the first place is a misallocation of scarce resources.

- **Plumes at Only One Well**--for the chemicals listed above that were detected only once, or have been detected only in a single well, it is difficult to assess the significance of the resulting "plume" found only at that location. For these cases, the presence of the plume should be confirmed by repeated sampling. It is possible that this contamination is due to some local conditions, such as transport along the well casing, and that the contamination is not as high elsewhere, but if the level is high enough to be of regulatory concern, the potential for a plume should be checked with other wells located immediately downgradient and with other wells located immediately upgradient.

- **Well Construction Data**--some wells may be appropriate or inappropriate for particular uses (sampling, aquifer tests, geophysical logging) but this cannot be determined because of inconsistencies in the recorded information on their construction (especially screened depths) as well as their current condition (e.g., screen clogging). The depth of the wells could be especially significant in cases where the declining water table could leave a well dry; this could result in a loss of data until a new well can be installed.

  Based on review of existing well construction data and comparison to hydrostratigraphy, many of the wells have been screened across different hydrostratigraphic units. Some of these wells are identified on Table 4-2, and have groundwater elevations (and analytical results) which may therefore be unrepresentative of either screened unit. As discussed in Section 3.5.2, groundwater level elevations from the deeper aquifers or from wells representative of more than one hydrostratigraphic unit may have been included with unconfined aquifer elevations on existing water table maps.

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Well construction issues could easily be resolved to a considerable degree by television logging and other simple methods. All wells with screened intervals which are known or suspected to include multiple hydrostratigraphic units should be identified, and water levels from these wells should be reviewed for consistency and representativeness.

- **Well Locations and Elevations**--a more precise accounting of well locations and elevations is becoming increasingly important to the investigation. The locations of wells are important to allow development of detailed geologic models (cross sections) for field sampling plans, and the elevations are needed to provide the basis for calculating groundwater gradients. The gradients are so low in an area in the western portion of the 200 East Area that errors of less than 15 cm (6 in.) are significant, and distances between wells in this area are far enough that ordinary (third order) surveying techniques may not be sufficient. As recommended by Jensen (1987) some of the 600 Area wells need to be resurveyed due to suspiciously low unconfined aquifer groundwater elevations (pre-1987) and changes in top-of-casing elevations due to casing movement. Based on date-of-survey information provided by Westinghouse Hanford, the wells have not been resurveyed to date.

- **Aquifer Properties**--aquifer properties such as hydraulic conductivity, transmissivity, storage coefficient, and porosity are not well determined. To date, aquifer testing has consisted of slug testing and some poorly designed pumping tests. Pumping tests have been difficult to carry out due to problems disposing of fluids, and slug testing may not provide representative aquifer properties. Pumping test issues could be negotiated and solved, and properly designed tests carried out.

- **Geochemical Properties of Earth Materials**--Data on the geochemical properties of the earth materials in the vadose zone and the shallow unconfined aquifer are needed for modeling contaminant mobilization and transport. Geochemical properties such as K_d, Eh, and/or pH measurements for speciation, solubility, and mobility of inorganics, and organic carbon contents for transport of organics are needed for characterizing contaminant mobilization and transport. These properties may significantly influence contaminant migration and the effectiveness of remedial measures.

- **Potential for Continuing Releases from the Vadose Zone**--many source waste management units have been inactive for years and so have not added moisture to the soil column during this time. It is unknown how long after shutdown the soil under such a unit will continue to drain, and to transport contamination down to the groundwater. Since such a process, if it is occurring, would constitute a continuing source of groundwater contamination, it is important to predict when it will occur. This also applies to dry sites that have never received free liquids but through which wastes could be leached by precipitation recharge or by continuing discharges of clean

water to soils (via septic drain fields). Modeling efforts for transport through the vadose zone are ongoing, using models such as UNSAT-H, PORFLO-3, and VAM3D-CG, and so specific data requirements of these models will be included in the field investigation programs. A generic list of these data needs is presented in Table 8-2. It is also vital to obtain better data on the levels and depths of chemical and radiologic constituents in the soil column which are available for transport. This last issue is the responsibility of source investigations.

Another alternative in this regard is to monitor the transport of contaminants through the soil using borehole geophysical logging like the RLS program. This has the advantages of monitoring actual rather than theoretical migration rates of the contaminants of concern directly and cuts through the multitude of assumptions and approximations inherent in such modeling. It has the major disadvantage of requiring a much longer program to come up with results and the interpretation of the results may not allow extrapolation to other sites. In addition, many radionuclides do not have sufficient gamma emissions to allow detection of their migration.

There is also a potential problem with the well installation methods presently employed. The use of annular seals (clay-based grout) compromises the detection capability of the logging by attenuating radiation from beyond the borehole and introducing other radionuclides in the grout.

- **Estimation of Recharge Rates**--available data from previous studies (such as lysimeter studies, see Section 3.5.1.5.1) indicate a wide range of estimates of recharge through natural or disturbed Hanford Site soils. Since this could affect both the transport from dry or inactive sites as well as changes in concentration in the saturated zone during transport, it is potentially very important. Freshley and Graham (1988) indicate that the range of possible recharge rates lead to predictions of very different flow patterns in the unconfined aquifer, including opposite directions of flow through Gable Gap.

- **Hydraulic Interconnections with Confined Aquifers**--the effect of connections with confined aquifers, particularly the Ringold unit A gravels in the southern part of the 200 East Area, and the confined portions of the Rattlesnake Ridge interbed, can be of significant concern, mainly for the potential for allowing further spread of contamination but also due to its potential effects on flow in the unconfined aquifer. This is especially a potential in areas where the interbed sediments are exposed to overlying sediments through eroded areas of the basalt, such as between the 200 East Area and Gable Gap and in the fracture zone that was identified within the upper Elephant Mountain flow unit east of the 200 East Area. These areas are downgradient of many of the contaminant plumes in the 200 East Area, and so are of special concern.

- **Groundwater Inflows from Off-Hanford Site**--the quantity of flow entering the Hanford Site from upgradient (from the west), particularly from the Cold Creek and Dry Creek basins, is not well understood, and will affect the modeling by imposing important boundary conditions on the model. The sources could be natural infiltration of runoff or recharge from irrigation.

- **Contaminant Travel Time to the Columbia River**--this issue addresses the degree to which degradation can be anticipated to affect contaminant concentrations. If the travel time is known, then the decay of radioactive constituents can be accurately determined. This travel time can be obtained from groundwater modeling, and so interacts with a great many other factors with their own data needs, particularly hydraulic conductivity, porosity, gradients, and retardation parameters. It is significant to note that for the purposes of modeling these data are required for the entire area of potential migration across the Hanford Site to the Columbia River.

- **Dense Nonaqueous Phase Liquids (DNAPLs)**--some liquid chemicals that are denser .than water, low in viscosity, and relatively insoluble in water can form deposits of relatively pure chemicals in zones at the bottom of an aquifer, if disposed originally in sufficient quantity. This could be the situation with many of the chlorinated organic constituents listed on Table 4-1, particularly where these compounds are not associated with a petroleum hydrocarbon matrix. This possibility appears to be less likely in the 200 East Area than in the 200 West Area, where high concentrations of carbon tetrachloride have been observed, but could be occurring near the central landfill. If these deposits are present, they could act as "secondary sources" and continue to feed groundwater contamination even after the vadose zone is remediated (e.g., via vapor extraction). The presence of DNAPLs would also have an influence on the nature of the plume, making it more concentrated near the bottom of the aquifer than at the top (the case with vadose-zone sources). Because of their higher density, DNAPLs can move against the gradient (and flow) in the groundwater system in response to geological structures and gravity. Density plumes could also occur from high-salt wastes and could have a similar effect. One location where such a density plume is thought possibly to originate from is the BY Cribs near the 216-B-5 Reverse Well (impacting Well 299-E33-12, for example, see Sections 4.1.1.7.9 and 4.1.1.7.12). However, these waste materials may be less likely to lodge for extended periods of time in the aquifer and travel by their density gradient because of their solubility and high viscosity.

- **Enhancement of Contaminant Transport by Complexing**--some chemicals can help transport other possibly more toxic chemicals by forming complexes with them. At many sites a great variety of chemicals were potentially disposed, including some that were selected for the processes in which they were used to form such complexes.

- **Dispersivity**--this parameter is difficult to estimate in situ or from physical properties of the soils and is impossible to duplicate at laboratory scale. The best methods are by calibration to the behavior of plumes that have been tracked over time (mainly tritium and nitrate). The value of these parameters will significantly affect the changes in concentration as the plumes transit the site.

- **Vertical Extent of Plumes**--there are very few well groups that adequately assess the thickness of the contaminant plumes within the unconfined aquifer. Many of the newer wells are screened only in the shallow part of the unconfined aquifer, across the water table at the top of the saturated zone; some of the old wells have very long screened sections across multiple hydrostratigraphic units. Neither of these will give information about the depth to which contamination can be found in the plume in the unconfined aquifer or deeper aquifers. The existing well network should be supplemented with deeper wells to assess the vertical distribution of contamination. The data would assist evaluation of dispersivity and would assist in the screening of remedial technologies. These data are especially important for chemical constituents which can form DNAPLs such as chlorinated hydrocarbons listed on Table 4-1.

- **Vertical Gradients**--existing data on vertical gradients (Section 3.5) is largely based on previous work including DOE (1988), Jensen (1987), Graham et al. (1984) for the unconfined aquifer and the Rattlesnake Ridge interbed. More detailed assessment of vertical gradients between the shallow and deep portions of the unconfined aquifer, and between the unconfined aquifer and confined Ringold unit A gravels is necessary. Additional well installations in the deep unconfined and confined aquifers of the Ringold unit A gravels would provide supplemental information on vertical gradients, as well as contaminant distribution data. Vertical components can result in thicker plumes (based solely on advection, not dispersion) and thus will have to be taken into account.

- **Effects of Old Monitoring Well Construction**--wells constructed before the late 1980's were generally constructed of mild carbon steel rather than stainless steel. This construction is thought to affect the measured concentrations of both radioactive and hazardous constituents by adsorbing them. This can also have an effect on the use of the wells for gamma ray logging. It will be very expensive to replace these wells, and so some level of study should be put into determining if this is really a problem.

- **Focussed Feasibility Studies of Remedial Technologies**--some of the technologies suggested for use on groundwater should be assessed at various scales for their applicability in the 200 East Area groundwater environment. In part this investigation should include a comprehensive best available technology (BAT) assessment of applicable technologies, and should consider costs (per unit volume), secondary wastes,

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and adverse effects. Various properties for contaminant treatability should also be obtained through treatability testing; these include strippability, adsorbability, biodegradability (natural biodegradation), heavy metal properties, and natural degradability for radionuclides.

- **Innovative Technologies**--these state-of-the-art technologies for cleaning up groundwater should be assessed in a separate program which is linked to the AAMS studies by providing data requirements to field programs, and treatability studies (at various scales) to develop needed parameters and to preliminarily assess their applicability to site conditions.

8.3 DATA COLLECTION PROGRAM (STAGE 3 OF THE DQO PROCESS)

The data collection program is Stage 3 of the process to develop DQOs. Conducting an investigation by a sequentially-adapted process that uses the data as it comes in is a common method for optimizing the quantity and quality of the data collected. It would be very inefficient and overly expensive to specify beforehand all the well location depths sampling schedules, and analyses that will yield the most complete and accurate understanding of the contamination and physical behavior of the site. Data adequate to achieve the goals and objectives for remedial action decisions are obtained at a lower cost by using the information obtained in the field to focus the ongoing investigation and remediation process.

Initial sampling should collect new data believed most necessary to confirm and refine the conceptual model particularly along transport pathways with priority constituents or quantities of flow. Sampling may then be extended to further reduce uncertainty, to fill in remaining data gaps, to collect more detailed information for certain points where such information is required, or to conduct any needed treatability studies or otherwise support the data needs of the remedial action selection process. The need for subsequent investigation phases will be assessed throughout the investigation and remediation activities as data become available. Assessing completeness of the investigation data through a formal statistical procedure is not possible, given the complexity and uncertainty of the parameters required to describe the site and the time to make decisions. Rather, the use of engineering judgment is considered sufficient to the decision process.

8.3.1 General Rationale

The general rationale for the investigation of groundwater contamination in the 200 East Groundwater Aggregate Area is to collect needed data that are not available. Because of the size of the aggregate area, the complexity of past operations, and the number of potential sources and plumes, a large amount of new information will be required such as the specific radionuclides and chemicals present, their spatial distribution and form, and the presence of special migration pathways such as potential (localized) perched groundwater systems.

The following work plan approach will be used for LFIs and RI/FS in the 200 East Groundwater Aggregate Area. The results are described in Sections 8.3.2 and 8.3.3 in a general form.

- Existing data as described in Sections 2.0, 3.0, and 4.0 should be used to the maximum extent possible. Although existing data are not validated fully, the data are still useful in developing a preliminary conceptual model (Section 4.2) and in helping to focus and guide the planning of investigations, expedited actions, and interim measures. The data as is are sufficient for preliminary risk assessment purposes.

- Additional data at validated and screening levels should be collected to obtain the maximum amount of useful information for the amount of time and resources invested in the investigation.

- Data should be collected to support the intended data uses identified in Section 8.2.1.

- Data collected from initial investigation activities should be used to confirm and refine the conceptual model (Section 4.2), refine the analyte constituents of concern, adjust the locations for subsequently installed monitoring wells, and provide information to conduct interim response actions or risk assessment activities.

- Additional investigation activities are proposed to support quantitative baseline risk assessments for final cleanup actions and further refine the conceptual model.

- Field investigation techniques should be used to minimize the amount of hazardous or mixed waste generated. Any waste generated will be in accordance with EII 4.2, "Interim Control of Unknown Suspected Hazardous and Mixed Waste " (WHC 1988c).

8.3.2 General Strategy

The overall objective of any field investigation (LFI, IRM, or RI) of the groundwater in the 200 East Groundwater Aggregate Area will be to gather additional information to support risk assessment and remedial action selection according to the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a) flow chart discussed in Section 8.1.5. The general approach or strategy for obtaining this additional information is presented below.

- The investigations should interface closely with the source operable unit field investigations to achieve data goals of both projects with a minimal field program. For example, if geologic assessment is required in a particular source area, the data should be shared with the groundwater operable units, to allow refinement of the hydrogeological model. When samples are to be taken in saturated zones (for other reasons) they should also allow testing of parameters required for groundwater models.

- New wells should be situated according to the most recent data about plume extents and locations, to reduce uncertainty most efficiently. Thus, as data become available regarding groundwater concentrations, they should be incorporated in the model of plume distributions and the locations of subsequent wells to be reviewed according to this most recent information. Existing wells should be evaluated, and those which may be providing pathways for contaminant transport to deeper strata should be abandoned or remediated (this is a continuation of an already on-going program).

- Specification of analytical parameters should start with the long list of potential contaminants of concern and be narrowed to a shorter list as quickly as possible, perhaps with different lists in different areas limited to those of concern at the specific area. Increased use of field screening methods at the well head may also reduce the cost of analysis and increase the amount of meaningful data obtained for the cost expended by allowing submittal of only those samples most likely to be contaminated. Occasional samples should continue to be analyzed for the long list, but the best allocation of resources is to analyze for those constituents which will give the most information. Nondetects, if highly predictable, do not convey much additional information.

8.3.3 Investigation Methodology

Initial field investigations (mainly LFIs, but also associated with IRMs for appropriate plumes and possibly some RIs) may include some or all of the following integrated methodologies:

- Plume Nature and Extent Investigation (Section 8.3.3.1)
- Groundwater Transport Investigation (Section 8.3.3.2)
- Source Release Investigation (Section 8.3.3.3)
- Geologic Investigation (Section 8.3.3.4)
- Geodetic Survey (Section 8.3.3.5)

Each investigation methodology is briefly outlined in the following sections. Specific field methods such as well construction methods have not been recommended to allow flexibility in the development of field sampling plans which can be sensitive to very local conditions. Some of the data needs are very local especially for specific limited plumes, others must be addressed on an area-wide basis (e.g., stratigraphy interpretation). More detailed descriptions and specific methods and instrumentation will be included in site-specific work plans, sampling and analysis plans, and field sampling plans for LFIs/IRMs for plumes that require these investigations.

These investigations are presented in the approximate priority of their need, with the plume, nature and extent investigation first because of its importance to the decisions about remedial action on a site-by-site basis. The other investigations are of lower priority, and will be conducted according to the availability of resources.

8.3.3.1 Plume Nature and Extent Investigation. The purpose of the plume investigation is to confirm the characteristics and locations of the plumes in the 200 East Groundwater Aggregate Area. "Nature" encompasses the contaminants present in the plume as well as their concentrations and interrelations. "Extent" involves the areal bounds of the plumes but also their thicknesses (vertical extent). This investigation will address data gaps (Section 8.2.3) relating to the limitations in well coverage of plumes including single-well plumes, missing or unusual chemical constituents, confirmation or refutation of single detection chemicals, and the issue of vertical extent. Activities for this investigation methodology may include the following:

- **Installation of New Monitoring Wells**--this will allow gaps in the coverage of known plumes to be filled in. In particular, new wells should be situated just downgradient from single-well plumes (those with repeated confirmations of the presence of a chemical but only in one well), in areas with the greatest uncertainty about the location of existing plumes (e.g., in parts of the 200 East Area and 600 Area where wells are sparse and the plumes have moved beyond monitoring control in the 200 East Area), at lower portions of the unconfined aquifer, in the zone where the Ringold A becomes a confined aquifer, and in the uppermost confined basalt aquifers. Locations of these wells will be derived for priority plumes of concern in separate field sampling plans to be developed by Westinghouse Hanford. Some wells may be required on an aggregate area basis rather than at an operable unit scale.

- **Sampling and Analysis**--sampling of some existing wells that have not been adequately covered in the past and new wells should include analyses of constituents that have been reported or can reasonably be expected to be released in some of the waste streams going to cribs or other liquid waste disposal facilities. Appendix A includes Tables A-1 and A-2 that list the chemicals and radionuclides detected in samplings of wells and their maximum detections. Table A-3 lists constituents that have not been detected in any of these wells, including the number of times the constituent was analyzed for and the analysis detection limit. Table A-4 lists all wells where chemical constituents have been detected. These tables, in conjunction with the table of contaminants of concern (Table 4-5) can allow for selection of target analyte lists in the vicinity of specific plumes. To some extent, the ongoing groundwater sampling in support of the 200 Areas AAMS will address these issues.

  For the case of single-detection plumes where the compound in question is of concern at low concentrations, analysis at the well with the detection, as well as other nearby wells which may also be affected, should employ special analytical methods with lower detection limits. This will help delineate the actual extent of a plume with lower concentrations, and get a better estimate of the concentration even in the well with the detection. Wells with elevated gross alpha and/or gross beta should include tests for specific radionuclides which may be causing the indicator parameter.

  Some potentially highly toxic constituents may require method development to give suitably low detection limits.

  Determination of background levels (Hoover and LeGore 1991, DOE/RL 1992c, see Section 4.1.1.2) will also be supported by analysis of these groundwater samples.

  The proposed investigation will also include reviewing and television logging of wells to determine their suitability for sampling.

8.3.3.2 Groundwater Transport Investigation. The purpose of the groundwater transport investigation is to gather additional information about groundwater transport to determine future plume directions, changes in concentration, and potential impacts. To a great extent, this investigation will be interdependent on the development of groundwater models for the Hanford Site which are already under way under a separate Tri-Party Agreement milestone (M29-00), which is developing more detailed data requirements for the models.

Data gaps that this investigation will address include recharge rates both at former disposal sites as well as generally across the site, the potential for interconnections with other aquifers (also addressed by new wells listed in the plume investigation, Section 8.3.3.1), groundwater inflows from Cold Creek and Dry Creek valleys, dispersivity, vertical gradients

(also to be addressed with additional wells), and travel time issues. Data needs for contaminant mobilization and transport will also be developed, such as K_d, Eh, and/or pH measurements for speciation, solubility and mobility of inorganics, and organic carbon contents for transport of organics.

8.3.3.3 Source Release Investigation. A very significant data gap is whether former liquid disposal sites continue to release contamination to groundwater after disposal is terminated. This issue can be addressed in two ways, each of which may be confirmatory of the other. First, models should be calibrated using available data that will predict the flows in these unsaturated systems. This also may involve obtaining additional data to supply parameters for these models through field investigation, as determined by the model developers. Second, an investigation should be carried out to track levels of contamination beneath these facilities to see if there is a net movement of the contamination. This latter investigation will probably use radioactive contaminants such as tracers for contamination, and detect their levels and depths through spectral gamma logging, such as the RLS surveys being conducted in support of the AAMS study. Both studies should coordinate with field investigations being conducted for the source operable units to assure proper parameters are collected for the vadose zone transport models and that permanent logging wells are to be installed through representative facilities. Another aspect of the confirmatory field studies is to track groundwater concentrations at the tail end of plumes to determine from the groundwater side the possibility of continuing releases.

8.3.3.4 Geologic Investigation. The purpose of the geologic investigation is to clarify the stratigraphic constraints on groundwater flow. This may utilize geophysical methods in conjunction with geologic and geophysical logging in boreholes. It is essential that this investigation be coordinated with the field investigations at the various source operable units. This would minimize the drilling cost by drilling characterization wells once rather than twice (once for vadose zone properties then a separate boring for the saturated zone).

8.3.3.5 Geodetic Survey. Geodetic surveys will be conducted after the installation and completion of each investigation activity. Horizontal and vertical locations of all wells will be surveyed. The survey should also include existing wells with known or suspected erroneous reference elevations. The geodetic survey should be conducted by a professional surveyor licensed in the state of Washington and should be referenced to both historic (e.g., Hanford coordinates) and current coordinate datums (e.g., North American Datum of 1983 - NAD-83), both vertical and horizontal.

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8.3.4 Data Evaluation and Decision Making

Data will be evaluated as soon as results (e.g., soil gas, radiation screening, drilling results) become available for use in restructuring and focusing the investigation activities. Data reports will be developed that summarize and interpret new data. This includes the ongoing groundwater sampling and RLS borehole logging as part of the AAMS and the results of the source investigations under the various source AAMS. Data will be used to refine the conceptual model, further assess potential contaminant-specific ARARs, develop the quantitative risk assessment, and assess remedial action alternatives.

The objectives of data evaluation are:

- To reduce and integrate data to ensure that data gaps are identified and that the goals and objectives of the 200 East Groundwater AAMS are met
- To confirm that data are representative of the media sampled and that other QA/QC criteria have been met.

9 3 1 2 2 5 7 1 6 4 8

Table 8-1. Data Requirements for Modeling Flow and Transport.

C.1 CLIMATIC DATA

- 1.1 Precipitation Data (from Meteorological Measurements)
  - 1.1.1 Rainfall
  - 1.1.2 Snowmelt
  - 1.1.3 Runoff from Precipitation Events (Field-Measured)
- 1.2 Potential Evapotranspiration Data (From Meteorological Measurements)
  - 1.2.1 Air Temperature
  - 1.2.2 Relative Humidity (Wet and Dry Bulk)
  - 1.2.3 Wind Speed
  - 1.2.4 Solar Radiation

C.2 PLANT AND VEGETATION DATA

- 2.1 Transpiration Function (Field-Measured)
  - 2.1.1 Plant Type and Depth of Root System
  - 2.1.2 Plant Density
- 2.2 Plant Cover
  - 2.2.1 Leaf Area Index (Field-Measured)

C.3 FLOW DOMAIN CHARACTERISTICS

- 3.1 Size of Flow Domain (Based on Field Data)
  - 3.1.1 Spatial Discretization (Numerical Input)
  - 3.1.2 Temporal Discretization (Numerical Input)
- 3.2 Boundary Conditions
  - 3.2.1 Flow (Field-Measured Moisture Contents of Fluxes)
  - 3.2.2 Contaminant Transport (Field-Measured Concentration or Mass Fluxes for Various Species)
  - 3.2.3 Recharge from Vadose Zone to Unconfined Aquifer
  - 3.2.4 Discharge Locations and Levels
  - 3.2.5 Interchange with Adjacent (confined) Aquifers
- 3.3 Initial Conditions
  - 3.3.1 Flow (Field-Measured Moisture Contents or Pressure Potentials)
  - 3.3.2 Contaminant Transport (Field-Measured Concentrations for Various Contaminant Species)
- 3.4 Depth to Water Table (Field-Measured)
- 3.5 Thickness and Hydraulic Properties of the Unconfined Aquifer (Field-Measured)
- 3.6 Location and Rates of Pumping/Injection Wells (Field Data)

9 3 1 2 9 7 1 6 4 9

Table 8-1. Data Requirements for Modeling Flow and Transport.

C.4 SOIL CHARACTERISTICS (These are considered to be the critical hydrologic parameters)

- 4.1 Heterogeneity and Anisotropy (Field-Measured)
  - 4.1.1 Layering (Thickness and Continuity of Various Layers)
  - 4.1.2 Anisotropic Characteristics of Various Layers
- 4.2 Moisture Characteristic Curves for Each Layer
  - 4.2.1 Moisture Content Versus Pressure Potential Curves (Field or Laboratory Measured)
  - 4.2.2 Hydraulic Conductivity Versus Moisture Content Curves (Field- or Laboratory-Measured or Derived From Moisture Content Versus Pressure Potential Curves)
  - 4.2.3 Hysteresis Data for Wetting and Drying Cycles (Field- or Laboratory-Measured)
- 4.3 Saturated Hydraulic Properties for Unconfined and Confined Aquifers
  - 4.3.1 Conductivities
  - 4.3.2 Storage Coefficients
- 4.4 Soil Bulk Density and Porosity for Each layer (Field- or Laboratory-Measured)

C.5 CONTAMINANT TRANSPORT PARAMETERS

- 5.1 Diffusion Coefficients (Laboratory-Measured or Obtained From Literature)
- 5.2 Hydrodynamic Dispersion Coefficients (Laboratory-Measured or Obtained from Literature)
- 5.3 Retardation Coefficients (Laboratory-Measured or Obtained From Literature)
- 5.4 Radioactive Decay Constants (Laboratory-Measured or Obtained From Literature)

C.6 CONTAMINANT SOURCE CHARACTERISTICS

- 6.1 Major Radionuclides and Their Concentrations
- 6.2 Mass Source Loading Rate for Radionuclide

Source: DOE/RL1991e

9 3 1 2 9 3 7 1 6 3 0

Table 8-2. Data Needs for Preliminary Remedial Action Technologies for 200 East Groundwater Aggregate Area Operable Units. Page 1 of 2

Technology Group	Physical Attribute	Chemical Attribute
Physical Containment Examples: • Freeze wells • Grout curtains	• Areal extent • Depth • Hydrogeologic conditions • Geologic conditions • Potential siting for operational refrigeration units • Surface access along corridor of installation	• Radioactivity
Hydraulic Containment Examples: • Injection wells • Extraction wells	• Areal extent • Depth • Hydrogeologic conditions • Potential water disposal sites • Sources of water for injection	• Chemical contaminants which affect disposal of extracted water
Pump and Treat Examples: • Comprehensive BAT treatment • Target treatment of single chemical class Treatment options • Ion exchange • Chemical precipitation • Air stripping • Carbon absorption • Reverse osmosis • Evaporation • UV oxidation • Filtration	• Areal extent • Vertical extent • Hydrogeologic conditions • Geologic conditions • Potential water disposal/ reinjection sites • Siting for potential treatment facilities	• Applicable treatment options depend on complex, interrelated contaminant matrix • Contaminant variability • Geochemistry of saturated soils
Natural Attenuation Examples: • Point of use • Point of discharge	• Areal extent • Migration pathways • Geologic conditions between source and point of use • Hydrogeologic conditions between source and point of use • Siting conditions for treatment facility at point of use	• Chemical matrix at point of use • Applicable treatment options depend on complex, interrelated contaminant matrix • Geochemistry between source and point of use • Natural attenuation potential of contaminant

9 3 1 2 9 7 1 6 5 1

Table 8-2. Data Needs for Preliminary Remedial Action Technologies for 200 East Groundwater Aggregate Area Operable Units. Page 2 of 2

Technology Group	Physical Attribute	Chemical Attribute
<u>In Situ Treatment</u> Examples: • Air sparging • In situ precipitation • In situ destruction • In situ mobilization • In situ natural attenuation	• Areal extent • Vertical extent • Hydrogeologic conditions • Geologic conditions	• Specific treatment is contaminant dependent • Geochemistry of saturated soils • Contaminant heterogeneity

9 3 1 2 9 5 7 1 6 5 2

Table 8-3. Analytical Levels for the 200 East Groundwater Aggregate Area.

Level	Description
LEVEL I	Field screening. This level is characterized by the use of portable instruments which can provide real-time data to assist in the optimization of sampling point locations and for health and safety support. Data can be generated regarding the presence or absence of certain contaminants (especially volatiles) at sampling locations.
LEVEL II	Field analysis. This level is characterized by the use of portable analytical instruments which can be used onsite, or in mobile laboratories stationed near a site (close-support laboratories). Depending on the types of contaminants, sample matrix, and personnel skill, qualitative and quantitative data can be obtained.
LEVEL III	Laboratory analysis using methods other than the Contract Laboratory Program (CLP) Routine Analytical Services (RAS). This level is used primarily in support of engineering studies using standard EPA-approved procedures. Some procedures may be equivalent to CLP RAS without the CLP requirements for documentation.
LEVEL IV	Contract Laboratory Program (CLP) Routine Analytical Services (RAS). This level is characterized by rigorous QA/QC protocols and documentation and provides qualitative and quantitative analytical data. Some regions have obtained similar support via their own regional laboratories, university laboratories, or other commercial laboratories.
LEVEL V	Nonstandard methods. Analyses which may require method modification and/or development are considered Level V by CLP Special Analytical Services (SAS).

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Table 8-4. Data Quality Objective Parameters for Chemical/Radiochemical Analyses.

	Soil/Sediment				Water			
	Analysis Method	Practical Quantitation Limit (pCi/g)	Precision (RPD)	Accuracy (%)	Analysis Method	Practical Quantitation Limit (pCi/L)	Precision (RPD)	Accuracy (%)
RADIONUCLIDES								
Gross Alpha	900.0 M	TBD	±30	±25	900.0	10	±25	±25
Gross Beta	900.0 M	TBD	±30	±25	900.0	5	±25	±25
Gamma Scan	D3699 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Actinium-225	907.0 M	TBD	±30	±25	907.0	TBD	±25	±25
Actinium-227	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Americium-241	Am-01	TBD	±30	±25	Am-03	TBD	±25	±25
Americium-242	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Americium-242m	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Americium-243	Am-01	TBD	±30	±25	Am-03	TBD	±25	±25
Antinomy-126	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Antimony-126m	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Barium-137m	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Bismuth-210	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Bismuth-211	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Bismuth-213	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Bismuth-214	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Carbon-14	C-01 M	TBD	±30	±25	TBD	TBD	±25	±25
Cesium-134	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Cesium-135	901.0 M	TBD	±30	±25	901.0	TBD	±25	±25
Cesium-137	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Cobalt-60	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Curium-242	907.0 M	TBD	±30	±25	907.0	TBD	±25	±25
Curium-244	907.0 M	TBD	±30	±25	907.0	TBD	±25	±25
Curium-245	907.0 M	TBD	±30	±25	907.0	TBD	±25	±25
Europium-152	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Europium-154	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25

Table 8-4. Data Quality Objective Parameters for Chemical/Radiochemical Analyses.

	Soil/Sediment				Water			
	Analysis Method	Practical Quantitation Limit (pCi/g)	Precision (RPD)	Accuracy (%)	Analysis Method	Practical Quantitation Limit (pCi/L)	Precision (RPD)	Accuracy (%)
RADIONUCLIDES (cont.)								
Europium-155	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Francium-221	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Iodine-129	902.0 M	TBD	±30	±25	902.0	TBD	±25	±25
Lead-209	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Lead-210	Pb-01 M	TBD	±30	±25	Pb-01	TBD	±25	±25
Lead-211	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Lead-212	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Lead-214	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Neptunium-237	907.0 M	TBD	±30	±25	907.0	TBD	±25	±25
Neptunium-239	D35649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Nickel-59	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Nickel-63	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Niobium-93m	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Plutonium	Pu-02	TBD	±30	±25	Pu-10	TBD	±25	±25
Plutonium-238	Pu-02	TBD	±30	±25	Pu-10	TBD	±25	±25
Plutonium-239/240	Pu-02	TBD	±30	±25	Pu-10	TBD	±25	±25
Plutonium-241	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Polonium-214	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Polonium-215	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Polonium-218	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Potassium-40	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Protactinium-231	TBD	TBD	±30	±25	TBD	TBD	±25	±25

Table 8-4. Data Quality Objective Parameters for Chemical/Radiochemical Analyses.

	Soil/Sediment				Water			
	Analysis Method	Practical Quantitation Limit (pCi/g)	Precision (RPD)	Accuracy (%)	Analysis Method	Practical Quantitation Limit (pCi/L)	Precision (RPD)	Accuracy (%)
RADIONUCLIDES (cont.)								
Protactinium-234m	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Radium	Ra-04	TBD	±30	±25	Ra-05	TBD	±25	±25
Radium-225	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Radium-226	Ra-04	TBD	±30	±25	Ra-05	TBD	±25	±25
Ruthenium-106	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Samarium-151	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Selenium-79	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Sodium-22	D3649 M	TBD	±30	±25	D3649 M	TBD	±25	±25
Strontium-90	Sr-02	TBD	±30	±25	Sr-02	TBD	±25	±25
Technetium-99	Tc-01 M	TBD	±30	±25	Tc-01	TBD	±25	±25
Thallium-207	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Thorium-227	00-06	TBD	±30	±25	00-07	TBD	±25	±25
Thorium-229	00-06	TBD	±30	±25	00-07	TBD	±25	±25
Thorium-230	00-06	TBD	±30	±25	00-07	TBD	±25	±25
Thorium-231	TBD	TBD	±30	±25	TBD	TBD	±25	±25
Tritium	906.0 M	TBD	±30	±25	906.0	300	±25	±25
Uranium	U-04	TBD	±30	±25	U-04	TBD	±25	±25
Uranium-233	U	TBD	±30	±25	908.0	TBD	±25	±25
Uranium-234	U	TBD	±30	±25	908.0	TBD	±25	±25
Uranium-235	U	TBD	±30	±25	908.0	TBD	±25	±25
Uranium-238	U	TBD	±30	±25	908.0	TBD	±25	±25
Yttrium-90	Sr-02	TBD	±30	±25	Sr-02	TBD	±25	±25
Zirconium-93	TBD	TBD	±30	±25	TBD	TBD	±25	±25

Table 8-4. Data Quality Objective Parameters for Chemical/Radiochemical Analyses.

	Soil/Sediment				Water			
	Analysis Method	Practical Quantitation Limit (mg/kg)	Precision (RPD)	Accuracy (%)	Analysis Method	Practical Quantitation Limit (μg/L)	Precision (RPD)	Accuracy (%)
INORGANICS								
Arsenic	7061	0.02	±25	±30	7061	0.0005	±20	±25
Barium	6010	0.02	±25	±30	200.8	0.00002	±20	±25
Boron	6010	TBD	±25	±30	200.8	0.00011	±20	±25
Cadmium	6010	0.09	±25	±30	200.8	1	±20	±25
Chromium	6010	0.07	±25	±30	200.8	0.0002	±20	±25
Copper	6010	0.06	±25	±30	220.2	0.00005	±20	±25
Cyanide	9010	TBD	±25	±30	335.3	50	±20	±25
Fluoride	300 M	TBD	±25	±30	300	50	±20	±25
Iron	6010	20	±25	±30	6010	70	±20	±25
Lead	6010	0.45	±25	±30	200.8	0.0002	±20	±25
Manganese	6010	0.02	±25	±30	6010	20	±20	±25
Mercury	7471	0.02	±25	±30	245.2	2	±20	±25
Nickel	6010	1.5	±25	±30	200.8	0.0002	±20	±25
Nitrate	300 M	TBD	±25	±30	300	130	±20	±25
Nitrite	300 M	TBD	±25	±30	300	40	±20	±25
Selenium	6010	0.75	±25	±30	200.8	0.001	±20	±25
Silver	6010	2	±25	±30	200.8	0.00002	±20	±25
Titanium	6010	TBD	±25	±30	6010	TBD	±20	±25
Vanadium	6010	0.08	±25	±30	200.8	0.0001	±20	±25
Zinc	6010	0.02	±25	±30	200.8	0.0002	±20	±25

Table 8-4. Data Quality Objective Parameters for Chemical/Radiochemical Analyses.

	Soil/Sediment				Water			
	Analysis Method	Practical Quantitation Limit (mg/kg)	Precision (RPD)	Accuracy (%)	Analysis Method	Practical Quantitation Limit (μg/L)	Precision (RPD)	Accuracy (%)
ORGANICS								
Acetone	8240	0.1	±25	±30	8240	100	±20	±25
Carbon tetrachloride	8240	0.005	±25	±30	8240	1	±20	±25
Chloroform	8240	0.005	±25	±30	8240	5	±20	±25
Kerosene	8015M	20	±35	±30	8015M	500	±35	±25
Methylene chloride	8240	0.005	±25	±30	8240	5	±20	±25
MIBK	8240	0.5	±25	±30	8240	5	±20	±25
1,1,1-Trichloroethane	8240	0.005	±25	±30	8240	5	±20	±25
Toluene	8240	0.005	±25	±30	8240	5	±20	±25
Tributyl phosphate	TBD	TBD	±25	±30	TBD	TBD	±30	±25

TBD = To Be Determined
M = method modified to include extraction from the solid medium, extraction method is matrix and laboratory-specific
RPD = Relative Percent Difference
Prescribed Procedures for Measurement of Radioactivity in Drinking Water (EPA 1980)
Test Methods for Evaluating Solid Wastes (EPA 1986b)
Methods for Chemical Analysis of Water and Wastes (EPA 1983)
Eastern Environmental Radiation Facility Radiochemistry Procedures Manual (EPA 1984)
Precision and accuracy are goals. Since these parameters are highly matrix dependent they could vary greatly from the goals listed.

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9.0 RECOMMENDATIONS

The purpose of the aggregate area management study (AAMS) is to compile and evaluate the existing body of knowledge to support the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a) decision making process. A primary task in achieving this purpose is to assess each contaminant within the groundwater aggregate area to determine the most effective path for remediation within the statutory requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and Resource Conservation and Recovery Act (RCRA). The existing body of pertinent knowledge regarding the 200 East Groundwater Aggregate Area was summarized and evaluated in the previous sections of this study. A data evaluation process has been established that uses the existing data to develop preliminary recommendations on the appropriate remediation path for each contaminant detected in groundwater monitoring wells. This data evaluation process is a refinement of the *Hanford Site Past-Practice Strategy* (Figure 1-2) and establishes criteria for selecting appropriate *Hanford Site Past-Practice Strategy* paths (expedited response action [ERA], interim remedial measure [IRM], limited field investigation [LFI], and final remedy selection) for contaminant releases within the 200 East Groundwater Aggregate Area. The process is an extension of, and is consistent with, the process used in source AAMS to plan remediation for waste management units and unplanned releases. A discussion of the criteria for path selection and the results of the data evaluation process are provided in Sections 9.1 and 9.2, respectively. Figure 9-1 provides a flowchart of the data evaluation process that will be discussed. Table 9-1 provides a summary of the results of the data evaluation assessment of each constituent. Table 9-2 provides the decisional matrix patterns followed for each constituent.

This section presents recommended assessment paths for the contaminants detected in the 200 East Groundwater Aggregate Area. These recommendations are only proposed at this time and are subject to adjustment and change. Factors that may affect development of final recommendations include, but are not limited to, comments and advice from the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), or U.S. Department of Energy (DOE); identification and development of new information; and modification of the criteria used in the assessment path decision-making process. The data evaluation process depicted on Figure 9-1 and discussed in Section 9.1 was developed to facilitate only the technical data evaluation step shown on the *Hanford Site Past-Practice Strategy* (Figure 1-2). Procedural and administrative requirements to implement the recommendations provided in this AAMS will be performed in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990) and the *Hanford Site Past-Practice Strategy* (DOE/RL 1992a). Changes in recommendations will be addressed, and more detail on recommended assessment

paths for groundwater contamination will be included in work plans for the actual investigation and remediation activities as they are developed.

Many of the distinct contaminant plumes in the 200 East Groundwater Aggregate Area with the highest rankings have enough information on the nature and extent of contamination for at least preliminary risk assessments based on their present day concentrations and distribution of contaminants. Some constituents with lower concentrations or poorly defined plumes will require an LFI or remedial investigation (RI) to verify that contamination is present, or to assess the extent of contamination to support IRM path decisions.

ERAs. The data evaluation process recommends that an ERA be initiated for the highest concentration portion (greater than 800 pCi/L, 100 times the 4% Derived Concentration Guide (DCG) standard of 8 pCi/L) of the Strontium-90 (^{90}Sr) plume B in the immediate vicinity of the 216-B-5 Reverse Well. Although indications are that this plume is not migrating significantly, it is felt that the high activity in the plume and the fact that ^{90}Sr is found in the groundwater make this eligible for consideration for an ERA. This ERA would have to deal with what is potentially a very recalcitrant problem, as indicated by the fact that the well was last used for disposal in 1947, and these highest levels have only shown up in two of the closest monitoring wells, 299-E28-23 and 299-E28-25. The ERA will probably have to attempt a variety of remedial technologies, including innovative processes such as in-situ soil washing or solubilization or in-situ precipitation, or a combination of extraction, treatment (by ion exchange, precipitation, co-precipitation/adsorption, or reverse osmosis), and disposal of the effluent, possibly by reinjection into the aquifer for containment and flushing. The actual remediation will be chosen through the Engineering Evaluation/Cost Analysis (EE/CA) process required for ERAs.

The ^{90}Sr plume recommended for an ERA overlaps at the two nearby wells with the highest concentrations of the plumes of Cesium-137 (^{137}Cs) and Plutonium-239,240 ($^{239,240}Pu$), both of which are proposed for other remediation paths. While the ERA will focus on removing the ^{90}Sr, the other radioactive contaminants of concern will behave similarly to the ^{90}Sr and so will also likely be removed during the ERA.

The ^{90}Sr plume represents the highest contribution to the maximum carcinogenic relative risk at present according to the Multimedia Environmental Pollutant Assessment System (MEPAS) model (Section 5.0), with only the unconfirmed detections of hydrazine and bis(2-ethylhexyl)phthalate that would if confirmed show higher carcinogenic relative risk. This radionuclide is not a major contributor to future carcinogenic risk, probably because of its retardation, and thus limited tendency to migrate.

IRMs. The next highest contributor to present carcinogenic relative risk, and the highest contributor to future carcinogenic relative risk, is ^{99}Tc, which is a proposed IRM. The ^{99}Tc plume B effectively coincides with areas where nitrate plume B, cyanide, and ^{60}Co are above drinking water standards maximum contaminant levels (MCLs) or 4% of DCGs; therefore, all these plumes should be addressed collectively under a single multicontaminant IRM centered at Well 699-50-53A. Nitrate and cyanide are respectively the seventh and third highest present noncarcinogenic relative risk, and respectively second and third ranked for future noncarcinogenic relative risk. There are also high levels of several dissolved metals, including selenium, strontium, magnesium, and potassium, which contribute to the noncarcinogenic relative risk. Dealing with the nitrate and the cyanide at this location also mitigates the second and third highest future noncarcinogenic relative risk.

Also proposed for IRMs are ^{137}Cs and $^{239\text{-}240}Pu$, which are above their 4% DCGs near the 216-B-5 Reverse Well. This IRM is included here for completeness; the contamination will largely be remediated as part of the ^{90}Sr ERA.

The fourth IRM involves possible remediation of uranium, including its three isotopes most common at Hanford (^{234}U, ^{235}U, and ^{238}U), at the one well (299-E28-21) where ^{234}U and ^{238}U exceed standards.

LFIs/RI. Other inorganic constituents that may present significant relative risks, including aluminum, antimony, arsenic, beryllium, cadmium, chromium, selenium, and thallium, will require at least an LFI assessment of background levels to confirm potential risks or exceedances before IRMs are initiated. Similar studies (under the RI rather than an LFI) will be necessary before a risk assessment can be completed for barium, boron, cobalt, copper, iron, lead, lithium, magnesium, manganese, mercury, nickel, potassium, silver, sodium, strontium, vanadium, and zinc. Two radiochemicals, ^{40}K and uranium, will require determination of their naturally-occurring levels as well. Some studies may also be necessary to better determine the extent of any or all of these constituents. Of these inorganics, beryllium, thallium, selenium, aluminum, and antimony are major contributors to noncarcinogenic relative risk.

Lead lacks an EPA-approved toxicity value; therefore, risk-related action for this constituent may not be possible to determine. One inorganic which is not naturally occurring, hydrazine, will require an LFI to determine the nature and extent of its plume, and even to confirm that it is present (the two wells in which it was detected have apparently not been resampled and analyzed). Hydrazine, if present at the concentration detected, would be ranked far and away the highest carcinogenic relative risk of all constituents in the 200 East Groundwater Aggregate Area. The presence of hydrazine is uncertain because the two wells in which it was detected are distant from each other, but since it was used in the separations processing it is possible that releases have occurred.

Another area for a combined organics LFI involves several pesticides which have a strikingly consistent pattern of detections among a limited set of wells. The pesticides include:

Aldrin
DDD
DDT
Dieldrin
Endrin
Endrin Aldehyde
Gamma BHC
Heptachlor

These pesticides were detected in five wells near the grout vault area: 299-E25-29P, -31, -33, -32P, and 299-E34-8. It must yet be confirmed that these are actual detections, by validation of the results and confirmation sampling, and if so the LFI should be extended to determine their nature and extent. These pesticides include some (endrin, dieldrin, and heptachlor) which are major contributors to carcinogenic relative risk, and two (endrin and heptachlor) which are above their MCLs.

Recommended LFI activities in support of other possible IRMs for organics include verification and/or plume delineation of bis(2-ethylhexyl)phthalate, 2,4-dinitrotoluene, 2,4-dinitrophenol, and pentachlorophenol. These constituents are potentially contributors of some of the highest levels of relative risk. Because of its high detection limit (10 ppb), bis(2-ethylhexyl)phthalate is above its MCL (6 ppb) in all thirteen wells where it was detected. Other detected organics do not appear to be of sufficient concern to merit special investigation before the RI is initiated in the 200 East Aggregate Area.

Among other radionuclides, tritium (^{3}H) is proposed for inclusion in the final remedy risk assessment; gross alpha and beta are proposed for LFIs to determine the specific radionuclides which contribute to these indicator parameters, and ^{40}K, Ruthenium-106 (^{106}Ru), and Iodine-129 (^{129}I) are proposed for LFIs to support decisions on whether an IRM is justified. The LFIs should mainly be scoped to better delineate the nature and extent of these plumes. Finally, other detected radionuclides are proposed for the RI to support final remedy risk assessment.

In some cases various separate geographic portions of the plumes, as shown in the plume maps (Figures 4-1 through 4-15), are recommended for LFI or RI investigations while the higher priority portion is recommended for IRM activities.

A discussion of the four decision-making paths shown on Figure 9-1 (ERA, IRM, LFI, and final remedy selection) is provided in Section 9.1. Section 9.2 provides a discussion of the contaminants categorized under each of these paths. A discussion of regrouping and prioritization of the contaminants is provided in Section 9.3. Recommendations for defining and prioritizing groundwater operable units within the 200 East Groundwater Aggregate Area are provided in Section 9.3. All recommendations for future characterization needs (see Section 8.0) will be more fully developed and implemented through work plans. Plan development and submittal will be accomplished in accordance with requirements of the *Hanford Site Past-Practice Strategy* and the Tri-Party Agreement (Ecology et al. 1990) and could include RI/FS or LFI work plans. Sections 9.4 and 9.5 provide recommendations for focused feasibility and treatability studies, respectively. Section 9.6 discusses recommendations for site characterization on an aggregate area scale.

9.1 DECISION MAKING CRITERIA

The criteria used to assess the most appropriate and expeditious remediation process path are based primarily on urgency for action and whether data are adequate to proceed along a given path (Figure 9-1). Chemical-specific contaminant plumes [i.e., contaminants detected, as developed by Connelly et al. (1992a) and checked by a direct access of the Westinghouse Hanford groundwater contamination data base] in 200 East Area groundwater are considered evidence of a release and are thus initially evaluated in the data evaluation process as candidates for an ERA. However, gross alpha and beta are considered indicator parameters and are not developed as distinct constituents. Conditions that might trigger an ERA are the determination of an unacceptable health or environmental risk or that minimal time is available to mitigate the problem (DOE/RL 1992a). As a result, candidate ERA constituents were evaluated against a set of criteria to determine whether potential for exposure to unacceptable health or environmental risks currently exists. Despite the fact that there presently are no receptors (e.g., no drinking water wells in the vicinity, no seeps, etc.), and thus no present risk from the groundwater, the presence of high levels of contaminants in groundwater could be considered an unacceptable release. Contaminants recommended for ERAs will undergo a formal evaluation following the selection process outlined in WHC (1991b).

Constituents that are not recommended for an ERA continue through the data evaluation process. Contaminants continuing through the process that potentially pose a high relative risk (refer to Section 5.0) become candidates for an IRM. The criteria used to determine a high risk potential, thereby indicating a high priority, include relative risk and/or exceedance of standards. The candidate IRM contaminants are identified in Table 9-2 with "Y" in the IRM section. Candidate IRMs were then further evaluated to determine if an

IRM is appropriate. Candidate IRM contaminants that did not meet the IRM criteria were placed into the final remedy selection path.

Specific criteria used to develop initial recommendations for ERAs, LFIs, and IRMs for constituents detected within the 200 East Groundwater Aggregate Area are provided in Sections 9.1.1 and 9.1.2. Constituents not initially addressed under an ERA, LFI or IRM will be evaluated under the final remedy selection path discussed in Section 9.1.3.

9.1.1 Expedited Response Action Path

All detected constituents are assessed against the ERA criteria to determine if they pose an unacceptable health or environmental risk. Again, in the absence of receptors, this must be considered a theoretical health or environmental risk. The *Hanford Site Past-Practice Strategy* describes conditions that might trigger abatement under an ERA. Generally, these conditions would rely on a determination of, or suspicion of, existing or future unacceptable health or environmental risks, and a short time-frame available to mitigate the problem. Conditions include, but are not limited to:

- Actual or potential exposure to nearby human populations, biota, or the food chain from hazardous substances and radioactive or mixed waste contaminants
- Actual or potential contamination of drinking water supplies or sensitive ecosystems
- Threats of release of hazardous substances and radioactive or mixed waste contaminants
- High levels of hazardous substances and radioactive or mixed waste contaminants in soils that pose or may pose a threat to human health or the environment, or have the potential for migration
- Weather conditions that may increase the potential for release or migration of hazardous substances and radioactive or mixed waste contaminants
- The availability of other appropriate federal or state response mechanisms to respond to the release
- Time required to develop and implement a final remedy

- Further degradation of the medium which may occur if a response action is not expeditiously initiated

- Risks of fire or explosion or potential for exposure as a result of an accident or failure of a container or handling system

- Other situations or factors that may pose threats to human health, welfare, or the environment.

These conditions were used as the initial screening criteria to identify candidate contaminants for ERAs. Candidate contaminants that did not meet these conditions were not assessed through the ERA evaluation path. Contaminants were eliminated if the constituents were not hazardous, i.e., if they did not have EPA risk parameters. Additional criteria for further, detailed screening of ERA candidates were developed based on the conditions outlined in the *Hanford Site Past-Practice Strategy*. These additional screening criteria are shown in Figure 9-1 and are described below.

Constituents were first assessed to determine if they pose unacceptable (theoretical) health or environmental risks. The criteria used to determine "unacceptable" are based on the maximum concentration detected (averaged for all samples collected in a well during 1989 through 1992). For hazardous or radioactive constituents at concentrations that are 100 times the applicable standard (" > 100*Std?" on Table 9-2), the contaminant continues to be considered for an ERA. Application of the criterion of 100 times applicable standards is for quantification of the strategy criteria which addresses "high levels of hazardous substances and radioactive or mixed waste contaminants ...." The factor of 100 is based on engineering judgment of what constitutes a high level of contamination warranting expedited action. Standards applied include MCLs under the Safe Drinking Water Act and 4% of DOE DCGs as prescribed by DOE Order 5400.5, Section II.1.d(2) for radionuclides which do not have promulgated MCLs. The application of these standards does not imply they are recognized as applicable or relevant and appropriate requirements (ARARs). Final promulgation of the most recent MCLs was considered an adequate basis for their use in this screening; their effective dates were not considered because of the long-term nature of the remediation process.

The ERA screening criteria, in addition to those presented in the *Hanford Site Past-Practice Strategy*, were applied to provide a consistent quantitative basis for making recommendations in this AAMS. Final decisions to implement the recommendations developed in this AAMS will be made collectively between DOE, EPA, and Ecology.

If a groundwater contaminant concentration is unacceptable with respect to health or environmental risk according to these criteria, it may still be necessary to verify if the

contamination level is real. It is possible that some detections are spurious, due to either laboratory error or a transcription error in conveying the laboratory results to the data base used in this analysis. Thus, an ERA should not be initiated on the basis of single isolated analytical results. Only if the concentration is confirmed (abbreviated "Conf?" on Table 9-2), and is based on more than one analytical result will the constituent continue to be considered for an ERA. The other constituents will drop down for consideration on the IRM path. Even in a worst-case scenario (e.g., a newly detected true high-concentration plume is dropped from the ERA path), LFI confirmation studies will be initiated to support an IRM and the situation would be controlled.

At the next decision step, even if a contaminant concentration is a true high priority, a technology must be readily available to control the contaminant plume for it to be considered for an ERA. An example that would require substantial technology development before implementation of cleanup is tritium since the established treatment technology available to separate low concentrations of tritium from water has not been demonstrated to be effective at a scale applicable to Hanford Site plumes. This is referred to on Figure 9-1 and Table 9-2 as best demonstrated available technology (BDAT). The availability of funds to develop technology for these contaminants is beyond the scope of this AAMS.

The next step in the ERA evaluation path involves determining whether implementation of the available technology would have adverse consequences that would offset the benefits of an ERA. Examples of adverse consequences (abbreviated "adv cnsq" on Table 9-2) include: (1) use of technologies that result in risks to cleanup personnel or the public that are much greater than the risks of the contaminant; (2) the ERA would preclude future remedial actions; and (3) the ERA would prevent or greatly hinder future data collection activities. If adverse consequences are not expected, the constituent remains in consideration for an ERA. At this point, because all criteria are satisfied, the recommendation for an ERA is made.

The final decision regarding whether ERAs are pursued in groundwater aggregate areas will be made among DOE, EPA, and Ecology based, at least in part, on the recommendations provided in this section, results of the final selection process outlined in WHC (1991b), and availability of resources.

9.1.2 Limited Field Investigation and Interim Remedial Measure Paths

An IRM is desired for high priority contaminants/plumes where extensive characterization is not necessary to reach defensible cleanup decisions. The first step, therefore, in the IRM evaluation path is a screening based on (1) exceedance of MCLs provided in applicable standards, e.g., drinking water standards (40 CFR 141) or 4% of the

DCGs (DOE Order 5400.5), and (2) semiquantitative relative risk indices (RRIs) developed in Section 5.0. Both of these numerical criteria are presented in Table 9-2.

Comparison of the maximum contaminant concentrations in groundwater to the MCLs and DCGs identified those contaminants that would be considered for an IRM. The RRI values provided a supplementary basis for prioritizing potential IRMs for contaminants that do not have an MCL. These high priority contaminants were considered in the IRM path.

High priority contaminants were then evaluated to determine if sufficient need and information exists such that an IRM could be pursued. Implementation of an IRM for a contaminant with minimal characterization may rely on observational data acquired during remedial activities, including full-scale treatability studies, pump tests to determine aquifer properties, and confirmatory sampling using existing wells. Successful execution of this strategy is expected to reduce both time and cost for cleanup of the site groundwater without impacting the effectiveness of the implemented action.

The next step in the IRM evaluation path is to assess data adequacy. The existing data are evaluated to determine if: (1) existing data are sufficient to develop a conceptual model and perform a qualitative risk assessment; (2) the IRM will work for this path; (3) implementing the IRM will have adverse impacts on the environment, future remediation activities or data collection efforts; (4) the benefits of implementing the IRM are greater than the costs. If data are not adequate, an assessment will be made to determine if an LFI might provide enough data to perform an IRM. If an LFI is not expected to collect sufficient data to perform an IRM, the contaminant will be addressed in the final remedy selection path.

The final step in the IRM evaluation process is to assess if the IRM will work without significant adverse consequences. This includes: will the IRM be successful? will it create significant adverse environmental impacts (e.g., environmental releases)? will the costs outweigh the benefits? will it preclude future cleanup or data collection efforts? and will the risks of the cleanup be greater than the risks of no action? Units are recommended for IRMs where remediation is considered to be possible without adverse consequences outweighing benefits of the remediation.

Final decisions will be made between DOE, EPA, and Ecology on whether particular IRMs are pursued based, at least in part, on the recommendation provided in this AAMSR, results of any supporting LFI, and the availability of resources.

9.1.3 Final Remedy Selection Path

Contaminants recommended for initial consideration in the final remedy selection path are low priority contaminants not previously recommended for IRMs, LFIs, or ERAs. It is recognized that all contaminants of concern within the aggregate area will eventually be addressed collectively under the final remedy path to support a final Record of Decision (ROD).

The initial step in the final remedy selection process path is to assess whether the combined data from the AAMS, and any completed ERAs, IRMs, and LFIs, are adequate for performing a risk assessment and selecting a final remedy. Whereas the scope of an ERA or IRM is limited to an individual contaminant or a single multicontaminant plume, the final remedy selection path will likely address all contaminants and plumes within the operable unit or aggregate area.

If the data are collectively sufficient, an operable unit or aggregate area risk assessment will be performed. If sufficient data are not available, additional needs will be identified and collected.

9.2 PATH RECOMMENDATIONS

Initial recommendations for ERA, IRM, and LFI are discussed in Section 9.2.1 through 9.2.3, respectively. Contaminants proposed for initial consideration under the final remedy selection path are discussed in Section 9.2.4. Table 9-1 provides a summary of the data evaluation process path assessment. A summary of the responses to the decision points on the flowchart that led to the recommendations is provided in Table 9-2. Following approval by DOE, EPA, and Ecology, these recommendations will be further developed and implemented in work plans.

9.2.1 Proposed Contaminants for Expedited Response Actions

The ^{90}Sr plume at the 216-B-5 Reverse Well is proposed for an ERA. The following section describes the selection of this plume and the likely ERA activity. Implementing an ERA now may reduce further spread of contaminant plumes in advance of a potentially lengthy RI/FS process, will extract high levels of contamination, and is expected to provide significant progress toward remediation. Remedial technologies are suggested in the following descriptions, although final selection of the appropriate means will require completion of an EE/CA.

Remedial actions under ERAs should be scoped as a containment/control program or a limited cleanup with a stopping point based on either a concentration threshold (such as the 100 times standards used in the selection criteria) or on reaching an asymptote on the remediation production curve (the point of diminishing returns). The objective is to provide substantial risk reduction within a short time frame, not to complete cleanup of groundwater contamination over the entire extent of the plume geometry. As there are no present day receptors for this groundwater contamination, there are also presently no immediate health and safety concerns.

9.2.1.1 Strontium-90 ERA Selection. The drinking water standard (MCL) for ^{90}Sr is 8 pCi/L. The highest concentrations found in the groundwater, nearly 5,150 pCi/L, are almost 650 times higher than the standard. The ^{90}Sr at this well is ranked highest in carcinogenic relative risk index (RRI), except only for hydrazine and bis(2-ethylhexyl)phthalate which are unconfirmed. The area in which ^{90}Sr exceeds the 800 pCi/L (100 times standard) is apparently very small—it is only in two wells, 299-E28-23 and 299-E28-25, which are located only 7.4 m (24 ft) apart. The source of the contamination appears to be the 216-B-5 Reverse Well, which from April 1945 to October 1947, received 31 million liters (8 million gallons) of liquid wastes containing some 4 kg (9 lb) of plutonium and 3,800 Ci of beta-gamma activity (see Section 2.0 for more details, including inventory). The B Plant source AAMSR recommended an ERA for this waste management unit based on its release history; the two proposed ERAs will however be integrated into a single ERA.

The location of the ^{90}Sr ERA plume also contains concentrations greater than standards of other contaminants, notably $^{239,240}Pu$ and ^{137}Cs. Also ^{238}Pu is found here at its highest concentration in the 200 East Area, although not above the 4% DCG level. The gross beta measurement is found here at its highest level (10,250 pCi/L), so there may be other fission products present. While it is likely that the most feasible remediation technology will treat all of these constituents, it is possible that one or more of the constituents may not be adequately treated. The residual contaminants co-existing with the ^{90}Sr plume would continue as candidates for future IRMs.

This ERA addresses what is clearly the most serious groundwater contamination issue in the 200 East Groundwater Aggregate Area, based on the combined carcinogenic risk associated with the contaminants in the groundwater at this location. It is apparently true that the contamination at this location has not migrated any substantial distance in the 45 years since waste was disposed here. Nevertheless, the contaminants are mobile (as demonstrated by the fact that they are in the sampled groundwater) and therefore constitute a groundwater contaminant plume of some extent.

9.2.1.2 ERA Remediation Alternatives. Remedial alternatives which may be suitable for the proposed ERA on the ^{90}Sr plume include:

- Pump and treat--extraction of the contaminated groundwater and treatment by any of several systems which would remove the ^{90}Sr. Suitable candidate technologies include precipitation, ion exchange, coprecipitation/adsorption, and reverse osmosis. Other treatment technologies can be added to a pump and treat system to treat other contaminants.

- In situ immobilization--immobilization of ^{90}Sr by introducing reagents that precipitate or grout the compounds of concern in the subsurface. There will likely be gratuitous treatment of $^{239,240}Pu$ and ^{137}Cs, but the ERA will be driven by the strontium concentration. Bench and pilot scale treatability studies would be needed before implementing a full scale in situ immobilization system. Because of the time needed to develop this technology and the need for rapid response under an ERA, in situ immobilization may be used to supplement the pump and treat option rather than be used as a stand-alone system.

- In situ solubilization--heavy metal solubilization, in which reagents such as mild acids are added to dissolve the strontium, plutonium, and cesium. In situ solubilization would be coupled with an aggressive program of groundwater extraction and monitoring to minimize fugitive releases of the contaminants of concern. Bench and pilot scale treatability studies would be needed prior to implementing a full scale in situ solubilization system. Because of this constraint and the need for rapid response under an ERA, in situ solubilization may be used to supplement the pump and treat option rather than be used as a stand-alone system.

9.2.2 Proposed Contaminants for Interim Remedial Measures

Seven constituents are proposed for direct application of IRMs: nitrate, ^{60}Co, ^{99}Tc, ^{137}Cs, uranium (^{234}U and ^{238}U), $^{239/240}Pu$, and cyanide. These are organized into three operational IRM groups:

- ^{137}Cs and $^{239/240}Pu$
- ^{99}Tc, ^{60}Co, Cyanide, and Nitrate
- Uranium (^{234}U and ^{238}U)

These are discussed in the following sections.

Like ERAs, IRMs should not be designed just to specifically meet ARARs (e.g., MCLs), but should also be based on risk reduction. Groundwater remediation should proceed until the response objective (e.g., reduction in RRI or containment) is met or until

contaminant concentrations reach an asymptote, beyond which the returns on a treatment effort diminish or natural attenuation exceeds active treatment. After the response objective is met or the concentration asymptote is reached, the IRM should be discontinued and any residual plume be addressed in the final remedy selection path.

9.2.2.1 ^{137}Cs and $^{239/240}$Pu IRMs. The highest concentrations of these two radiochemicals are found in the same wells (299-E28-23, -24, -25) near the 216-B-5 Reverse Well which is the subject of the ^{90}Sr ERA. This is also the only location where these constituents are above their drinking water standards (4% of DCGs). The ^{137}Cs at this well is ranked fifth highest in present carcinogenic RRI, and the ^{239,240}Pu is ranked third. In addition to these contaminants, ^{238}Pu and fluoride are found in these wells at their highest concentrations in the 200 East Area, as well as high levels of tritium and uranium. The same treatment which would be used for the ^{90}Sr will probably also treat the other major heavy metal constituents (the cesium, plutonium, and uranium) at this location. Because of the limited extent of the detections, these radionuclides may be fully addressed as part of the ^{90}Sr ERA.

9.2.2.2 ^{99}Tc, ^{60}Co, Cyanide, and Nitrate IRMs. These IRMs are located north of the 200 East Area, primarily around Well 699-50-53A. This single well had the highest levels of these four constituents, as well as a number of inorganics (selenium, strontium, magnesium, potassium, and sulfate). The concentration of ^{99}Tc yields a present carcinogenic RRI ranked second, just behind the ^{90}Sr which is recommended for an ERA; ^{60}Co is ranked tenth. Well 699-49-55A also has high levels of ^{99}Tc and nitrate, and should also be included. The IRMs address the only plume area of cyanide (Figure 4-3), plume B of nitrate (Figure 4-4), plume C of gross beta (Figure 4-7), the only plume area of ^{60}Co (Figure 4-10), and plume B of ^{99}Tc (Figure 4-12). With such a variety of constituents it may be necessary to use pump and treat with a multi-component treatment train, although ion exchange may be sufficient for most of the constituents. It may also be necessary to do some additional field investigation (LFI) to better determine the extent of this plume and its nature.

9.2.2.3 Uranium (^{234}U and ^{238}U) IRM. This IRM is proposed to deal with a localized area of high uranium concentrations near Well 299-E28-21. This well is the only one with uranium isotopic concentrations above the required 4% DCG drinking water standard, although the extent of uranium contamination can be shown to extend some distance beyond this well. The uranium isotopes are respectively ranked eleventh and twelfth in present carcinogenic RRI. The well does not have levels above drinking water standards of other constituents except tritium, although the levels may be high enough to affect remedial technologies.

9.2.3 Proposed Contaminants for Limited Field Investigation

Nineteen contaminants appear to be eligible for IRMs but data were insufficient to determine whether an IRM is justified. It is recommended that these constituents first undergo LFI to supply additional data required to support the conceptual model and a qualitative risk assessment. Another purpose of the data acquisition would be to delineate the vertical and horizontal extent of their plumes. These constituents include the following:

- Bis(2-ethylhexyl)phthalate
- Methylene chloride
- 2,4-dinitrotoluene
- 2,4-dinitrophenol
- Pentachlorophenol
- Pesticides (aldrin, dieldrin, and endrin)
- Potassium-40
- Ruthenium-106
- Iodine-129
- Antimony
- Arsenic
- Beryllium
- Cadmium
- Chromium
- Hydrazine
- Selenium
- Thallium.

The two radioactivity parameters (gross alpha and gross beta) should also be investigated in the course of the LFI activities to determine the radionuclides which constitute the highest levels of these plumes.

In addition to these contaminants, some contaminant plumes for which an IRM is recommended also have portions where an LFI is recommended. These secondary plumes (e.g., nitrate plumes A, C, D, and E on Figure 4-4) are classified differently to avoid confusion in identifying contaminant plumes. These secondary plumes typically require better delineation of vertical and horizontal extent before an IRM can be initiated.

The rationale and scope for the IRMs and LFIs will be more completely developed in work plans; however, the following address possible considerations during work plan development:

- Confirm contamination to be present in well(s) and determine average levels of that contamination. Some contaminants designated for LFIs had only a single detection or only one at a level of concern. "Plumes" with less than three wells delineating the extent of concentrations over MCL or risk levels are not adequately defined for risk assessment or remediation decision making. Lower detection limit analyses may be required for some contaminants with very low action levels.

- Background concentrations of inorganics must be determined to gauge the significance of the detected levels. A program is presently underway to determine site background levels (Hoover and LeGore 1991, DOE/RL 1992c, see Section 4.1.1.2) which may be sufficient to answer this data gap.

- The nature of the radionuclides making up the beta radiation must be determined. Much may be ^{60}Co, ^{90}Sr, ^{99}Tc, or ^{137}Cs, which are known to exist in the vicinity of high beta levels, but other fission products may be contributing. The same study requirement exists for high gross alpha levels.

- Toxicity data may be required for some constituents, although these data must be sanctioned by EPA (i.e., included in IRIS or HEAST) before final risk assessment is possible. This includes lead and uranium (for its chemical toxicity) as well as some of the lesser-known organics which were detected.

- Remediation methods will require data gathering, and may lead into treatability testing.

- Cesium-137 and $^{239,240}Pu$, proposed for IRMs are located within the boundaries of the ^{90}Sr ERA. The ERA will likely remediate these IRM constituents of concern. Nevertheless, there may still be an LFI required to evaluate the effectiveness of the ERA as a final remediation of the IRM constituents. At a minimum, it will be necessary for the ERA to consider the presence of these contaminants, as well as others such as tritium which are present, in regard to remediation and disposal options.

- Well-designed aquifer tests should be conducted to determine geohydrological properties such as hydraulic conductivity, transmissivity, and storage coefficients and thus help estimate flow rates in areas considered for groundwater extraction.

- Wells that are screened across more than one aquifer should be considered for remediation as they may provide contaminant pathways between the aquifers.

9.2.4 Proposed Contaminants for Final Remedy Selection

Several of the low priority contaminants have been proposed for the final remedy selection path. Section 9.2.4.2 discusses those proposed for direct inclusion in the final remedy selection risk assessment. An RI is recommended for the remainder of the contaminants due to the lack of information to support a final risk assessment and select a final remedy(ies). These are discussed in Section 9.2.4.1.

9.2.4.1 Proposed Contaminants for Remedial Investigation. An RI should be conducted for several contaminants of apparent low priority, poor definition, and uncertain verification. These include:

- Organics: Chloroform, carbon tetrachloride, pyrene, styrene, toluene, phenol, o-nitrophenol, 2-chlorophenol, 2,4-dichlorophenol, 2,3,4,6-tetrachlorophenol, 2,4-dimethylphenol, acetone, methyl ethyl ketone, 4-methyl-2-pentanone, cyclohexanone, DDD, DDT, endrin aldehyde, gamma-BHC, heptachlor, diethyl ether, dimethoate, ethyl cyanide, p-chloro-m-cresol, phorate, trichloromonofluoromethane, and triethylene glycol. These also require confirmation and development of lower detection limits.

- Radionuclides: ^{7}Be, ^{14}C, ^{65}Zn, $^{95}Zr/Nb$, ^{125}Sb, ^{134}Cs, $^{144}Ce/Pr$, ^{154}Eu, ^{155}Eu, ^{212}Pb, radium, ^{235}U, ^{238}Pu, and ^{241}Am. These share the need for verification and even any indication that there is contamination in cases where the detection is unconfirmed. Background levels of uranium and ^{40}K will also be required.

- Inorganics: aluminum, ammonium, barium, boron, bromide, calcium, chloride, cobalt, copper, fluoride, iron, lead, lithium, magnesium, manganese, mercury, nickel, phosphate, potassium, silicon, silver, sodium, strontium, titanium, uranium (from a chemical point of view), vanadium, and zinc. These constituents generally require confirmation, better delineation (if actually at levels of concern), and sampling and analysis of background levels.

- Miscellaneous Parameters/Constituents: Other parameters will also be considered during the RI although they do not constitute constituent/contaminant plumes of concern, such as total carbon and total organic carbon, total dissolved solids, total organic halogens, chemical oxygen demand, alkalinity, pH, conductivity, turbidity, and coliform bacteria.

In addition, some geographic portions (sub-plumes) of IRM contaminants of concern will require consideration under the RI phase, even though other parts of these contaminant

plumes are addressed by IRM or LFI activities. Residual contamination after ERA/IRM completion for all constituents, will also be included in the RI scope if necessary.

9.2.4.2 Proposed Contaminants for Risk Assessment. The tritium plume presents a high risk level and exceeds standards: 4,270,000 pCi/L at Well 299-E24-11 is more than 200 times the standard (MCL) of 20,000 pCi/L. It also has the fourth highest carcinogenic RRI, in both present and in future scenarios. Nevertheless, because of its chemical similarity with water, there is presently no commercially viable treatment systems to remove tritiated water from the groundwater at a scale applicable to the Hanford Site. No ERA could, therefore, be proposed. One possible strategy would be to extract tritium-contaminated groundwater and reinject it upgradient to increase the groundwater travel time, thereby increasing the time for natural decay before a receptor is reached.

The tritium plume is well enough defined to proceed directly into risk assessment without attempting any further investigation. If the risk assessment confirms the need for remediation, then the RI/FS process will investigate further remedial alternatives.

9 3 1 2 9 7 1 6 7 5

9.3 GROUNDWATER OPERABLE UNIT DEFINITION AND PRIORITIZATION

The investigation process can be made more efficient if plumes with multiple contaminants in the same general vicinity can be studied together. The data needs and remedial actions required for many of the contaminants are frequently the same. It is much easier to ensure a consistent level of effort, investigation methodology, prioritization, funding, and regulatory oversight if associated constituents are grouped together. Economies of scale also make the investigation process more cost effective if larger areas are studied together.

9.3.1 Groundwater Operable Unit Definition

An objective of the 200 East Groundwater AAMS is to define appropriate groundwater-specific operable units. A groundwater operable unit is a portion or aspect of a remedial action site which can best be planned and remediated as a single entity. At the Hanford Site, a source area operable unit is usually a group of waste management units which are spatially close to each other and generally shared a similar disposal history. Prior to the AAMS process, 12 of the 21 operable units in the 200 East and 200 North Areas were designated as combination source and groundwater contamination. These include the following:

- 200-PO-1
- 200-PO-2

- 200-PO-4
- 200-PO-5
- 200-BP-1
- 200-BP-2
- 200-BP-3
- 200-BP-4
- 200-BP-11
- 200-IU-6
- 200-SO-1
- 200-NO-1.

To maximize the efficiency of the investigation of groundwater flow and contamination, it is recommended that separate groundwater operable units be defined for the 200 East Area and vicinity on the basis of flow patterns and plume distributions, both of which are hydrologic in nature and do not respect the geographic boundaries established for the source operable units. In addition, the groundwater plumes as discussed in previous sections frequently overlap or coincide, and so the groundwater at a point may have several contaminants at significant concentrations from different sources and source operable units. For these reasons, each of the 200 East source AAMS reports recommends that groundwater be deleted from the source operable units and be placed in a groundwater-specific operable unit.

Because of the interrelations of the contaminant plumes in the 200 East Area, it is considered best to have a relatively small number of groundwater-specific operable units. It is also important, however, to keep the size and complexity of groundwater operable units small enough so that each can efficiently handle all groundwater issues in that portion of the 200 East Area.

With these considerations, two operable units are recommended for the 200 East Groundwater Aggregate Area. These would be divided on the basis of the hydrologic flow system which is present under the aggregate area. Two hydrologic regimes can be defined, originating at the groundwater divide in the center of the 200 East Area and moving from this east-west line in opposite directions (Figures 3-44 and 3-61). Groundwater flow on the north side of the divide generally flows north towards Gable Gap. Groundwater south of the divide generally flows south and then east towards the Columbia River. The distributions of the contaminant plumes in the 200 East Groundwater Aggregate Area reflect these flow conditions. Contaminant plumes in one regime or the other generally do not mix. These two groundwater flow regimes can therefore be the basis of the two groundwater operable units. The line of their division runs approximately along the northern edge of the 200-SS-1 Operable Unit (see Figure 9-2), the southern edge of 200-SO-1, and the northern edges of 200-PO-3 and 200-PO-5 until it reaches the 216-B-3 Pond System. (The divide is so gradual

that the exact location is not well determined and does not need to be.) While this divide will change according to recharge conditions, which will vary, it should be consistent enough over the period of time during which studies will be done that further modifications will not be necessary.

The south groundwater operable unit, tentatively called GW-OU-3 because GW-OU-1 and -2 have previously been identified as 200 West groundwater operable units, could be identified with PUREX and the plumes originating in that area. The northerly groundwater operable unit, tentatively GW-OU-4, includes those plumes in the B Plant Aggregate Area (including Gable Mountain Pond). This includes the ^{90}Sr ERA plume, and the ^{137}Cs and $^{239/240}$Pu IRMs; the ^{99}Tc, ^{60}Co, cyanide, and nitrate, IRMs; and the uranium (^{234}U and ^{238}U) IRM.

To keep the number of operable units constant over the 200 Areas, including both source and groundwater, it is advisable to combine source operable units, so that new groundwater-specific operable units can be created. Candidates may be obtained from the source AAMSRs. The B Plant AAMSR has already indicated the availability of 200-BP-8 as a name for GW-OU-4. There does not appear to be a similarly available operable unit name in the PUREX Plant Aggregate Area to be used for GW-OU-3; it may be necessary to create a new operable unit name (e.g., 200-PO-7). Efficiencies should be obtained by developing groundwater specific operable units.

9.3.2 Investigation Prioritization

Although contaminants have been individually recommended for an ERA or IRM, the scope of a remediation activity will likely address multiple contaminants because many of the priority groundwater contaminants in the 200 East Area are collocated. Implementing ERAs and IRMs may also result in addressing contaminants of lower priority. As a result, recommendations for functionally grouping contaminants and their relative priority were provided in the functional groups recommended for IRMs (Section 9.2.2).

The ^{90}Sr ERA plume coincides with the ^{137}Cs and ^{239,240}Pu IRM plumes. As a result, it is recommended that the ERA activity at least address ^{137}Cs and ^{239,240}Pu in addition to ^{90}Sr. Although ^{137}Cs and ^{239,240}Pu and other constituents may be treated as part of the ERA, ^{90}Sr concentrations should specifically determine the starting and stopping points for the ERA. That is, when the ^{90}Sr concentration decreases to levels that satisfy the ERA objective, the ERA should be discontinued. This ERA addresses what is clearly the most critical groundwater contamination issue in the 200 East Groundwater Aggregate Area and should receive the highest priority.

Overlapping plumes should be coremediated under single multicontaminant IRMs as described in Section 9.2.2 to the extent the technology is available. These IRMs should receive priority according to the carcinogenic and noncarcinogenic relative risks associated with each multicontaminant plume. These IRMs would be prioritized in the following order: ^{137}Cs and $^{239/240}Pu$ IRMs (under the ^{90}Sr ERA); ^{99}Tc, ^{60}Co, cyanide, and nitrate IRMs; and the uranium (^{234}U and ^{238}U) IRM.

To summarize, remedial actions or investigations in cases of overlapping plumes should normally be driven by the highest priority activity. For example, if an ERA plume overlaps an IRM plume, the overlapping areas should be first addressed by the ERA activities which are higher in priority. The ERA will dictate the extent of treatment, such that when the ERA goals are satisfied, the ERA activities will be discontinued in the region of overlap. The overlapping area, if necessary, can then be addressed more completely under an IRM. In the case of overlapping plumes that require IRMs, LFIs, and RIs, the work plans and other planning and implementation activities should address the overlapping plumes on a case-by-case basis.

Although ERAs and IRMs will likely be implemented based on multicontaminant plumes, LFIs should be implemented based on the operable unit work plan framework. As a result, arsenic (plumes C and D in Figure 4-1), hydrazine, 2,4-dinitrophenol, pesticides (aldrin, dielrin, and endrin), ^{106}Ru, and ^{129}I (Figure 4-13) should be addressed under an LFI work plan for GW-OU-3; and chromium (plumes A, B, and C in Figure 4-2), thallium, 2,4-dinitrotoluene, and pentachlorophenol should be addressed under an LFI work plan for GW-OU-4. Studies of gross alpha (Figure 4-6) and gross beta (plumes A, B, and C in Figure 4-7) are also included in GW-OU-4. Priority should be given to GW-OU-4.

Individually (i.e., outside the operable unit work plan framework), LFIs would be prioritized in the following order: bis(2-ethylhexyl)phthalate, beryllium, selenium, antimony, arsenic (general aspects), methylene chloride, ^{40}K, cadmium, and chromium.

Tritium is the only plume for direct risk assessment, and does not require prioritization.

The RI activities should be performed simultaneously on the following constituents: aluminum, ammonium, barium, boron, bromide, calcium, chloride, cobalt, copper, fluoride, iron, lead, lithium, magnesium, manganese, mercury, nickel, phosphate, potassium, silicon, silver, sodium, strontium, sulfate, titanium, uranium (from a chemical point of view), vanadium, and zinc; coliform bacteria; chloroform, carbon tetrachloride, 1,2-dichloroethane, cis- and trans-1,2-dichloroethylene, 1,1,2-trichloroethane, pyrene, styrene, toluene, phenol, o-nitrophenol, 2-chlorophenol, 2,4-dichlorophenol, 2,3,4,6-tetrachlorophenol, 2,4-dimethylphenol, acetone, methyl ethyl ketone, 4-methyl-2-pentanone, cyclohexanone, DDD,

DDT, endrin aldehyde, gamma-BHC, heptachlor, diethyl ether, dimethoate, ethyl cyanide, p-chloro-m-cresol, phorate, trichloromonofluoromethane, and triethylene glycol; ^{7}Be, ^{14}C, ^{65}Zn, $^{95}Zr/Nb$, ^{125}Sb, ^{134}Cs, $^{144}Ce/Pr$, ^{154}Eu, ^{155}Eu, ^{212}Pb, radium, ^{235}U, ^{238}Pu, and ^{241}Am.

9.3.3 RCRA Facility Interface

As discussed in Section 2.8, groundwater monitoring programs are underway at several RCRA facilities in the 200 East Groundwater Aggregate Area. If these monitoring programs indicate that groundwater contamination is originating from a RCRA treatment, storage or disposal (TSD) unit, it is likely that groundwater remediation will need to be integrated with the overall CERCLA remediation program for the 200 Areas. It is recommended that groundwater remediation activities associated with RCRA TSD units be fully integrated with the past practice program. Even though efforts have been made by the regulators to integrate the RCRA and CERCLA programs, further site specific integration decisions will be required at the NPL site- or waste management unit-level.

Section 2.6 described the RCRA TSD groundwater monitoring programs in the 200 East Area. RCRA units with groundwater monitoring programs in the 200 East Area are listed below along with the planned actions (e.g., closure under interim status, final facility operating permit):

TSD Unit	Planned Action
200 East Area Liquid Effluent Retention Facility (LERF)	Storage Facility Permit
216-A-10 Crib	Closure
216-A-36B Crib	Closure
216-A-29 Ditch	Closure
216-B-3 Pond System (Includes 216-B-3, -3A, -3B, -3C Ponds and 216-B-3-3 Ditch)	Closure
216-B-63 Trench	Closure
218-E-10 Burial Ground (LLWMA-1)	Landfill Operating Permit
218-E-12B Burial Ground (LLWMA-2)	Landfill Operating Permit
Single-Shell Tanks (Includes 241-A, -AX, -B, -BX, -BY and -C Farms)	Closure
2101-M Pond	Closure

Grout Treatment Facility | Treatment/Landfill Permit

Closure of the single-shell tanks will be addressed under RCRA by the Single-Shell Tank Program (see Section 2.7.1), which presently incorporates groundwater. After closure of the surface facilities, however, it is likely that any groundwater contamination will be remediated under the CERCLA program. Sections 9.3.3.1 through 9.3.3.3 discuss CERCLA/RCRA integration considerations for the remaining RCRA TSD units within the 200 East Groundwater Aggregate Area in terms of:

- Common, baseline activities that must be integrated
- The approach used to recommend whether groundwater monitoring and remediation activities should be addressed under CERCLA or RCRA for RCRA TSD units within the groundwater aggregate area
- Considerations which must be addressed to ensure RCRA conformance under CERCLA activities.

Section 2.7 discussed interactions with other site programs. Coordination with the Expedited Response Action Program will be required for the proposed ERAs and for any IRMs which interact with these ERAs.

The Effluent Treatment Program is developing treatment and disposal facilities for remaining site effluent streams. Such a facility (such as the SALDS, see Section 2.7.3) could potentially be used for treatment and disposal of extracted groundwater under either an ERA or IRM.

Finally, the Remedial Technology Development Program could have a significant role in the development of appropriate remedial alternatives for the mixtures of contaminants which may be found in groundwater at the site of an ERA or IRM.

9.3.3.1 Common RCRA/CERCLA Integration Considerations. Regardless of the program chosen for groundwater characterization and remediation activities at individual units, the needs and requirements of both programs must be considered during the planning and execution of the various project phases. Integration of the requirements of both RCRA and CERCLA into these activities will accomplish several goals, including:

- Coordinate document preparation, investigation and remediation efforts
- Maximize use of existing and collected data
- Minimize amount of additional/duplicative data collection
- More efficient use of resources

- Ensure compatibility of selected remedial measures
- Provide consistency of cleanup action levels

The needs of both the CERCLA and RCRA programs in the groundwater aggregate area should be considered when planning monitoring well installations. The numbers and locations of the wells, the type and depth of well screening, and the type of well installation (e.g., single, nested) should be determined in such a manner as to ensure that both CERCLA and RCRA program needs are served to the maximum extent possible.

Sampling frequencies, and the monitoring parameters and constituents that the samples will be analyzed for, in all monitoring wells in the groundwater aggregate area should be selected to ensure that data necessary to support both the RCRA and CERCLA programs are collected while minimizing sampling efforts.

Analytical methods and QA/QC protocols should be chosen carefully during the preparation of workplans or groundwater monitoring plans to ensure that sample analytical requirements for both the CERCLA and RCRA programs will be met to the maximum extent possible. For example, groundwater activities under RCRA generally rely upon the use of methods from *Test Methods for Evaluating Solid Wastes* (EPA 1986b), while definitive CERCLA activities are generally performed using Contract Laboratory Program (CLP) analytical methods and quality assurance protocols. Specific quantitation limit requirements, such as those established in 40 CFR Part 264 Appendix IX, may also need to be met. The methods used for interpretation and statistical analysis of the data collected must also be chosen to ensure both RCRA and CERCLA program requirements will be met.

A single, consistent approach should be used to establish Health Based Levels (HBLs) for RCRA groundwater monitoring programs and cleanup limits for CERCLA groundwater remediation efforts within the groundwater aggregate area. This approach should ensure that common risk levels, compound toxicity factors, and uptake/transport assumptions are used for both programs to the maximum extent possible.

Preparation of the documents necessary to plan and execute characterization and remediation activities (e.g., work plans, closure plans) should be coordinated to ensure that all documentation is available in the time frames necessary to support integrated actions. Time constraints, including Tri-Party Agreement commitments, may dictate whether actions at individual RCRA TSD units are taken under the RCRA or CERCLA programs.

Furthermore, remedial actions should be designed to be mutually beneficial whenever appropriate. Potential adverse effects from remedial actions, such as those that may be associated with modifying groundwater flow patterns or chemistry, should be minimized.

9.3.3.2 RCRA Facility Interface Strategy. Groundwater programs exist for a number of RCRA TSD units. Although the source AAMS reports have provided recommendations for integrating past practice and TSD waste management unit activities with respect to vadose zone contamination, some of the TSD units may have contributed, or are recognized as potential contributors, to groundwater contamination. Thus, it is necessary to have a strategy for deciding if groundwater contamination associated with a TSD unit (or group of TSD units) would best be addressed under the RCRA or CERCLA program. Such a strategy has been developed to facilitate CERCLA/RCRA groundwater integration decisions, and is outlined in this section.

The acceptability of a strategy which allows the use of past practice programs to remediate groundwater contamination at TSD units scheduled for either permitting or closure is discussed in the Tri-Party Agreement. Part One, Article III of the Tri-Party Agreement notes that one purpose of the agreement is to:

> "... *promote an orderly, effective investigation and cleanup of contamination at the Hanford Site* [Section 13B] ... *and coordinate* [RCRA TSD unit] *closure with any inter-connected remedial action at the Hanford Site* ... [Section 14A]"

To ensure that this objective is achieved, integration of CERCLA and RCRA groundwater remediation activities is specifically addressed in Part One, Article IV of the Tri-Party Agreement, which states in part that:

> "... *The Parties agree that past practice authority may provide the most efficient means for addressing groundwater contamination plumes originating from both TSD and past practice units ... remedial actions that address TSD groundwater contamination, excluding situations where there is an imminent threat to the public health or environment, will meet or exceed the substantive requirements of RCRA* [Section 17] ... *the Parties recognize and agree that remediation of groundwater contamination from TSD units at the Hanford Site may be managed either under Part Three of this Agreement* [Remedial and Corrective Actions], *or under Part Two of this Agreement* [Permitting/Closure of TSD Facilities] ... [Section 18]"

In keeping with the principles outlined above, groundwater contamination associated with a RCRA TSD unit should be investigated/remediated under CERCLA if any one of the following criteria are met:

- There is minimal contribution from the TSD unit to a major, overall CERCLA groundwater unit. For example, if the TSD unit represents a small "island"

contributing minimally to the larger past-practice derived contamination which will be dealt with under the CERCLA program.

- If the TSD unit has been closed and the interim status or final permit has been terminated or nearly terminated (e.g., public notice has been issued).

- If a planned CERCLA ERA or IRM would result in completely or substantially remediating any groundwater releases from the TSD unit.

- If the source TSD unit is addressed under CERCLA as part of an analogous group as a part of a source aggregate area.

For TSD units meeting the following criteria, groundwater activities should remain under the RCRA Program:

- There is no evidence of groundwater contamination at an active or closed TSD unit. Where applicable, active TSD units or TSD units closed as landfills would maintain established detection monitoring programs.

- Groundwater contamination is clearly dominated by contributions from a RCRA TSD unit and any CERCLA contaminants present would be adequately addressed under a RCRA corrective action.

- Groundwater associated with the TSD unit is hydrologically isolated and has little or no interaction with established groundwater operable units addressed under CERCLA.

Using this strategy, the unit-specific integration recommendations outlined in Sections 9.3.3.2.1 through 9.3.3.2.9 have been developed for the RCRA TSD units currently involved in a groundwater monitoring program.

9.3.3.2.1 200 East Area Liquid Effluent Retention Facility. At the close of 1991, LERF completed a background monitoring program and is currently in a detection monitoring program for indicator parameters. The RCRA final facility status permit application for LERF was submitted in 1991, and is currently under agency review. LERF is currently operating, and it has been recommended in the B Plant source AAMSR that final closure of the source unit occur under the RCRA program.

Groundwater beneath LERF is not hydrologically isolated, and interacts with groundwater from other locations in the 200 East Area. There is currently no evidence that groundwater has been contaminated by releases associated with the LERF. It is

recommended that groundwater monitoring activities continue under the RCRA program, integrating CERCLA program needs as described in Section 9.3.3.1. If future detection monitoring indicates that groundwater has been contaminated, it may be necessary to reevaluate the status of groundwater activities at LERF for possible inclusion in the CERCLA program.

9.3.3.2.2 216-A-10 and 216-A-36B Cribs. The 216-A-10 and 216-A-36B Cribs are currently in detection monitoring program for indicator parameters. The 216-A-10 and 216-A-36B Cribs are inactive and are slated for closure in 1996. It is anticipated that the 216-A-10 and 216-A-36B Crib source units will be clean closed under RCRA.

Groundwater beneath the 216-A-10 and 216-A-36B Cribs is not hydrologically isolated, and interacts with groundwater from other locations in the 200 East Area. There is no direct evidence that groundwater beneath these cribs has been contaminated by releases associated with the 216-A-10 or 216-A-36B Cribs. The 216-A-10 Crib is spatially related to the Iodine-129 contamination beneath the 216-A-29 Ditch and a possible contributor to this contamination, as discussed below; however, sample data are currently insufficient to define the source or character of the observed contamination. It is recommended that groundwater monitoring activities at these cribs continue under the RCRA program, integrating CERCLA program needs as described in Section 9.3.3.1. If future detection monitoring indicates that groundwater beneath these cribs has been contaminated as a result of releases from the cribs, it may be necessary to reevaluate the status of groundwater activities at 216-A-10 and 216-A-36B Cribs for possible inclusion in the CERCLA program.

9.3.3.2.3 216-A-29 Ditch. The 216-A-29 Ditch is currently undergoing a groundwater quality assessment due to elevated specific conductance in one downgradient well. The 216-A-29 Ditch is inactive and has undergone interim stabilization. The 216-A-29 Ditch currently is scheduled for clean closure under RCRA; the closure plan is scheduled for submittal in 1996. It has been recommended in the B Plant AAMSR that the 216-A-29 Ditch source unit be transferred to Operable Unit 200-BP-11 and be addressed as part of the 216-B-3 Pond system.

Groundwater beneath the 216-A-29 Ditch is not hydrologically isolated and interacts with groundwater from other locations in the 200 East Area. A portion of the known Iodine-129 plume, believed to be the result of releases from the 216-A-10 and 216-A-45 Cribs, is located beneath the 216-A-29 Ditch (See Figure 4-13). Although there is evidence of possible additional groundwater contamination resulting from releases at the 216-A-29 Ditch, sample data are currently insufficient to define the source or character of the observed contamination. It is recommended that groundwater monitoring continue at the 216-A-29 Ditch under the RCRA program, integrating CERCLA program needs as described in Section 9.3.3.1. Once the nature and apparent source of the groundwater contamination beneath the

216-A-29 Ditch are confirmed, the status of groundwater activities at 216-A-29 Ditch should be reevaluated for possible inclusion in the CERCLA program.

9.3.3.2.4 216-B-63 Ditch System. Currently the 216-B-63 Ditch has completed background monitoring and is in detection monitoring for indicator parameters. The RCRA closure plan is scheduled to be submitted in 1996. The 216-B-63 Ditch is scheduled for closure under the RCRA program. It has been recommended in the B Plant AAMSR that the 216-B-63 Ditch be transferred to Operable Unit 200-BP-11 and be addressed as part of the 216-B-3 Pond system.

Groundwater beneath the 216-B-63 Ditch is not hydrologically isolated, and interacts with groundwater from other locations in the 200 East Area. Currently there is no direct evidence that groundwater has been contaminated as a result of releases from the 216-B-63 Ditch. It is recommended that groundwater monitoring continue under RCRA.

9.3.3.2.5 216-B-3 Pond System. The 216-B-3 Pond System is currently undergoing a groundwater quality assessment due to elevated total organic halogen and total organic carbon concentrations in samples collected in 1990. Assessment monitoring parameters include herbicides, pesticides, PCBs, volatile organics, semi-volatile organics, hydrazine, ammonium, and tritium. All groundwater quality parameter concentrations were below applicable primary or secondary drinking water standards in samples collected in 1991; tritium levels exceeded 180,000 pCi/L (DOE/RL 1992b).

Groundwater beneath the 216-B-3 Pond System is not hydrologically isolated, and interacts with groundwater from other locations in the 200 East Area. Arsenic and tritium plumes are known to exist beneath the 216-B-3 Pond System (see Figures 4-1 and 4-8). Tritium plumes A and B and arsenic plume A are probably the result of past discharges to the 216-B-3 Pond System; the 216-B-3 Pond System may also have been a contributor to arsenic plume B (See Section 4.1.2.2). A LFI has been recommended to further characterize the 200 East Area arsenic plumes prior to considering an IRM, while a detailed risk assessment and possible RI/FS have been recommended for the 200 East Area tritium plumes (see Sections 9.2.3. and 9.2.4). A LFI/IRM coordinated with RCRA closure activities has been recommended to address soil contamination in the source units in the B-Plant AAMSR. Clean closure is anticipated at the 216-B-3A, 216-B-3B, and 216-B-3C Ponds; the 216-B-3 Pond and 216-B-3-3 Ditch will likely be closed as landfills. Closure plans for the 216-B-3 Pond System were submitted for agency review in 1990.

The 216-B-3 Pond System is spatially related to arsenic plumes A and B, and is a potential contributor to these plumes. The extent of the arsenic plumes currently appears to be limited to the vicinity of the 216-B-3 Pond System, and the plumes do not currently overlap other inorganic contaminant plumes which will be addressed under CERCLA, with

the exception of the tritium plumes A and B. Therefore, further investigation of the groundwater contamination associated with the 216-B-3 Pond System should occur under the RCRA program, integrating CERCLA program needs as discussed in Section 9.3.3.1. One goal of this investigation should be to better delineate and describe the potential extent of groundwater contamination from the 216-B-3 Pond System, including identifying other potential contaminants which should be addressed.

Assuming that the 216-B-3 Pond System was the source of arsenic contamination, and no other past-practice groundwater contaminants are discovered which do not appear to originate from the 216-B-3 Pond System, remediation of arsenic plumes A and B, if required, should occur under the RCRA program. Any remediation efforts taken under RCRA should be coordinated with similar CERCLA activities in the 200 East Area to ensure consistency of assumptions and approach.

Investigation of tritium plumes A and B should be integrated into the RCRA activities at the 216-B-3 Pond System, ensuring that CERCLA program needs are met as discussed in Section 9.3.3.1. Currently, a risk assessment under the CERCLA program has been recommended for the 200 East Area tritium plumes (see Section 9.2.4.2). Remediation of tritium plumes A and B, if required, would occur under the CERCLA program.

It is recommended that risk assessments under the CERCLA program and closure determinations under the RCRA program be performed in a consistent manner for all groundwater contamination associated with units in the 216-B-3 Pond System. To accomplish this, groundwater contamination would be evaluated in accordance with the risk assessment methodology being developed and agreed to between DOE, EPA and Ecology under Tri-Party Agreement Milestone M-29-03. The latest presentation of the risk assessment protocols appears in *The Hanford Site Baseline Risk Assessment Methodology* (DOE/RL 1991e). It is expected that these risk assessment protocols will be at least as conservative as the guidelines established under EPA's proposed 40 CFR Part 264 Subpart S regulations published in the July 27, 1990 Federal Register. The Subpart S guidelines will provide the bases for closing RCRA units in a manner that will prevent future threats to human health and the environment. Use of the Milestone M-29-03 methodology would both satisfy the CERCLA past practices risk assessment procedures and allow evaluation of whether or not adequate closure of RCRA TSD units has been accomplished.

9.3.3.2.6 218-E-10 Burial Grounds. The 218-E-10 Burial Grounds make up the Low Level Waste Management Area Number 1 (LLWMA-1) RCRA groundwater monitoring unit. The LLWMA-1 unit is currently undergoing a groundwater quality assessment due to elevated specific conductivity noted in samples collected in 1989. Elevated concentrations of tritium, gross alpha, and gross beta have also been noted (DOE/RL 1992b). Chromium plume A is currently beneath the 218-E-10 Burial Ground (See Figure 4-2). The RCRA final

facility permit application was submitted for the 218-E-10 Burial Ground in 1989, and is currently under agency review.

Groundwater beneath the LLWMA-1 unit is not hydrologically isolated, and interacts with groundwater from other locations in the 200 East Area. It is likely that the groundwater contaminants noted above originated from past practice units to the south and east of the 218-E-10 Burial Grounds (See Section 4.1.2.2 and DOE/RL 1992b), and is a part of the larger, overall past-practice contamination which will be dealt with by the CERCLA program in the 200 East Area. Therefore, it is recommended that groundwater contamination beneath the 218-E-10 Burial Ground be investigated and, if necessary, remediated under the CERCLA program (e.g., as a part of proposed groundwater operable unit GW-OU-4 as defined in Section 9.3.1), integrating RCRA program needs as described in Sections 9.3.3.1 and 9.3.3.3.

9.3.3.2.7 218-E-12B Burial Grounds. The 218-E-12B Burial Grounds make up the Low Level Waste Management Area Number 2 (LLWMA-2) RCRA groundwater monitoring unit. The LLWMA-2 is in a detection monitoring program for indicator parameters. The RCRA final facility permit application was submitted for the 218-E-12B Burial Ground in 1989, and is under agency review. The 218-E-12B Burial Ground source unit is recommended for LFI activities under CERCLA. Investigations of the active portion of the 218-E-12B Burial Ground will be included in the past practices investigation if the unit is deactivated prior to the investigation (DOE/RL 1992b).

Groundwater beneath the 218-E-12B Burial Ground is not hydrologically isolated or unique. Groundwater associated with the Burial Ground interacts with groundwater from other locations in the 200 East Area. There is no evidence that groundwater has been contaminated by releases associated with the 218-E-12B Burial Ground. It is recommended that groundwater monitoring activities continue under the RCRA program, integrating CERCLA program needs as described in Section 9.3.3.1. If future detection monitoring indicates that groundwater has been contaminated, it may be necessary to reevaluate the status of groundwater activities at 218-E-12B Burial Ground for possible inclusion in the CERCLA program.

9.3.3.2.8 2101-M Pond. The 2101-M Pond, located southwest of the 2101-M Building, is currently in a detection monitoring program for indicator parameters. The 2101-M Pond is active, receiving small volumes of waste water from the 2101-M Building heating and air conditioning system. The RCRA closure plan was submitted in 1991 and is currently undergoing agency review. The 2101-M Pond is currently scheduled for clean closure under the RCRA program.

Groundwater beneath the 2101-M Pond is not hydrologically isolated and interacts with groundwater from other locations in the 200 East Area. Arsenic plume D is located beneath the 2101-M Pond; this spatial relationship implies that the 2101-M Pond may be the source of arsenic plume D (See Figure 4-1). However, there is no historical record of arsenic compounds being discharged to the 2101-M Pond, and the apparent elevated arsenic concentrations have previously been attributed to local variations in background concentrations (DOE/RL 1991d). The extent of arsenic plume D appears to be limited to the vicinity of the 2101-M Pond, and this plume does not currently overlap other inorganic contaminant plumes which will be addressed under CERCLA. Therefore, further investigation of the groundwater contamination beneath the 2101-M Pond should occur under the RCRA program, integrating CERCLA program needs for GW-OU-3 as discussed in Section 9.3.3.1.

If future groundwater investigations indicate that groundwater has been contaminated by releases from the 2101-M Pond, it may be necessary to reevaluate the status of groundwater activities at the 2101-M Pond for possible inclusion in the CERCLA program.

9.3.3.2.9 Grout Treatment Facility. Currently, the Grout Treatment Facility is in a detection monitoring program for indicator parameters. The facility is currently active, stabilizing wastes with cementatious grout prior to disposal into onsite disposal vaults. The Part B RCRA TSD facility permit application for the Grout Treatment Facility was submitted in 1988 and is currently under agency review.

Groundwater beneath the Grout Treatment Facility is not hydrologically isolated and interacts with groundwater from other locations in the 200 East Area. Currently there is no evidence that groundwater has been contaminated as a result of releases from the Grout Treatment Facility. Groundwater beneath the Grout Treatment Facility contains elevated concentrations of several indicator parameters and contaminants (e.g., TOX, TOC, conductivity, tritium) believed to be the result of releases from other, past-practice units in the 200 East Area. It is recommended that groundwater monitoring activities continue under the RCRA program, integrating CERCLA program needs as described in Section 9.3.3.1. If future detection monitoring indicates that groundwater has been contaminated as a result of releases from the Grout Treatment Facility, it may be necessary to reevaluate the status of groundwater activities at the Grout Treatment Facility for possible inclusion in the CERCLA program.

9.3.3.3 Ensuring RCRA Conformance Under CERCLA Activities. In order to close or permit a RCRA TSD unit, it will be necessary to gather certain information and make certain demonstrations. In the event that groundwater associated with a TSD unit is investigated or remediated under CERCLA, the CERCLA activities should be performed in a manner that

will support final RCRA actions. The goals of integrating RCRA requirements into CERCLA actions are:

- To ensure that cleanup and closure are performed once, in a single action
- To demonstrate that the substantive requirements of RCRA have been satisfied
- To support final permitting or closure of the TSD unit
- To minimize the need for post-closure care.

CERCLA activities will affect site conditions at neighboring and included RCRA TSD units. The potential impact that these affects may have on the data collected or the demonstrations being performed to achieve conformance with RCRA standards must be accounted for when planning CERCLA groundwater activities. An example where careful planning and integration would be necessary would be the case where groundwater extraction and treatment are being performed at a CERCLA operable unit, altering groundwater flow patterns and contaminant transport characteristics within groundwater monitoring networks which have been established to conform to RCRA requirements.

Investigation and remediation activities performed under CERCLA at RCRA TSD units must supply the data necessary to support RCRA TSD unit permit or demonstration needs. Examples would be ensuring that groundwater characterization data necessary to support a petition for exemption from dangerous waste tank release standards, or to demonstrate clean closure of a RCRA TSD unit, are collected.

CERCLA groundwater activities must ensure that RCRA groundwater closure requirements are met. For example, groundwater monitoring at RCRA TSD units closed through a CERCLA remedial action may be required to continue for as long as 30 years after completion of the remedial action. When possible, CERCLA groundwater remediation activities should be performed in such a manner as to ensure that only detection monitoring will be required for active or closed RCRA TSD units within the 200 East Groundwater Aggregate Area. When practical, CERCLA activities should be performed in such a manner as to demonstrate clean closure of the RCRA TSD unit. An example of such a case would be a RCRA TSD unit within a CERCLA operable unit where cleanup of the groundwater to RCRA cleanup criteria for the constituents of concern at the RCRA TSD unit is achievable.

9.3.4 Integration of Ongoing CERCLA Activities

CERCLA activities are currently underway at operable unit 200-BP-1 in the 200 East Area. This operable unit is addressing groundwater contamination originating from WMUs within the operable unit. Phase II RI activities are planned for 1993 at this operable unit, including the following investigations:

- Delineation of the erosional windows interconnecting the uppermost (unconfined) aquifer and the Rattlesnake Ridge confined aquifer
- Widened groundwater monitoring
- Aquifer testing
- Treatability studies

These activities address data needs which are not specific to 200-BP-1 but are also applicable to the broader groundwater operable unit as discussed in Section 9.3.2. The lack of groundwater monitoring data, plume definition, geologic characterization of the erosional windows, adequate aquifer testing, and treatability data were identified as a data gaps in Sections 8.3.2 and 9.2.3. In addition, 200-BP-1 contaminants of concern including ^{99}Tc ^{60}Co, cyanide, and nitrate have moved to the north beyond the source operable unit boundaries and have been recommended for an IRM in Section 9.2.2. As a result, it is recommended that the scope of work associated with 200-BP-1 Phase II activities be expanded to include the LFIs recommended for the northern ground water operable unit designated GW-04-4. This can be accomplished by preparing a joint or common work plan (e.g., Groundwater Operable Unit 200-BP-8 Work Plan) that is appropriately prioritized to ensure that the original 200-BP-1 RI/FS schedule is maintained. This would be an initial step in integrating the 200-BP-1 program into the overall AAMS and Hanford Past-Practice Strategy (HPPS) process for the 200 Areas and consistent with the general recommendation to remove the groundwater from source operable units.

The scale of the proposed GW-OU-4 is somewhat larger than that of 200-BP-1, but the information derived from the needs of 200-BP-1 is directly applicable to the AAMS process. Groundwater and contaminant concentration data will be useful to both studies in defining the extent of contamination. Treatability study information from 200-BP-1 will be helpful in determining IRM treatment technologies for the $^{99}Tc/^{60}Co$/cyanide/nitrate plume. The remediation schedule for the plume should be enhanced if it is addressed as a priority IRM rather that go through the multiphase RI/FS process. As an added benefit, there would be savings associated with installing wells, collecting plume data, and performing other investigations that satisfy the needs of the broader study than if several studies were conducted independently of each other.

9.3.5 Contaminants Addressed by Other Programs

The 200 East Groundwater AAMS was instituted to address contamination emanating from sources within the 200 East source aggregate areas. Some contamination has been

detected in monitoring wells which originate from outside the 200 East source aggregate areas. The constituents in this category are mainly chlorinated aliphatic hydrocarbons which have historically been used in solvents and as degreasing agents. They have been found near the Solid Waste Landfill (located in Operable Unit 200-IU-3) about 6 km (4 mi) southeast of the 200 East Area and are probably associated with it.

These constituents include tetrachlorethylene (PCE), trichloroethylene (TCE), 1,1,1-trichloroethane (TCA), 1,1,2-TCA (not confirmed), 1,1-dichloroethane (DCA), 1,2-DCA (not confirmed), cis- and trans- isomers of 1,2-dichloroethylene (DCE, neither confirmed), carbon tetrachloride (not confirmed), chloroform, and methylene chloride (not confirmed). These could be either residuals of solvent materials which may have been disposed of in the landfill, or breakdown products of such materials. Trichloroethylene and PCE exceeded their drinking water standards (MCLs) and are considered carcinogenic. The 1,1,1-TCA, although not above its MCL, is potentially a major contributor to noncarcinogenic risk (ranked second highest maximum present noncarcinogenic relative risk). 1,1-DCA contributes to carcinogenic risk.

These constituents are addressed by the Hanford Site Solid Waste Landfill Application (DOE/RL-90-38) and groundwater monitoring program per WAC 173-304.

9.4 FEASIBILITY STUDY

Two types of FS will be conducted to support remediation in the 200 Areas including focused and the final FS. Focused feasibility studies (FFSs) are studies in which a limited number of contaminants or remedial alternatives are considered. A final FS will be prepared to provide the data necessary to support the preparation of final ROD. Data are insufficient to prepare either a focused or final FS for any contaminants in the 200 East Groundwater Aggregate Area. Sufficient data are considered available to prepare a FFS on selected remedial alternatives.

9.4.1 Focused Feasibility Study

IRMs are planned for the 200 East Groundwater Aggregate Area for various contaminants or groups of contaminants and will need to be supported by FFSs. The FFS applied in this manner is intended to examine a limited number of alternatives for a specific contaminant or groups of contaminants. The FFS supporting IRMs will be based on the technology screening process applied in Section 7.0, engineering judgment, and/or new characterization data such as that generated by an LFI.

In most cases, LFIs will be conducted at plumes initially identified for IRMs. The information gathered is considered necessary prior to making a final determination whether an IRM is actually necessary or whether a remedy can be selected.

Rather than being driven by an IRM, the FFS will also be prepared to evaluate select remedial alternatives. In this case the FFS focuses on technologies or alternatives that are considered to be viable based on their implementability, cost, and effectiveness and broad application to a variety of sites. The following recommendations are made for FS that focus on a particular technology or alternative:

- Pump and treat
- Containment (e.g., grout/freeze walls and or hydraulic barriers via clean water injection)
- Gradient modification.

These recommendations reflect select technologies developed in Section 7.0 of this AAMSR.

The FFS is intended to provide a detailed analysis of select remedial alternatives. The results of the detailed analysis provide the basis for identifying preferred alternatives. The detailed analysis for alternatives consists of the following components:

- Further definition of each alternative, if appropriate, with respect to the volumes or areas of contaminated environmental media to be addressed, the technologies to be used, and any performance requirements associated with those technologies. Remedial investigations and treatability studies, if conducted, will also be used to further define applicable alternatives.
- An assessment and summary of each alternative against evaluation criteria specified in EPA's *Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA* (EPA 1988b).
- A comparative analysis of the alternatives that will facilitate the selection of a remedial action.

9.4.2 Final Feasibility Study

To complete the remediation process for an aggregate area, a final or summary FS will be prepared. This study will address those contaminants not previously evaluated and

will summarize the results of preceding evaluations. The overall study and evaluation process for an aggregate area will consist of a number of FFSs, field investigations, and interim RODs. All of this study information will be summarized in one final FS to provide the data necessary for the final ROD. The summary FS will likely be conducted on an aggregate area basis.

9.5 TREATABILITY STUDIES

In accordance with EPA RI/FS guidance (EPA 1988b), treatability studies will be conducted when existing data is insufficient to provide required design values, practical cost ranges, or proof-of-principle for technologies identified in the FS process. Treatability studies involve bench-scale testing, analysis of existing information and, in a few situations, pilot-scale proof-of-principle studies. It is important to conduct both treatability tests and pilot-scale tests at the earliest stages of the remediation process to allow overall schedules to be maintained.

The preliminary screening of technologies conducted in Section 7.0 identified several technologies that could play a key role in 200 East Area groundwater FSs but currently have insufficient data to establish engineering design values, functional cost estimates, or proof-of-principle. Therefore the following treatability studies are recommended.

9.5.1 Treatment of Extracted Groundwater

Treatment of extracted groundwater is likely to play an important role in 200 East Area groundwater remediation. The performance of even proven treatment technologies cannot sufficiently be predicted because of the numerous contaminants present in groundwater, the high level of performance required by potential RAOs, and the presence of interfering background chemicals common to groundwater (such as reduced iron). To establish the viability and practically of these proven technologies, treatability tests are required.

Key technologies identified in Section 7.0 include reverse osmosis, coagulation/filtration, chemical precipitation, ion exchange, and UV/oxidation. Treatability testing should include, at a minimum, an evaluation of fouling problems associated with background groundwater contaminants (such as reduced iron); technologies that have the widest range of applicability to contaminants identified in 200 East Area groundwater; interferences of these contaminants; secondary waste quantities (see Section 9.5.2); and other potential adverse effects. Most of these technologies are currently under evaluation for the C-018H and -049H Projects. These programs should be used as models for a groundwater

treatability program. A key consideration will be establishing which technologies are capable of meeting the potentially stringent standards anticipated in final RAOs.

9.5.2 Treatment of Secondary Waste

Ion exchange, chemical precipitation, and reverse osmosis are candidate technologies for removing inorganics and radionuclides from groundwater; however, the production of secondary waste in these technologies is an adverse effect. For ion exchange and reverse osmosis, the volume of secondary waste can exceed 10% of the influent mass. Typically at the Hanford Site, secondary waste is solidified and landfilled, or placed in double-shell tanks for later volume reduction by evaporation. Because these practices are increasingly undesirable, alternative secondary waste concentration technologies should be evaluated on a bench scale. Innovative technologies that might be evaluated include freeze crystallization and supercritical extraction.

9.5.3 Pilot Testing of Containment Technologies

Section 7.0 identified engineered barriers (i.e., containment) technologies including grout injection and freeze technologies as important in the final remedy for 200 East Area groundwater. Containment technologies are not believed to be a sole solution, but their unique qualities make them mandatory components of a final solution. Preliminary screening indicated that due to the depth of groundwater in the 200 Areas, implementation costs and effectiveness need to be established prior to their consideration.

Small-scale pilot tests (or other means) should be conducted to assess this uncertainty. Pilot-scale testing should be conducted to determine required grout injection point or freezing equipment spacing to identify special installation techniques needed, and to better understand potential cost ranges.

9.6 AGGREGATE AREA-SCALE CHARACTERIZATION RECOMMENDATIONS

The analysis of data needs (Section 8.2.3) and resulting investigation strategy (Section 8.3.3) pointed out a number of issues which should be addressed in investigations subsequent to the AAMS process. Some of these issues will be addressed as part of the LFIs and the RI, but some are not plume specific and would be better investigated on an aggregate area basis. These issues include:

- **Installation of additional monitoring wells**, mainly in areas where historically few wells have been located. These include the portion of the B Plant Aggregate Area north of the 200 East Area fenceline where the ^{99}Tc IRM is located; areas near the 216-B-5 Reverse Well; and other areas where plumes are not well delineated. In addition, many of the plumes have migrated into the 600 Area (i.e., outside the 200 East Area fenceline) and the number of wells is few here as well. While some of the wells required in this area will be installed in the course of the investigation of these plumes, it may be necessary to install others in the 600 Areas to provide sufficient coverage. This process will also provide data to bridge gaps in the geologic understanding of this area.

- **Continued groundwater monitoring** is necessary to continue to augment the analytical data base. To some extent this will be supplied by other programs (especially the programs by the Westinghouse Hanford Operational Groundwater Monitoring Network and the Pacific Northwest Laboratory), but the coverage obtained by the AAMS sampling should also be continued and expanded. As the data base is checked, specific questions can be addressed in this program which can be configured to be flexible in such matters as which analytes and wells are to be included.

- **Computer modeling capabilities** should be enhanced and developed. This is necessary at three levels: at the source unit level, where vadose zone models must be calibrated and applied to determine the potential for continuing releases; at the aggregate area level to show the details of the groundwater flow system and the effects of various remedial alternatives; and at the Hanford Site level, which will estimate the long term effects of groundwater flow systems and contaminant plumes on receptors beyond the extent of the 200 East Groundwater Aggregate Area. The models for these purposes have been chosen, only their development on a site-specific basis and calibration remain.

- **Groundwater transport characterization** should be carried out to better understand the groundwater flow system, which is the basis of most contaminant transport. Aquifer testing (mainly pumping tests) will be a major component of this study, along with further delineation of site stratigraphy and the relationship between hydraulic properties and the geology. Part of this study should also address the degree of interconnection of the uppermost (unconfined) aquifer with underlying confined zones.

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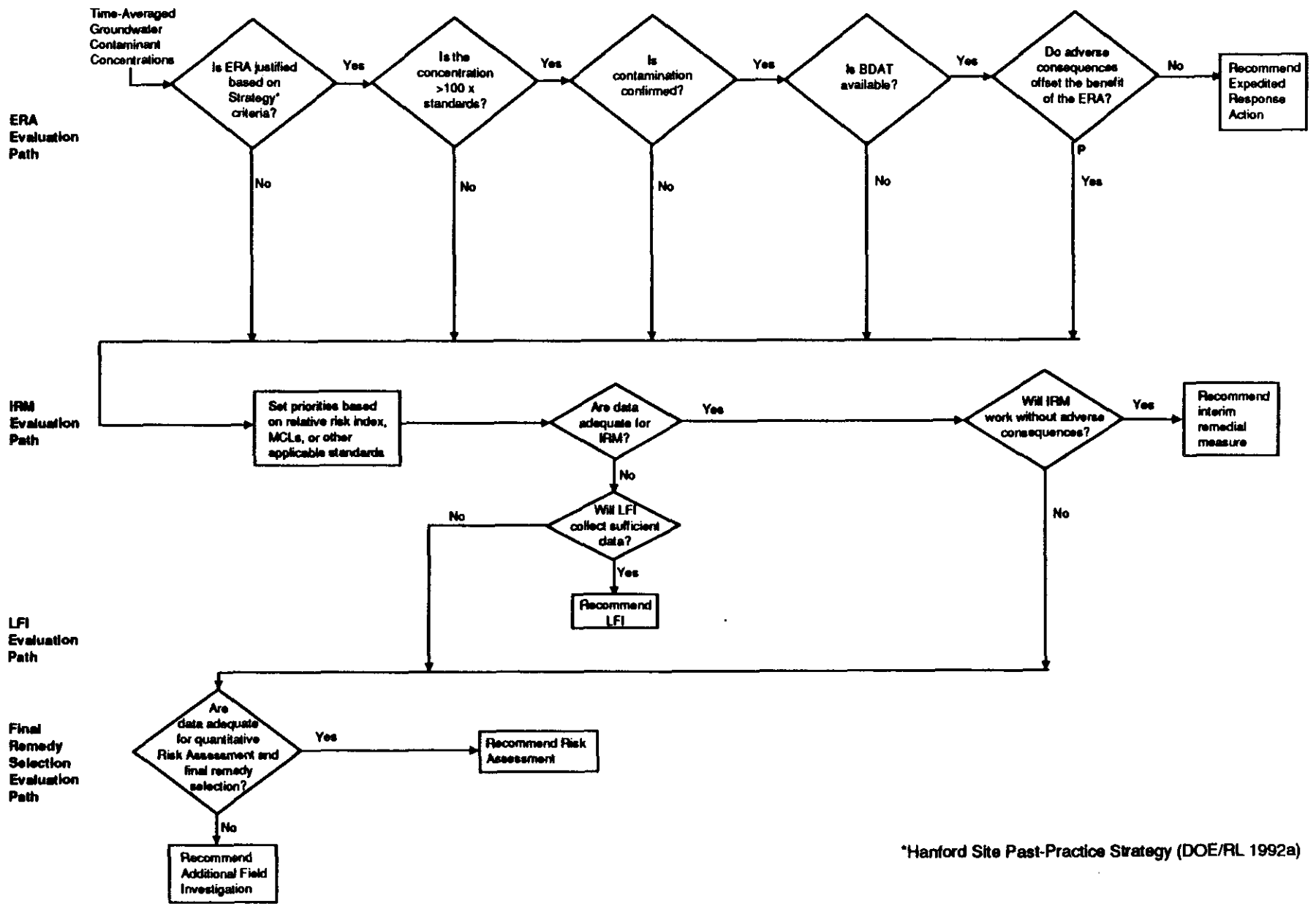

Figure 9-1. Groundwater Aggregate Area Management Study Data Evaluation Process.

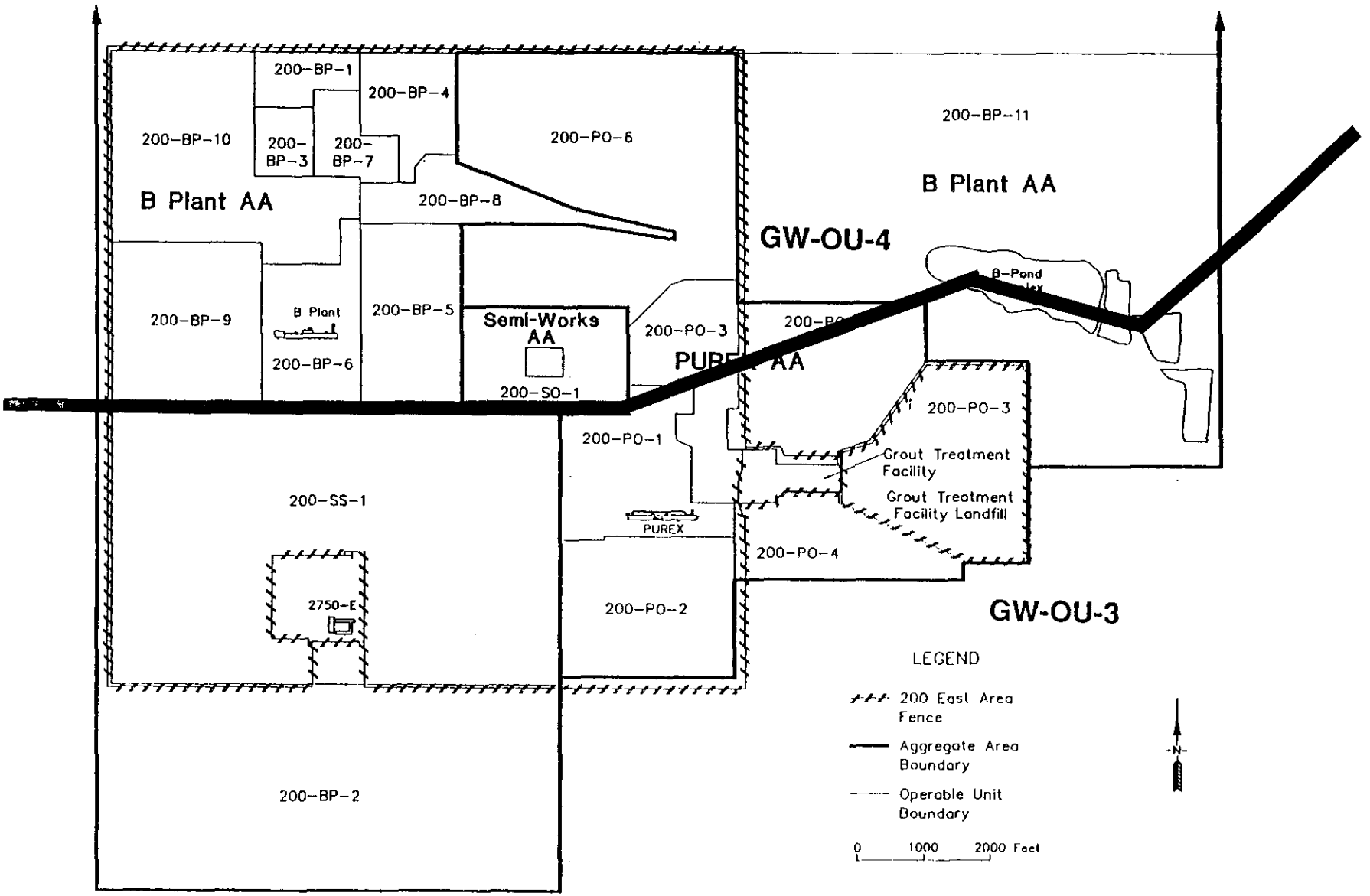

Figure 9-2. 200 East Aggregate Areas.

Table 9-1. Summary of the Results of the Data Evaluation Process Path Assessment.

Detected Constituent	ERA	IRM	LFI	RA	RI	Remarks
ORGANIC COMPOUNDS (μg/L)						
Chlorinated Aliphatics						
Chloroform (CHCl3)	--	--	--	--	X	
Carbon Tetrachloride (CCl4)	--	--	--	--	X	Not confirmed in any well detected (of 7)
Methylene Chloride	--	--	X	--	--	Possible laboratory contaminant
1,1-Dichloroethane (DCA)	--	--	--	--	--*	
1,2-Dichloroethane (DCA)	--	--	--	--	--*	Single detection, not confirmed
Cis-1,2-Dichloroethylene (DCE)	--	--	--	--	--*	Not confirmed in either well detected
Trans-1,2-Dichloroethylene (DCE)	--	--	--	--	--*	Not confirmed in either well detected
1,1,1-Trichloroethane (TCA)	--	--	--	--	--*	Below MCL but RRI rank = 2 (current, NC)
1,1,2-Trichloroethane (TCA)	--	--	--	--	--*	Single detection, not confirmed
Trichloroethylene (TCE)	--	--	--	--	--*	Above MCL in 2 wells
Tetrachloroethylene (PCE)	--	--	--	--	--*	Above MCL in 4 wells
Aromatics						
Pyrene	--	--	--	--	X	Single detection, not confirmed
Styrene	--	--	--	--	X	
Toluene	--	--	--	--	X	
2,4-Dinitrotoluene	--	--	X	--	--	Single detection, not confirmed
Phenols						
Phenol	--	--	--	--	X	Not confirmed in any well detected (of 5)
o-Nitrophenol	--	--	--	--	X	Neither detetion (of 2) confirmed
2,4-Dinitrophenol	--	--	X	--	--	Neither detection (of 2) confirmed
2-Chlorophenol	--	--	--	--	X	
2,4-Dichlorophenol	--	--	--	--	X	Single detection, not confirmed
2,3,4,6-Tetrachlorophenol	--	--	--	--	X	Single detection, not confirmed
Pentachlorophenol	--	--	X	--	--	Single detection, not confirmed
2,4-Dimethylphenol	--	--	--	--	X	Neither detection (of 2) confirmed
Ketones						
Acetone	--	--	--	--	X	Possible laboratory contaminant, no detection confirmed (of 25 wells)
Methyl ethyl ketone (MEK)	--	--	--	--	X	No detection confirmed (of 4 wells)
4-Methyl-2-Pentanone	--	--	--	--	X	Neither detection (of 2) confirmed
Cyclohexanone	--	--	--	--	X	Single detection, not confirmed
Pesticides						All pesticide detections colocated.
Aldrin	--	--	X	--	--	
DDD	--	--	--	--	X	

Table 9-1. Summary of the Results of the Data Evaluation Process Path Assessment.

Detected Constituent	ERA	IRM	LFI	RA	RI	Remarks
DDT	--	--	--	--	X	
Dieldrin	--	--	X	--	--	
Endrin	--	--	X	--	--	
Endrin Aldehyde	--	--	--	--	X	
Gamma-BHC	--	--	--	--	X	
Heptachlor	--	--	--	--	X	
Miscellaneous Organics						
Bis(2-ethylhexyl) phthalate	--	--	X	--	--	Possible laboratory or sampling artifact
Diethyl ether	--	--	--	--	X	No detection confirmed (of 3 wells)
Dimethoate	--	--	--	--	X	
Ethyl cyanide	--	--	--	--	X	Single detection, not confirmed
P-chloro-m-cresol	--	--	--	--	X	
Phorate	--	--	--	--	X	Neither detection (of 2) confirmed
Trichloromonofluoromethane	--	--	--	--	X	Neither detection (of 2) confirmed
Triethylene glycol	--	--	--	--	X	Single detection, not confirmed
RADIONUCLIDES (pCi/L)						
Gross alpha	--	--	X	--	--	Indicator parameter
Gross beta	--	--	X	--	--	Indicator parameter
Tritium (H-3)	--	--	--	X	--	
Beryllium(Be)-7	--	--	--	--	X	No detection (of 5) confirmed
Carbon(C)-14	--	--	--	--	X	
Potassium(K)-40	--	--	X	--	--	Naturally occurring
Cobalt(Co)-60	--	X	--	--	--	Colocated with Tc-99, cyanide, and nitrate
Zinc(Zn)-65	--	--	--	--	X	No detection (of 4) confirmed
Strontium(Sr)-90	X	--	--	--	--	
Zirconium/Niobium(Zr/Nb)-95	--	--	--	--	X	Neither detection (of 2) confirmed
Technetium(Tc)-99	--	X	--	--	--	Overlaps with Co-60, nitrate, and cyanide
Ruthenium(Ru)-106	--	--	X	--	--	
Antimony(Sb)-125	--	--	--	--	X	
Iodine(I)-129	--	--	X	--	--	Single detection above 4% DCG
Cesium(Cs)-134	--	--	--	--	X	
Cesium(Cs)-137	--	X	--	--	--	Colocated with Sr-90
Cerium/Praseodymium(Ce/Pr)-144	--	--	--	--	X	Neither detection (of 2) confirmed
Europium(Eu)-154	--	--	--	--	X	No detection (of 11) confirmed
Europium (Eu)-155	--	--	--	--	X	No detection (of 4) confirmed
Lead(Pb)-212	--	--	--	--	X	No detection (of 4) confirmed
Radium (Ra)	--	--	--	--	X	

Table 9-1. Summary of the Results of the Data Evaluation Process Path Assessment.

Detected Constituent	ERA	IRM	LFI	RA	RI	Remarks
Uranium (U)	--	--	--	--	X	
Uranium(U)-234	--	X	--	--	--	One well above 4% DCG
Uranium(U)-235	--	--	--	--	X	
Uranium(U)-238	--	X	--	--	--	One well above 4% DCG
Plutonium(Pu)-238	--	--	--	--	X	Colocated with Pu-239/240
Plutonium(Pu)-239/40	--	X	--	--	--	Colocated with Sr-90
Americium(Am)-241	--	--	--	--	X	
INORGANIC COMPOUNDS (μg/L)						Most inorganics require determination of background determination
Aluminum (Al)	--	--	--	--	X	
Ammonium ion (NH4)	--	--	--	--	X	
Antimony (Sb)	--	--	X	--	--	
Arsenic (As)	--	--	X	--	--	
Barium (Ba)	--	--	--	--	X	
Beryllium (Be)	--	--	X	--	--	No detection (of 8) confirmed
Boron (B)	--	--	--	--	X	
Bromide (Br)	--	--	--	--	X	No detection (of 4) confirmed
Cadmium (Cd)	--	--	X	--	--	
Calcium (Ca)	--	--	--	--	X	
Chloride (Cl)	--	--	--	--	X	
Chromium (Cr)	--	--	X	--	--	Long term relative risk
Cobalt (Co)	--	--	--	--	X	No detection (of 4) confirmed
Copper (Cu)	--	--	--	--	X	
Cyanide (CN)	--	X	--	--	--	Colocated with Co-60, Tc-99, and nitrate
Fluoride (F)	--	--	--	--	X	
Hydrazine	--	--	X	--	--	Neither detection confirmed
Iron (Fe)	--	--	--	--	X	
Lead (Pb)	--	--	--	--	X	
Lithium (Li)	--	--	--	--	X	
Magnesium (Mg)	--	--	--	--	X	
Manganese (Mn)	--	--	--	--	X	
Mercury (Hg)	--	--	--	--	X	No detection (of 3) confirmed
Nickel (Ni)	--	--	--	--	X	
Nitrate (NO3)	--	X	--	--	--	Highest levels colocated with Tc-99, Co-60, and cyanide
Nitrite (NO2)	--	--	--	--	X	
Phosphate (PO4)	--	--	--	--	X	
Potassium (K)	--	--	--	--	X	

Table 9-1. Summary of the Results of the Data Evaluation Process Path Assessment.

Detected Constituent	ERA	IRM	LFI	RA	RI	Remarks
Selenium (Se)	--	--	X	--	--	
Silicon (Si)	--	--	--	--	X	
Silver (Ag)	--	--	--	--	X	Single detection, not confirmed
Sodium (Na)	--	--	--	--	X	
Strontium (Sr)	--	--	--	--	X	
Sulfate (SO4)	--	--	--	--	X	
Thallium (Tl)	--	--	X	--	--	Single detection, not confirmed
Titanium (Ti)	--	--	--	--	X	
Uranium (U), chemical	--	--	--	--	X	
Vanadium (V)	--	--	--	--	X	
Zinc (Zn)	--	--	--	--	X	

* Addressed separately from Aggregate Area Management Study

Table 9-2. 200 East Groundwater Aggregate Area Data Evaluation Decision Matrix.

	ERA Evaluation Path								RRI Rank				IRM Path				Final Remedy Path		
									Current		Future								
Detected Constituent	Max Conc	HSPPS justfd?	GW Std	>100 *Std?	conf?	BDAT avail?	Adv Cnsq?	ERA?	C	NC	C	NC	Data Adeq?	LFI?	Adv Cnsq?	IRM?	Data Adeq?	RA?	RI?
ORGANIC COMPOUNDS (μg/L)																			
Chlorinated Aliphatics																			
Chloroform (CHCl3)	8.3	Y	100	N	--	--	--	N	18	--	--	--	N	N	--	--	N	--	Y
Carbon Tetra-chloride (CCl4)	4.5	Y	5	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Methylene Chloride	1,286	Y	5	Y	N	--	--	N	NR	--	--	--	N	Y	--	--	--	--	--
1,1-Dichloro-ethane (DCA)	5.3	Y	NA	N.	--	--	--	N	7	24	--	--	N	N	--	--	N	--	N*
1,2-Dichloro-ethane (DCA)	4.0	Y	5	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	N*
Cis-1,2-Dichloro-ethylene (DCE)	1.2	Y	70	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	N*
Trans-1,2 Dichloro-ethylene (DCE)	4.7	Y	100	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	N*
1,1,1-Trichloro-ethane (TCA)	39.5	Y	200	N	--	--	--	N	--	2	--	--	N	N	--	--	N	--	N*
1,1,2-Trichloro-ethane (TCA)	2.1	Y	5	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	N*
Trichloro ethylene (TCE)	12	Y	5	N	--	--	--	N	18	--	--	--	N	N	--	--	N	--	N*
Tetrachloro-ethylene (PCE)	8.2	Y	5	N	--	--	--	N	22	--	--	--	N	N	--	--	N	--	N*
Aromatics																			
Pyrene	8.5	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Styrene	9.5	Y	100	N	--	--	--	N	--	5	--	--	N	N	--	--	N	--	Y
Toluene	30	Y	1,000	N	--	--	--	N	--	21	--	--	N	N	--	--	N	--	Y
2,4-dinitro-toulene	8.7	Y	NA	N	--	--	--	N	NR	--	--	--	N	Y	--	--	--	--	--

Table 9-2. 200 East Groundwater Aggregate Area Data Evaluation Decision Matrix.

	ERA Evaluation Path								RRI Rank				IRM Path				Final Remedy Path		
									Current		Future								
Detected Constituent	Max Conc	HSPPS justfd?	GW Std	>100 *Std?	conf?	BDAT avail?	Adv Cnsq?	ERA?	C	NC	C	NC	Data Adeq?	LFI?	Adv Cnsq?	IRM?	Data Adeq?	RA?	RI?
Phenols																			
Phenol	12.3	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
o-Nitrophenol	28	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
2,4-Dinitrophenol	120	Y	NA	N	--	--	--	N	--	NR	--	--	N	Y	--	--	--	--	--
2-Chlorophenol	15.3	Y	NA	N	--	--	--	N	--	12	--	--	N	N	--	--	N	--	Y
2,4-Dichloro-phenol	18	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
2,3,4,5-Tetra-chlorophenol	10	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Pentachloro-phenol	67	Y	1	N	--	--	--	N	--	NR	--	--	N	Y	--	--	--	--	--
2,4-Dimethyl-phenol	20	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Ketones																			
Acetone	140	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Methyl ethyl ketone (MEK)	37	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
4-Methyl-2-Pentanone	11	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Cyclohexanone	4	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Pesticides																			
Aldrin	0.7	Y	NA	N	--	--	--	N	NR	--	--	--	N	Y	--	--	--	--	--
DDD	0.2	Y	NA	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
DDT	2.5	Y	NA	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Dieldrin	1.6	Y	NA	N	--	--	--	N	NR	--	--	--	N	Y	--	--	--	--	--
Endrin	2.3	Y	2	N	--	--	--	N	--	NR	--	--	N	Y	--	--	--	--	--
Endrin Aldehyde	0.3	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y

Table 9-2. 200 East Groundwater Aggregate Area Data Evaluation Decision Matrix.

	ERA Evaluation Path								RRI Rank				IRM Path				Final Remedy Path		
									Current		Future								
Detected Constituent	Max Conc	HSPPS justfd?	GW Std	>100 *Std?	conf?	BDAT avail?	Adv Cnsq?	ERA?	C	NC	C	NC	Data Adeq?	LFI?	Adv Cnsq?	IRM?	Data Adeq?	RA?	RI?
Gamma-BHC	0.7	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Heptachlor	0.6	Y	0.4	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Miscellaneous Organics																			
Bis(2-ethylhexyl) phthalate	56	Y	6	N	--	--	--	N	NR	--	--	--	N	Y	--	--	--	--	--
Diethyl ether	10	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Dimethoate	5,243	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Ethyl cyanide	5,003	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
P-chloro-m-cresol	15	Y	NA	N	--	--	--	N	--	20	--	--	N	N	--	--	N	--	Y
Phorate	11	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Trichloromonofluoromethane	11	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Triethylene glycol	10	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
RADIONUCLIDES (pCi/l)																			
Gross alpha	167	Y	15	N	--	--	--	N	--	--	--	--	N	Y	--	--	--	--	--
Gross beta	10,254	Y	50	Y	Y	N	--	N	--	--	--	--	N	Y	--	--	--	--	--
Tritium (H-3)	4,270,000	Y	20,000	Y	Y	N	--	N	4	--	4	--	Y	N	Y	--	Y	Y	--
Beryllium(Be)-7	222	Y	40,000	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Carbon(C)-14	38	Y	2,800	N	--	--	--	N	16	--	--	--	N	N	--	--	N	--	Y
Potassium(K)-40	240	Y	280	N	--	--	--	N	7	--	--	--	N	Y	--	--	--	--	--
Cobalt(Co)-60	474	Y	200	N	--	--	--	N	10	--	L	--	N	N	N	Y	--	--	--
Zinc(Zn)-65	7.5	Y	360	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Strontium(Sr)-90	5,150	Y	8	Y	Y	Y	N	Y	1	--	L	--	--	--	--	--	--	--	--
Zirconium/Niobium (Zr/Nb)-95	81	Y	1,600	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y

Table 9-2. 200 East Groundwater Aggregate Area Data Evaluation Decision Matrix.

	ERA Evaluation Path								RRI Rank				IRM Path				Final Remedy Path		
									Current		Future								
Detected Constituent	Max Conc	HSPPS justfd?	GW Std	>100 *Std?	conf?	BDAT avail?	Adv Cnsq?	ERA?	C	NC	C	NC	Data Adeq?	LFI?	Adv Cnsq?	IRM?	Data Adeq?	RA?	RI?
Technetium (Tc)-99	21,700	Y	4,000	N	--	--	--	N	2	--	1	--	Y	N	N	Y	--	--	--
Ruthenium (Ru)-106	301	Y	240	N	--	--	--	N	12	--	--	--	N	Y	--	--	--	--	--
Antimony (Sb)-125	7.9	Y	2,000	N	--	--	--	N	23	--	--	--	N	N	--	--	N	--	Y
Iodine(I)-129	30	Y	20	N	--	--	--	N	7	--	3	--	N	Y	--	--	--	--	--
Cesium(Cs)-134	3.6	Y	80	N	--	--	--	N	17	--	--	--	N	N	--	--	N	--	Y
Cesium(Cs)-137	1,330	Y	120	N	--	--	--	N	5	--	L	--	Y	N	N	Y	--	--	--
Cerium/Praseodymium(Ce/Pr)-144	29	Y	280	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Europium (Eu)-154	12	Y	800	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Europium(Eu)-155	9.4	Y	4,000	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Lead(Pb)-212	13	Y	120	N	--	--	--	N	NR	--	--	--	N	N	--	--	N	--	Y
Radium (Ra)	1.6	Y	5	N	--	--	--	N	14	--	--	--	N	N	--	--	N	--	Y
Uranium (U)	21	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Uranium(U)-234	33	Y	20	N	--	--	--	N	11	--	--	--	Y	N	N	Y	--	--	--
Uranium(U)-235	1.6	Y	24	N	--	--	--	N	18	--	--	--	N	N	--	--	N	--	Y
Uranium(U)-238	31	Y	24	N	--	--	--	N	12	--	--	--	Y	N	N	Y	--	--	--
Plutonium (Pu)-238	0.36	Y	1.6	N	--	--	--	N	15	--	--	--	N	N	--	--	N	--	Y
Plutonium (Pu)-239/40	74	Y	1.2	N	--	--	--	N	3	--	L	--	Y	N	N	Y	--	--	--
Americium (Am)-241	0.04	Y	1.2	N	--	--	--	N	21	--	--	--	N	N	--	--	N	--	Y
INORGANIC COMPOUNDS (μg/L)																			
Aluminum (Al), filtered	485	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Ammonium ion (NH4)	1,109	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Table 9-2. 200 East Groundwater Aggregate Area Data Evaluation Decision Matrix.

	ERA Evaluation Path								RRI Rank				IRM Path				Final Remedy Path		
									Current		Future								
Detected Constituent	Max Conc	HSPPS justfd?	GW Std	>100 *Std?	conf?	BDAT avail?	Adv Cnsq?	ERA?	C	NC	C	NC	Data Adeq?	LFI?	Adv Cnsq?	IRM?	Data Adeq?	RA?	RI?
Antimony (Sb)	115	Y	6	N	--	--	--	N	--	5	--	--	N	Y	--	--	--	--	--
Arsenic (As), filtered	24	Y	50	N	--	--	--	N	6	--	2	--	N	Y	--	--	--	--	--
Barium (Ba), filtered	113	Y	2,000	N	--	--	--	N	--	16	--	--	N	N	--	--	N	--	Y
Beryllium (Be), filtered	5.3	Y	4	N	--	--	--	N	L	NR	--	--	N	Y	--	--	--	--	--
Boron (B), filtered	168	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Bromide (Br)	862	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium (Cd), filtered	4.2	Y	5	N	--	--	--	N	L	8	--	--	N	Y	--	--	--	--	--
Calcium (Ca), filtered	241,000	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chloride (Cl)	193,000	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium (Cr), filtered	65	Y	100	N	--	--	--	N	L	10	L	1	N	Y	--	--	--	--	--
Cobalt (Co), filtered	30	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Copper (Cu), filtered	26	Y	NA	N	--	--	--	N	--	17	--	--	N	N	--	--	N	--	Y
Cyanide (CN)	869	Y	200	N	--	--	--	N	--	1	--	3	Y	N	N	Y	--	--	--
Fluoride (F)	2,200	Y	4,000	N	--	--	--	N	--	7	--	--	N	N	--	--	N	--	Y
Hydrazine	38	Y	NA	N	--	--	--	N	NR	--	--	--	N	Y	--	--	--	--	--
Iron (Fe), filtered	592,000	Y	NA	N	--	--	--	N	--	15	--	--	N	N	--	--	N	--	Y
Lead (Pb), filtered	6.6	Y	50	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Lithium (Li), filtered	16	Y	NA	N	--	--	--	N	--	23	--	--	N	N	--	--	N	--	Y
Magnesium (Mg), filtered	67,400	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Manganese (Mn), filtered	295	Y	NA	N	--	--	--	N	--	18	--	--	N	N	--	--	N	--	Y

Table 9-2. 200 East Groundwater Aggregate Area Data Evaluation Decision Matrix.

	ERA Evaluation Path								RRI Rank				IRM Path				Final Remedy Path		
									Current		Future								
Detected Constituent	Max Conc	HSPPS justfd?	GW Std	>100 *Std?	conf?	BDAT avail?	Adv Cnsq?	ERA?	C	NC	C	NC	Data Adeq?	LFI?	Adv Cnsq?	IRM?	Data Adeq?	RA?	RI?
Mercury (Hg)	0.21	Y	2	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Nickel (Ni), filtered	60	Y	100	N	--	--	--	N	L	14	--	--	N	N	--	--	N	--	Y
Nitrate (NO3)	503,000	Y	45,000	N	--	--	--	N	--	4	--	2	Y	N	N	Y	--	--	--
Nitrite (NO2)	1,080	Y	3,300	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Phosphate (PO4)	9,470	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Potassium (K), filtered	14,500	Y	NA	N	--	--	--	N	--	22	--	--	N	N	--	--	N	--	Y
Selenium (Se), filtered	24	Y	50	N	--	--	--	N	--	3	--	--	N	Y	--	--	--	--	--
Silicon (Si), filtered	31,600	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver (Ag), filtered	12	Y	NA	N	--	--	--	N	--	NR	--	--	N	N	--	--	N	--	Y
Sodium (Na), filtered	74,900	Y	NA	N	--	--	--	N	--	18	--	--	N	N	--	--	N	--	Y
Strontium (Sr), filtered	1,009	Y	NA	N	--	--	--	N	--	10	--	--	N	N	--	--	N	--	Y
Sulfate (SO4)	405,500	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y
Thallium (Tl)	50	Y	2	N	--	--	--	N	--	NR	--	--	N	Y	--	--	--	--	--
Titanium (Ti)	1,120	N	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Uranium (U), chemical	38	Y	NA	N	--	--	--	N	--	12	--	--	N	N	--	--	N	--	Y
Vanadium (V)	135	Y	NA	N	--	--	--	N	--	9	--	--	N	N	--	--	N	--	Y
Zinc (Zn)	358	Y	NA	N	--	--	--	N	--	--	--	--	N	N	--	--	N	--	Y

Y = Yes (decision)
N = No (decision)
NA = not available
NR = not ranked
L = low ranked (below MEPAS computation capability)
* = to be addressed separately from Aggregate Area Management Study process (see Section 9.3.1)

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Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 5 - Total Relative Risk Index (RRI) for Non-Carcinogenic Detections

RRI Contours at 0.03 0.1 0.3,1,3,10,30,100

Contaminant Data Based on Groundwater Sampling January 1988 - April 1992

Contour lines have been determined from values of relative risk index at each well as posted, through a linear interpolation to a grid via a triangular irregular network, and filtered with a low-pass filter. This process gives a smoother appearance to the contoured surface to show trends more clearly, but may not precisely agree with the values at the wells.

LEGEND

Aggregate Area Boundary

Perimeter Boundary

Buildings

Westinghouse Hanford Company
Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 4 - Total Relative Risk Index (RRI) for Carcinogenic Detections

RRI Contours at 0.1,0.3,1,3,10,30,100,300,1000,3000

Contaminant Data Based on Groundwater Sampling January 1988 - April 1992

Contour lines have been determined from values of relative risk index at each well as posted, through a linear interpolation to a grid via a triangular irregular network, and filtered with a low-pass filter. This process gives a smoother appearance to the contoured surface to show trends more clearly, but may not precisely agree with the values at the wells.

LEGEND

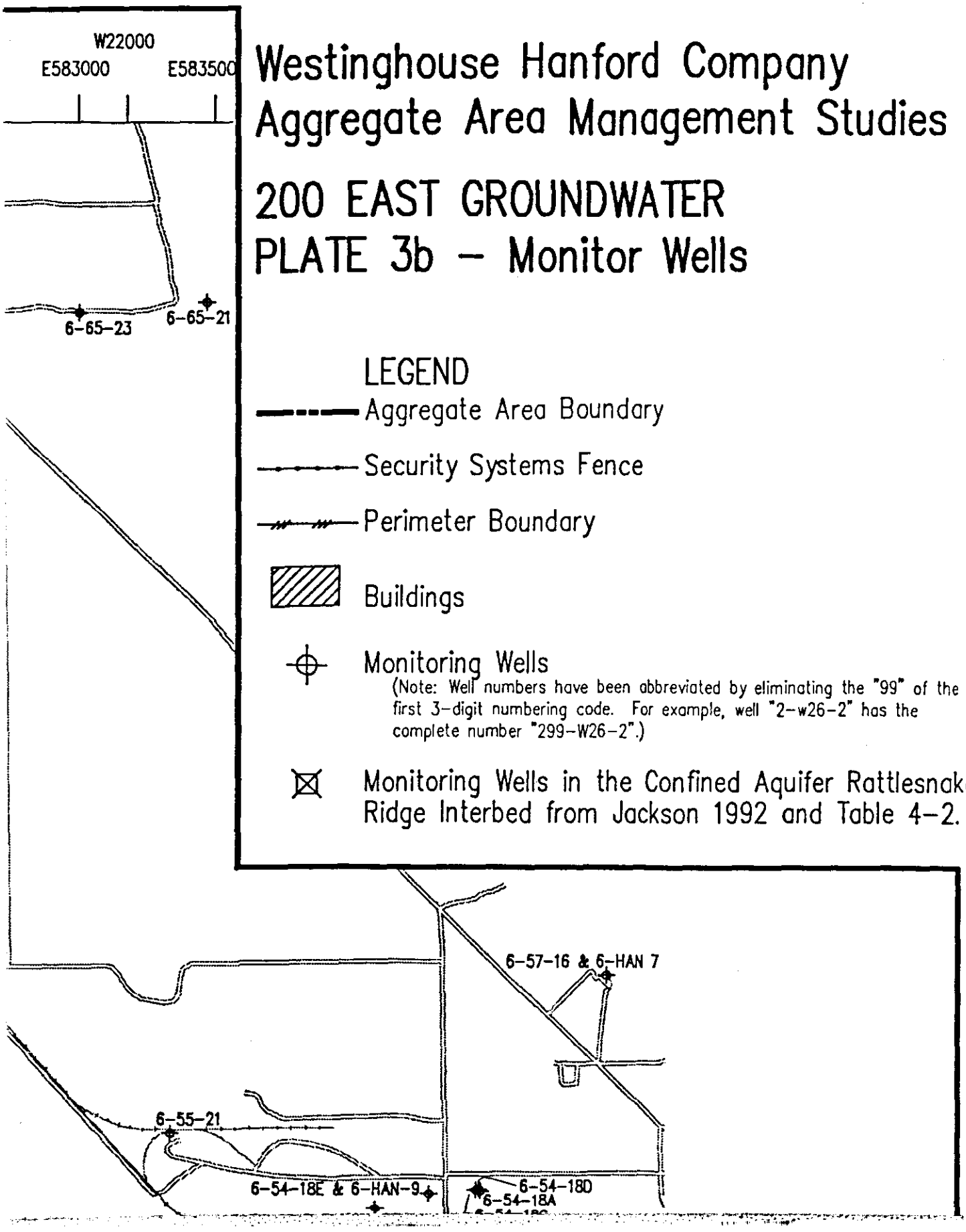
Aggregate Area Boundary

Perimeter Boundary

Buildings

Westinghouse Hanford Company
Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 3b – Monitor Wells



LEGEND

Aggregate Area Boundary

Security Systems Fence

Perimeter Boundary

Buildings

Monitoring Wells
(Note: Well numbers have been abbreviated by eliminating the "99" of the first 3-digit numbering code. For example, well "2-w26-2" has the complete number "299-W26-2".)

Monitoring Wells in the Confined Aquifer Rattlesnake Ridge Interbed from Jackson 1992 and Table 4-2.

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Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 3a – Monitor Wells

LEGEND

- Aggregate Area Boundary
- Security Systems Fence
- Perimeter Boundary
- Buildings

Westinghouse Hanford Company
Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 2b - Topography (North)

LEGEND

Aggregate Area Boundary

Security Systems/Fences

Perimeter Boundary

Buildings

Westinghouse Hanford Company
Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 2a - Topography (South)

LEGEND

Aggregate Area Boundary

Security Systems/Fences

Perimeter Boundary

Westinghouse Hanford Company
Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 1b - Facilities & Sites (North)

LEGEND

Aggregate Area Boundary

Security Systems/Fences

Perimeter Boundary

Buildings

Westinghouse Hanford Company
Aggregate Area Management Studies

200 EAST GROUNDWATER
PLATE 1a - Facilities & Sites (South)

LEGEND

Aggregate Area Boundary

Security Systems/Fences

Perimeter Boundary

Buildings

APPENDIX A

SUPPLEMENTAL DATA

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CONTENTS

TABLES:

A-1 Summary of Detections in 200 East Groundwater Aggregate Area (January 1988-April 1991)

A-2 Maximum Detections in 200 East Groundwater (October 1951-April 1991)

A-3 Summary of Reported Results Below Analytical Detection Limits

A-4 Summary of Wells with Detected Compounds

A-5 Input Parameters for Exposure to Current Onsite Contaminant Levels

A-6 Input Parameters for Exposure to Future Offsite Contaminant Levels

A-7 Chemical Specific Exposure Input Parameters

A-8 Transmissivity and Hydraulic Conductivity Values for the Uppermost Unconfined Portion of the Uppermost Aquifer

A-9 Uppermost Aquifer Hydrologic Test Data for the 200 East Area

A-10 Summary of Groundwater Monitoring Wells and Their Associated Networks for the 200 East Area

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For Table A-1, organic and inorganic constituent concentrations are in μg/L. Radionuclide concentrations are in pCi/L.

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Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 1

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a 1,1,1-trichloroethane							
	6-23-34	39.467	60.000	30.000	15	0	15
	6-24-34B	33.231	58.000	17.000	13	0	13
	6-24-34A	26.250	44.000	15.000	12	0	12
	6-24-34C	23.692	33.000	16.000	12	1	13
	6-24-33	17.500	23.000	15.000	10	0	10
	6-25-34C	5.408	8.100	3.900	12	1	13
	6-26-35A	4.720	3.600	3.600	1	4	5
	6-25-34B	4.600	7.000	7.000	1	4	5
	6-26-33	4.500	2.500	2.500	1	4	5
	6-25-34A	4.420	6.100	6.100	1	4	5
	6-24-35	3.854	6.800	2.800	8	5	13
a 1,1,2-trichloroethane							
	6-24-34C	2.100	.600	.600	1	12	13
a 1,1-dichloroethane							
	6-24-33	5.260	2.200	1.100	5	5	10
	6-24-34C	5.077	4.000	1.200	7	6	13
	6-23-34	4.807	7.000	4.000	10	4	14
	6-24-34B	4.508	6.000	3.000	8	4	12
	6-24-34A	4.145	5.400	3.000	7	4	11
a 1,2-dichloroethane							
	6-24-34C	4.042	.500	.500	1	11	12
2,3,4,6-tetrachlorophenol							
	6-40-40B	10.000	10.000	10.000	1	0	1
2,4-dichlorophenol							
	2-E17-16	18.000	26.000	26.000	1	1	2
2,4-dimethylphenol							
	2-E17-1B	20.000	20.000	20.000	1	0	1
	6-43-42J	6.500	8.000	8.000	1	1	2
2,4-dinitrophenol							
	6-42-41	120.000	120.000	120.000	1	0	1
	6-40-40B	59.000	59.000	59.000	1	0	1
2,4-dinitrotoluene							
	2-E33-3	8.667	11.000	11.000	1	2	3
2-chlorophenol							
	2-E33-3	15.333	22.000	14.000	2	1	3
	2-E35-2	6.500	8.000	8.000	1	1	2
4-Methyl-2-Pentanone							
	2-E33-5	11.000	11.000	11.000	1	0	1
	6-25-34A	3.000	3.000	3.000	1	0	1
Acetone by VOA							
	2-E28-7	140.000	140.000	140.000	1	0	1
	6-48-50	120.000	120.000	120.000	1	0	1
	2-E34-8	77.375	9.500	9.500	1	3	4
	2-E33-37	68.833	6.500	6.500	1	2	3
	2-E33-30	39.556	6.000	6.000	1	8	9
	2-E28-26	36.600	8.000	8.000	1	9	10
	2-E24-17	31.750	8.000	8.000	1	7	8
	2-E34-5	30.750	3.000	3.000	1	7	8
	2-E34-6	27.800	10.000	10.000	1	4	5
	6-43-42J	24.667	12.000	12.000	1	5	6
	2-E18-2	23.000	11.000	11.000	1	5	6
	2-E34-3	23.000	3.000	3.000	1	5	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 2

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Acetone by VOA							
	6-47-60	22.000	22.000	22.000	1	0	1
	2-E24-16	21.414	7.900	7.900	1	6	7
	6-53-55A	21.000	21.000	21.000	1	0	1
	2-E34-2	20.250	4.000	4.000	1	7	8
	6-49-55A	19.000	28.000	28.000	1	1	2
	6-55-57	17.000	17.000	17.000	1	0	1
	2-E17-16	12.500	20.000	20.000	1	3	4
	2-E17-19	12.400	23.000	23.000	1	4	5
	6-42-40A	10.825	13.300	13.300	1	3	4
	2-E17-9	10.000	10.000	10.000	1	3	4
	2-E33-3	10.000	11.000	11.000	1	1	2
	6-55-50C	8.000	8.000	8.000	1	0	1
	6-35-70	7.900	7.900	7.900	1	0	1
Aldrin							
	2-E25-33	.740	1.800	1.700	2	3	5
	2-E34-8	.633	1.800	1.800	1	2	3
	2-E25-29P	.450	1.600	1.600	1	3	4
	2-E25-31	.340	1.400	1.400	1	4	5
	2-E25-32P	.317	1.500	1.500	1	5	6
Alkalinity							
	6-23-34	219685.385	593000.000	250.000	13	0	13
	6-55-50C	189000.000	265000.000	113000.000	2	0	2
	6-24-34B	181790.833	231000.000	240.000	12	0	12
	6-24-34C	173210.833	234000.000	260.000	12	0	12
	6-24-34A	164678.182	217000.000	230.000	11	0	11
	6-24-33	161747.000	214000.000	230.000	10	0	10
	2-E13-5	159500.000	165000.000	156000.000	4	0	4
	6-35-66	155500.000	157000.000	153000.000	4	0	4
	6-36-61B	154000.000	154000.000	154000.000	1	0	1
	2-E17-6	151500.000	152000.000	151000.000	2	0	2
	6-53-47A	149000.000	149000.000	149000.000	1	0	1
	6-36-61A	148666.667	149000.000	148000.000	3	0	3
	6-40-62	139333.333	140000.000	139000.000	3	0	3
	6-24-46	139000.000	140000.000	138000.000	3	0	3
	2-E13-14	137500.000	150000.000	117000.000	4	0	4
	2-E28-13	136500.000	138000.000	135000.000	2	0	2
	6-35-70	132500.000	134000.000	131000.000	2	0	2
	6-20-39	128500.000	130000.000	127000.000	2	0	2
	6-38-65	128000.000	128000.000	128000.000	1	0	1
	6-45-69A	122000.000	122000.000	122000.000	1	0	1
	2-E28-18	121500.000	132000.000	111000.000	2	0	2
	6-47-60	118666.667	120000.000	118000.000	3	0	3
	2-E25-21	118500.000	124000.000	113000.000	4	0	4
	6-44-64	117500.000	118000.000	117000.000	4	0	4
	6-25-34C	116279.167	151000.000	170.000	12	0	12
	2-E25-24	114333.333	116000.000	113000.000	3	0	3
	2-E28-21	114000.000	116000.000	112000.000	3	0	3
	6-24-35	113860.000	147000.000	160.000	12	0	12
	2-E33-18	111000.000	111000.000	111000.000	1	0	1
	2-E33-5	110333.333	114000.000	108000.000	3	0	3
	2-E24-12	109000.000	109000.000	109000.000	1	0	1
	2-E33-24	109000.000	109000.000	109000.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 3

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Alkalinity							
	2-E33-1	108325.000	114000.000	97300.000	4	0	4
	6-26-34	107333.333	108000.000	106000.000	3	0	3
	2-E25-20	107000.000	110000.000	104000.000	2	0	2
	2-E33-3	106666.667	109000.000	104000.000	3	0	3
	2-E25-23	105333.333	107000.000	104000.000	3	0	3
	2-E17-9	104000.000	104000.000	104000.000	2	0	2
	2-E18-1	104000.000	108000.000	102000.000	3	0	3
	2-E33-8	104000.000	104000.000	104000.000	1	0	1
	6-49-55A	103555.556	111000.000	96300.000	9	0	9
	2-E33-21	103000.000	103000.000	103000.000	1	0	1
	2-E16-2	102850.000	108000.000	97700.000	2	0	2
	2-E18-4	102666.667	105000.000	98000.000	3	0	3
	2-E27-5	102000.000	102000.000	102000.000	1	0	1
	6-45-42	101750.000	103000.000	101000.000	4	0	4
	2-E18-3	100900.000	105000.000	96600.000	4	0	4
	2-E33-10	100266.667	104000.000	97700.000	3	0	3
	6-37-43	100066.667	107000.000	94100.000	3	0	3
	6-25-33A	98032.500	132000.000	130.000	4	0	4
	2-E17-1	98000.000	101000.000	95000.000	2	0	2
	2-E32-1	97000.000	98100.000	95900.000	2	0	2
	2-E34-2	97000.000	97000.000	97000.000	1	0	1
	2-E28-23	96850.000	98100.000	95600.000	2	0	2
	2-E28-7	96600.000	96600.000	96600.000	1	0	1
	2-E24-8	95100.000	95100.000	95100.000	1	0	1
	2-E34-1	93366.667	97000.000	89100.000	3	0	3
	2-E25-19	93300.000	95600.000	90400.000	4	0	4
	2-E26-5	91400.000	91400.000	91400.000	1	0	1
	6-47-50	91200.000	92400.000	90000.000	2	0	2
	6-25-34B	91040.000	123000.000	160.000	4	0	4
	2-E24-2	90650.000	92700.000	88600.000	2	0	2
	2-E18-2	90500.000	91000.000	90000.000	3	0	3
	6-26-35C	90030.000	122000.000	120.000	4	0	4
	2-E17-12	89733.333	90900.000	88000.000	3	0	3
	2-E25-22	89100.000	89100.000	89100.000	1	0	1
	6-25-34A	87287.500	119000.000	150.000	4	0	4
	6-47-46A	86400.000	87700.000	85000.000	3	0	3
	2-E25-18	85700.000	85700.000	85700.000	1	0	1
	6-26-33	83280.000	112000.000	120.000	4	0	4
	6-39-39	79050.000	95300.000	62800.000	2	0	2
	6-42-40A	75200.000	75200.000	75200.000	1	0	1
	2-E26-1	75100.000	75100.000	75100.000	1	0	1
	6-26-35A	69850.000	117000.000	120.000	5	0	5
	6-50-53A	67262.500	68500.000	65300.000	8	0	8
	6-42-40B	53000.000	53000.000	53000.000	1	0	1
	2-E17-5	48745.000	97400.000	90.000	2	0	2
	6-43-42J	120.000	120.000	120.000	1	0	1
	6-53-50	110.000	110.000	110.000	1	0	1
	6-44-42	100.000	100.000	100.000	1	0	1
	2-E25-33	97.333	110.000	89.000	3	0	3
	2-E25-31	96.000	100.000	92.000	4	0	4
	2-E25-29P	92.250	95.000	90.000	4	0	4
	2-E17-17	92.000	93.000	91.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 4

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Alkalinity							
	2-E17-14	91.000	91.000	91.000	1	0	1
	2-E17-15	91.000	93.000	89.000	2	0	2
	2-E17-18	89.500	90.000	89.000	2	0	2
	2-E17-16	89.000	89.000	89.000	2	0	2
	2-E25-37	87.000	90.000	84.000	4	0	4
	2-E25-38	77.250	80.000	76.000	4	0	4
	2-E25-32P	73.000	74.000	72.000	2	0	2
	2-E25-39	70.250	74.000	68.000	4	0	4
	2-E25-25	70.200	72.000	66.000	5	0	5
Aluminum							
	2-E16-2	11195.000	14000.000	8390.000	2	0	2
	2-E25-9	4730.000	4730.000	4730.000	1	0	1
	2-E25-6	4530.000	4530.000	4530.000	1	0	1
	6-42-40B	3669.000	7110.000	228.000	2	0	2
	2-E26-5	2270.000	2270.000	2270.000	1	0	1
	2-E25-11	2030.000	2030.000	2030.000	1	0	1
	2-E33-40	1690.000	1690.000	1690.000	1	0	1
	2-E25-17	1180.000	1180.000	1180.000	1	0	1
	6-49-57B	775.000	775.000	775.000	1	0	1
	6-43-41F	637.667	1140.000	323.000	3	0	3
	6-50-53A	603.000	603.000	603.000	1	0	1
	2-E34-6	340.167	950.000	491.000	2	4	6
	2-E28-7	304.000	304.000	304.000	1	0	1
	2-E28-12	301.000	301.000	301.000	1	0	1
	2-E17-14	272.857	1010.000	1010.000	1	6	7
	2-E18-1	257.714	609.000	244.000	3	4	7
	2-E34-2	252.875	470.000	77.000	6	2	8
	2-E27-10	231.500	637.000	152.000	2	4	6
	6-41-40	230.333	291.000	250.000	2	1	3
	6-40-39	229.333	345.000	193.000	2	1	3
	6-44-43B	218.250	405.000	168.000	2	2	4
	2-E27-9	194.167	296.000	269.000	2	4	6
	6-50-53B	182.500	288.000	77.000	2	0	2
	2-E25-38	179.250	208.000	175.000	3	1	4
	2-E24-19	177.000	177.000	177.000	1	0	1
	2-E32-4	173.875	276.000	215.000	2	6	8
	2-E25-33	165.500	258.000	153.000	5	7	12
	2-E25-30P	165.000	211.000	179.000	2	4	6
	2-E25-31	162.545	288.000	288.000	1	10	11
	2-E25-25	156.900	219.000	219.000	1	9	10
	2-E25-29P	154.222	188.000	188.000	1	8	9
	2-E18-4	153.286	173.000	173.000	1	6	7
	2-E33-28	139.571	77.000	77.000	1	6	7
	2-E33-30	139.571	77.000	77.000	1	6	7
	2-E34-5	139.571	77.000	77.000	1	6	7
	2-E34-1	125.667	77.000	77.000	1	2	3
	6-55-55	124.000	124.000	124.000	1	0	1
	2-E33-31	113.500	77.000	77.000	1	1	2
	2-E33-32	113.500	77.000	77.000	1	1	2
	6-49-55B	102.000	102.000	102.000	1	0	1
	2-E33-15	77.000	77.000	77.000	1	0	1
	2-E33-18	77.000	77.000	77.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 5

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Aluminum							
	2-E33-24	77.000	77.000	77.000	1	0	1
	2-E33-38	77.000	77.000	77.000	1	0	1
	2-E33-39	77.000	77.000	77.000	1	0	1
	6-47-50	77.000	77.000	77.000	1	0	1
	6-49-55A	77.000	77.000	77.000	1	0	1
	6-49-57A	77.000	77.000	77.000	1	0	1
	6-52-54	77.000	77.000	77.000	1	0	1
	6-52-57	77.000	77.000	77.000	1	0	1
Aluminum, filtered							
	6-40-33A	485.000	485.000	485.000	1	0	1
	6-37-43	255.333	466.000	466.000	1	2	3
	6-49-57B	244.000	244.000	244.000	1	0	1
	2-E34-2	205.625	505.000	77.000	3	5	8
	6-43-41F	200.000	300.000	300.000	1	2	3
	2-E33-40	190.000	190.000	190.000	1	0	1
	2-E17-14	182.429	377.000	377.000	1	6	7
	2-E25-33	152.222	170.000	170.000	1	8	9
	2-E33-30	139.571	77.000	77.000	1	6	7
	2-E34-5	139.571	77.000	77.000	1	6	7
	2-E33-28	137.833	77.000	77.000	1	5	6
	6-49-55A	135.400	77.000	77.000	1	4	5
	6-47-50	125.667	77.000	77.000	1	2	3
	2-E33-18	113.500	77.000	77.000	1	1	2
	2-E33-24	113.500	77.000	77.000	1	1	2
	2-E33-31	113.500	77.000	77.000	1	1	2
	2-E33-32	113.500	77.000	77.000	1	1	2
	2-E34-1	113.500	77.000	77.000	1	1	2
	6-49-55B	110.000	110.000	110.000	1	0	1
	2-E33-15	77.000	77.000	77.000	1	0	1
	2-E33-38	77.000	77.000	77.000	1	0	1
	2-E33-39	77.000	77.000	77.000	1	0	1
	6-49-57A	77.000	77.000	77.000	1	0	1
	6-52-54	77.000	77.000	77.000	1	0	1
	6-52-57	77.000	77.000	77.000	1	0	1
	6-55-55	77.000	77.000	77.000	1	0	1
Americium-241							
	2-E33-35	.040	.085	.085	1	1	2
	2-E18-1	.030	.030	.030	1	0	1
	2-E25-34	.024	.024	.024	1	0	1
	2-E17-9	.010	.010	.010	1	0	1
	2-E28-28	.010	.035	-.001	2	1	3
	2-E27-10	.009	.009	.009	1	0	1
	2-E27-8	.007	.007	.007	1	0	1
	2-E27-9	.003	-.001	-.001	1	1	2
	2-E27-11	.003	-.002	-.002	1	1	2
	2-E28-26	.002	.005	.005	1	2	3
	2-E28-27	.000	.009	.009	1	2	3
Ammonium ion							
	6-49-55A	1109.400	1490.000	800.000	5	0	5
	2-E32-5	568.333	1800.000	50.000	5	1	6
	2-E28-26	362.600	1190.000	63.000	6	4	10
	6-53-47A	341.000	341.000	341.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 6

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Ammonium ion							
	2-E25-17	257.000	257.000	257.000	1	0	1
	2-E32-3	233.333	1120.000	430.000	2	7	9
	2-E27-5	137.000	137.000	137.000	1	0	1
	2-E13-5	104.000	320.000	320.000	1	4	5
	6-42-39B	100.000	100.000	100.000	1	0	1
	2-E25-9	97.000	97.000	97.000	1	0	1
	2-E25-18	90.167	91.000	91.000	1	5	6
	2-E28-21	89.000	206.000	206.000	1	3	4
	6-41-40	88.000	140.000	140.000	1	4	5
	6-43-41E	87.250	149.000	149.000	1	3	4
	2-E17-17	71.889	180.000	67.000	2	7	9
	2-E26-13	70.000	40.000	40.000	1	1	2
	2-E27-11	70.000	30.000	30.000	1	3	4
	6-50-53A	68.500	82.000	55.000	2	0	2
	2-E17-15	65.200	52.000	52.000	1	9	10
	2-E16-2	64.333	93.000	93.000	1	2	3
	2-E33-29	64.167	20.000	20.000	1	11	12
	2-E17-14	63.750	110.000	110.000	1	7	8
	2-E25-31	63.600	76.000	67.000	3	2	5
	6-43-41F	62.667	88.000	88.000	1	2	3
	2-E17-12	60.000	80.000	80.000	1	2	3
	2-E25-30P	60.000	80.000	80.000	1	2	3
	2-E25-42	60.000	20.000	20.000	1	1	2
	6-40-40A	60.000	60.000	60.000	1	0	1
	2-E32-4	59.231	20.000	20.000	1	12	13
	2-E25-32P	57.778	20.000	20.000	1	8	9
	2-E28-13	56.667	70.000	70.000	1	2	3
	2-E17-5	56.600	66.000	66.000	1	9	10
	6-44-64	56.000	62.000	62.000	1	1	2
	6-40-39	54.000	20.000	20.000	1	4	5
	6-47-50	54.000	58.000	58.000	1	1	2
	2-E34-5	53.750	60.000	20.000	2	6	8
	2-E17-6	53.667	62.000	60.000	2	4	6
	6-47-46A	53.000	56.000	56.000	1	1	2
	6-47-60	53.000	56.000	56.000	1	1	2
	6-39-39	52.000	54.000	54.000	1	1	2
	6-35-66	50.000	50.000	50.000	1	1	2
	6-43-41G	50.000	50.000	50.000	1	0	1
	2-E34-6	47.143	30.000	30.000	1	6	7
	2-E25-11	35.000	20.000	20.000	1	1	2
	6-43-40	30.000	30.000	30.000	1	0	1
Antimony							
	2-E33-31	129.750	19.000	19.000	1	3	4
	2-E33-32	129.750	19.000	19.000	1	3	4
	2-E33-28	129.309	22.400	22.400	1	10	11
	2-E33-30	121.900	19.000	19.000	1	9	10
	2-E34-5	114.244	28.200	28.200	1	8	9
	2-E34-2	102.111	19.000	19.000	1	8	9
	2-E34-1	59.500	19.000	19.000	1	1	2
	6-49-57A	24.100	24.100	24.100	1	0	1
	6-47-50	19.600	19.600	19.600	1	0	1
	2-E33-18	19.000	19.000	19.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 7

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Antimony							
	2-E33-24	19.000	19.000	19.000	1	0	1
	2-E33-38	19.000	19.000	19.000	1	0	1
	2-E33-39	19.000	19.000	19.000	1	0	1
	2-E33-40	19.000	19.000	19.000	1	0	1
	6-49-55A	19.000	19.000	19.000	1	0	1
	6-49-57B	19.000	19.000	19.000	1	0	1
	6-50-53A	19.000	19.000	19.000	1	0	1
	6-50-53B	19.000	19.000	19.000	2	0	2
	6-52-54	19.000	19.000	19.000	1	0	1
	6-55-55	19.000	19.000	19.000	1	0	1
Antimony, filtered							
	2-E33-28	114.875	19.000	19.000	1	7	8
	2-E33-30	113.222	19.000	19.000	1	8	9
	2-E33-31	106.333	19.000	19.000	1	2	3
	2-E33-32	106.333	19.000	19.000	1	2	3
	2-E34-2	102.111	19.000	19.000	1	8	9
	2-E34-5	88.429	19.000	19.000	1	6	7
	6-49-55A	83.800	19.000	19.000	1	4	5
	6-47-50	73.000	19.000	19.000	1	2	3
	2-E34-1	60.050	20.100	20.100	1	1	2
	2-E33-18	59.500	19.000	19.000	1	1	2
	2-E33-24	59.500	19.000	19.000	1	1	2
	6-49-57A	42.900	42.900	42.900	1	0	1
	2-E33-15	19.000	19.000	19.000	1	0	1
	2-E33-38	19.000	19.000	19.000	1	0	1
	2-E33-39	19.000	19.000	19.000	1	0	1
	2-E33-40	19.000	19.000	19.000	1	0	1
	6-49-55B	19.000	19.000	19.000	1	0	1
	6-49-57B	19.000	19.000	19.000	1	0	1
	6-52-54	19.000	19.000	19.000	1	0	1
	6-52-57	19.000	19.000	19.000	1	0	1
	6-55-55	19.000	19.000	19.000	1	0	1
Antimony-125							
	2-E34-8	7.885	11.900	10.900	2	1	3
	2-E17-5	7.260	7.260	7.260	1	0	1
	6-34-42	6.300	6.300	6.300	1	0	1
	2-E27-16	3.541	6.700	6.700	1	1	2
	6-24-33	3.533	7.650	7.650	1	3	4
	6-40-33A	3.510	23.100	8.460	2	4	6
	2-E33-36	2.510	9.820	9.820	1	1	2
	2-E26-9	.369	.369	.369	1	0	1
	2-E28-28	.243	7.900	7.900	1	2	3
	2-E17-17	-.500	2.230	2.230	1	1	2
	2-E24-16	-2.875	-1.050	-1.050	1	1	2
	2-E25-37	-3.890	-3.890	-3.890	1	0	1
	2-E27-8	-4.790	-7.570	-7.570	1	1	2
	6-36-61A	-6.470	-6.470	-6.470	1	0	1
	2-E26-11	-7.360	-7.360	-7.360	1	0	1
Arsenic							
	2-E25-17	56.000	56.000	56.000	1	0	1
	2-E25-30P	31.383	46.000	15.000	6	0	6
	2-E16-2	31.000	38.000	24.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 8

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Arsenic							
	2-E25-23	24.000	24.000	24.000	1	0	1
	2-E25-9	21.000	21.000	21.000	1	0	1
	2-E25-24	17.000	19.000	15.000	4	0	4
	2-E18-3	16.778	51.000	11.000	9	0	9
	2-E25-6	15.000	15.000	15.000	1	0	1
	2-E27-16	13.667	14.000	13.000	3	0	3
	6-44-42	13.000	16.000	11.000	7	0	7
	2-E25-21	12.800	14.000	12.000	5	0	5
	6-43-42J	12.375	17.000	8.000	8	0	8
	2-E25-40	12.333	13.000	12.000	3	0	3
	2-E17-9	12.143	14.000	11.000	7	0	7
	2-E25-29P	11.694	14.000	7.700	17	0	17
	2-E25-35	11.408	17.000	9.000	11	1	12
	2-E25-11	10.600	14.000	7.200	2	0	2
	2-E33-41	10.500	11.000	10.000	2	0	2
	2-E18-4	10.429	11.000	9.000	7	0	7
	6-43-45	10.371	12.000	8.600	7	0	7
	2-E33-36	10.333	12.000	8.000	3	0	3
	2-E25-33	10.326	15.000	5.000	19	0	19
	2-E25-38	10.289	12.000	9.000	9	0	9
	2-E33-33	10.233	14.000	8.000	3	0	3
	2-E17-16	10.140	15.000	5.000	10	0	10
	2-E25-41	10.000	11.000	9.000	3	0	3
	2-E33-3	10.000	10.000	10.000	1	0	1
	2-E33-37	10.000	11.000	9.000	2	0	2
	2-E17-18	9.880	12.000	7.000	10	0	10
	2-E25-28	9.733	11.000	8.000	12	0	12
	2-E24-17	9.667	11.000	8.000	6	0	6
	2-E33-38	9.650	9.700	9.600	2	0	2
	2-E24-19	9.633	10.000	9.000	3	0	3
	2-E24-20	9.600	9.600	9.600	1	0	1
	2-E25-18	9.575	12.000	7.000	12	0	12
	2-E33-32	9.575	11.000	9.000	4	0	4
	2-E24-2	9.500	12.000	7.000	6	0	6
	2-E27-13	9.433	11.000	8.000	3	0	3
	2-E34-8	9.275	10.000	8.000	4	0	4
	2-E25-31	9.025	11.000	6.800	20	0	20
	2-E27-14	9.000	10.000	8.000	2	0	2
	2-E33-5	9.000	10.000	8.000	2	0	2
	2-E24-16	8.913	11.000	5.900	8	0	8
	2-E33-24	8.900	8.900	8.900	1	0	1
	2-E25-22	8.857	10.000	8.000	7	0	7
	2-E27-11	8.750	10.000	7.700	4	0	4
	2-E26-13	8.700	9.100	8.100	3	0	3
	2-E25-36	8.545	11.000	6.000	11	0	11
	2-E27-15	8.400	9.000	8.000	3	0	3
	2-E26-10	8.317	9.900	8.000	5	1	6
	2-E25-19	8.300	9.000	7.000	4	0	4
	2-E33-15	8.300	8.300	8.300	1	0	1
	2-E27-12	8.267	9.000	7.800	3	0	3
	2-E33-39	8.200	8.200	8.200	1	0	1
	2-E26-5	8.000	8.000	8.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 9

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Arsenic							
	2-E33-35	8.000	8.000	8.000	2	0	2
	2-E33-8	8.000	8.000	8.000	1	0	1
	2-E33-31	7.950	9.000	7.000	4	0	4
	2-E25-43	7.933	8.500	7.200	3	0	3
	2-E17-14	7.750	10.000	6.000	8	0	8
	2-E35-2	7.750	9.000	6.000	6	0	6
	6-43-43	7.700	9.500	7.000	8	0	8
	2-E25-20	7.678	11.000	7.000	7	2	9
	2-E17-13	7.667	10.000	6.000	3	0	3
	2-E33-28	7.608	9.000	5.800	12	0	12
	2-E25-34	7.600	9.000	5.000	10	0	10
	2-E26-9	7.540	9.000	6.000	5	0	5
	2-E27-9	7.530	9.000	6.000	10	0	10
	2-E26-12	7.500	9.800	6.100	3	0	3
	2-E33-34	7.500	8.000	7.000	2	0	2
	2-E17-15	7.345	9.000	5.000	11	0	11
	2-E27-8	7.322	9.000	5.000	9	0	9
	6-49-57A	7.100	7.100	7.100	1	0	1
	2-E17-12	7.000	9.000	7.000	2	1	3
	2-E17-5	7.000	8.000	6.000	9	1	10
	2-E27-7	7.000	7.000	7.000	2	0	2
	2-E33-1	7.000	9.000	9.000	1	1	2
	2-E33-21	7.000	7.000	7.000	1	0	1
	2-E27-10	6.956	9.000	6.700	8	1	9
	2-E33-18	6.900	6.900	6.900	1	0	1
	6-25-34C	6.889	22.000	5.000	3	6	9
	6-44-43B	6.888	9.000	6.100	7	1	8
	2-E17-19	6.800	8.000	6.000	5	0	5
	2-E34-2	6.750	11.000	5.000	10	0	10
	2-E33-29	6.746	10.000	5.900	11	2	13
	2-E17-20	6.430	8.000	5.000	10	0	10
	2-E25-42	6.425	7.100	5.600	4	0	4
	6-55-55	6.400	6.400	6.400	1	0	1
	2-E25-37	6.200	8.000	5.300	9	1	10
	2-E17-17	6.190	7.100	5.000	9	1	10
	2-E33-30	6.190	9.000	4.900	9	1	10
	2-E24-18	6.167	7.000	5.000	6	0	6
	6-42-42B	6.143	7.000	6.000	6	1	7
	2-E25-26	6.125	7.000	5.000	11	1	12
	6-49-55A	6.100	6.100	6.100	1	0	1
	2-E18-2	6.000	7.000	5.000	8	0	8
	2-E33-10	6.000	7.000	5.000	2	0	2
	2-E34-3	6.000	8.000	5.000	6	1	7
	2-E32-2	5.810	7.000	5.000	10	0	10
	2-E26-11	5.750	7.000	4.700	5	1	6
	6-26-34	5.750	7.000	5.000	3	1	4
	6-43-41G	5.700	6.400	6.400	1	1	2
	2-E28-27	5.691	7.000	5.000	9	2	11
	2-E17-1	5.600	7.000	5.000	4	1	5
	2-E25-27	5.600	7.000	5.000	4	1	5
	6-26-33	5.600	7.000	5.000	3	2	5
	6-24-35	5.556	7.000	5.000	4	5	9

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 10

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Arsenic							
	2-E34-5	5.530	7.000	5.000	10	0	10
	6-43-41F	5.500	7.000	7.000	1	3	4
	6-52-54	5.500	5.500	5.500	1	0	1
	6-34-42	5.350	5.700	5.700	1	1	2
	2-E34-6	5.286	6.000	5.000	3	4	7
	2-E28-26	5.222	7.000	5.000	2	7	9
	6-24-34B	5.222	6.000	6.000	2	7	9
	6-45-42	5.167	5.500	5.500	1	2	3
	2-E25-32P	5.071	6.000	6.000	1	13	14
	2-E25-25	5.067	6.000	6.000	1	14	15
	2-E32-3	5.000	5.000	5.000	3	6	9
	2-E34-7	5.000	5.000	5.000	1	2	3
	6-24-34A	5.000	5.000	5.000	1	8	9
	6-25-34A	5.000	5.000	5.000	3	1	4
	6-26-35A	5.000	5.000	5.000	1	3	4
	6-42-40B	5.000	5.000	5.000	1	1	2
	2-E34-1	4.300	2.900	2.900	1	2	3
	6-50-53A	2.900	2.900	2.900	1	0	1
	6-47-50	2.700	2.700	2.700	1	0	1
	2-E33-40	2.300	2.300	2.300	1	0	1
Arsenic, filtered							
	2-E25-30P	23.675	34.000	15.000	4	0	4
	2-E25-23	19.667	21.000	18.000	3	0	3
	2-E25-24	16.333	19.000	15.000	6	0	6
	2-E27-16	13.000	13.000	13.000	2	0	2
	2-E17-9	12.714	17.000	9.000	7	0	7
	6-44-42	12.500	15.000	8.000	6	0	6
	2-E25-29P	12.464	15.000	11.000	14	0	14
	2-E18-3	12.333	14.000	11.000	9	0	9
	6-37-43	12.000	17.000	7.000	2	0	2
	2-E25-21	11.400	13.000	10.000	5	0	5
	2-E25-40	11.000	12.000	10.000	4	0	4
	2-E25-35	10.675	15.000	8.000	8	0	8
	2-E24-2	10.667	12.000	9.000	6	0	6
	2-E25-33	10.667	15.000	6.000	15	0	15
	6-43-45	10.200	12.000	9.000	5	0	5
	6-43-42J	10.143	15.000	7.000	7	0	7
	2-E24-17	10.000	12.000	9.000	7	0	7
	2-E33-10	10.000	10.000	10.000	1	0	1
	2-E33-3	10.000	10.000	10.000	1	0	1
	2-E33-37	10.000	10.000	10.000	1	0	1
	2-E24-20	9.900	9.900	9.900	1	0	1
	2-E17-18	9.889	12.000	8.000	9	0	9
	2-E33-18	9.800	9.800	9.800	1	0	1
	2-E33-38	9.800	10.600	9.000	2	0	2
	2-E33-33	9.800	13.000	8.000	3	0	3
	2-E25-18	9.700	12.000	6.000	10	0	10
	2-E33-41	9.700	9.900	9.500	2	0	2
	2-E25-28	9.630	12.000	8.000	10	0	10
	2-E25-36	9.544	15.000	7.000	9	0	9
	2-E18-4	9.500	12.000	8.000	8	0	8
	2-E33-32	9.450	10.000	9.000	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 11

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Arsenic, filtered							
	2-E35-2	9.400	15.000	6.000	4	0	4
	2-E25-38	9.388	11.000	6.100	8	0	8
	2-E17-16	9.375	13.000	6.000	8	0	8
	2-E25-41	9.333	10.000	9.000	3	0	3
	2-E27-13	9.233	10.000	8.700	3	0	3
	2-E26-13	9.150	9.200	9.100	2	0	2
	2-E33-8	9.000	9.000	9.000	1	0	1
	2-E25-22	8.857	11.000	6.000	7	0	7
	2-E24-16	8.800	10.000	6.000	8	0	8
	2-E26-10	8.800	9.800	8.000	5	0	5
	2-E33-24	8.700	8.700	8.700	1	0	1
	2-E33-15	8.600	8.600	8.600	1	0	1
	2-E25-31	8.594	10.000	5.000	17	0	17
	2-E27-14	8.500	10.000	7.000	2	0	2
	2-E34-8	8.450	9.900	7.000	2	0	2
	2-E27-12	8.400	10.000	7.200	3	0	3
	2-E33-31	8.400	9.000	7.000	4	0	4
	2-E27-15	8.067	8.200	8.000	3	0	3
	2-E17-13	8.000	9.000	7.000	2	0	2
	2-E24-19	8.000	9.000	7.000	3	0	3
	2-E27-7	8.000	9.000	7.000	2	0	2
	2-E33-21	8.000	8.000	8.000	1	0	1
	2-E25-34	7.913	9.000	6.000	8	0	8
	2-E26-12	7.850	9.100	6.600	2	0	2
	2-E33-28	7.800	10.000	6.300	9	0	9
	2-E25-19	7.800	9.000	7.000	5	0	5
	6-49-57A	7.800	7.800	7.800	1	0	1
	2-E25-20	7.750	11.000	6.000	7	1	8
	2-E25-43	7.750	8.100	7.400	2	0	2
	2-E27-8	7.750	9.000	7.000	8	0	8
	2-E27-11	7.700	8.000	7.400	2	0	2
	2-E27-9	7.556	9.000	7.000	9	0	9
	2-E33-5	7.500	8.000	7.000	2	0	2
	2-E27-10	7.357	10.000	6.500	7	0	7
	6-43-43	7.333	9.000	7.000	5	1	6
	2-E17-12	7.000	9.000	7.000	2	1	3
	2-E33-1	7.000	9.000	9.000	1	1	2
	2-E33-34	7.000	8.000	6.000	2	0	2
	2-E33-35	7.000	8.000	6.000	2	0	2
	2-E33-36	7.000	7.000	7.000	1	0	1
	2-E26-9	6.900	9.000	5.000	3	0	3
	2-E17-15	6.889	8.000	6.000	8	1	9
	2-E17-20	6.889	9.000	5.000	8	1	9
	2-E34-3	6.857	11.000	5.000	7	0	7
	2-E17-14	6.750	9.000	5.000	8	0	8
	2-E33-29	6.645	9.000	5.000	11	0	11
	6-44-43B	6.571	8.000	6.000	5	2	7
	2-E17-19	6.480	8.000	5.000	5	0	5
	2-E33-30	6.444	7.000	6.000	9	0	9
	6-43-41G	6.400	6.400	6.400	1	0	1
	2-E26-11	6.367	7.000	6.000	3	0	3
	2-E17-17	6.350	7.000	6.000	8	0	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 12

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Arsenic, filtered							
	2-E24-18	6.333	7.000	6.000	6	0	6
	2-E17-5	6.300	8.000	5.000	9	1	10
	6-55-55	6.300	6.300	6.300	1	0	1
	2-E34-2	6.230	8.000	5.000	10	0	10
	2-E34-5	6.213	10.000	5.000	7	1	8
	6-42-42B	6.167	7.000	6.000	5	1	6
	2-E25-26	6.030	8.000	5.000	9	1	10
	6-25-34B	6.000	8.000	8.000	1	2	3
	6-47-60	6.000	7.000	7.000	1	1	2
	2-E25-37	5.917	7.000	5.500	5	1	6
	2-E25-42	5.900	6.200	5.600	2	0	2
	2-E25-27	5.800	7.000	6.000	3	2	5
	2-E28-27	5.750	7.000	5.000	6	2	8
	2-E32-2	5.711	6.000	5.000	9	0	9
	6-34-42	5.700	5.700	5.700	1	0	1
	6-45-42	5.500	6.000	5.000	2	0	2
	6-52-54	5.500	5.500	5.500	1	0	1
	2-E18-2	5.375	6.000	5.000	7	1	8
	2-E17-1	5.333	6.000	5.000	5	1	6
	2-E28-18	5.333	6.000	6.000	1	2	3
	6-25-34A	5.333	6.000	5.000	2	1	3
	6-26-33	5.250	6.000	5.000	4	0	4
	6-49-55A	5.225	5.900	5.000	2	2	4
	2-E34-6	5.143	6.000	5.000	3	4	7
	6-24-35	5.111	6.000	5.000	4	5	9
	6-25-34C	5.111	6.000	5.000	2	7	9
	2-E25-25	5.071	6.000	6.000	1	13	14
	2-E25-32P	5.000	5.000	5.000	1	13	14
	2-E32-3	5.000	5.000	5.000	1	7	8
	2-E34-7	5.000	5.000	5.000	1	2	3
	6-26-34	5.000	5.000	5.000	1	2	3
	6-26-35A	5.000	5.000	5.000	1	2	3
	6-43-41F	5.000	5.000	5.000	1	3	4
	6-47-50	4.233	2.700	2.700	1	2	3
	2-E34-1	4.000	3.000	3.000	1	1	2
	6-52-57	2.100	2.100	2.100	1	0	1
Barium							
	2-E25-17	343.000	343.000	343.000	1	0	1
	2-E25-9	289.000	289.000	289.000	1	0	1
	2-E25-6	242.000	242.000	242.000	1	0	1
	2-E16-2	220.500	269.000	172.000	2	0	2
	6-40-40B	126.500	170.000	83.000	2	0	2
	6-40-40A	125.000	140.000	110.000	2	0	2
	6-40-39	116.000	120.000	110.000	6	0	6
	2-E28-12	110.000	110.000	110.000	1	0	1
	6-50-53A	99.600	99.600	99.600	1	0	1
	6-49-55B	87.500	87.500	87.500	1	0	1
	6-49-57B	86.900	86.900	86.900	1	0	1
	6-42-39B	85.000	87.000	83.000	2	0	2
	2-E28-13	82.500	83.000	82.000	2	0	2
	2-E33-40	80.700	80.700	80.700	1	0	1
	6-23-34	78.193	84.000	70.900	15	0	15

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 13

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Barium							
	6-50-53B	78.150	78.400	77.900	2	0	2
	2-E26-5	75.000	75.000	75.000	1	0	1
	2-E32-4	74.692	82.000	67.000	13	0	13
	6-41-40	74.571	84.000	66.000	7	0	7
	2-E17-6	74.286	86.000	61.000	7	0	7
	2-E17-20	69.650	80.000	55.000	10	0	10
	6-24-34B	68.646	82.000	61.400	13	0	13
	2-E25-11	66.500	100.000	33.000	2	0	2
	6-43-40	65.500	75.000	56.000	2	0	2
	6-24-34A	63.667	69.000	57.000	12	0	12
	6-42-39A	63.500	66.000	61.000	2	0	2
	6-42-40B	61.500	111.000	12.000	2	0	2
	2-E17-9	61.143	64.000	57.000	7	0	7
	6-53-47A	61.000	61.000	61.000	1	0	1
	2-E17-14	59.556	82.000	44.000	9	0	9
	6-43-41G	59.500	66.000	53.000	2	0	2
	6-24-33	59.450	63.600	52.000	8	0	8
	6-36-61A	58.500	60.000	57.000	2	0	2
	6-40-62	58.000	59.000	57.000	2	0	2
	2-E18-3	55.444	62.000	50.000	9	0	9
	2-E18-2	55.200	61.000	49.000	10	0	10
	2-E13-14	55.000	55.000	55.000	1	0	1
	2-E34-7	55.000	55.000	55.000	1	0	1
	2-E18-4	54.833	59.000	49.000	9	0	9
	2-E25-19	54.500	71.000	47.000	5	0	5
	2-E17-19	54.333	63.000	47.000	6	0	6
	2-E17-15	54.182	64.000	47.000	11	0	11
	2-E28-7	53.000	53.000	53.000	1	0	1
	2-E35-1	53.000	53.000	53.000	1	0	1
	2-E24-17	52.667	61.000	47.000	6	0	6
	2-E17-1	51.200	58.000	45.000	5	0	5
	6-24-34C	51.129	61.000	46.000	14	0	14
	2-E24-16	50.625	54.000	47.000	8	0	8
	2-E24-18	49.333	62.000	41.000	6	0	6
	6-24-35	48.786	60.000	42.000	14	0	14
	2-E32-3	47.944	55.500	36.000	9	0	9
	6-44-43B	47.571	52.000	42.000	7	0	7
	2-E25-20	47.444	69.000	36.000	8	1	9
	2-E32-5	47.417	53.500	45.000	6	0	6
	2-E34-3	47.286	62.000	39.000	7	0	7
	6-43-41F	47.125	52.000	37.500	4	0	4
	6-43-41E	46.250	61.000	36.000	6	0	6
	2-E24-2	46.167	64.000	36.000	6	0	6
	6-26-35C	45.000	50.000	39.000	5	0	5
	6-52-54	44.000	44.000	44.000	1	0	1
	2-E17-17	43.778	48.000	40.000	9	0	9
	2-E28-28	42.400	49.000	39.000	5	0	5
	2-E17-5	41.650	61.000	30.500	10	0	10
	2-E27-11	41.000	45.000	38.000	4	0	4
	2-E33-37	40.500	55.500	31.000	3	0	3
	6-25-34C	40.154	45.000	33.000	13	0	13
	2-E28-21	40.000	40.000	40.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 14

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Barium							
	6-35-70	40.000	40.000	40.000	1	0	1
	2-E28-27	39.167	45.000	31.000	12	0	12
	2-E33-36	38.667	42.000	35.000	3	0	3
	6-43-45	37.571	41.000	32.000	7	0	7
	2-E28-26	37.556	52.000	31.000	9	0	9
	2-E34-2	37.290	58.000	30.000	10	0	10
	2-E33-29	36.700	44.000	32.000	10	0	10
	2-E33-31	36.400	43.600	32.000	4	0	4
	6-25-34A	36.200	40.000	32.000	5	0	5
	2-E17-13	36.000	38.000	35.000	3	0	3
	6-49-55A	36.000	36.000	36.000	1	0	1
	2-E27-9	35.818	42.000	26.000	11	0	11
	2-E34-6	35.500	53.000	28.000	8	0	8
	2-E33-39	35.400	35.400	35.400	1	0	1
	6-25-34B	35.400	39.000	29.000	5	0	5
	2-E26-11	35.200	40.000	33.000	5	0	5
	2-E27-10	35.167	41.000	31.000	9	0	9
	2-E17-18	34.864	39.500	30.000	11	0	11
	2-E33-33	34.833	37.000	31.500	3	0	3
	2-E35-2	34.667	41.500	27.000	6	0	6
	2-E17-12	34.333	35.000	34.000	3	0	3
	2-E27-15	34.333	36.000	32.000	3	0	3
	2-E33-5	34.000	35.000	33.000	2	0	2
	2-E33-28	33.615	38.500	31.000	13	0	13
	2-E32-2	33.591	40.000	28.000	11	0	11
	2-E33-41	33.500	34.500	32.500	2	0	2
	2-E25-33	33.367	46.000	29.000	21	0	21
	2-E25-35	33.364	36.000	27.000	11	0	11
	2-E33-1	33.000	39.000	27.000	2	0	2
	2-E33-15	32.900	32.900	32.900	1	0	1
	6-52-57	32.900	32.900	32.900	1	0	1
	6-26-33	32.600	37.000	30.000	5	0	5
	2-E17-16	32.545	53.000	20.000	11	0	11
	2-E32-1	32.500	37.000	28.000	2	0	2
	2-E33-35	32.500	35.000	30.000	2	0	2
	2-E18-1	32.333	54.000	23.000	12	0	12
	2-E33-24	32.300	32.300	32.300	1	0	1
	2-E27-8	32.278	40.000	26.000	9	0	9
	2-E34-8	32.250	40.000	26.000	4	0	4
	2-E27-14	32.000	34.000	30.000	2	0	2
	2-E33-10	32.000	39.000	25.000	2	0	2
	2-E33-38	32.000	32.600	31.400	2	0	2
	2-E25-31	31.772	40.000	25.000	25	0	25
	6-26-35A	31.286	35.000	28.000	7	0	7
	6-49-57A	30.400	30.400	30.400	1	0	1
	2-E24-19	30.167	35.500	24.000	3	0	3
	2-E33-18	30.100	30.100	30.100	1	0	1
	6-45-42	30.000	32.000	28.000	2	0	2
	2-E33-32	29.900	32.000	28.600	4	0	4
	2-E24-20	29.500	29.500	29.500	1	0	1
	2-E25-23	29.000	29.000	29.000	1	0	1
	2-E33-21	29.000	29.000	29.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 15

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Barium							
	2-E33-8	29.000	29.000	29.000	1	0	1
	2-E33-34	28.833	30.000	28.000	3	0	3
	2-E27-12	27.833	29.000	26.500	3	0	3
	2-E34-5	27.660	35.000	21.000	10	0	10
	2-E25-24	27.500	33.000	24.000	4	0	4
	2-E27-16	27.000	28.000	26.000	2	0	2
	2-E27-13	26.833	31.000	22.500	3	0	3
	2-E25-43	26.333	27.000	26.000	3	0	3
	2-E26-9	26.200	40.000	21.000	5	0	5
	6-26-34	26.000	28.000	23.000	4	0	4
	2-E26-10	25.750	33.000	30.000	2	2	4
	6-45-69A	25.500	28.000	23.000	2	0	2
	6-42-42B	25.429	30.000	21.000	7	0	7
	2-E34-1	25.033	28.000	23.100	3	0	3
	2-E28-18	24.750	30.000	20.000	4	0	4
	6-25-33A	24.600	30.000	20.000	5	0	5
	2-E25-42	23.500	24.000	23.000	2	0	2
	2-E33-30	23.400	26.900	19.000	11	0	11
	6-34-42	21.500	22.000	21.000	2	0	2
	2-E33-3	21.000	21.000	21.000	1	0	1
	2-E25-40	20.750	22.000	20.500	3	1	4
	2-E25-36	20.364	25.000	16.000	8	3	11
	2-E25-29P	20.357	26.000	16.000	18	3	21
	2-E25-34	19.900	22.000	17.000	8	2	10
	2-E25-21	19.750	19.000	19.000	1	3	4
	2-E25-38	19.667	22.000	17.000	5	4	9
	2-E25-41	18.250	17.000	16.000	2	2	4
	2-E25-30P	17.357	33.000	8.000	7	0	7
	2-E25-37	17.250	15.000	14.000	4	4	8
	2-E27-7	17.000	14.000	14.000	1	1	2
	6-42-40A	16.667	73.000	6.000	3	6	9
	2-E25-18	16.455	20.000	7.000	7	4	11
	6-44-42	16.000	27.000	12.000	6	1	7
	2-E25-28	15.855	20.000	12.000	8	3	11
	2-E25-25	15.505	20.000	10.000	17	4	21
	6-43-42J	14.500	13.000	11.000	4	2	6
	2-E25-32P	14.329	16.000	10.000	14	3	17
	6-43-43	14.250	14.000	9.000	6	2	8
	2-E28-23	14.000	14.000	14.000	1	0	1
	2-E25-26	13.764	13.000	9.000	8	3	11
	2-E25-22	12.814	15.000	9.000	7	0	7
	2-E25-27	12.080	16.000	10.000	5	0	5
	6-55-55	11.500	11.500	11.500	1	0	1
Barium, filtered							
	6-40-39	113.200	120.000	108.000	5	0	5
	6-40-33A	104.000	104.000	104.000	1	0	1
	6-38-65	86.000	89.000	83.000	2	0	2
	6-49-55B	81.600	81.600	81.600	1	0	1
	2-E28-13	79.250	88.000	76.000	4	0	4
	6-49-57B	77.300	77.300	77.300	1	0	1
	6-23-34	76.091	83.000	68.000	11	0	11
	6-50-53A	75.250	86.000	69.000	8	0	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 16

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Barium, filtered							
	2-E17-6	75.222	85.000	68.000	9	0	9
	6-41-40	74.600	82.000	69.000	5	0	5
	2-E32-4	72.000	76.000	69.000	9	0	9
	6-24-46	72.000	76.000	70.000	3	0	3
	6-47-35A	71.000	71.000	71.000	1	0	1
	2-E17-20	69.875	75.000	63.000	8	0	8
	6-47-50	67.467	74.000	61.400	3	0	3
	6-24-34B	66.667	72.000	60.000	12	0	12
	6-40-62	65.000	67.000	64.000	3	0	3
	2-E17-9	63.750	72.000	58.000	8	0	8
	6-36-61A	63.000	65.000	61.000	4	0	4
	6-53-47A	63.000	63.000	63.000	1	0	1
	2-E25-19	62.250	85.000	45.000	8	0	8
	6-24-34A	61.444	64.000	57.000	9	0	9
	2-E33-40	61.400	61.400	61.400	1	0	1
	6-53-47B	61.000	61.000	61.000	1	0	1
	2-E17-14	60.333	76.000	44.000	9	0	9
	6-24-33	60.222	70.000	55.000	9	0	9
	2-E18-2	57.700	73.000	51.000	10	0	10
	2-E17-15	57.400	70.000	48.000	10	0	10
	2-E24-17	57.000	66.000	51.000	6	0	6
	2-E18-4	56.750	65.000	52.000	8	0	8
	2-E18-3	56.700	63.000	50.000	10	0	10
	6-43-41E	55.500	57.000	54.000	2	0	2
	2-E17-1	55.200	75.000	45.000	5	0	5
	2-E17-19	55.167	60.000	51.000	6	0	6
	2-E34-7	54.000	54.000	54.000	1	0	1
	2-E13-5	53.250	56.000	48.000	4	0	4
	2-E25-20	51.900	63.000	37.000	9	1	10
	6-53-50	51.000	51.000	51.000	1	0	1
	6-24-34C	50.909	57.000	48.000	11	0	11
	2-E24-18	50.600	57.000	42.000	5	0	5
	6-47-46A	50.250	53.000	46.000	4	0	4
	6-44-64	49.800	54.000	46.000	5	0	5
	2-E24-16	49.143	52.000	46.000	7	0	7
	2-E34-3	48.714	64.000	42.000	7	0	7
	6-44-43B	48.500	52.000	43.000	6	0	6
	2-E32-3	47.167	53.000	39.000	6	0	6
	2-E28-28	47.000	47.000	47.000	1	0	1
	2-E32-5	47.000	48.000	46.000	2	0	2
	6-54-34	47.000	47.000	47.000	1	0	1
	6-24-35	46.500	61.000	42.000	12	0	12
	6-26-35C	46.200	52.000	40.000	5	0	5
	2-E24-12	46.000	51.000	41.000	2	0	2
	6-37-43	46.000	81.000	28.000	3	0	3
	6-43-41F	45.333	50.000	42.000	3	0	3
	2-E35-1	45.000	45.000	45.000	1	0	1
	6-33-56	45.000	45.000	45.000	1	0	1
	6-35-66	44.750	47.000	44.000	4	0	4
	2-E24-2	44.429	64.000	35.000	7	0	7
	2-E13-14	44.250	47.000	42.000	4	0	4
	2-E17-5	44.222	61.000	35.000	9	0	9

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 17

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Barium, filtered							
	2-E27-11	44.000	44.000	44.000	1	0	1
	2-E17-17	43.571	49.000	41.000	7	0	7
	6-34-51	43.000	43.000	43.000	1	0	1
	6-52-54	42.100	42.100	42.100	1	0	1
	2-E28-21	42.000	47.000	36.000	5	0	5
	2-E34-8	40.000	40.000	40.000	1	0	1
	6-46-21B	40.000	40.000	40.000	1	0	1
	6-35-70	39.333	41.000	38.000	3	0	3
	6-49-55A	39.275	45.000	32.000	8	0	8
	6-39-39	38.500	49.000	28.000	2	0	2
	2-E33-29	38.429	48.000	33.000	7	0	7
	2-E28-26	38.286	46.000	34.000	7	0	7
	2-E28-27	38.000	45.000	34.000	7	0	7
	2-E17-12	37.750	44.000	34.000	4	0	4
	6-43-45	37.600	39.000	36.000	5	0	5
	6-25-34C	37.455	44.000	33.000	11	0	11
	2-E26-11	37.000	40.000	34.000	2	0	2
	2-E33-15	36.900	36.900	36.900	1	0	1
	6-47-60	36.667	39.000	34.000	3	0	3
	2-E17-13	36.000	38.000	34.000	3	0	3
	2-E33-33	36.000	36.000	36.000	2	0	2
	2-E27-9	35.778	46.000	28.000	9	0	9
	6-25-34A	35.500	38.000	34.000	4	0	4
	2-E34-2	35.390	42.000	29.000	10	0	10
	2-E27-10	34.833	42.000	32.000	6	0	6
	2-E34-6	34.833	40.000	28.000	6	0	6
	2-E18-1	34.778	48.000	25.000	9	0	9
	2-E33-31	34.733	37.200	33.000	3	0	3
	2-E27-8	34.714	41.000	31.000	7	0	7
	2-E32-1	33.667	36.000	30.000	3	0	3
	2-E33-28	33.422	37.800	31.000	9	0	9
	2-E25-31	33.286	51.000	23.000	21	0	21
	2-E17-18	33.000	38.000	29.000	8	0	8
	2-E33-21	33.000	35.000	31.000	2	0	2
	6-25-34B	33.000	35.000	31.000	4	0	4
	6-26-33	32.833	36.000	31.000	6	0	6
	6-26-35A	32.500	36.000	29.000	4	0	4
	6-52-57	32.300	32.300	32.300	1	0	1
	2-E33-39	32.000	32.000	32.000	1	0	1
	2-E17-16	31.875	51.000	21.000	8	0	8
	2-E27-14	31.500	34.000	29.000	2	0	2
	2-E32-2	31.333	34.000	30.000	6	0	6
	2-E33-5	31.250	34.000	29.000	4	0	4
	2-E25-23	31.200	39.000	26.000	5	0	5
	2-E27-15	31.000	31.000	31.000	1	0	1
	2-E25-33	30.944	37.000	28.000	18	0	18
	2-E33-38	30.900	32.200	29.600	2	0	2
	2-E25-35	30.500	34.000	24.000	10	0	10
	2-E26-9	30.500	40.000	21.000	2	0	2
	2-E33-10	30.500	35.000	26.000	2	0	2
	2-E24-8	30.000	30.000	30.000	1	0	1
	6-32-43	30.000	30.000	30.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 18

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Barium, filtered							
	6-45-42	29.800	35.000	16.000	5	0	5
	2-E27-12	29.500	30.000	29.000	2	0	2
	2-E33-32	29.467	32.000	25.400	3	0	3
	2-E33-35	29.000	29.000	29.000	1	0	1
	2-E33-34	28.500	29.000	28.000	2	0	2
	6-26-34	28.500	32.000	23.000	4	0	4
	2-E34-5	28.214	31.000	27.000	7	0	7
	2-E24-19	28.000	28.000	28.000	1	0	1
	2-E25-24	28.000	32.000	24.000	8	0	8
	6-42-42B	28.000	33.000	23.000	6	0	6
	6-49-57A	27.700	27.700	27.700	1	0	1
	2-E33-1	27.600	41.000	22.000	5	0	5
	2-E27-5	27.000	27.000	27.000	1	0	1
	2-E33-24	26.850	27.700	26.000	2	0	2
	2-E27-13	26.500	29.000	24.000	2	0	2
	2-E28-18	26.500	31.000	24.000	4	0	4
	2-E33-18	26.050	28.100	24.000	2	0	2
	2-E25-43	26.000	26.000	26.000	1	0	1
	6-57-29A	26.000	26.000	26.000	1	0	1
	6-25-33A	25.800	26.000	25.000	5	0	5
	2-E33-8	25.500	26.000	25.000	2	0	2
	2-E26-10	25.000	30.000	30.000	1	1	2
	2-E34-1	24.750	27.000	22.500	2	0	2
	2-E33-30	24.370	28.700	22.000	10	0	10
	2-E25-42	24.000	24.000	24.000	1	0	1
	2-E25-21	23.000	32.000	20.000	5	1	6
	2-E33-3	23.000	24.000	22.000	3	0	3
	2-E25-29P	22.625	29.000	18.000	15	1	16
	6-20-39	22.500	29.000	16.000	2	0	2
	6-45-69A	22.500	23.000	22.000	2	0	2
	6-31-31	20.000	20.000	20.000	1	0	1
	2-E25-34	19.571	20.000	19.000	6	1	7
	2-E25-30P	19.429	31.000	11.000	7	0	7
	2-E25-38	19.125	21.000	17.000	6	2	8
	2-E25-40	19.000	19.000	19.000	1	0	1
	2-E25-36	18.000	22.000	15.000	6	1	7
	2-E25-18	17.556	20.000	13.000	9	0	9
	6-60-57	17.000	17.000	17.000	1	0	1
	2-E25-37	16.286	14.000	13.000	4	3	7
	2-E25-22	16.125	21.000	13.000	8	0	8
	6-54-48	16.000	16.000	16.000	1	0	1
	6-43-43	15.167	18.000	12.000	5	1	6
	2-E25-25	15.050	19.000	11.000	16	4	20
	2-E27-7	15.000	15.000	15.000	1	0	1
	6-44-42	14.833	17.000	12.000	5	1	6
	2-E25-41	14.500	15.000	14.000	2	0	2
	2-E25-26	14.444	18.000	11.000	8	1	9
	2-E25-28	14.333	19.000	12.000	8	1	9
	6-43-42J	13.800	17.000	12.000	5	0	5
	2-E28-23	13.333	18.000	8.000	3	0	3
	2-E25-32P	13.316	16.000	11.000	16	3	19
	2-E25-27	12.400	16.000	10.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 19

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Barium, filtered							
	6-55-50C	11.000	12.000	9.000	3	0	3
	6-55-55	11.000	11.000	11.000	1	0	1
	6-59-58	10.000	10.000	10.000	1	0	1
	6-54-49	9.000	9.000	9.000	1	0	1
	6-42-40A	8.857	12.000	12.000	1	6	7
Beryllium							
	2-E32-4	4.750	10.000	10.000	1	11	12
	2-E24-17	4.667	5.000	5.000	1	5	6
	2-E18-1	4.422	3.800	3.800	1	8	9
	2-E25-34	4.375	6.000	6.000	1	7	8
	2-E25-35	4.111	5.000	5.000	1	8	9
Beryllium, filtered							
	2-E27-10	5.333	7.000	7.000	1	5	6
	2-E25-19	5.167	6.000	6.000	1	5	6
	6-24-34C	5.091	6.000	6.000	1	10	11
	2-E18-4	5.000	5.000	5.000	1	6	7
	6-24-35	5.000	5.000	5.000	1	11	12
	2-E17-14	4.889	6.000	6.000	1	8	9
	2-E34-3	4.857	6.000	6.000	1	6	7
	2-E25-34	4.833	6.000	6.000	1	5	6
Beryllium-7							
	6-50-42	222.000	222.000	222.000	1	0	1
	2-E17-20	53.700	53.700	53.700	1	0	1
	2-E18-3	46.900	46.900	46.900	1	0	1
	2-E18-4	44.800	44.800	44.800	1	0	1
	6-40-33A	23.760	166.000	166.000	1	4	5
Bis(2-ethylhexyl) phthalate							
	2-E32-5	56.000	56.000	56.000	1	0	1
	2-E25-38	30.000	30.000	30.000	1	0	1
	2-E25-11	16.000	16.000	16.000	1	0	1
	2-E32-2	16.000	22.000	22.000	1	1	2
	2-E24-17	14.000	14.000	14.000	1	0	1
	2-E25-29P	14.000	14.000	14.000	1	0	1
	2-E25-21	13.000	13.000	13.000	1	0	1
	2-E17-19	12.000	12.000	12.000	1	0	1
	2-E25-26	12.000	14.000	14.000	1	1	2
	2-E17-15	11.000	12.000	12.000	1	1	2
	2-E24-18	11.000	11.000	11.000	1	0	1
	2-E28-27	10.500	11.000	11.000	1	1	2
	2-E34-1	10.000	10.000	10.000	1	2	3
Boron							
	2-E32-5	182.000	182.000	182.000	1	0	1
	2-E28-21	136.000	136.000	136.000	1	0	1
	2-E28-26	131.250	185.000	95.000	4	0	4
	2-E25-17	115.000	115.000	115.000	1	0	1
	2-E32-3	107.500	110.000	105.000	2	0	2
	2-E28-18	101.000	101.000	101.000	1	0	1
	6-24-34A	81.833	213.000	35.000	6	0	6
	6-24-35	47.714	138.000	28.000	7	0	7
	2-E25-6	46.000	46.000	46.000	1	0	1
	6-24-34B	44.143	65.000	32.000	7	0	7
	6-24-33	43.167	57.000	36.000	6	0	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 20

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Boron							
	2-E33-5	43.000	43.000	43.000	1	0	1
	6-25-34C	42.429	71.000	29.000	7	0	7
	2-E32-4	42.333	61.000	23.000	6	0	6
	2-E27-7	42.000	42.000	42.000	1	0	1
	6-23-34	40.750	98.000	27.000	8	0	8
	6-24-34C	39.875	49.000	31.000	8	0	8
	2-E25-20	39.800	44.000	37.000	5	0	5
	2-E33-21	39.000	39.000	39.000	1	0	1
	2-E27-11	36.000	36.000	36.000	1	0	1
	2-E33-32	36.000	36.000	36.000	1	0	1
	2-E25-30P	35.000	37.000	33.000	4	0	4
	2-E18-1	34.750	38.000	31.000	4	0	4
	2-E27-12	34.000	34.000	34.000	1	0	1
	2-E28-27	33.600	37.000	31.000	5	0	5
	2-E25-21	33.000	33.000	33.000	1	0	1
	6-25-34B	32.000	32.000	32.000	1	0	1
	6-40-39	31.000	40.000	25.000	3	0	3
	2-E34-6	30.250	37.000	26.000	4	0	4
	6-26-33	30.000	30.000	30.000	1	0	1
	6-26-34	30.000	30.000	30.000	1	0	1
	2-E25-18	29.000	73.000	13.000	4	0	4
	6-26-35A	29.000	29.000	29.000	1	0	1
	2-E33-1	28.000	28.000	28.000	1	0	1
	6-25-34A	28.000	28.000	28.000	1	0	1
	2-E25-33	27.188	59.000	18.000	16	0	16
	2-E28-13	27.000	27.000	27.000	1	0	1
	2-E34-5	27.000	33.000	24.000	4	0	4
	2-E17-1	26.667	39.000	17.000	3	0	3
	6-26-35C	26.000	26.000	26.000	1	0	1
	2-E28-12	25.000	25.000	25.000	1	0	1
	2-E25-35	24.800	37.000	19.000	5	0	5
	2-E25-11	24.000	24.000	24.000	1	0	1
	2-E25-19	24.000	24.000	24.000	1	0	1
	2-E25-9	24.000	24.000	24.000	1	0	1
	2-E17-9	23.800	29.000	21.000	5	0	5
	6-41-40	23.667	30.000	19.000	3	0	3
	2-E32-2	23.250	25.000	21.000	4	0	4
	2-E34-2	22.800	42.000	11.000	5	0	5
	2-E17-15	22.600	32.000	15.000	5	0	5
	2-E25-23	22.000	22.000	22.000	1	0	1
	2-E25-40	22.000	22.000	22.000	1	0	1
	6-44-43B	21.800	37.000	13.000	5	0	5
	2-E27-10	21.750	34.000	12.000	4	0	4
	2-E27-9	21.667	32.000	14.000	6	0	6
	2-E25-31	21.600	60.000	11.000	20	0	20
	6-44-42	21.500	54.000	11.000	3	1	4
	2-E33-29	21.250	25.000	19.000	4	0	4
	2-E33-31	21.000	21.000	21.000	1	0	1
	6-25-33A	21.000	21.000	21.000	1	0	1
	2-E25-29P	20.611	36.000	11.000	18	0	18
	2-E17-20	20.600	23.000	18.000	5	0	5
	2-E17-18	20.200	21.000	19.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 21

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Boron							
	2-E17-6	20.000	22.000	18.000	4	0	4
	2-E24-18	19.750	21.000	18.000	4	0	4
	2-E33-30	19.750	27.000	13.000	4	0	4
	2-E17-17	19.600	30.000	16.000	5	0	5
	2-E27-8	19.250	34.000	16.000	3	1	4
	2-E24-17	19.000	21.000	17.000	4	0	4
	2-E27-14	19.000	19.000	19.000	1	0	1
	2-E17-14	18.800	24.000	16.000	5	0	5
	2-E25-22	18.750	20.000	17.000	4	0	4
	2-E18-2	18.600	24.000	13.000	5	0	5
	2-E34-3	18.500	27.000	13.000	4	0	4
	2-E17-12	18.000	18.000	18.000	1	0	1
	2-E25-41	18.000	19.000	17.000	2	0	2
	2-E33-8	18.000	18.000	18.000	1	0	1
	6-42-42B	18.000	28.000	13.000	4	0	4
	6-43-41F	17.333	21.000	14.000	3	0	3
	2-E25-24	17.250	22.000	12.000	4	0	4
	2-E17-19	17.200	28.000	11.000	5	0	5
	2-E24-16	17.200	23.000	13.000	5	0	5
	2-E17-16	17.000	21.000	14.000	4	0	4
	2-E17-5	17.000	21.000	15.000	5	0	5
	6-43-41E	16.500	17.000	16.000	2	0	2
	2-E25-37	16.333	21.000	12.000	5	1	6
	6-42-40B	16.000	16.000	16.000	1	0	1
	2-E25-25	15.857	26.000	12.000	11	3	14
	2-E24-2	15.750	20.000	14.000	3	1	4
	2-E33-28	15.000	19.000	14.000	4	1	5
	2-E34-1	15.000	15.000	15.000	1	0	1
	2-E25-36	14.750	18.000	15.000	3	1	4
	6-42-40A	14.500	26.000	10.000	3	1	4
	6-43-42J	14.500	17.000	13.000	4	0	4
	2-E18-4	14.000	17.000	14.000	3	1	4
	2-E27-15	14.000	14.000	14.000	1	0	1
	2-E32-1	14.000	14.000	14.000	1	0	1
	2-E18-3	13.833	18.000	11.000	6	0	6
	2-E25-32P	13.462	22.000	12.000	9	4	13
	2-E25-26	13.400	17.000	12.000	4	1	5
	2-E17-13	13.000	13.000	13.000	1	0	1
	2-E25-34	13.000	19.000	11.000	4	1	5
	2-E25-38	13.000	19.000	11.000	4	1	5
	2-E27-13	13.000	13.000	13.000	1	0	1
	2-E33-33	13.000	13.000	13.000	1	0	1
	2-E25-28	12.200	14.000	12.000	4	1	5
	2-E16-2	12.000	12.000	12.000	1	0	1
	2-E24-19	12.000	12.000	12.000	1	0	1
	6-43-43	11.800	14.000	12.000	3	2	5
	6-43-45	11.667	12.000	11.000	3	0	3
	2-E25-27	11.333	13.000	11.000	2	1	3
Boron, filtered							
	2-E32-5	168.000	168.000	168.000	1	0	1
	2-E28-21	136.500	137.000	136.000	2	0	2
	2-E28-26	131.500	182.000	95.000	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 22

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Boron, filtered							
	2-E28-18	108.500	116.000	101.000	2	0	2
	2-E32-3	106.000	110.000	102.000	2	0	2
	6-40-33A	77.000	77.000	77.000	1	0	1
	6-60-57	75.000	75.000	75.000	1	0	1
	6-32-43	56.000	56.000	56.000	1	0	1
	2-E33-21	52.000	52.000	52.000	1	0	1
	6-24-34A	51.000	78.000	38.000	5	0	5
	2-E25-21	45.000	49.000	41.000	2	0	2
	2-E27-7	44.000	44.000	44.000	1	0	1
	6-24-33	44.000	51.000	36.000	6	0	6
	6-26-35A	42.000	42.000	42.000	1	0	1
	6-31-31	42.000	42.000	42.000	1	0	1
	2-E25-20	41.833	47.000	38.000	6	0	6
	2-E32-4	41.667	62.000	24.000	6	0	6
	6-26-33	40.500	47.000	34.000	2	0	2
	6-24-35	40.125	88.000	25.000	8	0	8
	6-24-34C	39.625	46.000	36.000	8	0	8
	6-24-34B	38.429	46.000	34.000	7	0	7
	2-E33-31	38.000	38.000	38.000	1	0	1
	6-25-34B	37.000	37.000	37.000	1	0	1
	2-E18-1	36.000	42.000	30.000	4	0	4
	2-E33-1	36.000	54.000	18.000	2	0	2
	6-25-34A	36.000	36.000	36.000	1	0	1
	6-25-34C	35.571	44.000	28.000	7	0	7
	2-E27-11	35.000	35.000	35.000	1	0	1
	2-E28-27	34.000	36.000	31.000	5	0	5
	2-E25-30P	33.500	47.000	25.000	6	0	6
	6-26-34	33.000	33.000	33.000	1	0	1
	6-23-34	32.714	40.000	26.000	7	0	7
	6-38-65	32.000	32.000	32.000	1	0	1
	6-54-48	31.000	31.000	31.000	1	0	1
	6-59-58	31.000	31.000	31.000	1	0	1
	6-35-70	30.500	36.000	25.000	2	0	2
	2-E34-2	29.600	46.000	17.000	5	0	5
	2-E25-19	29.500	36.000	23.000	2	0	2
	2-E34-6	28.500	37.000	25.000	4	0	4
	6-36-61A	28.000	28.000	28.000	1	0	1
	6-40-39	27.333	33.000	23.000	3	0	3
	2-E25-35	27.000	37.000	20.000	5	0	5
	2-E28-13	25.500	28.000	23.000	2	0	2
	2-E28-23	25.000	25.000	25.000	1	0	1
	6-26-35C	25.000	25.000	25.000	1	0	1
	2-E18-2	24.200	34.000	16.000	5	0	5
	2-E25-33	24.063	35.000	19.000	16	0	16
	2-E17-12	24.000	27.000	21.000	2	0	2
	2-E34-5	24.000	35.000	17.000	4	0	4
	6-25-33A	24.000	24.000	24.000	1	0	1
	6-46-21B	24.000	24.000	24.000	1	0	1
	6-50-53A	24.000	24.000	24.000	1	0	1
	6-57-29A	24.000	24.000	24.000	1	0	1
	6-43-45	23.667	30.000	19.000	3	0	3
	2-E17-9	23.600	28.000	20.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 23

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Boron, filtered							
	2-E25-41	23.500	25.000	22.000	2	0	2
	2-E33-29	23.500	33.000	19.000	4	0	4
	2-E34-3	23.500	41.000	15.000	4	0	4
	2-E25-28	23.400	54.000	14.000	3	2	5
	2-E17-1	23.333	40.000	12.000	3	0	3
	6-41-40	23.333	24.000	23.000	3	0	3
	2-E24-19	23.000	23.000	23.000	1	0	1
	2-E27-9	23.000	50.000	14.000	6	0	6
	2-E17-16	22.750	26.000	20.000	4	0	4
	2-E27-8	22.250	36.000	17.000	4	0	4
	2-E17-14	22.200	28.000	16.000	5	0	5
	2-E25-24	22.200	51.000	13.000	5	0	5
	2-E25-40	22.000	22.000	22.000	1	0	1
	2-E32-1	22.000	22.000	22.000	1	0	1
	2-E33-5	22.000	22.000	22.000	1	0	1
	2-E33-8	22.000	22.000	22.000	1	0	1
	2-E32-2	21.750	27.000	16.000	4	0	4
	2-E33-30	21.500	24.000	16.000	4	0	4
	6-49-55A	21.333	24.000	19.000	3	0	3
	6-35-66	21.000	21.000	21.000	1	0	1
	2-E17-17	20.600	25.000	17.000	5	0	5
	2-E25-38	20.571	60.000	12.000	6	1	7
	2-E27-15	20.000	20.000	20.000	1	0	1
	2-E25-29P	19.529	30.000	12.000	17	0	17
	2-E17-6	19.500	21.000	18.000	4	0	4
	2-E25-22	19.400	27.000	16.000	4	1	5
	2-E24-12	19.000	19.000	19.000	1	0	1
	6-53-47B	19.000	19.000	19.000	1	0	1
	6-42-42B	18.500	26.000	13.000	4	0	4
	6-44-64	18.500	19.000	18.000	2	0	2
	6-54-34	18.000	18.000	18.000	1	0	1
	2-E17-5	17.800	20.000	16.000	5	0	5
	6-44-43B	17.750	23.000	15.000	4	0	4
	2-E25-31	17.688	43.000	12.000	15	1	16
	2-E17-13	17.667	22.000	15.000	3	0	3
	6-43-41F	17.667	25.000	13.000	3	0	3
	2-E17-15	17.500	19.000	16.000	4	0	4
	2-E17-20	17.500	24.000	16.000	5	1	6
	2-E25-23	17.500	20.000	15.000	2	0	2
	2-E17-18	17.200	24.000	11.000	5	0	5
	2-E17-19	17.200	19.000	14.000	5	0	5
	2-E24-17	17.000	19.000	15.000	4	0	4
	2-E24-18	17.000	22.000	13.000	4	0	4
	6-45-69A	17.000	17.000	17.000	1	0	1
	2-E25-18	16.800	23.000	13.000	5	0	5
	2-E25-37	16.286	21.000	11.000	7	0	7
	2-E25-36	16.250	21.000	12.000	4	0	4
	6-44-42	16.250	20.000	12.000	4	0	4
	2-E25-25	16.000	37.000	10.000	11	2	13
	2-E33-33	16.000	16.000	16.000	1	0	1
	6-45-42	16.000	18.000	14.000	2	0	2
	6-54-49	16.000	18.000	14.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 24

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Boron, filtered							
	6-55-50C	16.000	16.000	16.000	1	0	1
	2-E24-2	15.750	25.000	12.000	3	1	4
	6-43-43	15.600	20.000	13.000	4	1	5
	6-43-41E	15.500	18.000	13.000	2	0	2
	6-43-42J	15.500	16.000	14.000	4	0	4
	2-E18-4	15.400	19.000	14.000	5	0	5
	2-E25-34	15.000	20.000	17.000	3	2	5
	2-E33-32	15.000	15.000	15.000	1	0	1
	2-E35-1	15.000	15.000	15.000	1	0	1
	2-E24-16	14.500	17.000	14.000	3	1	4
	2-E27-12	14.000	14.000	14.000	1	0	1
	2-E27-13	14.000	14.000	14.000	1	0	1
	2-E27-14	14.000	14.000	14.000	1	0	1
	6-47-46A	14.000	14.000	14.000	1	0	1
	2-E33-28	13.500	19.000	10.000	4	0	4
	2-E25-26	13.400	22.000	12.000	3	2	5
	2-E27-10	13.000	16.000	13.000	3	1	4
	2-E18-3	12.833	20.000	11.000	4	2	6
	6-42-40A	12.750	19.000	10.000	3	1	4
	2-E25-27	12.667	15.000	11.000	3	0	3
	2-E25-32P	11.273	19.000	10.000	6	5	11
Bromide							
	2-E25-25	861.538	200.000	200.000	1	12	13
	6-44-64	700.000	100.000	100.000	1	2	3
	2-E25-39	433.333	300.000	300.000	1	2	3
	6-53-47A	200.000	200.000	200.000	1	0	1
COD							
	6-43-41E	101.000	178.000	24.000	2	0	2
	2-E25-31	34.000	34.000	34.000	1	0	1
Cadmium							
	2-E25-17	211.000	211.000	211.000	1	0	1
	2-E25-6	81.000	81.000	81.000	1	0	1
	2-E25-9	55.000	55.000	55.000	1	0	1
	2-E16-2	22.000	42.000	42.000	1	1	2
	6-42-40B	22.000	41.000	3.000	2	0	2
	2-E25-11	15.500	21.000	21.000	1	1	2
	2-E28-7	9.000	9.000	9.000	1	0	1
	2-E28-12	8.000	8.000	8.000	1	0	1
	2-E33-32	6.500	2.000	2.000	1	3	4
	2-E17-20	5.700	6.000	3.000	2	8	10
	2-E28-26	5.444	9.000	9.000	1	8	9
	6-42-42B	4.667	2.000	2.000	2	4	6
	6-43-42J	4.667	2.000	2.000	1	5	6
	2-E17-14	4.500	14.000	14.000	1	7	8
	2-E25-29P	4.286	2.000	2.000	1	13	14
	2-E25-25	4.133	2.000	2.000	1	14	15
	6-42-40A	4.125	3.000	3.000	1	7	8
	6-25-34C	3.692	8.000	8.000	1	12	13
	6-24-34A	3.605	3.650	3.650	1	10	11
	6-24-34B	3.417	3.000	3.000	1	11	12
	2-E17-19	2.000	2.000	2.000	1	4	5
	2-E24-2	2.000	2.000	2.000	2	4	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 25

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Cadmium, filtered							
	2-E17-14	4.222	12.000	4.000	2	7	9
	2-E17-15	4.222	6.000	6.000	1	8	9
	6-47-35A	4.000	4.000	4.000	1	0	1
	2-E24-16	3.333	2.000	2.000	1	5	6
	2-E25-31	3.308	3.000	3.000	1	12	13
	2-E34-3	3.143	2.000	2.000	1	6	7
	2-E18-3	3.000	2.000	2.000	1	7	8
	2-E25-19	2.667	6.000	6.000	1	5	6
	2-E17-9	2.625	7.000	7.000	1	7	8
	2-E33-8	2.500	3.000	3.000	1	1	2
	6-49-55A	2.500	3.000	3.000	1	5	6
	6-43-42J	2.250	3.000	3.000	1	3	4
	2-E17-18	2.143	3.000	3.000	1	6	7
	6-24-35	2.083	3.000	3.000	1	11	12
	2-E13-5	2.000	2.000	2.000	1	3	4
	2-E17-12	2.000	2.000	2.000	1	3	4
	6-23-34	2.000	2.000	2.000	1	9	10
	6-24-34A	2.000	2.000	2.000	1	7	8
Calcium							
	2-E28-12	80700.000	80700.000	80700.000	1	0	1
	6-23-34	74766.667	81000.000	70200.000	15	0	15
	6-24-34B	73984.615	87800.000	69600.000	13	0	13
	2-E17-15	73316.667	97000.000	58000.000	12	0	12
	6-24-34C	72685.714	88000.000	59800.000	14	0	14
	2-E17-14	68777.778	86800.000	50000.000	9	0	9
	6-24-34A	68575.000	76500.000	58900.000	12	0	12
	6-24-33	67966.667	75000.000	63300.000	9	0	9
	2-E17-20	63591.667	77800.000	55000.000	12	0	12
	6-52-54	63200.000	63200.000	63200.000	1	0	1
	2-E25-35	62223.077	76300.000	51800.000	13	0	13
	2-E18-1	59483.333	72800.000	55700.000	12	0	12
	2-E28-26	58330.000	74400.000	49000.000	10	0	10
	6-49-55A	58200.000	58200.000	58200.000	1	0	1
	6-47-50	57400.000	57400.000	57400.000	1	0	1
	2-E32-5	56433.333	59500.000	54100.000	6	0	6
	2-E34-7	55000.000	55000.000	55000.000	1	0	1
	2-E28-21	53100.000	53100.000	53100.000	1	0	1
	2-E17-1	52400.000	61100.000	47600.000	5	0	5
	2-E34-5	50890.000	58600.000	46000.000	10	0	10
	2-E34-1	50300.000	58000.000	42400.000	3	0	3
	2-E28-18	49400.000	54500.000	43000.000	3	0	3
	2-E34-2	49022.222	62300.000	41000.000	9	0	9
	2-E25-20	48940.000	68500.000	23000.000	10	0	10
	2-E28-28	48600.000	52000.000	46000.000	5	0	5
	2-E17-9	48314.286	57400.000	44400.000	7	0	7
	6-24-35	47978.571	63100.000	42700.000	14	0	14
	2-E17-19	47750.000	78800.000	36200.000	6	0	6
	2-E28-13	47300.000	49300.000	45300.000	2	0	2
	6-40-62	47000.000	47000.000	47000.000	1	0	1
	2-E32-3	46680.000	52500.000	38200.000	10	0	10
	6-53-47A	46000.000	46000.000	46000.000	1	0	1
	6-25-34C	45484.615	56000.000	40400.000	13	0	13

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 26

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Calcium							
	2-E13-14	45000.000	45000.000	45000.000	1	0	1
	2-E35-1	44900.000	44900.000	44900.000	1	0	1
	2-E17-5	44790.000	69800.000	29000.000	10	0	10
	2-E25-19	44500.000	52500.000	41000.000	4	0	4
	2-E34-6	43528.571	47500.000	37000.000	7	0	7
	6-26-35C	43500.000	44800.000	41300.000	5	0	5
	2-E32-4	42876.923	46000.000	39200.000	13	0	13
	6-36-61A	42500.000	43000.000	42000.000	2	0	2
	2-E24-2	42466.667	59000.000	33600.000	6	0	6
	6-25-34B	42460.000	50500.000	38700.000	5	0	5
	2-E24-16	42450.000	46300.000	38300.000	8	0	8
	2-E24-17	42328.571	46200.000	38500.000	7	0	7
	6-35-70	42000.000	42000.000	42000.000	1	0	1
	2-E25-17	41400.000	41400.000	41400.000	1	0	1
	6-45-69A	41000.000	42000.000	40000.000	2	0	2
	6-50-53B	41000.000	41000.000	41000.000	1	0	1
	6-49-57A	40000.000	40000.000	40000.000	1	0	1
	6-26-35A	39528.571	43000.000	36300.000	7	0	7
	6-25-34A	38960.000	46500.000	35100.000	5	0	5
	2-E33-38	38500.000	38800.000	38200.000	2	0	2
	6-52-57	38400.000	38400.000	38400.000	1	0	1
	2-E33-34	38333.333	40000.000	36000.000	3	0	3
	2-E27-14	37650.000	40300.000	35000.000	2	0	2
	2-E27-9	37620.000	39400.000	35000.000	10	0	10
	2-E27-8	37244.444	41300.000	33900.000	9	0	9
	2-E17-6	37214.286	45500.000	30600.000	7	0	7
	2-E27-11	36250.000	38000.000	33500.000	4	0	4
	2-E34-3	36214.286	49000.000	30500.000	7	0	7
	2-E25-9	35900.000	35900.000	35900.000	1	0	1
	2-E33-15	35100.000	35100.000	35100.000	1	0	1
	2-E35-2	35100.000	43000.000	26000.000	5	0	5
	2-E25-6	35000.000	35000.000	35000.000	1	0	1
	2-E17-16	34940.000	52400.000	21700.000	10	0	10
	6-26-33	34566.667	37300.000	31400.000	6	0	6
	2-E33-5	34550.000	34900.000	34200.000	2	0	2
	2-E24-20	34000.000	34000.000	34000.000	1	0	1
	2-E17-17	33840.000	42000.000	28000.000	10	0	10
	2-E33-18	33800.000	33800.000	33800.000	1	0	1
	2-E24-18	33700.000	39400.000	30600.000	6	0	6
	6-26-34	33625.000	36000.000	29000.000	4	0	4
	2-E33-31	33600.000	41500.000	28900.000	4	0	4
	2-E33-24	33200.000	33200.000	33200.000	1	0	1
	2-E27-10	33066.667	42000.000	27800.000	9	0	9
	6-55-50C	33000.000	33000.000	33000.000	1	0	1
	6-25-33A	32900.000	34900.000	31000.000	5	0	5
	2-E33-39	32800.000	32800.000	32800.000	1	0	1
	2-E33-41	32500.000	34000.000	31000.000	2	0	2
	2-E28-7	32400.000	32400.000	32400.000	1	0	1
	2-E25-40	32200.000	33500.000	30100.000	3	0	3
	2-E33-3	31900.000	31900.000	31900.000	1	0	1
	6-49-55B	31800.000	31800.000	31800.000	1	0	1
	6-50-53A	31200.000	31200.000	31200.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 27

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Calcium							
	2-E26-11	31083.333	34000.000	29000.000	6	0	6
	2-E18-4	30433.333	32500.000	27500.000	9	0	9
	2-E33-37	30166.667	40500.000	24000.000	3	0	3
	2-E26-10	30125.000	40500.000	23000.000	4	0	4
	2-E28-23	30000.000	30000.000	30000.000	1	0	1
	2-E33-10	29750.000	30600.000	28900.000	2	0	2
	2-E33-1	29650.000	32300.000	27000.000	2	0	2
	2-E33-35	29500.000	30000.000	29000.000	2	0	2
	6-42-39A	29500.000	30000.000	29000.000	2	0	2
	6-49-57B	29500.000	29500.000	29500.000	1	0	1
	2-E26-13	29333.333	30000.000	29000.000	3	0	3
	2-E33-33	29333.333	31000.000	28500.000	3	0	3
	2-E25-41	29275.000	35000.000	24300.000	4	0	4
	2-E33-40	29200.000	29200.000	29200.000	1	0	1
	2-E17-12	29166.667	29400.000	29000.000	3	0	3
	2-E33-30	29081.818	32600.000	26400.000	11	0	11
	2-E26-12	29000.000	30000.000	28000.000	3	0	3
	6-41-40	28866.667	30000.000	28000.000	6	0	6
	2-E25-18	28727.273	33900.000	21500.000	11	0	11
	2-E16-2	28650.000	29200.000	28100.000	2	0	2
	2-E33-8	28600.000	28600.000	28600.000	1	0	1
	2-E25-33	28584.000	36300.000	23300.000	25	0	25
	2-E28-27	28545.455	31500.000	26300.000	11	0	11
	2-E33-36	28500.000	30000.000	27000.000	4	0	4
	2-E32-2	28350.000	34000.000	23600.000	10	0	10
	2-E33-29	28309.091	32400.000	26600.000	11	0	11
	2-E17-13	28166.667	30000.000	26500.000	3	0	3
	2-E18-3	28020.000	29600.000	24800.000	10	0	10
	2-E26-9	28000.000	43000.000	21000.000	4	0	4
	2-E33-32	27950.000	29000.000	26000.000	4	0	4
	6-42-39B	27000.000	27000.000	27000.000	1	0	1
	6-43-45	26866.667	29000.000	25400.000	6	0	6
	2-E27-13	26800.000	28000.000	25900.000	3	0	3
	6-44-43B	26788.889	51000.000	21900.000	9	0	9
	2-E33-28	26725.000	29000.000	24900.000	12	0	12
	2-E32-1	26400.000	27700.000	25100.000	2	0	2
	6-43-41F	26175.000	27000.000	25100.000	4	0	4
	6-40-40B	26000.000	29000.000	23000.000	2	0	2
	6-43-43	25875.000	28000.000	24600.000	8	0	8
	2-E25-36	25716.667	29000.000	20700.000	12	0	12
	2-E18-2	25590.000	27700.000	22900.000	10	0	10
	2-E25-42	25500.000	26000.000	25000.000	2	0	2
	2-E25-43	25500.000	26000.000	25000.000	2	0	2
	2-E27-15	25466.667	26500.000	23900.000	3	0	3
	6-43-41E	25466.667	26500.000	24300.000	6	0	6
	2-E25-31	25275.000	31100.000	20700.000	28	0	28
	2-E27-12	25266.667	26000.000	23800.000	3	0	3
	2-E24-4	25000.000	25000.000	25000.000	1	0	1
	2-E25-11	25000.000	30000.000	20000.000	2	0	2
	2-E33-21	24700.000	24700.000	24700.000	1	0	1
	2-E24-19	24566.667	27000.000	22700.000	3	0	3
	2-E17-18	24220.000	27000.000	21900.000	10	0	10

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 28

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Calcium							
	2-E26-5	24000.000	24000.000	24000.000	1	0	1
	2-E34-8	24000.000	26000.000	22000.000	3	0	3
	6-34-42	24000.000	24000.000	24000.000	1	0	1
	2-E25-24	23975.000	28500.000	20500.000	4	0	4
	2-E27-7	23800.000	24500.000	23100.000	2	0	2
	6-55-55	23600.000	23600.000	23600.000	1	0	1
	2-E25-29P	23584.000	26700.000	20200.000	25	0	25
	6-45-42	23100.000	24200.000	22000.000	2	0	2
	2-E27-16	23000.000	24000.000	22000.000	2	0	2
	6-42-41	23000.000	23000.000	23000.000	1	0	1
	6-43-41G	23000.000	23000.000	23000.000	1	0	1
	6-43-42J	22671.429	25300.000	20000.000	7	0	7
	6-44-42	22375.000	24100.000	19900.000	8	0	8
	6-40-40A	22000.000	23000.000	21000.000	2	0	2
	6-43-40	22000.000	23000.000	21000.000	2	0	2
	6-42-42B	21562.500	23000.000	19500.000	8	0	8
	2-E25-34	21280.000	24000.000	18000.000	10	0	10
	2-E25-23	21200.000	21200.000	21200.000	1	0	1
	2-E25-22	20928.571	23200.000	18700.000	7	0	7
	6-42-40B	20800.000	28400.000	13200.000	2	0	2
	2-E25-37	20769.231	24000.000	19500.000	13	0	13
	2-E25-26	20472.727	23000.000	17900.000	11	0	11
	2-E25-28	20416.667	24000.000	17500.000	12	0	12
	6-42-40A	20222.222	24300.000	16900.000	9	0	9
	6-40-39	20183.333	21000.000	19500.000	6	0	6
	2-E25-21	19980.000	23900.000	18000.000	5	0	5
	2-E25-39	19750.000	21000.000	19000.000	4	0	4
	2-E25-32P	19362.500	21400.000	16800.000	24	0	24
	2-E25-25	19107.143	21000.000	16500.000	28	0	28
	2-E25-27	18920.000	20900.000	17200.000	5	0	5
	2-E25-38	18758.333	24000.000	16300.000	12	0	12
	2-E25-30P	13214.286	20600.000	11000.000	7	0	7
Calcium, filtered							
	6-50-53A	240666.667	254000.000	222000.000	9	0	9
	6-49-55A	78900.000	99200.000	58700.000	10	0	10
	2-E17-15	77720.000	101000.000	57000.000	10	0	10
	6-54-48	75300.000	75300.000	75300.000	1	0	1
	6-23-34	74063.636	79800.000	67000.000	11	0	11
	6-24-34B	72853.846	82700.000	63900.000	13	0	13
	6-24-34C	71800.000	80300.000	66100.000	12	0	12
	2-E17-14	69366.667	89800.000	49000.000	9	0	9
	6-24-34A	68844.444	73500.000	64700.000	9	0	9
	6-24-33	68566.667	76300.000	63700.000	9	0	9
	2-E17-20	65762.500	73300.000	59700.000	8	0	8
	6-38-65	65100.000	65700.000	64500.000	2	0	2
	6-53-47B	65000.000	65000.000	65000.000	1	0	1
	2-E18-1	64222.222	73700.000	57600.000	9	0	9
	6-52-54	62500.000	62500.000	62500.000	1	0	1
	2-E25-35	60127.273	79800.000	46600.000	11	0	11
	2-E28-26	59671.429	65700.000	54000.000	7	0	7
	2-E28-21	58360.000	68000.000	52800.000	5	0	5
	2-E34-7	58000.000	58000.000	58000.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 29

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Calcium, filtered							
	2-E17-1	57880.000	81400.000	45500.000	5	0	5
	2-E34-1	55300.000	61900.000	48700.000	2	0	2
	2-E32-5	54350.000	57000.000	51700.000	2	0	2
	2-E25-20	53380.000	66800.000	22000.000	10	0	10
	6-47-50	53266.667	55900.000	48700.000	3	0	3
	2-E28-18	53150.000	60900.000	46300.000	4	0	4
	2-E28-28	53000.000	53000.000	53000.000	1	0	1
	2-E34-5	50400.000	54100.000	46500.000	7	0	7
	2-E17-19	49700.000	81800.000	40200.000	6	0	6
	2-E17-9	49700.000	58000.000	44300.000	8	0	8
	6-53-47A	49000.000	49000.000	49000.000	1	0	1
	6-40-62	48700.000	49400.000	47600.000	3	0	3
	6-35-66	48075.000	51900.000	44700.000	4	0	4
	2-E34-2	47811.111	56500.000	41000.000	9	0	9
	2-E24-12	47450.000	48600.000	46300.000	2	0	2
	2-E13-5	46900.000	47900.000	45400.000	4	0	4
	2-E17-5	46411.111	74900.000	34900.000	9	0	9
	2-E28-13	46150.000	49100.000	44800.000	4	0	4
	6-54-49	46150.000	46500.000	45800.000	2	0	2
	6-33-56	46000.000	46000.000	46000.000	1	0	1
	6-34-51	46000.000	46000.000	46000.000	1	0	1
	6-24-35	45950.000	54700.000	42400.000	12	0	12
	2-E32-3	45916.667	52000.000	39200.000	6	0	6
	2-E25-19	45412.500	62300.000	35200.000	8	0	8
	2-E35-1	44800.000	44800.000	44800.000	1	0	1
	6-25-34C	44663.636	49100.000	41900.000	11	0	11
	6-26-35C	44260.000	46000.000	43000.000	5	0	5
	2-E34-6	44133.333	48500.000	39300.000	6	0	6
	6-44-64	43860.000	46000.000	40800.000	5	0	5
	6-47-46A	43325.000	45400.000	38600.000	4	0	4
	2-E24-17	42950.000	46300.000	37800.000	6	0	6
	2-E24-16	42628.571	46500.000	40600.000	7	0	7
	6-36-61A	42575.000	45900.000	38900.000	4	0	4
	6-35-70	42533.333	45300.000	41000.000	3	0	3
	6-45-69A	42450.000	43900.000	41000.000	2	0	2
	2-E24-2	41957.143	64300.000	31600.000	7	0	7
	2-E13-14	41775.000	47400.000	37400.000	4	0	4
	2-E32-4	41520.000	46000.000	38200.000	10	0	10
	6-37-43	41166.667	81700.000	20000.000	3	0	3
	6-25-34B	39475.000	41400.000	37900.000	4	0	4
	6-46-21B	39300.000	39300.000	39300.000	1	0	1
	6-26-35A	39225.000	40700.000	37900.000	4	0	4
	6-25-34A	38900.000	41200.000	35700.000	4	0	4
	6-52-57	38800.000	38800.000	38800.000	1	0	1
	2-E33-15	38600.000	38600.000	38600.000	1	0	1
	6-39-39	38600.000	50200.000	27000.000	2	0	2
	2-E33-38	38500.000	39700.000	37300.000	2	0	2
	6-47-60	38500.000	41800.000	36400.000	3	0	3
	2-E27-8	37871.429	41600.000	34400.000	7	0	7
	6-20-39	37550.000	39700.000	35400.000	2	0	2
	2-E27-14	37300.000	40600.000	34000.000	2	0	2
	2-E33-34	37000.000	39000.000	35000.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 30

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Calcium, filtered							
	2-E34-3	36728.571	49000.000	30800.000	7	0	7
	2-E27-9	36688.889	40000.000	33000.000	9	0	9
	2-E17-6	36511.111	43600.000	32400.000	9	0	9
	6-49-57A	36300.000	36300.000	36300.000	1	0	1
	6-24-46	35200.000	37500.000	32700.000	3	0	3
	6-26-33	35066.667	37700.000	32800.000	6	0	6
	2-E17-16	34862.500	49300.000	24700.000	8	0	8
	2-E33-5	34525.000	36600.000	33200.000	4	0	4
	2-E33-3	34366.667	37800.000	31800.000	3	0	3
	2-E17-17	34185.714	39300.000	29500.000	7	0	7
	2-E24-18	34100.000	38700.000	30100.000	5	0	5
	6-26-34	33875.000	36000.000	30400.000	4	0	4
	2-E33-18	33300.000	33500.000	33100.000	2	0	2
	6-47-35A	33300.000	33300.000	33300.000	1	0	1
	2-E26-9	33000.000	43000.000	23000.000	2	0	2
	6-25-33A	32880.000	35500.000	31000.000	5	0	5
	2-E33-31	32766.667	37500.000	28800.000	3	0	3
	6-55-50C	32700.000	33400.000	32300.000	3	0	3
	2-E27-11	32500.000	32500.000	32500.000	1	0	1
	2-E33-24	32450.000	33100.000	31800.000	2	0	2
	2-E33-39	32400.000	32400.000	32400.000	1	0	1
	2-E33-1	32180.000	34100.000	30100.000	5	0	5
	2-E18-4	31100.000	35000.000	27400.000	8	0	8
	6-49-57B	31100.000	31100.000	31100.000	1	0	1
	2-E17-12	31000.000	38600.000	27000.000	4	0	4
	2-E26-11	31000.000	33000.000	29000.000	2	0	2
	2-E33-10	30700.000	30800.000	30600.000	2	0	2
	2-E27-10	30650.000	34200.000	27700.000	6	0	6
	6-49-55B	30500.000	30500.000	30500.000	1	0	1
	2-E27-5	30400.000	30400.000	30400.000	1	0	1
	2-E26-13	30000.000	30000.000	30000.000	1	0	1
	2-E33-33	29850.000	31000.000	28700.000	2	0	2
	2-E33-30	29740.000	33000.000	26600.000	10	0	10
	2-E25-18	29444.444	34700.000	22900.000	9	0	9
	2-E33-29	29357.143	34900.000	26900.000	7	0	7
	6-41-40	29160.000	30000.000	27300.000	5	0	5
	2-E33-35	29000.000	29000.000	29000.000	1	0	1
	6-53-50	29000.000	29000.000	29000.000	1	0	1
	2-E32-1	28733.333	32700.000	25800.000	3	0	3
	2-E18-3	28700.000	31000.000	26800.000	10	0	10
	2-E33-8	28650.000	29800.000	27500.000	2	0	2
	2-E25-40	28600.000	28600.000	28600.000	1	0	1
	2-E26-10	28500.000	33000.000	24000.000	2	0	2
	2-E24-8	28300.000	28300.000	28300.000	1	0	1
	2-E28-23	28166.667	29700.000	25900.000	3	0	3
	2-E26-12	28000.000	28000.000	28000.000	1	0	1
	2-E25-33	27845.455	37600.000	23000.000	22	0	22
	2-E28-27	27528.571	29600.000	26000.000	7	0	7
	2-E33-32	27300.000	30000.000	25800.000	3	0	3
	6-32-43	27300.000	27300.000	27300.000	1	0	1
	2-E17-13	27200.000	29000.000	24800.000	3	0	3
	2-E33-28	27166.667	30300.000	25000.000	9	0	9

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Calcium, filtered							
	2-E33-21	27100.000	29900.000	24300.000	2	0	2
	6-43-45	27080.000	29000.000	25900.000	5	0	5
	2-E18-2	26620.000	32300.000	24600.000	10	0	10
	2-E27-13	26300.000	27000.000	25600.000	2	0	2
	2-E33-40	26300.000	26300.000	26300.000	1	0	1
	6-45-42	26300.000	29700.000	22000.000	5	0	5
	2-E32-2	26166.667	27200.000	25200.000	6	0	6
	2-E25-42	26000.000	26000.000	26000.000	1	0	1
	2-E25-43	26000.000	26000.000	26000.000	1	0	1
	2-E25-31	25553.846	38000.000	20400.000	26	0	26
	6-43-41F	25466.667	26500.000	24800.000	3	0	3
	2-E27-12	25250.000	26000.000	24500.000	2	0	2
	2-E25-41	25200.000	25700.000	24700.000	2	0	2
	6-55-55	25100.000	25100.000	25100.000	1	0	1
	6-43-43	25050.000	27000.000	22600.000	6	0	6
	2-E34-8	25000.000	25000.000	25000.000	1	0	1
	6-43-42J	24980.000	26100.000	23400.000	5	0	5
	2-E25-24	24950.000	29600.000	20900.000	8	0	8
	2-E25-29P	24477.273	28400.000	20400.000	22	0	22
	6-44-43B	24085.714	26000.000	22600.000	7	0	7
	2-E17-18	24012.500	27500.000	21200.000	8	0	8
	2-E25-21	23983.333	28900.000	19000.000	6	0	6
	6-43-41E	23950.000	24500.000	23400.000	2	0	2
	2-E25-23	23560.000	27900.000	20700.000	5	0	5
	2-E27-15	23300.000	23300.000	23300.000	1	0	1
	2-E25-36	23214.286	29000.000	19200.000	7	0	7
	2-E24-19	22800.000	22800.000	22800.000	1	0	1
	6-57-29A	22600.000	22600.000	22600.000	1	0	1
	6-44-42	22500.000	24100.000	20500.000	6	0	6
	2-E27-7	22400.000	22400.000	22400.000	1	0	1
	6-42-42B	21983.333	25000.000	19600.000	6	0	6
	6-42-40A	21157.143	23900.000	17000.000	7	0	7
	6-59-58	21100.000	21100.000	21100.000	1	0	1
	2-E25-34	20842.857	23000.000	19000.000	7	0	7
	2-E25-26	20800.000	22500.000	18600.000	9	0	9
	2-E25-37	20645.455	23000.000	19600.000	11	0	11
	2-E25-39	20333.333	22000.000	19000.000	3	0	3
	6-40-39	20220.000	22000.000	19100.000	5	0	5
	2-E25-22	20175.000	22200.000	17900.000	8	0	8
	2-E25-32P	19573.913	21600.000	18300.000	23	0	23
	2-E25-27	19500.000	21700.000	17100.000	5	0	5
	2-E25-28	19466.667	21000.000	17600.000	9	0	9
	2-E25-38	19110.000	25000.000	16600.000	10	0	10
	2-E25-25	18984.615	21200.000	16900.000	26	0	26
	6-31-31	17900.000	17900.000	17900.000	1	0	1
	6-60-57	16600.000	16600.000	16600.000	1	0	1
	6-54-34	14600.000	14600.000	14600.000	1	0	1
	2-E25-30P	14083.333	21800.000	10600.000	6	0	6
	6-40-33A	11800.000	11800.000	11800.000	1	0	1
@ Carbon Tetrachloride by GC							
	2-E27-8	4.475	.800	.800	1	7	8
	6-26-33	4.220	1.100	1.100	1	4	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
@ Carbon Tetrachloride by GC							
	6-35-70	3.800	3.800	3.800	1	0	1
	6-24-34A	2.818	5.000	5.000	1	10	11
	6-24-34B	2.750	6.000	6.000	1	11	12
	6-23-34	2.692	7.000	7.000	1	12	13
	6-24-34C	2.615	4.000	4.000	1	12	13
Carbon-14							
	2-E24-1	38.260	58.800	27.900	5	0	5
	2-E17-5	37.460	58.500	6.400	5	0	5
	2-E17-8	20.280	35.700	4.860	2	0	2
	6-35-70	12.488	19.600	4.080	5	1	6
	6-32-43	5.968	7.500	4.720	4	0	4
Cerium/Promethium-144							
	2-E34-2	28.650	34.700	34.700	1	1	2
	2-E18-2	24.900	24.900	24.900	1	0	1
Cesium-134							
	2-E17-1	3.650	3.650	3.650	1	0	1
	2-E17-17	3.540	3.540	3.540	1	0	1
	6-40-33A	1.713	8.960	3.320	2	3	5
Cesium-137							
	2-E28-23	1328.400	1800.000	844.000	10	0	10
	2-E28-25	246.533	1070.000	34.700	6	0	6
	2-E28-24	112.313	633.000	33.200	2	4	6
	2-E13-5	6.360	11.000	11.000	1	2	3
	2-E25-40	5.616	10.300	10.300	1	1	2
	2-E26-9	5.300	5.300	5.300	1	0	1
	2-E34-1	5.144	11.300	8.270	2	7	9
	2-E33-32	4.870	4.250	4.250	1	3	4
	2-E17-6	4.575	6.620	6.620	1	1	2
	2-E32-1	4.280	4.280	4.280	1	0	1
	2-E33-5	4.136	7.500	7.500	1	5	6
	2-E28-7	3.751	23.300	23.300	1	7	8
	2-E33-30	3.405	9.020	5.360	2	8	10
	6-53-48A	3.057	5.290	5.290	1	5	6
	2-E17-16	2.674	4.810	4.810	1	7	8
	2-E33-9	2.610	7.640	7.640	1	5	6
	2-E25-37	2.320	2.320	2.320	1	0	1
	2-E33-7	2.163	6.330	6.330	1	7	8
	2-E32-4	2.020	6.590	6.590	1	8	9
	2-E34-2	1.734	4.370	4.370	1	9	10
	2-E28-12	1.593	8.190	6.730	2	16	18
	2-E33-10	1.562	8.270	8.270	1	3	4
	6-53-47A	1.484	4.890	4.890	1	14	15
	2-E28-21	1.234	5.290	5.290	1	15	16
	2-E32-3	1.215	5.410	5.410	1	7	8
	6-24-34B	1.104	8.270	8.270	1	5	6
	2-E27-10	1.082	4.780	4.780	1	6	7
	6-35-70	.980	3.700	3.700	1	8	9
	6-42-40B	.723	13.300	13.300	1	17	18
	2-E17-12	.618	9.130	9.130	1	17	18
	6-31-31	.530	5.180	5.180	1	2	3
	2-E26-11	.520	.520	.520	1	0	1
	6-34-42	.434	.434	.434	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 33

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Cesium-137							
	2-E17-9	.420	5.770	5.770	1	15	16
	2-E27-8	.293	.432	.432	1	6	7
	6-38-65	.280	6.710	6.710	1	11	12
	2-E25-18	.181	7.640	7.640	1	7	8
	6-40-33A	.174	3.180	3.180	1	9	10
	6-42-40A	.114	3.780	3.780	1	5	6
	2-E27-16	-.123	.173	.173	1	1	2
	2-E24-16	-.159	-1.210	-1.210	1	1	2
	2-E25-30P	-.525	5.300	5.300	1	3	4
	2-E25-11	-.633	6.760	6.760	1	17	18
	2-E17-17	-1.316	.518	.518	1	6	7
	2-E34-8	-2.693	3.620	-11.700	2	1	3
	6-36-61A	-4.450	-4.450	-4.450	1	0	1
Chloride							
	2-E28-24	193000.000	193000.000	193000.000	1	0	1
	6-54-48	41300.000	41300.000	41300.000	1	0	1
	6-39-39	36946.667	72000.000	6540.000	3	0	3
	6-50-53A	35560.000	38200.000	31900.000	10	0	10
	2-E25-13	29900.000	29900.000	29900.000	1	0	1
	6-50-48B	29400.000	29400.000	29400.000	1	0	1
	6-47-50	29200.000	29500.000	28900.000	2	0	2
	6-56-53	25100.000	25100.000	25100.000	1	0	1
	6-52-46A	24400.000	24400.000	24400.000	1	0	1
	6-35-70	22520.000	24000.000	21000.000	5	0	5
	2-E28-7	22000.000	22000.000	22000.000	2	0	2
	2-E34-5	20800.000	22000.000	19000.000	8	0	8
	2-E28-23	20766.667	21000.000	20600.000	3	0	3
	6-51-46	20700.000	20700.000	20700.000	1	0	1
	2-E28-25	20300.000	20300.000	20300.000	1	0	1
	6-47-46A	20300.000	21000.000	19500.000	4	0	4
	6-50-45	19900.000	19900.000	19900.000	1	0	1
	6-53-47B	18900.000	18900.000	18900.000	1	0	1
	6-35-66	18060.000	21000.000	16300.000	5	0	5
	2-E33-29	17710.000	22000.000	13000.000	10	0	10
	2-E33-30	16870.000	20100.000	14000.000	10	0	10
	6-47-35A	16800.000	16800.000	16800.000	1	0	1
	2-E24-8	16700.000	16700.000	16700.000	1	0	1
	2-E34-6	16375.714	21300.000	1030.000	7	0	7
	2-E35-1	16100.000	16100.000	16100.000	1	0	1
	6-53-47A	15595.000	25000.000	6190.000	2	0	2
	2-E32-1	14266.667	15000.000	13500.000	3	0	3
	2-E34-1	13933.333	16600.000	12000.000	3	0	3
	6-38-65	13733.333	15000.000	12300.000	3	0	3
	6-49-55A	12722.222	15200.000	10700.000	9	0	9
	2-E34-7	12466.667	18000.000	9700.000	3	0	3
	6-54-57	12400.000	12400.000	12400.000	1	0	1
	6-20-20	12000.000	12000.000	12000.000	1	0	1
	6-44-64	11850.000	14000.000	9800.000	6	0	6
	2-E34-2	11725.000	12700.000	11000.000	8	0	8
	2-E33-10	10880.000	15100.000	5040.000	3	0	3
	6-46-21B	10800.000	10800.000	10800.000	1	0	1
	2-E28-17	10200.000	10200.000	10200.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 34

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chloride							
	2-E28-21	10120.000	12000.000	8400.000	5	0	5
	6-62-31	10000.000	10000.000	10000.000	1	0	1
	2-E32-2	9940.909	12000.000	7000.000	11	0	11
	6-37-43	9787.500	17000.000	3790.000	4	0	4
	2-E17-16	9647.778	24000.000	4500.000	9	0	9
	6-47-60	9553.333	10400.000	8610.000	3	0	3
	2-E13-14	9418.333	17000.000	7070.000	6	0	6
	2-E32-4	9237.692	10000.000	8400.000	13	0	13
	2-E32-5	9180.000	10000.000	7900.000	5	0	5
	6-40-62	9148.333	9650.000	8620.000	6	0	6
	2-E28-12	9050.000	9600.000	8500.000	2	0	2
	2-E18-4	8920.000	14600.000	6260.000	8	0	8
	2-E27-5	8900.000	8900.000	8900.000	1	0	1
	2-E28-26	8871.000	9700.000	7700.000	10	0	10
	6-61-62	8800.000	8800.000	8800.000	1	0	1
	6-42-39A	8700.000	8700.000	8700.000	1	0	1
	6-26-35C	8692.857	9780.000	8000.000	7	0	7
	2-E28-18	8620.000	10300.000	7300.000	5	0	5
	2-E28-28	8600.000	9200.000	7900.000	3	0	3
	2-E13-8	8500.000	8500.000	8500.000	1	0	1
	6-54-34	8500.000	8500.000	8500.000	1	0	1
	6-42-39B	8400.000	8400.000	8400.000	1	0	1
	2-E33-26	8204.545	12000.000	5400.000	11	0	11
	2-E13-5	8200.000	9800.000	7310.000	5	0	5
	6-36-61A	8156.000	9400.000	7060.000	5	0	5
	2-E26-11	8133.333	9000.000	7400.000	3	0	3
	2-E35-2	8033.333	13000.000	3700.000	3	0	3
	2-E26-8	8000.000	8000.000	8000.000	1	0	1
	2-E28-9	8000.000	8000.000	8000.000	1	0	1
	2-E28-13	7925.000	8900.000	7000.000	4	0	4
	2-E33-12	7900.000	7900.000	7900.000	1	0	1
	6-45-69A	7872.500	8100.000	7500.000	4	0	4
	2-E34-3	7865.714	16000.000	6460.000	7	0	7
	6-64-62	7800.000	7800.000	7800.000	1	0	1
	2-E26-10	7733.333	13000.000	2900.000	3	0	3
	2-E27-11	7733.333	8000.000	7400.000	3	0	3
	6-23-34	7581.538	9100.000	5700.000	13	0	13
	6-24-34A	7460.833	8360.000	6800.000	12	0	12
	6-24-34B	7450.714	9020.000	6800.000	14	0	14
	2-E28-27	7356.000	12000.000	5400.000	10	0	10
	2-E27-9	7345.556	9200.000	6010.000	9	0	9
	6-54-49	7300.000	7500.000	7100.000	2	0	2
	6-24-35	7266.429	8100.000	6000.000	14	0	14
	2-E27-8	7231.111	8400.000	6010.000	9	0	9
	6-41-40	7183.333	7700.000	6400.000	6	0	6
	6-24-33	7136.364	8610.000	6400.000	11	0	11
	6-24-34C	7076.923	8990.000	5700.000	13	0	13
	2-E32-3	7073.750	8700.000	5900.000	8	0	8
	2-E25-35	7061.000	8000.000	6190.000	10	0	10
	2-E18-1	7004.545	8000.000	6000.000	11	0	11
	6-60-57	6950.000	7600.000	6300.000	2	0	2
	6-57-29A	6900.000	6900.000	6900.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 35

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chloride							
	6-43-41E	6885.714	7300.000	6600.000	7	0	7
	6-25-34C	6729.231	7530.000	6100.000	13	0	13
	2-E13-19	6700.000	6700.000	6700.000	1	0	1
	6-36-61B	6700.000	6700.000	6700.000	1	0	1
	6-43-41F	6600.000	7900.000	6000.000	4	0	4
	6-63-58	6600.000	6600.000	6600.000	1	0	1
	6-26-35A	6597.778	7680.000	6000.000	9	0	9
	2-E24-7	6500.000	6500.000	6500.000	1	0	1
	6-25-33A	6461.429	7010.000	6000.000	7	0	7
	2-E33-34	6400.000	6700.000	6100.000	2	0	2
	6-25-34A	6245.714	7080.000	5700.000	7	0	7
	2-E18-3	6207.778	8700.000	4400.000	9	0	9
	6-25-34B	6190.000	7060.000	5600.000	8	0	8
	2-E26-1	6100.000	6100.000	6100.000	1	0	1
	6-63-55	6100.000	6100.000	6100.000	1	0	1
	6-26-34	6095.000	7700.000	5100.000	6	0	6
	2-E25-28	6070.000	33000.000	2800.000	10	0	10
	2-E33-5	6052.500	6170.000	5900.000	4	0	4
	2-E33-1	6052.000	10000.000	4870.000	5	0	5
	6-26-33	5978.571	6750.000	5200.000	7	0	7
	2-E17-9	5923.333	6810.000	5400.000	9	0	9
	2-E26-9	5843.333	14000.000	430.000	3	0	3
	6-55-50C	5830.000	6150.000	5670.000	4	0	4
	6-43-41G	5800.000	5800.000	5800.000	1	0	1
	6-40-40A	5600.000	5600.000	5600.000	1	0	1
	2-E27-14	5416.667	8500.000	750.000	3	0	3
	6-45-42	5408.333	5800.000	4830.000	6	0	6
	2-E25-31	5407.857	31000.000	2700.000	14	0	14
	2-E27-10	5346.250	11000.000	4100.000	8	0	8
	2-E33-24	5300.000	5300.000	5300.000	1	0	1
	6-58-24	5300.000	5300.000	5300.000	1	0	1
	2-E33-21	5250.000	5300.000	5200.000	2	0	2
	2-E25-40	5233.333	5400.000	5000.000	3	0	3
	6-43-40	5200.000	5200.000	5200.000	1	0	1
	6-32-43	5166.667	6400.000	4400.000	3	0	3
	6-52-48	5100.000	5100.000	5100.000	1	0	1
	2-E33-3	5066.667	5400.000	4680.000	3	0	3
	2-E18-2	5066.000	8000.000	2060.000	10	0	10
	2-E33-18	5000.000	5000.000	5000.000	1	0	1
	6-59-58	5000.000	5000.000	5000.000	1	0	1
	6-20-39	4975.000	5050.000	4900.000	2	0	2
	2-E33-41	4900.000	5100.000	4600.000	3	0	3
	2-E33-31	4833.333	5100.000	4600.000	3	0	3
	2-E33-33	4833.333	5300.000	4600.000	3	0	3
	2-E23-1	4800.000	4800.000	4800.000	1	0	1
	2-E33-8	4800.000	5000.000	4600.000	2	0	2
	6-24-46	4676.667	4850.000	4420.000	3	0	3
	2-E27-12	4600.000	5200.000	3800.000	3	0	3
	2-E27-15	4566.667	5000.000	3700.000	3	0	3
	2-E25-20	4546.364	6310.000	3200.000	11	0	11
	2-E25-41	4475.000	5400.000	3700.000	4	0	4
	2-E17-12	4428.000	5100.000	3800.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 36

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chloride							
	2-E17-2	4400.000	4400.000	4400.000	2	0	2
	2-E24-19	4400.000	4700.000	4200.000	3	0	3
	2-E33-35	4400.000	4600.000	4200.000	2	0	2
	2-E33-36	4400.000	4600.000	4200.000	2	0	2
	6-33-42	4400.000	4400.000	4400.000	1	0	1
	6-40-40B	4400.000	4400.000	4400.000	1	0	1
	2-E25-32P	4381.333	23000.000	2500.000	15	0	15
	2-E25-33	4335.000	5100.000	3700.000	12	0	12
	2-E24-20	4300.000	4300.000	4300.000	1	0	1
	2-E33-32	4266.667	4400.000	4200.000	3	0	3
	2-E17-14	4208.889	5030.000	3600.000	9	0	9
	2-E27-7	4200.000	4600.000	3700.000	3	0	3
	2-E24-18	4183.333	6200.000	3600.000	6	0	6
	2-E17-17	4181.111	5360.000	3700.000	9	0	9
	2-E17-1	4178.571	4650.000	3700.000	7	0	7
	2-E17-13	4175.000	4700.000	3700.000	4	0	4
	6-44-43B	4116.667	4600.000	3600.000	6	0	6
	2-E17-5	4079.167	5510.000	3500.000	12	0	12
	2-E24-2	4022.857	5760.000	3600.000	7	0	7
	2-E17-20	4020.000	4800.000	3500.000	10	0	10
	2-E24-16	4000.000	5200.000	3500.000	7	0	7
	2-E24-12	3950.000	4000.000	3900.000	2	0	2
	2-E17-15	3938.000	4500.000	3110.000	10	0	10
	6-42-42B	3933.333	4500.000	3600.000	6	0	6
	2-E25-36	3888.889	4500.000	3300.000	9	0	9
	6-31-31	3875.000	4100.000	3700.000	4	0	4
	2-E24-17	3866.667	5400.000	3300.000	6	0	6
	2-E27-13	3866.667	4200.000	3600.000	3	0	3
	2-E17-19	3755.000	3930.000	3500.000	6	0	6
	6-34-42	3700.000	3800.000	3600.000	2	0	2
	6-42-41	3700.000	3700.000	3700.000	1	0	1
	2-E33-37	3650.000	3800.000	3500.000	2	0	2
	2-E17-18	3584.000	4820.000	2900.000	10	0	10
	2-E24-4	3550.000	3700.000	3400.000	2	0	2
	2-E25-42	3550.000	3600.000	3500.000	2	0	2
	2-E25-19	3547.000	5000.000	2600.000	10	0	10
	2-E25-9	3500.000	4000.000	3000.000	2	0	2
	6-40-33A	3500.000	3500.000	3500.000	1	0	1
	2-E25-6	3450.000	3900.000	3000.000	2	0	2
	2-E25-18	3432.000	4320.000	3000.000	10	0	10
	2-E25-22	3400.000	3830.000	3100.000	8	0	8
	2-E25-38	3400.000	3700.000	3100.000	5	0	5
	2-E25-27	3366.000	3700.000	3100.000	5	0	5
	2-E26-5	3360.000	3360.000	3360.000	1	0	1
	2-E17-6	3351.111	4010.000	2950.000	9	0	9
	2-E25-17	3300.000	3800.000	2800.000	2	0	2
	2-E26-2	3300.000	3300.000	3300.000	1	0	1
	6-43-42J	3214.286	3500.000	2800.000	7	0	7
	2-E25-2	3200.000	3300.000	3100.000	2	0	2
	2-E25-43	3200.000	3200.000	3200.000	1	0	1
	2-E26-4	3200.000	3200.000	3200.000	1	0	1
	6-44-42	3200.000	3500.000	2900.000	7	0	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 37

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chloride							
	6-40-39	3183.333	3400.000	3100.000	6	0	6
	6-43-43	3142.857	3700.000	2800.000	7	0	7
	6-42-40A	3130.000	4100.000	2300.000	8	0	8
	2-E25-25	3127.333	4400.000	2000.000	15	0	15
	2-E25-3	3100.000	3100.000	3100.000	1	0	1
	2-E26-12	3100.000	3100.000	3100.000	1	0	1
	2-E25-34	3098.571	3300.000	2800.000	7	0	7
	2-E25-21	3088.571	3920.000	2100.000	7	0	7
	6-42-40B	3050.000	3200.000	2900.000	2	0	2
	2-E25-39	3033.333	3700.000	2300.000	3	0	3
	2-E26-13	3000.000	3000.000	3000.000	1	0	1
	2-E25-29P	2939.091	3300.000	2800.000	11	0	11
	6-31-31P	2900.000	2900.000	2900.000	1	0	1
	2-E25-37	2880.000	3400.000	2500.000	5	0	5
	2-E25-26	2850.000	3200.000	2200.000	10	0	10
	6-43-45	2850.000	3100.000	2500.000	6	0	6
	2-E27-16	2500.000	2700.000	2300.000	2	0	2
	2-E34-8	2233.333	2800.000	1900.000	3	0	3
	2-E25-30P	2165.000	2820.000	1700.000	6	0	6
	2-E25-11	2133.333	2700.000	1400.000	3	0	3
	2-E16-2	1722.500	2490.000	1200.000	4	0	4
	2-E25-23	1422.000	1820.000	1000.000	5	0	5
	2-E25-24	1283.750	1580.000	1000.000	8	0	8
a Chloroform							
	2-E18-3	8.333	25.000	25.000	1	5	6
	6-24-34C	4.385	1.500	1.500	1	12	13
	6-24-34B	4.250	.500	.500	2	10	12
	6-24-34A	4.191	.600	.600	1	10	11
	6-23-34	4.057	.800	.500	2	12	14
	2-E33-37	3.767	1.300	1.300	1	2	3
	6-45-69A	3.600	3.600	3.600	1	0	1
	2-E34-8	3.400	2.000	1.600	2	2	4
	2-E33-36	3.225	1.500	1.400	2	2	4
	2-E27-16	3.167	2.400	2.100	2	1	3
Chromium							
	6-40-40B	395.000	770.000	770.000	1	1	2
	2-E25-17	321.000	321.000	321.000	1	0	1
	2-E25-30P	270.857	429.000	85.000	7	0	7
	2-E24-20	205.000	205.000	205.000	1	0	1
	2-E24-19	172.500	340.000	74.000	3	0	3
	2-E35-1	164.000	164.000	164.000	1	0	1
	2-E34-6	157.625	1000.000	15.000	6	2	8
	2-E34-8	155.000	250.000	120.000	3	1	4
	6-43-41E	153.667	560.000	29.500	5	1	6
	2-E26-12	153.333	420.000	420.000	1	2	3
	2-E25-6	153.000	153.000	153.000	1	0	1
	6-43-40	140.000	260.000	260.000	1	1	2
	2-E25-9	130.000	130.000	130.000	1	0	1
	6-41-40	128.429	630.000	28.000	5	2	7
	6-40-39	120.167	570.000	19.000	5	1	6
	2-E27-11	119.200	360.000	42.000	4	1	5
	6-49-55A	112.000	112.000	112.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 38

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chromium							
	6-42-39B	109.500	190.000	29.000	2	0	2
	2-E33-36	102.500	230.000	140.000	2	2	4
	2-E34-2	96.170	182.000	38.000	10	0	10
	2-E25-39	96.000	190.000	120.000	3	2	5
	2-E26-11	89.000	230.000	30.000	4	1	5
	6-47-50	86.100	86.100	86.100	1	0	1
	6-43-42J	84.375	206.000	26.000	7	1	8
	6-50-53B	83.000	155.000	11.000	2	0	2
	6-49-55B	80.300	80.300	80.300	1	0	1
	2-E25-43	80.000	200.000	200.000	1	2	3
	2-E16-2	78.500	102.000	55.000	2	0	2
	2-E33-41	77.500	90.000	65.000	2	0	2
	2-E27-15	77.333	105.000	52.000	3	0	3
	2-E33-37	76.667	130.000	80.000	2	1	3
	2-E25-29P	73.936	400.000	12.000	21	4	25
	6-49-57B	73.100	73.100	73.100	1	0	1
	2-E17-20	72.250	360.000	19.000	11	1	12
	2-E34-7	71.000	71.000	71.000	1	0	1
	6-40-40A	70.000	120.000	120.000	1	1	2
	2-E26-13	66.667	160.000	160.000	1	2	3
	2-E17-15	66.250	225.000	21.000	10	2	12
	2-E25-40	65.375	76.000	55.500	4	0	4
	2-E25-37	65.308	121.000	13.000	12	1	13
	6-43-45	64.857	150.000	37.000	6	1	7
	2-E27-9	64.182	120.000	30.000	10	1	11
	2-E25-34	64.100	250.000	13.000	9	1	10
	2-E32-4	63.750	180.000	25.000	13	1	14
	2-E17-16	63.182	223.000	13.000	10	1	11
	2-E32-5	61.333	140.000	22.000	5	1	6
	2-E24-17	60.714	103.000	31.000	7	0	7
	2-E18-4	60.389	159.000	21.000	9	0	9
	2-E25-36	59.250	260.000	15.000	9	3	12
	2-E35-2	58.786	115.000	23.500	5	2	7
	2-E25-32P	58.563	250.000	18.000	27	0	27
	2-E26-10	57.833	130.000	27.000	4	2	6
	2-E24-18	56.667	104.000	21.000	5	1	6
	2-E25-41	56.625	80.000	31.000	4	0	4
	2-E25-42	55.667	90.000	57.000	2	1	3
	2-E18-1	55.333	150.000	20.000	11	1	12
	2-E25-31	54.603	260.000	12.000	27	2	29
	2-E25-35	54.385	200.000	27.000	11	2	13
	2-E32-2	54.364	123.000	20.000	9	2	11
	6-42-39A	54.000	88.000	88.000	1	1	2
	2-E24-16	53.333	84.000	36.000	8	1	9
	2-E18-3	52.600	104.000	21.000	9	1	10
	2-E25-38	52.333	103.000	37.000	9	3	12
	2-E33-31	50.500	62.000	31.500	4	0	4
	2-E26-9	49.000	115.000	40.000	3	2	5
	2-E27-13	48.167	83.000	22.000	3	0	3
	2-E17-19	47.667	74.000	27.000	6	0	6
	2-E32-3	47.600	150.000	21.000	8	2	10
	2-E33-30	47.545	110.000	17.000	9	2	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 39

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chromium							
	6-42-41	47.500	75.000	75.000	1	1	2
	2-E28-26	47.150	164.000	19.000	9	1	10
	2-E17-17	46.278	203.000	20.000	8	1	9
	2-E33-29	46.208	130.000	21.000	10	2	12
	2-E25-11	46.000	49.000	43.000	2	0	2
	6-44-43B	44.889	130.000	23.000	8	1	9
	2-E34-5	44.600	104.000	14.000	9	1	10
	6-55-55	44.200	44.200	44.200	1	0	1
	2-E27-14	44.000	63.000	25.000	2	0	2
	2-E33-38	43.600	57.900	29.300	2	0	2
	2-E33-32	43.175	51.200	35.000	4	0	4
	2-E28-28	41.800	72.000	47.000	3	2	5
	2-E17-18	39.750	121.000	15.000	9	1	10
	2-E27-10	39.556	81.000	19.000	8	1	9
	2-E27-16	39.333	70.000	28.000	2	1	3
	2-E33-40	39.000	39.000	39.000	1	0	1
	2-E18-2	38.900	87.000	16.000	9	1	10
	2-E33-33	38.333	56.000	23.000	3	0	3
	2-E27-8	38.167	50.000	26.000	9	0	9
	2-E34-3	37.571	89.000	23.000	7	0	7
	6-43-41F	37.500	69.000	23.000	4	0	4
	2-E33-28	37.408	110.000	20.000	11	2	13
	2-E33-39	36.400	36.400	36.400	1	0	1
	6-42-42B	35.250	79.000	13.000	7	1	8
	2-E28-27	35.042	61.000	21.000	10	2	12
	6-43-43	34.444	82.000	22.000	7	2	9
	6-42-40B	33.500	57.000	57.000	1	1	2
	2-E33-34	32.667	42.000	36.000	2	1	3
	2-E25-25	30.518	81.000	12.000	21	7	28
	6-44-42	29.125	66.000	18.000	5	3	8
	2-E34-1	29.100	67.300	67.300	1	2	3
	2-E27-12	28.167	39.500	12.000	3	0	3
	2-E25-33	27.636	66.000	11.000	24	1	25
	2-E17-14	26.778	73.000	12.000	9	0	9
	6-43-41G	24.000	28.000	28.000	1	1	2
	2-E33-35	22.250	23.500	21.000	2	0	2
	2-E13-14	22.000	22.000	22.000	1	0	1
	6-24-34A	17.818	56.000	24.000	3	8	11
	2-E28-12	17.000	17.000	17.000	1	0	1
	6-52-54	17.000	17.000	17.000	1	0	1
	6-25-34C	14.923	30.000	18.000	3	10	13
	6-24-34C	14.538	37.000	22.000	2	11	13
	6-24-35	14.538	29.000	14.000	3	10	13
	2-E33-18	13.900	13.900	13.900	1	0	1
	6-25-34B	12.400	12.000	12.000	1	4	5
	6-24-34B	12.231	14.000	10.000	4	9	13
	6-23-34	12.154	17.000	11.000	2	11	13
	6-49-57A	12.100	12.100	12.100	1	0	1
	6-26-35C	12.000	10.000	10.000	1	4	5
	6-52-57	11.100	11.100	11.100	1	0	1
	2-E17-1	11.000	15.000	15.000	1	4	5
	2-E28-7	10.000	10.000	10.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 40

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chromium							
	2-E33-10	10.000	10.000	10.000	1	1	2
	2-E33-15	3.600	3.600	3.600	1	0	1
Chromium, filtered							
	2-E24-19	65.000	65.000	65.000	1	0	1
	2-E25-39	53.333	120.000	120.000	1	2	3
	2-E13-14	47.250	67.000	28.000	4	0	4
	2-E34-2	33.667	92.000	7.000	6	3	9
	6-49-57B	26.400	26.400	26.400	1	0	1
	2-E25-20	24.444	130.000	130.000	1	8	9
	6-35-66	22.750	26.000	20.000	4	0	4
	6-33-56	21.000	21.000	21.000	1	0	1
	6-49-55B	20.800	20.800	20.800	1	0	1
	2-E27-9	20.750	63.000	33.000	2	6	8
	2-E25-37	19.286	42.000	13.000	2	5	7
	2-E25-38	19.167	35.000	35.000	1	5	6
	2-E17-15	17.556	55.000	23.000	2	7	9
	2-E25-35	17.500	55.000	10.000	2	8	10
	6-44-43B	17.500	40.000	15.000	2	4	6
	6-40-39	16.400	32.000	32.000	1	4	5
	6-41-40	16.200	21.000	21.000	1	4	5
	2-E25-30P	15.714	32.000	14.000	4	3	7
	2-E25-29P	15.143	40.000	11.000	4	10	14
	2-E25-40	15.000	15.000	15.000	1	0	1
	2-E25-31	13.533	42.000	11.000	2	13	15
	2-E25-33	13.455	26.000	10.000	4	7	11
	6-36-61A	12.750	15.000	13.000	3	1	4
	2-E25-25	12.733	19.000	12.000	2	13	15
	2-E17-14	12.250	18.000	18.000	1	7	8
	2-E33-32	12.133	6.400	6.400	1	2	3
	2-E24-8	12.000	12.000	12.000	1	0	1
	2-E33-29	12.000	14.000	14.000	1	6	7
	2-E33-28	11.813	4.500	4.500	1	7	8
	2-E25-34	11.667	10.000	10.000	1	5	6
	2-E33-3	11.667	15.000	15.000	1	2	3
	2-E33-30	11.667	5.000	5.000	1	8	9
	2-E25-32P	11.615	11.000	11.000	1	12	13
	2-E25-18	11.444	23.000	23.000	1	8	9
	2-E34-3	11.429	10.000	10.000	1	6	7
	6-43-43	11.429	10.000	10.000	1	6	7
	2-E18-3	11.333	12.000	12.000	1	8	9
	2-E18-2	11.222	11.000	11.000	1	8	9
	6-24-34A	10.625	15.000	15.000	1	7	8
	2-E13-5	10.500	12.000	12.000	1	3	4
	2-E33-18	10.400	10.800	10.800	1	1	2
	2-E33-1	10.200	11.000	11.000	1	4	5
	6-24-35	10.000	10.000	10.000	1	10	11
	6-50-53A	10.000	10.000	10.000	1	4	5
	6-49-57A	9.800	9.800	9.800	1	0	1
	2-E34-5	9.443	11.000	5.100	2	5	7
	6-49-55A	8.700	3.500	3.500	1	4	5
	6-52-54	6.300	6.300	6.300	1	0	1
	2-E33-15	6.100	6.100	6.100	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 41

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Chromium, filtered							
	2-E33-38	4.600	4.600	4.600	1	0	1
	2-E33-40	4.600	4.600	4.600	1	0	1
	2-E33-39	3.700	3.700	3.700	1	0	1
Cis-1,2-Dichloroethene							
	6-24-34A	1.233	1.700	1.700	1	2	3
	6-24-34C	1.150	1.300	1.300	1	1	2
Cobalt							
	2-E25-17	30.000	30.000	30.000	1	0	1
	2-E25-9	24.000	24.000	24.000	1	0	1
	2-E16-2	21.000	21.000	21.000	1	0	1
	2-E25-6	20.000	20.000	20.000	1	0	1
Cobalt-60							
	6-50-53A	473.778	532.000	352.000	9	0	9
	6-49-55A	95.783	222.000	11.700	12	0	12
	6-55-57	70.650	73.100	68.200	2	0	2
	2-E33-7	43.775	70.700	22.800	8	0	8
	2-E17-15	31.633	55.300	11.600	6	0	6
	2-E17-14	30.296	54.400	8.270	7	0	7
	2-E28-23	28.460	228.000	3.540	3	7	10
	2-E17-5	24.184	51.100	6.910	18	5	23
	2-E33-4	22.900	22.900	22.900	1	0	1
	2-E17-16	21.716	61.100	18.900	5	3	8
	6-52-54	19.000	19.000	19.000	1	0	1
	2-E33-5	15.650	22.200	10.500	6	0	6
	2-E17-2	13.943	20.600	13.200	5	2	7
	2-E33-3	13.760	34.700	14.200	2	3	5
	2-E33-26	11.306	13.100	11.300	3	2	5
	2-E33-24	11.240	9.300	9.300	1	3	4
	2-E33-12	10.477	16.700	7.730	2	1	3
	6-64-62	10.036	14.000	12.800	3	2	5
	2-E33-34	8.550	8.350	6.850	2	2	4
	2-E17-17	8.312	15.300	6.250	4	3	7
	6-40-39	7.950	7.950	7.950	1	0	1
	2-E26-9	7.880	7.880	7.880	1	0	1
	6-61-62	7.758	21.400	5.330	3	3	6
	6-34-42	7.000	7.000	7.000	1	0	1
	2-E23-1	6.680	6.680	6.680	1	0	1
	6-44-43B	6.275	9.090	9.090	1	1	2
	2-E26-11	6.130	6.130	6.130	1	0	1
	2-E17-13	5.078	19.000	5.670	7	14	21
	2-E33-35	5.025	3.990	3.990	1	3	4
	2-E24-12	4.945	9.920	9.260	2	9	11
	2-E24-19	4.420	11.400	11.400	1	1	2
	2-E24-2	4.254	5.670	5.670	1	5	6
	2-E17-12	4.018	12.400	5.350	7	11	18
	6-24-33	3.396	6.130	5.670	2	10	12
	6-47-60	3.370	5.690	5.690	1	7	8
	2-E33-10	3.243	7.290	7.290	1	3	4
	6-34-41B	3.136	9.930	9.930	1	4	5
	2-E33-41	3.060	4.700	4.700	1	2	3
	6-32-43	3.013	7.060	3.810	5	9	14
	2-E33-8	2.865	5.910	5.910	1	3	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 42

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Cobalt-60							
	2-E24-16	2.675	3.650	3.650	1	1	2
	6-35-70	2.614	4.390	4.390	1	8	9
	6-47-46A	2.578	5.330	5.330	1	5	6
	2-E27-8	2.533	6.400	2.360	3	4	7
	2-E32-2	2.448	8.370	6.060	2	10	12
	2-E25-22	2.438	7.930	0.000	2	6	8
	2-E28-7	2.291	9.630	9.630	1	7	8
	2-E25-41	2.146	10.200	10.200	1	2	3
	2-E25-19	2.020	5.650	4.440	2	6	8
	2-E27-10	1.816	8.660	6.190	2	5	7
	2-E28-25	1.747	5.670	5.670	1	5	6
	6-31-31	1.710	3.960	3.960	1	2	3
	2-E33-29	1.653	7.140	5.870	2	10	12
	2-E34-6	1.599	7.000	7.000	1	5	6
	2-E32-5	1.487	7.260	7.260	1	4	5
	2-E33-30	1.444	4.030	4.030	1	9	10
	2-E25-27	1.405	6.120	6.120	1	1	2
	6-53-47B	1.387	0.000	0.000	1	5	6
	6-53-48B	1.353	5.060	5.060	1	5	6
	2-E24-4	1.316	5.670	0.000	2	5	7
	2-E34-8	1.253	6.800	-1.160	2	1	3
	6-38-65	1.206	8.890	5.470	2	10	12
	6-53-47A	1.180	8.290	0.000	2	13	15
	2-E24-13	1.014	8.690	8.690	1	2	3
	6-42-40B	1.008	5.640	5.640	1	17	18
	2-E27-11	.943	6.210	6.210	1	2	3
	2-E25-30P	.915	5.330	5.330	1	3	4
	2-E32-4	.879	4.360	4.360	1	8	9
	6-40-33A	.784	2.350	2.350	1	9	10
	2-E32-3	.642	4.370	4.370	1	7	8
	2-E16-2	.597	7.090	7.090	1	16	17
	2-E25-37	.486	.486	.486	1	0	1
	2-E25-17	.431	10.200	10.200	1	7	8
	2-E25-11	.375	7.300	6.420	2	16	18
	2-E28-18	.356	6.420	5.650	2	14	16
	2-E25-24	.068	7.040	7.040	1	5	6
	2-E25-18	.025	5.580	5.580	1	7	8
	2-E28-21	.021	7.460	7.340	2	14	16
	2-E25-32P	-.424	0.000	0.000	1	2	3
	2-E33-21	-.516	8.280	8.280	1	5	6
	6-39-39	-1.218	7.460	7.460	1	5	6
	2-E17-1	-1.964	6.070	6.070	1	3	4
	6-42-40A	-2.382	0.000	0.000	1	5	6
	2-E27-16	-3.002	-6.250	-6.250	1	1	2
	6-36-61A	-3.400	-3.400	-3.400	1	0	1
	6-31-53B	-3.760	0.000	0.000	1	1	2
Coliform (Membrane Filter)							
	2-E33-30	2.750	8.000	8.000	1	3	4
	6-24-34C	2.500	7.000	7.000	1	3	4
	2-E18-2	1.000	1.000	1.000	1	1	2
	2-E32-2	1.000	1.000	1.000	1	3	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 43

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Coliform bacteria							
	2-E25-29P	268.222	2400.000	2400.000	1	8	9
	6-43-40	15.000	15.000	15.000	1	0	1
	2-E25-37	8.800	31.000	31.000	1	3	4
	2-E32-4	5.060	32.000	32.000	1	9	10
	2-E17-14	4.960	16.000	2.200	2	3	5
	2-E17-1	4.720	16.000	16.000	1	4	5
	2-E17-18	4.300	16.000	16.000	1	5	6
	2-E17-5	3.360	9.200	2.200	2	3	5
	6-24-34A	2.073	2.000	2.000	1	10	11
	6-26-34	1.900	2.200	2.200	1	3	4
	2-E27-16	1.500	2.000	2.000	1	1	2
	6-25-34A	1.467	0.000	0.000	1	2	3
Conductivity, Laboratory							
	2-E25-13	1490.000	1490.000	1490.000	1	0	1
	2-E28-24	868.000	868.000	868.000	1	0	1
	2-E28-12	802.000	829.000	775.000	2	0	2
	2-E17-15	723.000	834.000	568.000	5	0	5
	2-E17-14	652.200	736.000	556.000	5	0	5
	2-E13-5	651.000	651.000	651.000	1	0	1
	2-E25-35	639.375	794.000	185.000	8	0	8
	2-E17-20	601.111	651.000	485.000	9	0	9
	6-23-34	596.536	697.000	548.000	28	0	28
	6-54-48	581.000	581.000	581.000	1	0	1
	6-24-34B	577.200	697.000	417.000	25	0	25
	2-E25-19	573.500	661.000	490.000	4	0	4
	6-24-34C	572.080	624.000	417.000	25	0	25
	6-24-34A	553.120	617.000	509.000	25	0	25
	2-E28-17	544.000	544.000	544.000	1	0	1
	2-E32-5	540.556	557.000	520.000	9	0	9
	6-24-33	538.714	576.000	503.000	21	0	21
	2-E17-1	535.714	608.000	368.000	7	0	7
	2-E18-1	535.586	588.000	474.000	29	0	29
	2-E13-8	533.000	533.000	533.000	1	0	1
	6-63-25A	520.000	520.000	520.000	1	0	1
	2-E28-26	511.440	560.000	429.000	25	0	25
	6-53-47B	503.000	503.000	503.000	1	0	1
	2-E24-12	501.000	501.000	501.000	1	0	1
	2-E25-20	501.000	721.000	200.000	4	0	4
	2-E34-5	500.524	545.000	448.000	21	0	21
	2-E28-9	499.000	499.000	499.000	1	0	1
	2-E28-21	497.000	521.000	460.000	3	0	3
	2-E34-2	495.476	557.000	430.000	21	0	21
	2-E28-13	494.000	502.000	486.000	2	0	2
	2-E17-9	493.000	533.000	466.000	5	0	5
	2-E13-14	487.500	505.000	470.000	2	0	2
	2-E28-18	479.333	516.000	410.000	3	0	3
	2-E28-28	470.000	470.000	470.000	1	0	1
	2-E17-19	468.750	771.000	390.000	8	0	8
	2-E34-6	458.889	514.000	429.000	18	0	18
	2-E17-6	457.000	486.000	432.000	3	0	3
	2-E13-19	450.000	450.000	450.000	1	0	1
	2-E34-1	447.000	447.000	447.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 44

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Conductivity, Laboratory							
	6-24-35	438.400	491.000	405.000	25	0	25
	2-E32-4	437.808	489.000	410.000	26	0	26
	2-E35-1	432.333	434.000	431.000	3	0	3
	6-25-34C	431.536	509.000	344.000	28	0	28
	2-E35-2	430.000	430.000	430.000	1	0	1
	2-E17-16	424.250	509.000	364.000	4	0	4
	2-E26-9	420.000	420.000	420.000	1	0	1
	2-E24-17	413.750	453.000	294.000	8	0	8
	2-E24-16	412.625	447.000	323.000	8	0	8
	2-E32-3	412.600	474.000	371.000	15	0	15
	2-E17-2	409.000	409.000	409.000	1	0	1
	6-26-35C	408.550	459.000	356.000	20	0	20
	2-E24-7	400.000	400.000	400.000	1	0	1
	6-25-34B	392.600	463.000	313.000	25	0	25
	2-E17-5	391.600	425.000	364.000	5	0	5
	6-26-35A	389.000	420.000	351.000	26	0	26
	6-41-40	386.667	403.000	377.000	3	0	3
	6-25-34A	382.136	461.000	297.000	22	0	22
	2-E33-34	380.000	380.000	380.000	1	0	1
	2-E34-7	373.600	375.000	371.000	5	0	5
	2-E27-14	370.667	382.000	360.000	3	0	3
	2-E24-2	368.375	396.000	329.000	8	0	8
	2-E23-1	361.000	361.000	361.000	1	0	1
	6-26-33	360.500	401.000	281.000	22	0	22
	2-E33-1	358.000	358.000	358.000	1	0	1
	6-26-34	357.350	396.000	309.000	20	0	20
	2-E17-17	354.000	373.000	337.000	4	0	4
	2-E28-7	350.000	350.000	350.000	1	0	1
	2-E24-18	347.875	401.000	252.000	8	0	8
	6-52-48	341.000	341.000	341.000	1	0	1
	6-25-33A	340.885	406.000	292.000	26	0	26
	2-E33-5	340.000	340.000	340.000	1	0	1
	2-E25-18	339.800	360.000	320.000	5	0	5
	2-E17-12	339.000	363.000	320.000	3	0	3
	2-E27-9	335.273	366.000	297.000	22	0	22
	2-E25-40	334.500	350.000	319.000	2	0	2
	2-E27-11	333.667	337.000	330.000	3	0	3
	6-43-41E	332.333	337.000	330.000	3	0	3
	2-E28-23	332.000	332.000	332.000	1	0	1
	2-E28-25	331.000	331.000	331.000	1	0	1
	6-54-49	329.000	329.000	329.000	1	0	1
	6-50-45	328.000	328.000	328.000	1	0	1
	2-E25-34	327.857	674.000	183.000	7	0	7
	2-E27-8	327.389	350.000	286.000	18	0	18
	2-E26-11	325.000	330.000	320.000	2	0	2
	6-40-39	314.667	326.000	308.000	3	0	3
	2-E33-30	314.423	350.000	278.000	26	0	26
	2-E32-2	314.000	357.000	292.000	25	0	25
	6-43-41F	314.000	324.000	298.000	3	0	3
	2-E28-27	313.833	366.000	276.000	24	0	24
	2-E33-29	313.773	353.000	295.000	22	0	22
	2-E25-21	312.667	350.000	260.000	3	0	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 45

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Conductivity, Laboratory							
	6-52-46A	311.000	311.000	311.000	1	0	1
	2-E25-24	310.500	316.000	305.000	2	0	2
	2-E26-10	310.000	310.000	310.000	1	0	1
	2-E32-1	308.333	311.000	304.000	3	0	3
	2-E34-3	306.895	470.000	278.000	19	0	19
	2-E17-13	304.000	320.000	282.000	3	0	3
	6-44-43B	302.667	309.000	290.000	3	0	3
	2-E25-11	302.500	308.000	297.000	2	0	2
	2-E25-33	301.500	321.000	280.000	4	0	4
	2-E25-41	300.000	330.000	250.000	3	0	3
	2-E34-8	300.000	300.000	300.000	1	0	1
	6-55-50C	294.000	294.000	294.000	1	0	1
	2-E33-31	291.500	300.000	283.000	2	0	2
	2-E25-17	289.500	307.000	272.000	2	0	2
	6-50-48B	287.000	287.000	287.000	1	0	1
	2-E33-33	286.500	300.000	273.000	2	0	2
	2-E25-29P	282.000	300.000	258.000	4	0	4
	6-54-57	281.000	281.000	281.000	1	0	1
	2-E33-35	280.000	280.000	280.000	1	0	1
	2-E33-32	272.000	290.000	246.000	3	0	3
	2-E33-28	270.720	310.000	250.000	25	0	25
	2-E33-36	270.000	270.000	270.000	1	0	1
	2-E33-8	268.000	268.000	268.000	1	0	1
	2-E18-2	266.150	304.000	223.000	20	0	20
	2-E25-31	262.800	302.000	240.000	5	0	5
	2-E18-4	262.080	296.000	218.000	25	0	25
	2-E27-10	261.526	300.000	241.000	19	0	19
	2-E24-19	254.667	270.000	234.000	3	0	3
	2-E17-18	254.500	263.000	240.000	4	0	4
	6-42-42B	252.600	270.000	242.000	5	0	5
	2-E26-8	251.000	251.000	251.000	1	0	1
	6-56-53	251.000	251.000	251.000	1	0	1
	2-E33-21	250.000	250.000	250.000	1	0	1
	2-E33-37	250.000	250.000	250.000	1	0	1
	2-E26-4	248.000	248.000	248.000	1	0	1
	2-E27-13	246.000	250.000	242.000	2	0	2
	6-43-45	246.000	257.000	240.000	3	0	3
	6-43-42J	245.800	284.000	220.000	5	0	5
	2-E16-2	245.500	253.000	238.000	2	0	2
	2-E26-2	245.000	245.000	245.000	1	0	1
	6-51-46	245.000	245.000	245.000	1	0	1
	2-E24-4	244.000	248.000	240.000	2	0	2
	2-E25-2	243.800	244.000	242.000	2	0	2
	2-E25-9	237.000	238.000	236.000	2	0	2
	2-E25-23	234.000	243.000	225.000	2	0	2
	2-E27-15	233.500	240.000	227.000	2	0	2
	2-E27-12	232.333	240.000	227.000	3	0	3
	2-E25-22	231.000	237.000	225.000	2	0	2
	2-E25-6	231.000	242.000	220.000	2	0	2
	6-44-42	229.600	240.000	217.000	5	0	5
	2-E18-3	228.950	279.000	178.000	20	0	20
	2-E27-7	222.500	241.000	200.000	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 46

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Conductivity, Laboratory							
	2-E25-36	220.375	290.000	183.000	8	0	8
	2-E27-16	220.000	220.000	220.000	1	0	1
	6-43-43	212.800	222.000	195.000	5	0	5
	2-E25-3	211.000	211.000	211.000	1	0	1
	2-E25-37	210.000	210.000	210.000	3	0	3
	2-E25-38	202.500	210.000	191.000	4	0	4
	2-E25-28	192.833	210.000	176.000	6	0	6
	2-E25-26	187.333	193.000	178.000	6	0	6
	2-E25-25	182.000	199.000	169.000	4	0	4
	2-E25-39	180.000	180.000	180.000	1	0	1
	2-E25-32P	176.875	199.000	160.000	8	0	8
	6-42-40A	168.800	193.000	145.000	5	0	5
	2-E33-12	158.000	158.000	158.000	1	0	1
	6-42-40B	142.000	142.000	142.000	1	0	1
Copper							
	2-E17-17	92.700	798.000	11.000	5	5	10
	2-E25-6	75.000	75.000	75.000	1	0	1
	2-E25-17	73.000	73.000	73.000	1	0	1
	2-E25-9	65.000	65.000	65.000	1	0	1
	2-E25-11	49.000	78.000	78.000	1	1	2
	2-E24-20	33.500	33.500	33.500	1	0	1
	2-E16-2	28.500	47.000	47.000	1	1	2
	6-40-40B	28.500	37.000	37.000	1	1	2
	2-E28-28	26.400	34.000	28.000	3	2	5
	2-E33-37	26.000	32.000	32.000	1	1	2
	2-E34-8	26.000	30.000	25.000	3	1	4
	2-E33-35	25.250	30.500	30.500	1	1	2
	6-42-40B	24.500	39.000	39.000	1	1	2
	2-E26-11	23.200	36.000	36.000	1	4	5
	2-E25-42	22.500	25.000	25.000	1	1	2
	2-E33-33	22.333	37.000	37.000	1	2	3
	2-E27-11	22.200	28.000	15.000	4	1	5
	2-E24-19	22.000	31.000	13.000	3	0	3
	2-E25-39	21.800	27.000	22.000	2	3	5
	2-E26-9	21.250	25.000	25.000	1	3	4
	2-E33-34	21.000	23.000	23.000	1	2	3
	2-E33-36	21.000	23.000	23.000	1	2	3
	2-E33-41	21.000	22.000	22.000	1	1	2
	2-E35-2	20.100	20.500	20.500	1	4	5
	2-E28-18	19.750	39.000	39.000	1	3	4
	2-E32-5	19.400	26.500	20.500	2	3	5
	2-E25-35	19.273	35.000	25.000	4	7	11
	2-E17-15	19.091	35.000	11.000	6	5	11
	2-E25-26	19.000	69.000	20.000	2	9	11
	2-E25-40	18.375	20.500	13.000	2	2	4
	2-E17-12	18.333	25.000	20.000	2	1	3
	6-43-41E	18.200	26.000	15.000	2	3	5
	2-E27-14	18.000	26.000	26.000	1	1	2
	2-E17-13	17.667	23.000	23.000	1	2	3
	2-E25-34	17.667	41.000	28.000	2	7	9
	2-E25-20	17.500	50.000	50.000	1	7	8
	2-E25-28	17.200	52.000	52.000	1	9	10

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 47

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Copper							
	2-E32-3	16.611	29.500	29.500	1	8	9
	2-E25-36	16.000	23.000	11.000	3	8	11
	6-25-33A	16.000	30.000	30.000	1	4	5
	6-41-40	16.000	22.000	22.000	1	6	7
	6-43-45	16.000	26.000	26.000	1	5	6
	2-E33-29	15.550	35.500	35.500	1	9	10
	2-E28-26	14.833	31.000	11.000	3	6	9
	2-E17-20	14.667	12.000	12.000	1	8	9
	2-E28-27	14.600	26.000	26.000	1	9	10
	2-E32-2	14.600	13.000	13.000	2	8	10
	2-E33-31	14.500	11.000	11.000	1	3	4
	2-E33-32	14.500	21.000	21.000	1	3	4
	2-E25-29P	14.077	33.000	33.000	1	12	13
	2-E28-12	14.000	14.000	14.000	1	0	1
	2-E32-4	13.792	22.500	13.000	2	10	12
	6-25-34C	13.385	42.000	12.000	2	11	13
	2-E25-32P	13.367	27.000	23.500	2	13	15
	6-24-34A	13.364	37.000	37.000	1	10	11
	2-E24-18	13.333	14.000	13.000	3	3	6
	2-E17-14	13.222	19.000	10.000	6	3	9
	6-43-43	13.143	22.000	22.000	1	6	7
	2-E27-9	13.125	25.000	25.000	1	7	8
	2-E34-2	13.100	34.000	34.000	1	9	10
	2-E33-30	13.000	23.000	10.000	2	8	10
	2-E18-1	12.909	12.000	12.000	1	10	11
	2-E24-16	12.857	10.000	10.000	1	6	7
	2-E18-4	12.625	18.000	13.000	2	6	8
	2-E25-31	12.563	11.000	11.000	1	15	16
	2-E17-16	12.556	13.000	13.000	1	8	9
	2-E17-18	12.333	11.000	11.000	1	8	9
	6-24-34C	12.000	26.000	26.000	1	12	13
	6-24-35	11.923	25.000	25.000	1	12	13
	6-50-53B	11.850	16.700	16.700	1	1	2
	2-E18-2	11.700	15.000	12.000	2	8	10
	2-E24-17	11.571	11.000	11.000	1	6	7
	2-E34-6	11.571	11.000	11.000	1	6	7
	6-23-34	11.571	12.000	12.000	1	13	14
	2-E33-40	11.500	11.500	11.500	1	0	1
	2-E17-19	11.200	15.000	11.000	2	3	5
	2-E17-9	10.429	13.000	13.000	1	6	7
	2-E35-1	10.000	10.000	10.000	1	0	1
	2-E34-1	9.300	7.900	7.900	1	2	3
	6-49-57B	7.500	7.500	7.500	1	0	1
	6-49-55A	7.400	7.400	7.400	1	0	1
	6-52-54	7.100	7.100	7.100	1	0	1
Copper, filtered							
	2-E33-34	26.000	32.000	32.000	1	1	2
	2-E33-35	25.000	25.000	25.000	1	0	1
	2-E27-14	21.500	33.000	33.000	1	1	2
	2-E34-7	21.000	21.000	21.000	1	0	1
	2-E32-3	16.667	40.000	40.000	1	5	6
	6-41-40	16.400	26.000	16.000	2	3	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 48

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Copper, filtered							
	6-40-39	15.800	29.000	29.000	1	4	5
	2-E27-13	15.500	21.000	21.000	1	1	2
	2-E24-16	14.857	34.000	13.000	3	4	7
	2-E25-20	14.444	40.000	40.000	1	8	9
	2-E33-32	14.000	25.000	25.000	1	2	3
	2-E34-2	13.800	30.000	21.000	2	8	10
	2-E17-15	13.700	21.000	11.000	5	5	10
	2-E32-4	13.300	33.000	33.000	1	9	10
	2-E34-3	13.286	33.000	33.000	1	6	7
	2-E25-33	12.923	24.000	11.000	3	10	13
	2-E18-3	12.500	30.000	30.000	1	7	8
	2-E25-26	12.444	17.000	12.000	3	6	9
	2-E17-14	11.625	13.000	10.000	2	6	8
	2-E18-2	11.556	22.000	12.000	2	7	9
	2-E25-28	11.250	10.000	10.000	1	7	8
	2-E17-9	10.875	15.000	12.000	2	6	8
	2-E17-17	10.833	13.000	12.000	2	4	6
	2-E17-5	10.667	16.000	16.000	1	8	9
	6-45-42	10.400	12.000	12.000	1	4	5
	2-E18-4	10.375	11.000	11.000	3	5	8
	2-E17-6	10.333	13.000	13.000	1	8	9
	2-E25-19	10.000	10.000	10.000	1	5	6
Cyanide							
	6-50-53A	869.333	1690.000	422.000	15	0	15
	6-49-55A	96.324	247.000	25.000	15	2	17
	6-52-54	47.700	47.700	47.700	1	0	1
	6-45-42	35.167	151.000	151.000	1	5	6
	6-49-57A	31.500	31.500	31.500	1	0	1
	2-E32-5	16.667	20.000	20.000	1	5	6
	6-44-64	15.250	20.100	11.000	4	2	6
	2-E33-3	12.333	17.000	10.000	2	1	3
	2-E33-5	12.333	17.000	17.000	1	2	3
Cyclohexanone							
	6-50-53B	4.000	4.000	4.000	1	0	1
DDD							
	2-E25-33	.166	.300	.230	2	3	5
	2-E25-29P	.145	.280	.280	1	3	4
	2-E25-31	.134	.270	.270	1	4	5
	2-E25-32P	.127	.260	.260	1	5	6
DDT							
	2-E34-8	2.500	5.000	4.800	2	2	4
	2-E25-33	1.500	3.700	3.500	2	3	5
	2-E25-29P	.925	3.400	3.400	1	3	4
	2-E25-31	.700	3.100	3.100	1	4	5
	2-E25-32P	.650	3.400	3.400	1	5	6
Dieldrin							
	2-E34-8	1.633	4.800	4.800	1	2	3
	2-E25-33	1.500	3.700	3.600	2	3	5
	2-E25-29P	.925	3.500	3.500	1	3	4
	2-E25-31	.780	3.600	3.600	1	4	5
	2-E25-32P	.667	3.600	3.600	1	5	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 49

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Diethyl ether							
	2-E34-5	10.000	10.000	10.000	1	0	1
	2-E34-2	9.000	9.000	9.000	1	0	1
	6-49-55A	9.000	9.000	9.000	1	0	1
Dimethoate							
	2-E25-31	5242.750	20600.000	349.000	2	2	4
	2-E25-29P	269.000	803.000	803.000	1	2	3
	2-E25-30P	81.200	81.200	81.200	1	0	1
	2-E25-25	2.540	2.540	2.540	1	0	1
Endrin							
	2-E34-8	2.300	4.600	4.400	2	2	4
	2-E25-33	.746	4.500	4.100	2	11	13
	2-E25-29P	.500	4.500	4.500	1	10	11
	2-E25-31	.408	4.100	4.100	1	12	13
	2-E25-32P	.392	3.900	3.900	1	12	13
Endrin Aldehyde							
	2-E25-32P	.333	.600	.600	1	2	3
	2-E25-31	.330	.590	.590	1	2	3
	2-E25-33	.288	.510	.240	2	2	4
	2-E25-29P	.170	.110	.110	1	2	3
Ethyl cyanide							
	2-E25-32P	5003.000	7.000	7.000	1	3	4
Europium-154							
	6-36-46R	12.200	12.200	12.200	1	0	1
	2-E25-19	11.900	11.900	11.900	1	0	1
	2-E27-9	11.200	11.200	11.200	1	0	1
	2-E24-17	9.500	9.500	9.500	1	0	1
	2-E33-37	9.420	9.420	9.420	1	0	1
	2-E18-2	7.160	7.160	7.160	1	0	1
	2-E32-4	7.120	6.320	6.320	1	1	2
	2-E28-27	1.785	12.500	12.500	1	1	2
	2-E28-28	1.510	10.800	10.800	1	1	2
	2-E32-3	-1.543	7.760	7.760	1	2	3
	6-40-33A	-5.042	9.320	9.320	1	4	5
Europium-155							
	2-E27-16	9.350	9.350	9.350	1	0	1
	2-E18-1	6.010	6.010	6.010	1	0	1
	2-E28-27	3.080	10.200	10.200	1	1	2
	2-E32-3	.878	4.510	4.510	1	2	3
a Fluoride							
	2-E28-24	2200.000	2200.000	2200.000	1	0	1
	6-60-57	1950.000	2000.000	1900.000	2	0	2
	6-63-55	1300.000	1300.000	1300.000	1	0	1
	6-63-58	1100.000	1100.000	1100.000	1	0	1
	6-59-58	1000.000	1000.000	1000.000	1	0	1
	6-61-62	900.000	900.000	900.000	1	0	1
	6-31-31P	800.000	800.000	800.000	1	0	1
	6-40-33A	800.000	800.000	800.000	1	0	1
	6-40-40A	800.000	800.000	800.000	1	0	1
	6-40-39	763.333	900.000	700.000	6	0	6
	2-E25-21	713.444	860.000	500.000	9	0	9
	2-E25-20	712.000	1000.000	260.000	10	0	10
	2-E17-2	700.000	900.000	900.000	1	1	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 50

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Fluoride							
	2-E25-42	700.000	700.000	700.000	1	0	1
	6-52-48	700.000	700.000	700.000	1	0	1
	6-54-34	700.000	700.000	700.000	1	0	1
	6-64-62	700.000	700.000	700.000	1	0	1
	2-E25-35	691.400	1000.000	540.000	10	0	10
	2-E25-24	686.600	800.000	600.000	9	1	10
	6-31-31	675.000	700.000	600.000	4	0	4
	2-E18-2	655.000	820.000	575.000	9	0	9
	2-E17-15	649.900	920.000	440.000	7	3	10
	6-41-40	635.000	790.000	500.000	6	0	6
	2-E34-7	633.333	900.000	900.000	1	2	3
	2-E25-33	624.000	810.000	500.000	12	0	12
	6-37-43	621.714	741.000	460.000	6	1	7
	2-E33-41	620.000	700.000	540.000	2	0	2
	6-45-42	613.125	1200.000	488.000	5	3	8
	2-E17-9	600.111	801.000	500.000	8	1	9
	2-E28-17	600.000	600.000	600.000	1	0	1
	6-34-42	600.000	600.000	600.000	1	0	1
	6-40-40B	600.000	600.000	600.000	1	0	1
	6-42-39A	600.000	600.000	600.000	1	0	1
	6-43-40	600.000	600.000	600.000	1	0	1
	6-26-33	599.600	712.000	451.000	9	1	10
	6-47-60	598.200	744.000	559.000	4	1	5
	6-26-34	588.333	730.000	498.000	9	0	9
	2-E32-2	587.200	710.000	490.000	10	0	10
	2-E34-6	585.714	700.000	600.000	5	2	7
	2-E28-27	583.818	700.000	400.000	11	0	11
	2-E17-19	583.333	900.000	500.000	3	3	6
	2-E32-4	583.077	720.000	500.000	12	1	13
	6-25-34B	581.600	684.000	482.000	9	1	10
	2-E34-2	575.556	760.000	500.000	6	3	9
	2-E34-1	574.667	724.000	500.000	2	1	3
	2-E17-17	574.222	740.000	500.000	7	2	9
	2-E25-19	572.583	730.000	500.000	11	1	12
	2-E17-16	568.222	834.000	500.000	6	3	9
	2-E27-11	566.667	900.000	300.000	2	1	3
	6-32-43	566.667	600.000	500.000	3	0	3
	2-E28-23	565.000	695.000	500.000	2	1	3
	2-E32-5	564.000	670.000	450.000	4	1	5
	2-E24-18	563.333	680.000	500.000	4	2	6
	2-E25-40	562.500	700.000	490.000	3	1	4
	2-E17-5	561.364	679.000	400.000	9	2	11
	6-25-34A	561.200	705.000	476.000	8	2	10
	2-E17-13	556.200	700.000	531.000	3	2	5
	2-E28-13	556.000	724.000	500.000	3	1	4
	2-E17-14	553.625	700.000	500.000	6	2	8
	2-E16-2	550.000	600.000	600.000	2	2	4
	2-E17-12	549.400	707.000	500.000	5	0	5
	6-26-35A	548.833	673.000	457.000	10	2	12
	6-43-41E	544.286	720.000	400.000	5	2	7
	6-50-53A	542.105	1700.000	250.000	17	2	19
	2-E17-1	541.125	862.000	400.000	6	2	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 51

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Fluoride							
	2-E25-30P	541.000	700.000	500.000	4	4	8
	2-E28-26	541.000	700.000	400.000	8	2	10
	2-E35-2	540.000	660.000	400.000	4	0	4
	2-E28-21	538.857	670.000	467.000	4	3	7
	2-E25-29P	538.545	900.000	400.000	5	6	11
	2-E26-9	536.667	580.000	500.000	3	0	3
	2-E32-3	536.667	680.000	450.000	8	1	9
	2-E33-32	536.667	600.000	510.000	2	1	3
	2-E18-1	536.000	670.000	500.000	7	3	10
	2-E17-18	535.889	700.000	500.000	8	1	9
	6-47-50	533.750	648.000	469.000	3	1	4
	6-25-34C	531.955	684.000	450.000	19	3	22
	2-E28-28	530.000	650.000	440.000	3	0	3
	6-43-41F	530.000	620.000	620.000	1	3	4
	2-E24-2	528.857	702.000	702.000	1	6	7
	2-E25-18	527.900	600.000	500.000	6	4	10
	6-42-42B	526.667	600.000	500.000	3	3	6
	6-24-34C	524.217	800.000	393.000	17	6	23
	2-E33-3	523.000	549.000	543.000	2	2	4
	2-E13-14	520.222	1100.000	334.000	4	5	9
	2-E28-18	518.000	670.000	420.000	2	3	5
	2-E17-20	516.667	600.000	410.000	5	4	9
	6-38-65	515.500	800.000	262.000	2	2	4
	2-E24-19	513.333	600.000	440.000	2	1	3
	2-E25-23	512.857	573.000	445.000	4	3	7
	6-24-35	512.652	676.000	400.000	17	6	23
	2-E34-5	512.500	600.000	500.000	3	5	8
	6-35-70	508.833	800.000	353.000	3	3	6
	6-43-42J	508.571	560.000	500.000	2	5	7
	2-E25-22	504.250	527.000	507.000	2	6	8
	2-E24-17	503.333	520.000	520.000	1	5	6
	2-E25-41	503.333	600.000	410.000	2	1	3
	2-E26-11	503.333	610.000	400.000	3	0	3
	2-E32-1	502.333	507.000	500.000	3	0	3
	6-24-34B	501.480	750.000	379.000	21	4	25
	2-E13-8	500.000	500.000	500.000	1	0	1
	2-E25-13	500.000	500.000	500.000	1	0	1
	2-E28-12	500.000	500.000	500.000	1	1	2
	6-33-42	500.000	500.000	500.000	1	0	1
	6-42-39B	500.000	500.000	500.000	1	0	1
	6-52-46A	500.000	500.000	500.000	1	0	1
	6-25-33A	499.700	672.000	384.000	7	3	10
	6-47-46A	499.571	668.000	375.000	5	2	7
	2-E33-30	498.889	590.000	400.000	3	6	9
	6-24-33	497.650	760.000	370.000	17	3	20
	2-E17-6	497.364	600.000	355.000	5	6	11
	2-E25-31	496.462	648.000	300.000	6	7	13
	6-24-34A	496.190	698.000	372.000	14	7	21
	2-E18-4	493.750	450.000	450.000	1	7	8
	2-E33-29	493.000	610.000	300.000	4	6	10
	2-E34-3	492.857	450.000	450.000	1	6	7
	2-E27-8	492.500	540.000	400.000	2	6	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 52

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Fluoride							
	2-E34-8	490.000	580.000	400.000	2	0	2
	6-44-64	488.667	745.000	348.000	5	4	9
	2-E24-16	488.571	520.000	400.000	2	5	7
	6-24-46	488.500	544.000	439.000	5	1	6
	2-E18-3	487.500	600.000	400.000	1	7	8
	6-23-34	482.455	739.000	358.000	15	7	22
	2-E33-1	482.333	394.000	394.000	1	5	6
	6-20-39	475.500	564.000	400.000	4	0	4
	2-E33-5	474.800	374.000	374.000	1	4	5
	2-E27-10	471.250	470.000	300.000	2	6	8
	2-E27-9	470.000	460.000	300.000	2	6	8
	2-E33-33	470.000	510.000	400.000	2	1	3
	6-44-43B	470.000	580.000	300.000	3	3	6
	6-26-35C	469.500	532.000	341.000	6	4	10
	2-E13-5	468.625	572.000	348.000	4	4	8
	2-E33-31	463.333	490.000	400.000	2	1	3
	2-E33-28	456.000	530.000	200.000	3	7	10
	6-45-69A	451.800	600.000	300.000	3	2	5
	2-E25-26	450.800	300.000	200.000	2	8	10
	2-E33-35	450.000	520.000	380.000	2	0	2
	6-44-42	450.000	350.000	300.000	2	5	7
	2-E27-15	446.667	500.000	340.000	2	1	3
	2-E27-7	446.667	340.000	340.000	1	2	3
	6-39-39	441.600	700.000	200.000	3	2	5
	2-E33-36	440.000	480.000	400.000	2	0	2
	6-43-45	438.333	420.000	310.000	3	3	6
	2-E25-28	437.000	330.000	240.000	3	7	10
	6-49-55A	434.909	500.000	334.000	6	5	11
	2-E25-34	431.429	300.000	220.000	2	5	7
	2-E33-34	430.000	510.000	350.000	2	0	2
	6-35-66	427.625	521.000	309.000	5	3	8
	2-E25-36	426.667	410.000	200.000	4	5	9
	6-43-43	425.714	280.000	200.000	2	5	7
	6-36-61A	424.875	400.000	315.000	4	4	8
	2-E26-10	420.000	560.000	300.000	3	0	3
	2-E25-25	418.571	300.000	140.000	4	10	14
	2-E25-32P	415.000	280.000	160.000	3	11	14
	2-E27-13	413.333	440.000	300.000	2	1	3
	6-42-40A	410.000	500.000	180.000	2	6	8
	2-E27-14	403.333	410.000	300.000	2	1	3
	2-E25-11	400.000	500.000	200.000	2	1	3
	6-43-41G	400.000	400.000	400.000	1	0	1
	6-58-24	400.000	400.000	400.000	1	0	1
	6-62-31	400.000	400.000	400.000	1	0	1
	2-E24-4	395.000	290.000	290.000	1	1	2
	2-E25-38	390.000	400.000	240.000	3	2	5
	6-40-62	389.333	547.000	300.000	8	1	9
	2-E25-37	376.000	350.000	230.000	3	2	5
	2-E33-37	365.000	400.000	330.000	2	0	2
	2-E27-16	355.000	400.000	310.000	2	0	2
	2-E27-12	353.333	360.000	200.000	2	1	3
	6-53-47A	350.000	200.000	200.000	1	1	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 53

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
@ Fluoride							
	6-55-50C	345.167	200.000	184.000	3	3	6
	2-E24-20	300.000	300.000	300.000	1	0	1
	6-20-20	300.000	300.000	300.000	1	0	1
	2-E25-39	246.667	300.000	170.000	3	0	3
	2-E26-13	100.000	100.000	100.000	1	0	1
	6-42-41	100.000	100.000	100.000	1	0	1
Gamma-BHC							
	2-E34-8	.667	1.900	1.900	1	2	3
	2-E25-33	.331	1.700	1.600	2	11	13
	2-E25-29P	.227	1.600	1.600	1	10	11
	2-E25-31	.208	1.600	1.600	1	12	13
	2-E25-32P	.208	1.600	1.600	1	12	13
@ Gross alpha							
	2-E28-24	166.802	1250.000	.340	5	3	8
	6-55-57	38.000	74.000	74.000	1	1	2
	2-E28-23	30.156	48.000	16.900	9	0	9
	2-E33-7	30.000	30.000	30.000	1	0	1
	2-E33-12	29.152	58.000	58.000	1	1	2
	2-E33-13	28.000	28.000	28.000	1	0	1
	2-E28-18	26.087	51.400	6.660	19	0	19
	2-E28-21	26.079	34.500	12.200	19	0	19
	2-E28-25	23.966	71.500	8.730	8	0	8
	6-52-54	20.000	20.000	20.000	1	0	1
	2-E28-26	16.770	24.000	13.100	10	0	10
	2-E33-4	16.000	16.000	16.000	1	0	1
	6-49-57A	15.000	15.000	15.000	1	0	1
	2-E32-5	13.966	23.000	12.500	4	1	5
	2-E28-28	12.833	13.600	11.900	3	0	3
	2-E32-3	11.233	16.300	4.680	9	0	9
	2-E28-19	10.426	13.000	7.900	5	0	5
	2-E23-1	9.840	9.840	9.840	1	0	1
	2-E28-17	9.415	16.000	4.850	8	0	8
	2-E33-3	9.200	9.200	9.200	1	0	1
	2-E28-12	9.013	13.800	6.610	3	0	3
	2-E17-14	7.793	16.500	3.620	9	0	9
	2-E33-1	7.550	19.000	1.650	2	1	3
	2-E28-9	6.894	9.380	4.020	7	0	7
	2-E33-40	6.400	6.400	6.400	1	0	1
	6-49-55A	6.354	42.000	1.920	9	2	11
	2-E24-7	6.130	6.130	6.130	1	0	1
	2-E33-5	6.103	15.000	1.310	2	1	3
	6-54-45A	6.086	31.100	.395	3	3	6
	6-53-55C	6.000	6.000	6.000	1	0	1
	6-40-40B	5.870	5.870	5.870	1	0	1
	2-E24-12	5.670	5.670	5.670	1	0	1
	2-E28-16	5.577	8.310	7.170	2	1	3
	2-E33-38	5.500	9.000	9.000	1	1	2
	2-E17-2	5.409	12.100	2.490	18	0	18
	6-53-55B	5.400	5.400	5.400	1	0	1
	2-E33-26	5.150	8.300	8.300	1	1	2
	2-E17-5	5.095	8.010	1.640	25	0	25
	2-E32-4	4.963	7.930	2.090	12	0	12

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 54

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
@ Gross alpha							
	6-50-53A	4.916	8.050	2.640	15	3	18
	2-E13-5	4.590	9.440	1.470	3	0	3
	2-E13-14	4.562	13.200	1.580	3	1	4
	6-53-47B	4.309	8.020	2.800	7	0	7
	2-E33-34	4.190	10.000	1.690	3	1	4
	2-E17-19	4.173	5.550	2.070	6	0	6
	2-E18-1	4.001	5.530	1.620	8	0	8
	2-E17-15	3.984	6.180	1.590	10	1	11
	2-E24-1	3.972	5.490	3.280	5	0	5
	6-43-40	3.910	3.910	3.910	1	0	1
	2-E13-8	3.860	3.860	3.860	1	0	1
	2-E26-2	3.810	3.810	3.810	1	0	1
	6-34-51	3.775	4.780	3.220	6	0	6
	6-24-35	3.718	4.770	1.530	12	0	12
	6-24-34A	3.703	4.720	2.400	12	0	12
	6-24-34C	3.683	5.820	2.280	11	0	11
	6-42-39B	3.660	3.660	3.660	1	0	1
	2-E28-27	3.628	6.960	2.010	10	1	11
	6-24-34B	3.602	6.150	1.740	13	1	14
	2-E35-1	3.550	3.550	3.550	1	0	1
	6-28-40	3.547	4.930	2.390	6	0	6
	6-32-43	3.545	4.570	2.200	8	0	8
	2-E17-12	3.536	4.410	2.470	19	0	19
	2-E26-4	3.520	3.520	3.520	1	0	1
	6-23-34	3.482	5.170	2.410	11	1	12
	2-E17-13	3.413	6.420	1.550	19	1	20
	2-E27-14	3.400	5.570	1.230	2	0	2
	2-E24-16	3.395	5.570	1.540	8	0	8
	2-E33-14	3.300	3.300	3.300	1	0	1
	2-E13-19	3.290	3.290	3.290	1	0	1
	6-33-42	3.288	4.000	2.360	6	0	6
	6-34-42	3.287	3.980	2.320	6	0	6
	6-24-33	3.286	5.040	2.030	22	1	23
	2-E24-18	3.275	5.320	1.900	6	0	6
	6-63-25A	3.253	6.220	1.830	6	0	6
	6-55-50D	3.251	7.320	2.020	6	1	7
	6-50-53B	3.200	3.200	3.200	1	0	1
	6-36-46A	3.150	3.160	3.140	2	0	2
	6-43-41F	3.125	4.440	2.090	4	0	4
	6-42-40C	3.114	4.270	2.480	5	0	5
	2-E34-5	3.094	3.810	2.200	10	0	10
	2-E33-31	3.073	8.200	1.080	3	2	5
	2-E32-2	3.061	5.600	1.800	11	2	13
	2-E17-17	3.012	5.240	1.970	10	0	10
	6-52-57	3.000	3.000	3.000	1	0	1
	6-33-56	2.984	3.950	1.640	5	0	5
	6-47-46A	2.980	3.210	2.750	2	0	2
	2-E25-2	2.950	4.600	1.300	2	0	2
	2-E24-2	2.939	4.870	.926	12	0	12
	6-25-34C	2.901	4.250	1.460	11	0	11
	6-48-50	2.900	3.800	3.800	1	1	2
	6-49-57B	2.900	2.900	2.900	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 55

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Gross alpha							
	6-40-40A	2.890	2.890	2.890	1	0	1
	2-E24-19	2.883	4.250	1.270	3	0	3
	6-37-43	2.850	6.170	1.240	3	1	4
	6-53-48A	2.849	9.490	2.020	2	4	6
	6-43-41E	2.821	4.880	1.680	7	0	7
	6-55-55	2.800	3.600	3.600	1	1	2
	6-41-40	2.793	4.630	2.010	8	0	8
	2-E28-13	2.763	3.220	2.170	3	0	3
	2-E17-16	2.760	5.260	1.040	9	1	10
	2-E17-18	2.760	3.660	1.170	10	0	10
	2-E33-41	2.733	3.200	2.490	3	0	3
	6-40-39	2.717	3.740	1.880	6	0	6
	2-E25-13	2.700	2.700	2.700	1	0	1
	6-42-39A	2.700	2.700	2.700	1	0	1
	6-49-55B	2.684	3.630	2.090	7	0	7
	2-E17-20	2.630	3.370	1.880	10	1	11
	6-32-22	2.590	3.480	1.990	6	0	6
	6-47-35A	2.555	2.900	2.210	2	0	2
	2-E25-41	2.535	3.690	1.740	3	1	4
	6-26-34	2.525	3.730	2.070	4	0	4
	6-44-43B	2.495	3.490	1.610	6	0	6
	6-46-21B	2.482	3.370	1.870	6	0	6
	2-E34-6	2.430	3.370	1.240	6	1	7
	2-E27-11	2.413	2.750	2.060	3	0	3
	2-E25-35	2.398	4.340	1.510	11	1	12
	6-47-60	2.365	4.900	1.420	3	1	4
	6-50-30	2.356	10.500	.349	4	2	6
	2-E24-17	2.350	3.620	1.770	7	0	7
	2-E17-1	2.342	4.150	2.090	6	3	9
	2-E26-12	2.340	2.340	2.340	1	0	1
	2-E17-9	2.320	3.830	1.400	15	1	16
	6-28-52A	2.296	4.730	4.730	1	1	2
	2-E16-2	2.292	7.280	.629	17	1	18
	2-E25-3	2.270	2.270	2.270	1	0	1
	2-E25-17	2.260	9.000	.588	15	3	18
	2-E33-32	2.220	4.260	1.730	3	2	5
	6-39-39	2.216	6.930	.503	5	3	8
	6-25-55	2.214	3.190	1.610	5	1	6
	6-47-50	2.192	4.000	1.460	5	1	6
	2-E34-8	2.173	2.500	1.860	3	0	3
	2-E18-4	2.156	3.770	.917	7	1	8
	2-E27-9	2.155	5.230	1.410	7	3	10
	6-43-41G	2.150	2.150	2.150	1	0	1
	2-E34-7	2.136	3.050	2.500	2	1	3
	6-38-65	2.126	4.240	1.910	5	2	7
	2-E33-24	2.100	2.100	2.100	1	0	1
	6-35-70	2.091	3.550	1.650	6	2	8
	6-26-35A	2.090	3.490	1.600	5	1	6
	6-40-62	2.089	3.680	1.560	8	1	9
	2-E33-33	2.076	4.650	1.070	3	2	5
	2-E27-13	2.053	3.710	1.090	3	0	3
	2-E25-40	2.036	5.710	1.240	2	2	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 56

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Gross alpha							
	6-53-55A	2.024	7.500	1.140	4	3	7
	2-E32-1	2.010	2.010	2.010	1	0	1
	6-25-34B	1.980	3.790	1.400	5	0	5
	6-54-57	1.972	3.600	.647	7	2	9
	6-26-33	1.968	2.940	1.000	6	0	6
	6-50-45	1.951	6.810	.475	7	0	7
	2-E28-7	1.940	4.360	.748	6	2	8
	6-61-37	1.938	2.870	1.390	5	0	5
	6-32-62	1.938	2.490	1.700	5	0	5
	6-52-46A	1.922	3.970	.496	6	1	7
	2-E27-10	1.921	2.570	1.410	8	0	8
	2-E33-37	1.895	1.940	1.850	2	0	2
	6-44-64	1.890	3.000	1.330	8	0	8
	6-25-33A	1.880	2.500	1.030	5	0	5
	2-E27-15	1.861	3.760	1.570	2	1	3
	2-E33-35	1.860	5.300	5.300	1	3	4
	2-E26-11	1.852	2.400	1.890	4	1	5
	6-24-46	1.795	2.640	1.240	4	0	4
	6-20-39	1.777	3.360	2.100	3	2	5
	2-E25-33	1.738	3.020	1.080	10	3	13
	6-35-66	1.737	2.400	1.390	3	0	3
	2-E25-42	1.735	2.130	1.340	2	0	2
	6-61-41	1.730	2.320	1.390	5	0	5
	6-41-23	1.720	2.710	1.570	5	1	6
	6-25-34A	1.716	2.420	1.490	4	1	5
	2-E34-2	1.715	3.300	1.910	5	6	11
	6-42-42B	1.694	2.670	1.310	5	2	7
	6-57-29A	1.686	2.070	1.250	5	0	5
	2-E18-2	1.676	3.010	.416	8	1	9
	6-26-35C	1.675	4.330	1.610	2	3	5
	6-45-42	1.636	3.000	.433	16	2	18
	2-E33-29	1.626	3.900	.965	9	4	13
	2-E33-28	1.617	4.500	1.150	8	5	13
	2-E27-12	1.617	3.640	3.640	1	2	3
	6-36-61A	1.590	1.750	1.430	2	0	2
	6-53-47A	1.588	3.940	.612	11	4	15
	6-45-69A	1.574	2.060	1.090	7	0	7
	6-40-33A	1.564	3.260	1.050	7	2	9
	2-E27-8	1.558	2.470	1.360	6	3	9
	2-E26-10	1.551	2.880	1.470	2	2	4
	2-E34-1	1.539	1.870	1.550	5	3	8
	6-54-48	1.511	2.110	.817	6	1	7
	6-31-31	1.487	1.640	1.570	2	1	3
	2-E26-9	1.471	1.860	1.820	2	2	4
	6-43-45	1.426	2.590	1.030	4	2	6
	2-E33-30	1.382	2.700	1.000	8	4	12
	2-E25-6	1.378	3.550	.364	17	0	17
	2-E17-6	1.376	4.090	1.120	6	3	9
	2-E26-6	1.367	3.690	.651	5	1	6
	2-E34-3	1.363	2.330	1.270	5	2	7
	2-E18-3	1.358	2.810	.931	6	3	9
	2-E24-20	1.330	1.330	1.330	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 57

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Gross alpha							
	6-43-42J	1.274	2.340	1.030	5	3	8
	2-E25-29P	1.262	2.310	1.340	6	6	12
	6-50-42	1.203	2.030	.803	7	1	8
	2-E25-22	1.177	2.210	.556	7	3	10
	2-E25-20	1.174	2.360	1.140	8	6	14
	2-E33-36	1.165	1.390	1.390	1	1	2
	2-E25-9	1.164	3.800	.457	14	3	17
	2-E25-39	1.152	1.440	.797	3	0	3
	6-49-28	1.126	4.530	2.210	2	4	6
	2-E25-37	1.115	1.410	1.130	4	2	6
	6-42-40B	1.102	2.650	2.650	1	1	2
	2-E35-2	1.087	1.430	1.350	3	2	5
	2-E25-31	1.085	2.430	1.030	7	7	14
	6-44-42	1.069	1.840	1.360	4	3	7
	2-E25-11	1.028	3.190	.660	14	7	21
	2-E25-34	1.016	1.980	1.540	3	6	9
	2-E25-18	1.006	2.630	.680	6	8	14
	6-34-39A	1.002	1.160	1.160	1	1	2
	6-54-49	1.001	2.050	.895	5	3	8
	2-E25-21	.991	2.040	.514	6	5	11
	2-E27-7	.990	1.590	.743	4	2	6
	2-E25-32P	.989	2.270	.909	8	8	16
	2-E25-43	.968	.968	.968	1	0	1
	6-52-48	.966	1.890	.739	4	3	7
	2-E25-24	.966	2.180	.673	7	5	12
	6-36-46Q	.925	1.970	1.540	2	2	4
	2-E25-30P	.922	1.880	1.880	1	3	4
	2-E25-26	.912	1.610	1.120	5	4	9
	6-55-50C	.902	1.330	.879	5	5	10
	6-42-41	.894	.894	.894	1	0	1
	2-E27-16	.879	1.290	1.290	1	1	2
	2-E25-25	.862	1.930	.998	6	9	15
	2-E25-36	.824	1.490	.944	3	6	9
	6-53-50	.823	2.830	.381	3	2	5
	6-42-40A	.812	2.980	.393	5	7	12
	6-36-61B	.786	2.640	.449	2	3	5
	2-E25-19	.776	1.920	.755	5	7	12
	2-E25-10	.773	.917	.629	2	0	2
	2-E25-28	.733	1.700	1.060	3	6	9
	2-E24-4	.730	1.480	1.480	1	2	3
	2-E25-38	.725	1.220	1.220	1	4	5
	6-43-43	.660	1.510	.962	3	5	8
	6-54-34	.616	2.460	.926	2	3	5
	6-56-43	.603	2.920	2.920	1	5	6
	2-E25-23	.572	1.040	.625	4	5	9
	2-E26-8	.338	.486	.486	1	5	6
	2-E25-27	.220	.796	.796	1	2	3
Gross beta							
	2-E28-23	10254.444	12900.000	7660.000	9	0	9
	2-E28-25	9333.333	12000.000	7160.000	6	0	6
	6-50-53A	2763.889	7100.000	1350.000	18	0	18
	2-E17-15	937.709	2950.000	85.800	11	0	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 58

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Gross beta							
	6-49-55A	929.818	1550.000	278.000	11	0	11
	6-55-57	890.000	920.000	860.000	2	0	2
	6-53-48B	557.500	857.000	447.000	6	0	6
	2-E33-7	484.875	723.000	312.000	8	0	8
	2-E17-5	378.860	814.000	28.800	25	0	25
	2-E17-14	376.633	846.000	96.700	9	0	9
	2-E33-13	340.000	340.000	340.000	1	0	1
	2-E28-24	315.500	349.000	272.000	6	0	6
	2-E33-12	286.900	1000.000	46.700	4	0	4
	2-E24-12	261.400	809.000	36.400	12	0	12
	2-E33-5	241.833	500.000	102.000	6	0	6
	2-E33-4	230.000	230.000	230.000	1	0	1
	2-E33-24	214.500	272.000	102.000	4	0	4
	2-E17-19	210.683	1150.000	13.200	6	0	6
	2-E33-26	208.400	380.000	86.000	5	0	5
	6-53-47B	197.000	300.000	151.000	7	0	7
	2-E33-34	194.500	370.000	91.000	4	0	4
	6-52-54	180.000	180.000	180.000	1	0	1
	2-E33-3	177.150	522.000	14.900	4	0	4
	6-49-57A	170.000	170.000	170.000	1	0	1
	2-E33-38	156.000	300.000	12.000	2	0	2
	2-E33-1	149.900	350.000	47.700	6	0	6
	2-E28-7	148.000	218.000	116.000	8	0	8
	2-E33-9	117.358	174.000	8.350	6	0	6
	6-53-47A	114.320	147.000	68.300	15	0	15
	6-53-48A	111.150	209.000	29.300	6	0	6
	2-E13-14	100.200	852.000	3.730	9	0	9
	2-E33-31	99.160	180.000	67.200	5	0	5
	6-61-62	96.200	114.000	67.600	6	0	6
	2-E17-17	95.170	208.000	40.400	10	0	10
	6-64-62	91.960	108.000	69.100	5	0	5
	2-E17-2	91.117	240.000	25.900	18	0	18
	6-54-48	87.914	106.000	67.800	7	0	7
	2-E33-41	87.567	108.000	66.300	3	0	3
	2-E33-35	81.975	150.000	45.000	4	0	4
	2-E17-13	73.275	184.000	12.800	20	0	20
	2-E33-8	71.075	80.200	55.600	4	0	4
	2-E17-16	57.773	302.000	8.630	10	0	10
	2-E27-14	57.650	60.100	55.200	2	0	2
	2-E17-12	55.721	113.000	13.200	19	0	19
	6-53-55C	51.000	51.000	51.000	1	0	1
	6-54-49	48.475	59.600	27.000	8	0	8
	6-60-60	44.950	49.800	40.100	2	0	2
	2-E24-1	44.644	66.800	17.000	16	0	16
	2-E17-20	43.618	81.100	28.400	11	0	11
	6-63-58	41.100	51.100	34.600	7	0	7
	2-E24-16	40.225	71.300	21.400	8	0	8
	2-E24-17	38.486	66.100	13.700	7	0	7
	6-32-22	34.833	46.900	22.200	6	0	6
	6-55-50A	34.682	46.700	6.390	6	0	6
	2-E25-19	33.243	73.700	7.730	12	0	12
	2-E17-6	33.219	148.000	4.870	15	0	15

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 59

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Gross beta							
	2-E17-8	32.080	42.900	22.600	5	0	5
	6-20-20	28.000	32.200	25.200	6	0	6
	2-E17-1	27.911	34.200	22.300	9	0	9
	6-26-34	27.325	36.300	11.000	4	0	4
	2-E24-2	26.743	45.600	9.110	12	0	12
	2-E17-9	26.538	37.300	17.000	16	0	16
	2-E24-18	26.488	64.900	7.930	6	0	6
	2-E23-1	25.800	25.800	25.800	1	0	1
	6-33-42	24.800	43.000	11.800	6	0	6
	6-26-33	23.875	32.400	8.450	6	0	6
	2-E24-11	23.771	58.700	12.200	17	0	17
	2-E33-10	23.700	30.600	14.900	3	0	3
	6-25-34A	23.396	33.600	6.980	5	0	5
	2-E32-2	22.746	35.000	12.400	13	0	13
	2-E28-9	22.430	105.000	7.100	7	0	7
	6-26-35A	22.217	30.600	13.700	6	0	6
	6-25-34C	21.991	34.000	12.000	11	0	11
	6-25-34B	21.280	31.000	10.500	5	0	5
	2-E28-27	21.273	27.300	16.700	11	0	11
	6-26-35C	20.960	26.000	13.100	5	0	5
	6-24-34B	20.186	30.000	13.300	14	0	14
	2-E33-40	20.000	20.000	20.000	1	0	1
	6-44-64	19.875	21.400	18.300	8	0	8
	2-E17-18	19.816	96.800	4.950	10	0	10
	2-E32-1	19.400	25.500	13.900	4	0	4
	6-24-34A	19.358	29.100	12.200	12	0	12
	6-53-55A	19.231	83.000	4.180	7	0	7
	6-24-34C	19.227	27.000	11.800	11	0	11
	2-E33-32	19.080	30.000	13.100	5	0	5
	2-E28-12	18.726	45.400	10.100	19	0	19
	6-35-70	18.717	32.800	11.700	12	0	12
	6-24-35	18.492	27.400	13.900	12	0	12
	6-24-33	18.435	34.100	10.100	23	0	23
	2-E32-3	18.411	23.900	13.700	9	0	9
	6-23-34	18.258	30.400	10.700	12	0	12
	2-E24-8	18.008	33.100	8.710	5	0	5
	2-E27-13	18.000	18.100	17.900	3	0	3
	6-51-46	17.664	73.100	5.410	7	0	7
	6-55-55	17.200	26.000	8.400	2	0	2
	2-E33-14	17.000	17.000	17.000	1	0	1
	6-63-55	16.683	21.500	12.300	6	0	6
	6-38-65	16.436	20.000	13.700	11	0	11
	2-E33-30	16.423	31.300	9.980	12	0	12
	2-E33-21	16.327	25.800	7.960	6	0	6
	2-E33-28	15.547	25.600	7.220	13	0	13
	2-E32-5	15.220	21.600	11.000	5	0	5
	2-E33-29	15.078	27.600	9.710	13	0	13
	2-E28-18	15.035	23.200	9.110	19	0	19
	6-32-43	15.029	30.500	10.900	11	1	12
	2-E33-15	15.000	15.000	15.000	1	0	1
	2-E28-21	13.926	21.300	7.340	19	0	19
	2-E25-20	13.509	18.500	3.190	14	0	14

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 60

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Gross beta							
	6-41-23	13.450	17.200	10.400	6	0	6
	2-E33-20	13.379	23.100	5.910	7	0	7
	6-40-40B	13.100	13.100	13.100	1	0	1
	2-E24-19	12.850	19.000	3.350	3	0	3
	6-28-40	12.833	15.100	10.100	6	0	6
	2-E28-17	12.745	16.300	9.190	2	0	2
	6-55-50D	12.286	49.200	3.740	7	0	7
	2-E27-5	12.217	19.100	7.790	3	0	3
	6-50-48B	12.000	13.500	11.000	5	0	5
	6-34-42	11.902	20.600	6.440	6	0	6
	6-36-46P	11.800	11.900	11.700	2	0	2
	2-E27-15	11.740	18.000	8.010	3	0	3
	2-E28-28	11.730	14.200	7.290	3	0	3
	2-E25-11	11.610	15.700	4.870	21	0	21
	6-42-40C	11.580	14.400	10.100	5	0	5
	6-56-53	11.550	43.000	5.160	7	0	7
	2-E25-40	11.490	15.800	9.290	4	0	4
	2-E28-26	11.285	17.600	6.490	10	0	10
	2-E16-2	11.093	23.600	6.050	18	0	18
	6-42-40B	10.883	121.000	2.890	19	0	19
	2-E25-24	10.854	17.800	7.000	12	0	12
	6-43-41G	10.800	10.800	10.800	1	0	1
	6-36-46R	10.445	13.000	7.890	2	0	2
	2-E34-3	10.371	17.800	3.170	7	0	7
	2-E28-19	10.336	12.000	8.590	5	0	5
	6-35-66	10.278	12.200	7.240	8	0	8
	6-51-63	10.202	36.200	3.140	6	0	6
	6-52-48	10.086	21.800	7.100	7	0	7
	2-E25-23	10.079	16.100	5.640	9	0	9
	2-E25-13	9.813	15.200	6.710	6	0	6
	6-53-55B	9.800	9.800	9.800	1	0	1
	6-54-57	9.670	21.400	6.510	9	0	9
	2-E25-17	9.598	15.200	5.410	18	0	18
	2-E13-5	9.523	28.800	5.160	8	0	8
	6-52-57	9.500	9.500	9.500	1	0	1
	2-E26-8	9.367	10.600	7.980	6	0	6
	6-31-31	9.313	12.000	6.240	3	0	3
	2-E34-6	9.287	18.000	4.260	7	0	7
	6-47-46A	9.280	13.500	7.390	8	0	8
	6-36-46Q	8.925	10.000	7.950	4	0	4
	6-52-46A	8.760	9.790	6.970	7	0	7
	6-25-33A	8.602	18.200	2.760	5	0	5
	6-36-61A	8.420	9.800	7.040	2	0	2
	6-28-52A	8.410	11.100	5.720	2	0	2
	6-65-50	8.318	11.500	6.100	6	0	6
	2-E33-18	8.313	10.400	6.190	3	0	3
	2-E25-21	8.276	13.100	5.290	10	1	11
	2-E34-2	8.167	14.200	4.260	11	0	11
	6-61-41	8.142	11.000	5.080	5	0	5
	2-E25-18	8.132	13.300	4.610	14	0	14
	6-37-43	8.083	9.890	4.000	4	0	4
	2-E34-1	7.899	10.000	4.790	8	0	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 61

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Gross beta							
	6-54-45A	7.777	16.700	5.000	6	0	6
	6-55-70	7.725	11.200	4.250	2	0	2
	6-46-21B	7.692	10.300	6.220	6	0	6
	6-47-50	7.683	11.600	6.000	6	0	6
	6-43-40	7.640	7.640	7.640	1	0	1
	6-40-62	7.614	11.900	4.380	9	0	9
	2-E32-4	7.502	10.100	3.720	12	0	12
	2-E25-35	7.500	12.800	3.370	12	0	12
	6-40-40A	7.440	7.440	7.440	1	0	1
	6-36-61B	7.412	9.750	5.150	5	0	5
	2-E25-36	7.354	10.300	4.280	9	0	9
	2-E18-1	7.340	10.700	3.890	8	0	8
	2-E25-41	7.338	9.240	3.370	4	0	4
	2-E28-13	7.313	8.360	6.220	7	0	7
	6-32-62	7.280	9.020	6.040	5	0	5
	2-E34-5	7.278	10.000	3.010	10	0	10
	6-57-29A	7.268	7.570	6.650	5	0	5
	2-E33-33	7.250	9.580	5.190	5	0	5
	2-E33-37	7.210	8.080	6.340	2	0	2
	6-59-58	7.198	12.200	4.580	6	0	6
	2-E27-11	7.193	10.700	4.530	3	0	3
	2-E25-30P	7.130	9.010	5.190	4	0	4
	6-42-39B	7.110	7.110	7.110	1	0	1
	6-50-53B	7.000	7.000	7.000	1	0	1
	2-E27-9	6.866	9.150	4.740	10	0	10
	2-E13-8	6.861	8.500	3.820	7	0	7
	2-E34-7	6.830	7.430	6.280	3	0	3
	6-40-33A	6.824	9.460	3.010	9	0	9
	2-E27-8	6.798	10.500	2.550	9	0	9
	6-34-51	6.783	9.570	4.100	6	0	6
	2-E25-6	6.772	36.900	2.740	17	0	17
	6-20-39	6.612	8.610	4.380	5	0	5
	6-47-60	6.594	8.200	5.600	10	0	10
	2-E24-13	6.585	9.000	5.640	6	0	6
	6-63-25A	6.530	12.800	4.310	6	0	6
	2-E25-43	6.510	6.510	6.510	1	0	1
	6-48-50	6.500	7.300	5.700	2	0	2
	6-60-57	6.468	8.510	4.820	5	0	5
	2-E28-16	6.437	8.290	2.800	3	0	3
	6-42-39A	6.390	6.390	6.390	1	0	1
	2-E26-10	6.380	7.750	4.760	4	0	4
	6-53-50	6.308	7.920	3.400	5	0	5
	6-50-45	6.306	8.920	4.530	7	0	7
	6-61-66	6.305	7.380	5.300	6	0	6
	2-E25-22	6.263	9.940	4.130	10	0	10
	6-50-30	6.257	13.800	3.340	6	0	6
	2-E26-4	6.233	10.600	3.230	8	0	8
	2-E13-19	6.216	8.040	4.380	7	0	7
	2-E27-10	6.213	9.930	3.790	8	0	8
	6-43-41E	6.203	11.600	2.740	7	0	7
	6-39-39	6.190	13.200	2.430	8	0	8
	6-34-39A	6.105	7.390	4.820	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 62

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Gross beta							
	6-49-55B	6.083	6.700	5.290	7	0	7
	6-43-43	6.048	11.900	3.990	8	0	8
	6-50-42	6.019	8.270	3.720	8	0	8
	6-43-41F	5.953	10.200	5.480	3	1	4
	6-33-56	5.926	7.310	4.570	5	0	5
	2-E25-32P	5.921	23.000	2.320	16	0	16
	2-E33-36	5.880	7.110	4.650	2	0	2
	2-E26-2	5.875	8.950	4.340	8	0	8
	2-E35-2	5.840	9.860	3.800	5	0	5
	2-E18-3	5.793	10.600	1.870	9	0	9
	6-55-50C	5.779	9.220	3.930	10	0	10
	2-E25-3	5.644	8.460	3.800	8	0	8
	6-61-37	5.624	6.710	3.960	5	0	5
	6-40-39	5.582	6.220	4.470	6	0	6
	6-24-46	5.575	7.490	5.600	3	1	4
	2-E25-2	5.566	8.710	3.440	5	0	5
	2-E27-16	5.495	6.440	4.550	2	0	2
	2-E25-28	5.493	14.100	3.510	7	2	9
	2-E25-27	5.490	9.510	4.840	2	1	3
	6-31-31P	5.395	5.800	4.990	2	0	2
	6-44-42	5.344	7.570	3.890	7	0	7
	6-43-45	5.337	6.860	4.670	5	1	6
	6-41-40	5.291	7.110	2.590	8	0	8
	6-42-42B	5.260	10.800	3.190	5	2	7
	2-E24-4	5.255	7.250	3.690	8	0	8
	6-44-43B	5.252	7.790	3.440	6	0	6
	2-E27-7	5.235	6.170	4.780	6	0	6
	6-43-42J	5.218	8.010	2.300	8	0	8
	2-E25-25	5.201	8.400	3.590	12	3	15
	2-E25-42	5.185	5.220	5.150	2	0	2
	2-E35-1	5.180	5.180	5.180	1	0	1
	2-E18-4	5.145	7.600	2.050	8	0	8
	2-E25-31	5.131	10.800	2.160	14	0	14
	2-E25-29P	5.118	11.600	3.000	12	0	12
	2-E26-9	5.100	8.510	3.940	4	0	4
	2-E27-12	5.010	5.880	3.570	3	0	3
	2-E18-2	4.962	9.440	4.700	7	2	9
	2-E26-11	4.914	7.500	3.350	5	0	5
	2-E25-9	4.849	8.030	3.050	17	0	17
	2-E25-33	4.791	10.500	2.500	10	3	13
	2-E25-38	4.732	5.650	2.940	5	0	5
	2-E26-13	4.720	4.720	4.720	1	0	1
	6-42-41	4.560	4.560	4.560	1	0	1
	2-E24-7	4.520	4.520	4.520	1	0	1
	2-E34-8	4.480	5.250	4.040	3	0	3
	6-45-42	4.382	7.250	2.360	18	0	18
	6-49-28	4.372	7.500	1.680	6	0	6
	6-47-35A	4.355	5.300	3.410	2	0	2
	2-E25-10	4.310	4.650	3.970	2	0	2
	6-42-40A	4.288	12.700	2.120	11	1	12
	2-E26-6	4.262	8.900	3.340	5	1	6
	2-E25-26	4.170	8.340	2.320	7	2	9

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Gross beta							
	2-E26-12	3.980	3.980	3.980	1	0	1
	6-54-34	3.902	6.350	1.930	5	0	5
	6-25-55	3.902	5.230	2.300	6	0	6
	2-E25-37	3.792	7.190	4.300	4	2	6
	6-45-69A	3.784	5.640	3.240	7	0	7
	2-E25-34	3.313	5.480	2.620	7	2	9
	6-56-43	2.963	4.780	2.000	6	0	6
	6-28-40P	2.945	4.080	1.810	2	0	2
	2-E25-39	2.743	3.920	2.620	2	1	3
Heptachlor							
	2-E34-8	.633	1.800	1.800	1	2	3
	2-E25-33	.620	1.500	1.400	2	3	5
	2-E25-29P	.425	1.500	1.500	1	3	4
	2-E25-31	.340	1.400	1.400	1	4	5
	2-E25-32P	.300	1.400	1.400	1	5	6
a Hydrazine							
	2-E25-17	38.000	38.000	38.000	1	0	1
	6-42-40B	36.000	36.000	36.000	1	0	1
a Iodine-129							
	6-35-70	30.051	87.800	10.300	7	0	7
	2-E24-1	26.600	26.600	26.600	1	0	1
	2-E17-9	16.867	20.400	14.200	3	0	3
	2-E17-14	14.750	18.900	11.500	4	0	4
	2-E17-15	12.700	12.700	12.700	1	0	1
	2-E17-1	12.360	18.300	6.420	2	0	2
	2-E24-17	11.900	11.900	11.900	1	0	1
	2-E27-14	9.630	9.630	9.630	1	0	1
	2-E17-17	9.285	14.500	6.620	4	0	4
	2-E17-5	8.025	15.600	1.990	8	0	8
	2-E25-40	7.630	7.830	7.310	3	0	3
	2-E27-13	7.250	8.040	6.460	2	0	2
	2-E33-32	6.315	6.400	6.230	2	0	2
	2-E24-20	6.260	6.260	6.260	1	0	1
	6-34-42	6.130	6.130	6.130	1	0	1
	2-E33-41	5.855	6.770	4.940	2	0	2
	6-31-31	5.760	6.430	5.090	2	0	2
	2-E25-41	5.525	6.390	4.660	2	0	2
	2-E24-19	5.410	5.680	5.140	2	0	2
	6-35-66	5.257	7.720	1.490	3	0	3
	2-E24-18	5.210	5.210	5.210	1	0	1
	2-E17-16	5.168	9.540	2.030	4	1	5
	6-41-23	5.138	7.430	1.550	4	0	4
	2-E25-31	5.100	5.100	5.100	1	0	1
	2-E17-8	5.010	5.010	5.010	1	0	1
	2-E33-31	4.995	5.750	4.240	2	0	2
	6-33-42	4.900	4.900	4.900	1	0	1
	2-E17-12	4.769	7.760	1.650	7	0	7
	2-E33-10	4.610	4.610	4.610	1	0	1
	2-E25-6	4.530	4.530	4.530	1	0	1
	6-32-22	4.175	7.670	1.530	4	0	4
	2-E24-13	4.073	7.440	2.220	3	0	3
	2-E26-10	4.070	4.070	4.070	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Iodine-129							
	2-E17-18	4.047	5.680	2.860	3	0	3
	2-E23-1	3.630	5.610	1.650	2	0	2
	2-E25-29P	3.460	3.460	3.460	1	0	1
	2-E17-13	3.191	6.230	1.330	8	0	8
	6-32-43	3.043	6.690	1.140	3	0	3
	2-E27-15	2.985	3.380	2.590	2	0	2
	2-E25-28	2.790	2.790	2.790	1	0	1
	2-E27-12	2.735	2.740	2.730	2	0	2
	2-E25-33	2.720	2.720	2.720	1	0	1
	2-E25-9	2.636	4.310	.961	2	0	2
	2-E28-1	2.545	4.030	1.060	2	0	2
	2-E25-17	2.520	2.520	2.520	1	0	1
	2-E28-23	2.490	2.490	2.490	1	0	1
	2-E25-18	2.450	2.780	2.120	3	0	3
	2-E33-3	2.390	2.390	2.390	1	0	1
	2-E27-7	2.320	2.320	2.320	1	0	1
	2-E25-20	2.040	3.000	1.080	2	0	2
	2-E27-5	2.020	2.510	1.530	2	0	2
	2-E24-12	1.910	1.910	1.910	1	0	1
	6-37-43	1.810	1.810	1.810	1	0	1
	6-38-65	1.808	3.510	.920	3	0	3
	6-24-33	1.727	2.710	.743	2	0	2
	2-E25-26	1.570	1.570	1.570	1	0	1
	2-E33-8	1.480	1.480	1.480	1	0	1
	2-E24-7	1.424	2.090	.721	3	0	3
	2-E27-1	1.410	1.410	1.410	1	0	1
	2-E33-21	1.380	1.380	1.380	1	0	1
	2-E33-33	1.295	1.550	1.040	2	0	2
	2-E26-4	1.265	1.370	1.160	2	0	2
	2-E25-3	1.240	1.310	1.170	2	0	2
	2-E26-3	1.230	1.230	1.230	1	0	1
	2-E25-19	1.204	2.270	.443	3	0	3
	6-20-20	1.183	1.660	.368	3	0	3
	2-E26-2	1.114	1.250	.978	2	0	2
	2-E28-7	1.044	1.260	.828	2	0	2
	2-E33-24	.989	.989	.989	1	0	1
	2-E17-2	.969	1.180	.730	3	0	3
	2-E33-18	.949	.949	.949	1	0	1
	2-E25-22	.919	1.410	.427	2	0	2
	2-E33-5	.836	.836	.836	1	0	1
	2-E33-20	.788	.890	.686	2	0	2
	2-E25-21	.787	.875	.698	2	0	2
	2-E28-21	.745	.745	.745	1	0	1
	2-E33-1	.695	.695	.695	1	0	1
	2-E26-9	.690	.690	.690	1	0	1
	2-E25-32P	.681	.681	.681	1	0	1
	2-E13-8	.654	1.300	1.300	1	1	2
	2-E26-11	.575	.575	.575	1	0	1
	2-E28-18	.447	.516	.330	3	0	3
	2-E33-7	.437	.504	.370	2	0	2
	2-E25-11	.414	.538	.290	2	0	2
	2-E28-12	.381	.381	.381	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 65

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Iodine-129							
	2-E26-1	.340	.399	.281	2	0	2
	6-61-62	.323	.525	.121	2	0	2
	2-E25-25	.321	.321	.321	1	0	1
	6-50-42	.315	.597	.319	2	1	3
	2-E25-30P	.219	.275	.162	2	0	2
	6-64-62	.184	.344	.344	1	2	3
	2-E16-2	.175	.211	.211	1	1	2
	6-28-40	.169	.128	.128	1	1	2
	6-40-62	.147	.266	.266	1	1	2
	6-50-53A	.145	.268	.268	1	1	2
	6-42-40C	.112	.152	.140	2	1	3
	6-34-51	.078	.292	.292	1	2	3
	6-47-35A	.062	.165	.165	1	1	2
	6-49-55A	.062	.081	.055	6	2	8
	2-E25-23	.059	.054	.054	1	1	2
	6-53-50	.039	.001	.001	1	1	2
	6-32-62	.038	.058	.058	1	1	2
	6-55-50D	.033	.073	.073	1	1	2
	6-56-53	.026	.050	.002	2	0	2
	6-52-48	.011	.000	.000	2	1	3
	6-47-50	.006	.006	.006	1	0	1
	6-51-46	.001	.000	.000	1	1	2
	6-50-48B	-.000	.003	.003	2	1	3
	6-52-46A	-.011	.000	.000	1	1	2
	6-50-45	-.017	.000	.000	1	1	2
Iron							
	2-E25-17	592000.000	592000.000	592000.000	1	0	1
	2-E25-6	312000.000	312000.000	312000.000	1	0	1
	2-E25-9	207000.000	207000.000	207000.000	1	0	1
	2-E16-2	118500.000	121000.000	116000.000	2	0	2
	2-E26-5	67800.000	67800.000	67800.000	1	0	1
	6-42-40B	64600.000	116000.000	13200.000	2	0	2
	2-E25-11	29100.000	44200.000	14000.000	2	0	2
	2-E28-12	23200.000	23200.000	23200.000	1	0	1
	2-E28-7	15800.000	15800.000	15800.000	1	0	1
	6-40-40B	11038.500	22000.000	77.000	2	0	2
	2-E33-40	5180.000	5180.000	5180.000	1	0	1
	6-25-34C	2920.154	34000.000	28.000	13	0	13
	6-40-40A	2910.000	5500.000	320.000	2	0	2
	6-42-40A	2730.778	22000.000	63.000	9	0	9
	6-45-69A	2160.000	4300.000	4300.000	1	1	2
	6-34-42	1979.500	3900.000	59.000	2	0	2
	6-43-41F	1395.000	2820.000	295.000	4	0	4
	6-47-50	1380.000	1380.000	1380.000	1	0	1
	6-49-57B	1330.000	1330.000	1330.000	1	0	1
	2-E17-12	1277.333	3770.000	42.000	2	1	3
	2-E34-6	1270.625	4700.000	70.000	8	0	8
	2-E25-30P	1226.429	2010.000	385.000	7	0	7
	2-E34-8	1108.250	2100.000	33.000	4	0	4
	2-E33-18	1080.000	1080.000	1080.000	1	0	1
	2-E35-1	1040.000	1040.000	1040.000	1	0	1
	6-42-39B	1025.000	1900.000	150.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 66

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Iron							
	6-43-41G	960.000	1900.000	1900.000	1	1	2
	2-E34-1	948.333	1440.000	345.000	3	0	3
	2-E24-19	875.333	1060.000	526.000	3	0	3
	6-55-55	857.000	857.000	857.000	1	0	1
	2-E24-20	823.500	823.500	823.500	1	0	1
	2-E34-2	816.500	1380.000	216.000	10	0	10
	6-40-39	785.667	2700.000	71.000	6	0	6
	6-41-40	767.857	2700.000	63.000	7	0	7
	2-E17-14	733.556	5630.000	55.000	9	0	9
	6-49-55A	729.000	729.000	729.000	1	0	1
	2-E25-19	716.100	1550.000	125.000	4	1	5
	6-43-41E	706.250	2300.000	24.000	6	0	6
	6-52-54	653.000	653.000	653.000	1	0	1
	6-24-34B	652.923	4620.000	29.000	13	0	13
	2-E18-1	633.875	1810.000	40.000	12	0	12
	6-55-50C	627.500	1200.000	55.000	2	0	2
	2-E26-12	621.333	1700.000	34.000	3	0	3
	6-43-40	615.000	1200.000	30.000	2	0	2
	2-E17-19	606.333	1280.000	178.000	6	0	6
	6-50-53B	565.650	1040.000	91.300	2	0	2
	2-E25-39	560.800	1100.000	54.000	5	0	5
	6-53-47A	553.000	553.000	553.000	1	0	1
	2-E34-7	550.000	550.000	550.000	1	0	1
	2-E27-11	546.300	1600.000	45.000	5	0	5
	2-E25-40	540.375	684.000	292.500	4	0	4
	2-E18-3	539.500	1440.000	45.000	10	0	10
	2-E32-4	530.786	1700.000	33.000	14	0	14
	6-24-33	516.667	4130.000	21.000	6	3	9
	6-45-42	512.667	940.000	170.000	3	0	3
	6-24-34A	508.500	1620.000	144.000	12	0	12
	2-E25-31	496.690	1400.000	50.000	29	0	29
	6-44-43B	493.333	1060.000	290.000	8	1	9
	2-E25-37	477.615	741.000	24.000	13	0	13
	6-42-39A	467.500	910.000	25.000	2	0	2
	6-42-41	466.500	910.000	23.000	2	0	2
	2-E18-4	461.611	1580.000	121.000	9	0	9
	2-E27-9	442.600	892.000	37.000	10	0	10
	2-E25-41	442.250	640.500	296.500	4	0	4
	2-E25-38	437.769	962.000	72.000	13	0	13
	6-24-34C	428.000	1030.000	55.000	14	0	14
	2-E27-14	420.500	610.000	231.000	2	0	2
	2-E33-36	414.250	1000.000	37.000	3	1	4
	2-E25-35	414.231	900.000	33.000	13	0	13
	2-E17-20	410.958	1500.000	54.000	12	0	12
	2-E25-43	409.333	910.000	48.000	3	0	3
	2-E27-15	403.000	517.500	266.000	3	0	3
	2-E33-1	398.500	743.000	54.000	2	0	2
	6-43-45	390.000	650.000	23.000	7	0	7
	2-E25-34	382.550	1100.000	104.000	9	1	10
	2-E27-10	375.278	1370.000	21.000	9	0	9
	2-E26-11	374.833	1100.000	22.000	6	0	6
	2-E25-29P	370.154	1500.000	26.000	25	1	26

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 67

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Iron							
	2-E33-31	368.250	650.000	161.000	4	0	4
	2-E33-41	365.250	418.000	312.500	2	0	2
	2-E24-17	360.929	520.000	175.000	7	0	7
	2-E25-20	360.800	2300.000	55.000	9	1	10
	2-E33-37	347.333	632.000	390.000	2	1	3
	2-E17-15	343.833	1080.000	52.000	12	0	12
	6-43-42J	333.250	795.000	25.000	8	0	8
	2-E32-5	329.667	670.000	55.000	6	0	6
	2-E25-25	324.700	1490.000	41.000	30	0	30
	2-E33-39	322.000	322.000	322.000	1	0	1
	2-E24-18	314.833	475.000	61.000	6	0	6
	2-E28-26	310.200	816.000	64.000	10	0	10
	2-E25-32P	305.722	1100.000	65.000	27	0	27
	6-26-33	302.833	1600.000	31.000	5	1	6
	2-E27-13	299.167	570.000	155.500	3	0	3
	2-E25-36	296.167	1100.000	46.000	12	0	12
	2-E24-16	289.667	466.000	47.000	9	0	9
	6-24-35	288.071	2080.000	41.000	13	1	14
	2-E26-10	286.500	660.000	120.000	5	1	6
	2-E17-16	283.818	1040.000	36.000	11	0	11
	2-E26-13	277.667	690.000	23.000	3	0	3
	2-E33-38	274.500	335.000	214.000	2	0	2
	2-E32-2	269.045	604.000	97.000	10	1	11
	2-E33-33	263.500	291.000	229.500	3	0	3
	2-E25-33	261.241	801.000	22.000	27	0	27
	2-E33-29	259.667	697.000	70.000	11	1	12
	2-E28-28	257.200	730.000	42.000	5	0	5
	2-E35-2	254.643	489.000	24.000	7	0	7
	6-23-34	244.467	843.000	28.000	15	0	15
	2-E33-30	244.455	580.000	77.000	11	0	11
	2-E33-28	241.077	690.000	51.000	13	0	13
	2-E18-2	235.800	535.000	77.000	10	0	10
	6-36-61A	235.500	430.000	41.000	2	0	2
	2-E17-17	231.500	1190.000	90.000	10	1	11
	2-E17-1	230.400	504.000	47.000	5	0	5
	2-E17-6	230.286	503.000	56.000	7	0	7
	2-E25-42	230.000	410.000	260.000	2	1	3
	2-E34-5	223.900	462.000	60.000	10	0	10
	2-E28-21	223.000	223.000	223.000	1	0	1
	6-42-42B	222.000	420.000	61.000	8	0	8
	6-25-34A	221.800	916.000	103.000	2	3	5
	2-E26-9	219.300	540.500	26.000	5	0	5
	2-E25-21	217.000	490.000	144.000	4	1	5
	2-E28-27	212.292	463.000	62.000	12	0	12
	2-E32-3	209.850	620.000	36.000	10	0	10
	2-E32-1	206.000	355.000	57.000	2	0	2
	2-E33-15	203.000	203.000	203.000	1	0	1
	2-E33-32	202.000	255.000	171.000	4	0	4
	2-E27-16	194.333	390.000	40.000	3	0	3
	2-E25-24	193.750	296.000	75.000	4	0	4
	2-E27-8	188.944	246.000	130.000	9	0	9
	2-E17-18	174.409	615.000	44.000	11	0	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 68

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Iron							
	2-E28-13	174.000	260.000	88.000	2	0	2
	2-E34-3	172.714	381.000	91.000	7	0	7
	6-52-57	164.000	164.000	164.000	1	0	1
	6-26-35A	153.000	360.000	21.000	5	2	7
	6-43-43	147.000	340.000	58.000	9	0	9
	2-E17-13	146.333	373.000	33.000	3	0	3
	2-E27-12	143.000	203.000	66.000	3	0	3
	6-44-42	134.750	290.000	21.000	8	0	8
	6-26-35C	134.000	170.000	66.000	5	0	5
	6-49-57A	128.000	128.000	128.000	1	0	1
	6-25-33A	125.200	160.000	94.000	5	0	5
	2-E33-34	124.667	200.000	32.000	3	0	3
	2-E25-23	122.000	122.000	122.000	1	0	1
	2-E33-21	115.000	115.000	115.000	1	0	1
	2-E28-18	113.750	308.000	33.000	3	1	4
	2-E33-35	109.250	110.000	108.500	2	0	2
	2-E25-18	104.000	250.000	36.000	11	1	12
	2-E25-27	99.000	140.000	104.000	4	1	5
	2-E33-10	94.500	148.000	41.000	2	0	2
	2-E27-7	93.500	95.000	92.000	2	0	2
	2-E25-26	87.883	363.000	35.000	11	1	12
	6-35-70	86.500	140.000	33.000	2	0	2
	2-E28-23	73.000	73.000	73.000	1	0	1
	2-E24-2	68.500	151.000	33.000	4	2	6
	6-25-34B	55.200	90.000	53.000	3	2	5
	2-E33-8	52.000	52.000	52.000	1	0	1
	2-E33-5	51.500	73.000	73.000	1	1	2
	6-40-62	51.500	83.000	83.000	1	1	2
	2-E33-3	47.000	47.000	47.000	1	0	1
	2-E25-28	44.550	118.000	32.500	5	5	10
	2-E17-9	40.429	60.000	43.000	4	3	7
	2-E33-24	37.000	37.000	37.000	1	0	1
	2-E25-22	35.429	59.000	34.000	3	4	7
	2-E17-5	34.050	44.000	42.500	3	7	10
	6-26-34	34.000	46.000	46.000	1	3	4
Iron, filtered							
	6-54-34	3370.000	3370.000	3370.000	1	0	1
	6-49-55B	1180.000	1180.000	1180.000	1	0	1
	6-37-43	1080.000	3180.000	3180.000	1	2	3
	2-E33-40	794.000	794.000	794.000	1	0	1
	6-40-33A	548.000	548.000	548.000	1	0	1
	2-E25-39	380.000	1100.000	20.000	2	1	3
	2-E34-2	367.720	1560.000	34.000	8	2	10
	6-49-57B	347.000	347.000	347.000	1	0	1
	2-E17-14	338.750	2470.000	37.000	3	5	8
	6-43-41F	322.333	747.000	63.000	3	0	3
	6-50-53A	309.333	375.000	265.000	9	0	9
	2-E17-6	243.556	601.000	37.000	7	2	9
	6-39-39	223.500	417.000	417.000	1	1	2
	6-44-43B	184.429	640.000	52.000	5	2	7
	6-47-50	177.233	262.000	66.700	3	0	3
	2-E24-19	155.000	155.000	155.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 69

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Iron, filtered							
	2-E25-40	147.000	147.000	147.000	1	0	1
	6-53-50	130.000	130.000	130.000	1	0	1
	2-E33-15	126.000	126.000	126.000	1	0	1
	6-24-34B	113.364	408.000	33.000	8	3	11
	6-53-47B	110.000	110.000	110.000	1	0	1
	6-49-55A	107.444	234.000	54.000	9	0	9
	2-E25-38	107.167	479.000	34.000	3	3	6
	6-24-34A	106.000	253.000	34.000	9	0	9
	2-E25-30P	98.714	204.000	44.000	5	2	7
	2-E25-33	95.500	511.000	87.000	4	8	12
	2-E27-9	94.444	373.000	26.000	8	1	9
	6-41-40	89.400	164.000	47.000	4	1	5
	6-40-39	88.400	230.000	39.000	4	1	5
	2-E17-15	80.556	411.000	36.000	4	5	9
	6-45-42	73.600	195.000	53.000	3	2	5
	2-E33-28	72.088	330.000	30.000	6	2	8
	2-E34-1	70.250	90.500	50.000	2	0	2
	6-42-40A	70.000	171.000	44.000	7	0	7
	6-23-34	68.273	139.000	31.000	10	1	11
	2-E25-37	67.636	297.000	30.000	8	3	11
	2-E26-11	67.500	70.000	65.000	2	0	2
	2-E28-23	66.667	100.000	49.000	3	0	3
	2-E25-35	64.909	260.000	33.000	10	1	11
	2-E25-29P	61.875	180.000	32.000	9	7	16
	2-E34-8	60.000	60.000	60.000	1	0	1
	6-59-58	60.000	60.000	60.000	1	0	1
	6-52-54	59.500	59.500	59.500	1	0	1
	6-57-29A	59.000	59.000	59.000	1	0	1
	2-E28-28	58.000	58.000	58.000	1	0	1
	2-E28-26	56.857	91.000	42.000	7	0	7
	2-E25-31	55.667	365.000	37.000	4	11	15
	2-E32-4	54.300	280.000	32.000	6	4	10
	2-E34-5	51.743	83.200	43.000	6	1	7
	2-E17-19	49.333	98.000	39.000	4	2	6
	6-24-34C	48.167	101.000	33.000	7	5	12
	2-E33-33	48.000	66.000	66.000	1	1	2
	2-E26-13	47.000	47.000	47.000	1	0	1
	2-E33-31	46.333	72.000	37.000	2	1	3
	6-55-55	46.300	46.300	46.300	1	0	1
	2-E25-43	46.000	46.000	46.000	1	0	1
	2-E32-3	46.000	67.000	23.000	5	1	6
	2-E33-38	44.200	51.400	37.000	2	0	2
	6-24-35	44.083	78.000	32.000	9	3	12
	6-25-34C	43.636	70.000	33.000	8	3	11
	2-E25-36	43.571	61.000	32.000	6	1	7
	2-E24-16	42.571	82.000	30.000	6	1	7
	2-E26-12	42.000	42.000	42.000	1	0	1
	2-E18-3	40.000	64.000	31.000	7	2	9
	2-E18-4	40.000	68.000	31.000	5	3	8
	2-E24-17	39.400	54.000	40.000	3	2	5
	2-E33-30	39.400	69.000	32.000	8	2	10
	2-E25-21	38.167	63.000	35.000	3	3	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 70

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Iron, filtered							
	2-E33-39	37.000	37.000	37.000	1	0	1
	6-49-57A	37.000	37.000	37.000	1	0	1
	6-52-57	37.000	37.000	37.000	1	0	1
	2-E25-25	36.278	102.000	31.000	5	13	18
	2-E17-18	35.375	45.000	32.000	5	3	8
	2-E27-8	35.333	55.000	32.000	3	3	6
	2-E17-17	35.000	53.000	31.000	4	3	7
	2-E33-29	34.714	50.000	34.000	3	4	7
	6-43-43	34.571	61.000	31.000	2	5	7
	2-E27-12	34.500	39.000	39.000	1	1	2
	6-43-45	34.200	59.000	22.000	2	3	5
	2-E17-20	34.000	50.000	20.000	4	3	7
	2-E18-2	33.600	40.000	38.000	4	6	10
	2-E27-13	33.500	37.000	37.000	1	1	2
	2-E33-18	33.500	37.000	37.000	1	1	2
	2-E33-24	33.500	37.000	37.000	1	1	2
	6-43-41E	33.500	37.000	30.000	2	0	2
	2-E24-18	33.400	41.000	36.000	2	3	5
	2-E18-1	33.375	49.000	33.000	3	5	8
	2-E17-16	33.143	48.000	34.000	2	5	7
	2-E34-7	33.000	33.000	33.000	1	0	1
	2-E25-19	32.714	47.000	32.000	2	5	7
	2-E25-34	32.571	38.000	33.000	3	4	7
	2-E32-2	32.500	38.000	37.000	2	4	6
	2-E25-18	32.333	51.000	51.000	1	8	9
	2-E25-32P	32.222	47.000	30.000	7	11	18
	2-E34-3	32.000	45.000	31.000	3	4	7
	2-E17-5	31.889	47.000	47.000	1	8	9
	2-E25-27	31.600	38.000	38.000	1	4	5
	6-42-42B	31.400	37.000	37.000	1	4	5
	2-E25-26	31.000	49.000	49.000	1	8	9
	2-E27-15	31.000	31.000	31.000	1	0	1
	2-E32-5	31.000	39.000	23.000	2	0	2
	2-E33-34	31.000	42.000	42.000	1	1	2
	2-E33-35	31.000	31.000	31.000	1	0	1
	6-43-42J	30.750	33.000	33.000	1	3	4
	6-44-42	30.667	34.000	34.000	1	5	6
	2-E27-10	30.500	33.000	33.000	1	5	6
	2-E34-6	30.500	33.000	33.000	1	5	6
	2-E17-1	30.400	32.000	32.000	1	4	5
	2-E25-24	30.375	33.000	33.000	1	7	8
	2-E33-1	30.200	31.000	31.000	1	4	5
	6-25-33A	30.200	31.000	30.000	2	3	5
	2-E28-27	30.143	31.000	31.000	1	6	7
	6-24-33	30.125	31.000	31.000	1	7	8
	2-E25-42	30.000	30.000	30.000	1	0	1
	2-E26-10	30.000	40.000	40.000	1	1	2
	2-E33-32	29.667	37.000	22.000	2	1	3
	6-26-33	29.600	28.000	28.000	1	4	5
	6-26-35C	28.800	24.000	24.000	1	4	5
	2-E25-20	27.778	30.000	20.000	2	7	9
	2-E26-9	25.000	30.000	30.000	1	1	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 71

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Lead (graphite furnace)							
	2-E25-17	52.000	52.000	52.000	1	0	1
	2-E16-2	40.900	50.000	31.800	2	0	2
	6-50-53A	20.000	20.000	20.000	1	0	1
	2-E25-9	19.000	19.000	19.000	1	0	1
	2-E26-5	17.000	17.000	17.000	1	0	1
	6-42-40B	15.000	25.000	25.000	1	1	2
	2-E27-9	13.444	46.000	5.000	3	6	9
	2-E25-29P	11.308	68.000	5.100	5	7	12
	2-E25-11	10.900	15.000	6.800	2	0	2
	2-E25-6	9.000	9.000	9.000	1	0	1
	2-E28-12	9.000	9.000	9.000	1	0	1
	2-E34-7	8.767	13.000	8.300	2	1	3
	2-E34-8	7.700	10.000	6.100	3	1	4
	6-45-42	7.500	12.000	5.500	2	1	3
	6-40-40B	6.650	8.300	8.300	1	1	2
	6-43-41E	6.500	14.000	14.000	1	5	6
	6-55-50C	6.500	8.000	8.000	1	1	2
	2-E32-4	6.455	12.000	5.000	5	6	11
	6-42-39B	6.400	7.800	7.800	1	1	2
	2-E25-40	6.300	7.900	6.000	2	1	3
	2-E17-14	6.250	13.000	7.000	2	6	8
	2-E25-31	6.214	22.000	22.000	1	13	14
	2-E32-5	6.200	11.000	11.000	1	4	5
	6-45-69A	6.000	7.000	7.000	1	1	2
	2-E18-4	5.917	9.500	6.000	2	4	6
	2-E34-6	5.857	11.000	11.000	1	6	7
	6-41-40	5.833	10.000	10.000	1	5	6
	2-E33-28	5.727	16.000	16.000	1	10	11
	6-24-34A	5.700	9.000	8.000	2	8	10
	2-E17-13	5.667	7.000	7.000	1	2	3
	2-E17-17	5.667	10.000	6.000	2	7	9
	2-E24-19	5.667	6.000	6.000	2	1	3
	2-E28-18	5.667	6.000	6.000	2	1	3
	2-E34-2	5.667	10.000	9.000	2	7	9
	2-E32-3	5.538	9.300	9.300	1	7	8
	2-E25-37	5.450	7.700	7.700	1	5	6
	2-E24-16	5.429	8.000	8.000	1	6	7
	2-E17-15	5.400	7.000	6.000	3	7	10
	2-E17-12	5.333	6.000	6.000	1	2	3
	2-E26-10	5.333	6.000	6.000	1	2	3
	6-43-45	5.286	7.000	7.000	1	6	7
	2-E27-11	5.275	6.100	6.100	1	3	4
	2-E25-20	5.250	7.000	7.000	1	7	8
	2-E25-34	5.225	6.800	6.800	1	7	8
	2-E17-20	5.222	7.000	7.000	1	8	9
	6-23-34	5.222	7.000	7.000	1	8	9
	6-25-34C	5.222	7.000	7.000	1	8	9
	2-E17-1	5.200	6.000	6.000	1	4	5
	2-E17-18	5.160	6.000	5.600	2	8	10
	6-24-34C	5.111	6.000	6.000	1	8	9
	2-E17-16	5.100	6.000	6.000	1	9	10
	6-24-34B	5.100	6.000	5.000	2	8	10

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 72

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Lead (graphite furnace)							
	2-E25-33	5.083	6.000	6.000	1	11	12
	2-E25-25	5.077	6.000	6.000	1	12	13
	2-E25-32P	5.077	6.000	6.000	1	12	13
	2-E26-11	5.075	5.300	5.300	1	3	4
	6-42-39A	5.050	5.100	5.100	1	1	2
	2-E25-36	5.030	5.300	5.300	1	9	10
	2-E32-2	5.030	5.300	5.300	1	9	10
	6-44-43B	5.029	5.200	5.200	1	6	7
	2-E25-38	5.000	5.000	5.000	1	4	5
	6-25-33A	5.000	5.000	5.000	1	3	4
	2-E33-30	4.778	6.000	6.000	1	8	9
	2-E33-31	4.600	6.000	6.000	1	4	5
	2-E33-32	4.600	6.000	6.000	1	4	5
	2-E33-18	3.800	3.800	3.800	1	0	1
	6-50-53B	3.200	4.400	4.400	1	1	2
	6-49-57B	2.200	2.200	2.200	1	0	1
Lead, filtered							
	2-E33-28	6.556	16.000	8.000	2	7	9
	2-E35-2	6.000	9.000	9.000	1	3	4
	6-43-42J	6.000	11.000	11.000	1	5	6
	6-43-45	5.667	9.000	9.000	1	5	6
	2-E33-31	5.560	7.800	7.800	1	4	5
	6-24-34A	5.556	8.000	7.000	2	7	9
	2-E27-12	5.500	6.500	6.500	1	2	3
	2-E33-3	5.500	6.000	6.000	1	1	2
	6-41-40	5.400	7.000	7.000	1	4	5
	2-E17-14	5.375	8.000	8.000	1	7	8
	2-E17-12	5.333	6.000	6.000	1	2	3
	6-23-34	5.333	8.000	8.000	1	8	9
	6-24-34B	5.333	8.000	8.000	1	8	9
	2-E17-20	5.222	7.000	7.000	1	8	9
	6-25-34C	5.222	7.000	7.000	1	8	9
	2-E25-29P	5.091	6.000	6.000	1	10	11
	2-E25-25	5.077	6.000	6.000	1	12	13
	2-E25-36	5.033	5.300	5.300	1	8	9
	2-E33-30	4.933	4.400	4.400	1	8	9
	6-49-57B	2.700	2.700	2.700	1	0	1
Lead-212							
	2-E33-35	12.600	12.600	12.600	1	0	1
	2-E18-1	10.300	10.300	10.300	1	0	1
	2-E17-16	9.760	9.760	9.760	1	0	1
	2-E24-16	9.560	9.560	9.560	1	0	1
Lithium							
	2-E16-2	19.000	19.000	19.000	1	0	1
	6-40-39	14.000	15.000	13.000	3	0	3
	6-42-40B	12.000	12.000	12.000	1	0	1
	2-E17-6	10.750	12.000	11.000	2	2	4
	2-E25-20	10.750	12.000	11.000	2	2	4
	2-E17-20	10.500	12.000	12.000	1	3	4
	6-41-40	10.333	11.000	10.000	3	0	3
	6-24-34B	10.167	11.000	11.000	1	5	6
	6-23-34	10.125	11.000	10.000	3	5	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 73

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Lithium, filtered							
	6-40-33A	16.000	16.000	16.000	1	0	1
	6-40-39	13.667	15.000	13.000	3	0	3
	6-50-53A	13.000	13.000	13.000	1	0	1
	2-E17-6	10.750	12.000	11.000	2	2	4
	6-23-34	10.429	12.000	11.000	2	5	7
	2-E25-20	10.400	11.000	10.000	3	2	5
	6-41-40	10.333	11.000	10.000	2	1	3
	6-24-34B	10.000	10.000	10.000	1	5	6
Magnesium							
	6-50-53A	89900.000	89900.000	89900.000	1	0	1
	2-E25-35	22891.667	28300.000	18900.000	12	0	12
	2-E28-12	22500.000	22500.000	22500.000	1	0	1
	6-52-54	20200.000	20200.000	20200.000	1	0	1
	2-E17-14	19500.000	24500.000	15000.000	9	0	9
	2-E17-20	18763.636	23100.000	16000.000	11	0	11
	2-E17-15	18158.333	25900.000	13000.000	12	0	12
	6-47-50	16800.000	16800.000	16800.000	1	0	1
	6-49-55A	16800.000	16800.000	16800.000	1	0	1
	6-23-34	16146.667	18000.000	14700.000	15	0	15
	6-24-34B	16115.385	18800.000	14500.000	13	0	13
	6-40-62	16000.000	16000.000	16000.000	1	0	1
	6-24-34C	15500.000	17000.000	14200.000	14	0	14
	6-45-69A	15500.000	16000.000	15000.000	2	0	2
	2-E17-1	15340.000	18100.000	14200.000	5	0	5
	6-24-33	15322.222	17000.000	13700.000	9	0	9
	6-24-34A	15275.000	17000.000	13800.000	12	0	12
	2-E13-14	15000.000	15000.000	15000.000	1	0	1
	2-E32-5	15000.000	16000.000	14000.000	5	0	5
	2-E34-5	14760.000	17100.000	13000.000	10	0	10
	2-E18-1	14554.545	17000.000	13000.000	11	0	11
	2-E17-19	14500.000	21700.000	11500.000	6	0	6
	2-E28-26	14500.000	17900.000	13000.000	9	0	9
	2-E28-13	14450.000	14800.000	14100.000	2	0	2
	2-E34-1	14433.333	16300.000	12300.000	3	0	3
	2-E17-9	14114.286	15400.000	12900.000	7	0	7
	2-E34-7	14000.000	14000.000	14000.000	1	0	1
	2-E34-2	13888.889	17100.000	12000.000	9	0	9
	2-E33-18	13800.000	13800.000	13800.000	1	0	1
	2-E28-21	13600.000	13600.000	13600.000	1	0	1
	6-53-47A	13600.000	13600.000	13600.000	1	0	1
	2-E32-4	13591.667	14300.000	12800.000	12	0	12
	2-E25-20	13477.778	17600.000	6300.000	9	0	9
	2-E28-18	13400.000	14400.000	12000.000	3	0	3
	2-E24-16	13150.000	14700.000	12100.000	8	0	8
	2-E17-5	13105.000	21300.000	8250.000	10	0	10
	6-35-70	13000.000	13000.000	13000.000	1	0	1
	6-36-61A	13000.000	13000.000	13000.000	1	0	1
	2-E17-6	12900.000	15000.000	11200.000	7	0	7
	2-E28-28	12800.000	13000.000	12000.000	5	0	5
	6-49-57A	12800.000	12800.000	12800.000	1	0	1
	2-E24-2	12716.667	18100.000	10000.000	6	0	6
	2-E24-17	12400.000	13800.000	11500.000	7	0	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 74

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Magnesium							
	2-E34-6	12157.143	14200.000	10000.000	7	0	7
	6-25-34C	12069.231	15000.000	10400.000	13	0	13
	6-24-35	11978.571	14900.000	10500.000	14	0	14
	2-E33-38	11950.000	12000.000	11900.000	2	0	2
	2-E32-3	11737.778	14000.000	9290.000	9	0	9
	6-26-35C	11560.000	12300.000	11000.000	5	0	5
	2-E25-19	11550.000	13200.000	11000.000	4	0	4
	2-E16-2	11500.000	12400.000	10600.000	2	0	2
	2-E35-1	11400.000	11400.000	11400.000	1	0	1
	6-25-34B	11400.000	13000.000	10200.000	5	0	5
	2-E17-16	11357.000	19200.000	6310.000	10	0	10
	2-E26-11	11250.000	12000.000	11000.000	4	0	4
	6-50-53B	11100.000	11300.000	10900.000	2	0	2
	2-E33-34	11000.000	12000.000	10000.000	3	0	3
	6-42-39A	11000.000	11000.000	11000.000	1	0	1
	6-26-35A	10914.286	12000.000	9500.000	7	0	7
	2-E33-15	10900.000	10900.000	10900.000	1	0	1
	6-41-40	10833.333	12000.000	10000.000	6	0	6
	6-25-34A	10688.000	12000.000	9740.000	5	0	5
	2-E33-5	10650.000	10800.000	10500.000	2	0	2
	2-E27-9	10633.333	11700.000	10000.000	9	0	9
	6-42-39B	10500.000	11000.000	10000.000	2	0	2
	6-43-41F	10425.000	10700.000	10000.000	4	0	4
	2-E27-14	10400.000	11300.000	9500.000	2	0	2
	2-E28-7	10300.000	10300.000	10300.000	1	0	1
	2-E33-31	10212.500	13600.000	8800.000	4	0	4
	2-E27-8	10208.889	11000.000	9400.000	9	0	9
	6-49-55B	10200.000	10200.000	10200.000	1	0	1
	2-E34-3	10064.286	14000.000	8710.000	7	0	7
	2-E33-24	10000.000	10000.000	10000.000	1	0	1
	2-E24-18	9996.667	11600.000	9000.000	6	0	6
	6-52-57	9960.000	9960.000	9960.000	1	0	1
	2-E17-17	9887.273	12200.000	7850.000	11	0	11
	6-26-34	9862.500	10700.000	8390.000	4	0	4
	2-E24-20	9850.000	9850.000	9850.000	1	0	1
	2-E27-11	9760.000	10000.000	9350.000	5	0	5
	6-26-33	9665.000	10200.000	8780.000	6	0	6
	2-E33-1	9590.000	10200.000	8980.000	2	0	2
	6-43-41G	9500.000	9500.000	9500.000	1	0	1
	2-E33-41	9425.000	9900.000	8950.000	2	0	2
	6-43-41E	9406.667	9900.000	9150.000	6	0	6
	2-E35-2	9400.000	11500.000	6900.000	6	0	6
	2-E28-23	9380.000	9380.000	9380.000	1	0	1
	6-55-50C	9350.000	9400.000	9300.000	2	0	2
	6-44-43B	9342.222	13000.000	8290.000	9	0	9
	2-E25-40	9333.333	9600.000	9000.000	3	0	3
	6-45-42	9333.333	10100.000	8900.000	3	0	3
	2-E33-39	9260.000	9260.000	9260.000	1	0	1
	2-E33-10	9100.000	9480.000	8720.000	2	0	2
	2-E33-30	9024.545	10100.000	8250.000	11	0	11
	2-E32-2	8985.455	11000.000	7310.000	11	0	11
	6-25-33A	8930.000	9420.000	8400.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 75

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Magnesium							
	2-E33-29	8893.636	10300.000	8090.000	11	0	11
	2-E28-27	8876.667	9800.000	7950.000	12	0	12
	2-E17-12	8870.000	9300.000	8650.000	3	0	3
	6-43-40	8800.000	9500.000	8100.000	2	0	2
	2-E33-3	8760.000	8760.000	8760.000	1	0	1
	2-E27-10	8647.778	11000.000	7350.000	9	0	9
	2-E25-41	8640.000	10450.000	7320.000	4	0	4
	2-E33-8	8600.000	8600.000	8600.000	1	0	1
	2-E25-9	8590.000	8590.000	8590.000	1	0	1
	2-E33-40	8540.000	8540.000	8540.000	1	0	1
	2-E33-35	8525.000	8550.000	8500.000	2	0	2
	6-55-55	8480.000	8480.000	8480.000	1	0	1
	2-E33-37	8416.667	11150.000	6800.000	3	0	3
	2-E25-17	8410.000	8410.000	8410.000	1	0	1
	2-E32-1	8380.000	9180.000	7580.000	2	0	2
	2-E17-13	8343.333	8500.000	8130.000	3	0	3
	2-E18-4	8195.556	8650.000	7810.000	9	0	9
	2-E33-33	8190.000	8400.000	8050.000	3	0	3
	2-E33-28	8158.462	9730.000	7280.000	13	0	13
	2-E33-32	8110.000	8450.000	7640.000	4	0	4
	2-E25-6	8040.000	8040.000	8040.000	1	0	1
	2-E25-18	8021.818	9280.000	6140.000	11	0	11
	6-40-40B	7900.000	10000.000	5800.000	2	0	2
	6-40-40A	7850.000	8300.000	7400.000	2	0	2
	2-E33-36	7800.000	8200.000	7400.000	4	0	4
	2-E18-3	7741.000	8320.000	7170.000	10	0	10
	6-40-39	7648.333	7800.000	7480.000	6	0	6
	2-E26-5	7630.000	7630.000	7630.000	1	0	1
	2-E33-21	7560.000	7560.000	7560.000	1	0	1
	2-E24-4	7500.000	7500.000	7500.000	1	0	1
	2-E27-13	7406.667	7500.000	7300.000	3	0	3
	6-42-42B	7360.000	7790.000	6570.000	8	0	8
	2-E17-18	7330.000	8290.000	6400.000	11	0	11
	2-E25-31	7271.667	11000.000	5740.000	30	0	30
	6-42-40B	7220.000	10100.000	4340.000	2	0	2
	2-E24-19	7193.333	7500.000	6830.000	3	0	3
	2-E26-13	7166.667	7200.000	7100.000	3	0	3
	2-E26-12	7150.000	7200.000	7100.000	2	0	2
	2-E18-2	7104.000	7800.000	6460.000	10	0	10
	2-E27-12	7070.000	7200.000	6960.000	3	0	3
	6-34-42	7050.000	7100.000	7000.000	2	0	2
	2-E26-10	7010.000	9750.000	5700.000	5	0	5
	2-E27-15	7003.333	7250.000	6760.000	3	0	3
	2-E26-9	6990.000	11000.000	5500.000	5	0	5
	2-E25-36	6958.333	7900.000	5530.000	12	0	12
	6-49-57B	6910.000	6910.000	6910.000	1	0	1
	2-E25-33	6879.615	9310.000	870.000	26	0	26
	2-E34-8	6700.000	7300.000	6200.000	3	0	3
	2-E27-7	6695.000	6740.000	6650.000	2	0	2
	2-E25-43	6633.333	6800.000	6500.000	3	0	3
	2-E25-42	6550.000	6600.000	6500.000	2	0	2
	6-43-45	6536.667	6800.000	6380.000	6	0	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 76

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Magnesium							
	2-E25-11	6355.000	7510.000	5200.000	2	0	2
	6-44-42	6170.000	6900.000	5260.000	8	0	8
	2-E25-29P	6019.615	6990.000	5260.000	26	0	26
	2-E25-34	6011.000	6800.000	5320.000	10	0	10
	2-E25-28	6004.167	7000.000	5190.000	12	0	12
	6-43-43	6003.333	6400.000	5620.000	9	0	9
	2-E27-16	6000.000	6300.000	5700.000	2	0	2
	2-E25-22	5834.286	6570.000	5490.000	7	0	7
	2-E25-37	5807.692	6600.000	5460.000	13	0	13
	2-E25-27	5728.000	5950.000	5430.000	5	0	5
	2-E25-26	5600.909	6200.000	5130.000	11	0	11
	2-E25-39	5600.000	6100.000	5400.000	5	0	5
	6-43-42J	5587.500	6350.000	5050.000	8	0	8
	2-E25-25	5431.667	6100.000	4870.000	30	0	30
	2-E25-32P	5419.231	6020.000	4800.000	26	0	26
	2-E25-24	5402.500	6460.000	4760.000	4	0	4
	6-42-41	5400.000	5400.000	5400.000	1	0	1
	2-E25-30P	5394.286	7360.000	4280.000	7	0	7
	6-42-40A	5385.556	6900.000	4010.000	9	0	9
	2-E25-38	5334.545	7000.000	4730.000	11	0	11
	2-E25-21	5316.000	6030.000	4750.000	5	0	5
	2-E25-23	3880.000	3880.000	3880.000	1	0	1
Magnesium, filtered							
	6-50-53A	67388.889	71100.000	63000.000	9	0	9
	6-49-55A	22090.000	26800.000	16700.000	10	0	10
	6-38-65	22050.000	22500.000	21600.000	2	0	2
	2-E25-35	21933.333	29000.000	16900.000	9	0	9
	2-E17-15	19900.000	30000.000	13000.000	10	0	10
	6-52-54	19800.000	19800.000	19800.000	1	0	1
	2-E17-20	19757.143	22000.000	17400.000	7	0	7
	2-E17-14	19375.000	24300.000	14000.000	8	0	8
	6-54-48	18000.000	18000.000	18000.000	1	0	1
	6-53-47B	17800.000	17800.000	17800.000	1	0	1
	2-E17-1	17460.000	24500.000	14000.000	5	0	5
	6-40-62	16633.333	16900.000	16300.000	3	0	3
	6-44-64	16300.000	17600.000	15200.000	5	0	5
	6-45-69A	16050.000	16300.000	15800.000	2	0	2
	6-24-34B	15807.692	17400.000	14200.000	13	0	13
	6-47-50	15800.000	16400.000	14800.000	3	0	3
	6-23-34	15672.727	16900.000	13900.000	11	0	11
	6-24-33	15522.222	16900.000	14700.000	9	0	9
	6-24-34C	15425.000	16600.000	14900.000	12	0	12
	2-E18-1	15422.222	17100.000	14000.000	9	0	9
	2-E13-5	15275.000	15900.000	15000.000	4	0	4
	2-E34-1	15200.000	16200.000	14200.000	2	0	2
	2-E17-9	15125.000	18800.000	12900.000	8	0	8
	6-24-34A	15077.778	15900.000	14000.000	9	0	9
	2-E28-21	14940.000	15600.000	14100.000	5	0	5
	2-E34-5	14928.571	15800.000	13700.000	7	0	7
	2-E13-14	14925.000	15500.000	14100.000	4	0	4
	2-E17-19	14916.667	22500.000	12300.000	6	0	6
	2-E28-26	14614.286	16100.000	13000.000	7	0	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 77

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Magnesium, filtered							
	6-47-46A	14475.000	15000.000	13100.000	4	0	4
	2-E28-13	14400.000	15500.000	13600.000	4	0	4
	2-E32-5	14400.000	15000.000	13800.000	2	0	2
	2-E28-18	14100.000	15700.000	13100.000	4	0	4
	6-53-47A	14100.000	14100.000	14100.000	1	0	1
	2-E25-20	14022.222	17900.000	6100.000	9	0	9
	2-E34-7	14000.000	14000.000	14000.000	1	0	1
	6-33-56	14000.000	14000.000	14000.000	1	0	1
	2-E34-2	13966.667	16000.000	12000.000	9	0	9
	6-46-21B	13800.000	13800.000	13800.000	1	0	1
	6-36-61A	13750.000	14200.000	13100.000	4	0	4
	6-35-66	13650.000	14200.000	12700.000	4	0	4
	2-E17-5	13577.778	19900.000	10200.000	9	0	9
	2-E24-12	13500.000	13600.000	13400.000	2	0	2
	2-E24-16	13328.571	14400.000	12700.000	7	0	7
	2-E32-4	13188.889	14000.000	12200.000	9	0	9
	6-35-70	13133.333	13600.000	12900.000	3	0	3
	2-E17-6	13000.000	14700.000	11900.000	9	0	9
	2-E28-28	13000.000	13000.000	13000.000	1	0	1
	6-34-51	13000.000	13000.000	13000.000	1	0	1
	2-E24-17	12780.000	13600.000	11500.000	5	0	5
	2-E24-2	12524.286	18800.000	9670.000	7	0	7
	2-E34-6	12516.667	14200.000	11000.000	6	0	6
	6-24-46	12133.333	12500.000	11500.000	3	0	3
	6-47-60	12133.333	12800.000	11700.000	3	0	3
	2-E33-15	12000.000	12000.000	12000.000	1	0	1
	2-E33-38	11950.000	12300.000	11600.000	2	0	2
	2-E17-16	11877.500	21000.000	8050.000	8	0	8
	6-25-34C	11800.000	12700.000	10900.000	11	0	11
	2-E25-19	11753.750	15100.000	9550.000	8	0	8
	6-49-57A	11700.000	11700.000	11700.000	1	0	1
	6-26-35C	11500.000	12100.000	11000.000	5	0	5
	6-24-35	11433.333	13400.000	10800.000	12	0	12
	2-E35-1	11400.000	11400.000	11400.000	1	0	1
	2-E32-3	11371.667	14000.000	9830.000	6	0	6
	6-26-35A	11075.000	11700.000	10200.000	4	0	4
	2-E26-11	11000.000	12000.000	10000.000	2	0	2
	6-25-34A	10950.000	11700.000	10400.000	4	0	4
	2-E33-18	10900.000	10900.000	10900.000	1	0	1
	6-20-39	10800.000	11000.000	10600.000	2	0	2
	6-47-35A	10800.000	10800.000	10800.000	1	0	1
	6-41-40	10732.000	12000.000	9960.000	5	0	5
	6-25-34B	10725.000	11100.000	10200.000	4	0	4
	2-E33-5	10675.000	11300.000	10000.000	4	0	4
	2-E27-8	10557.143	11600.000	9700.000	7	0	7
	2-E33-34	10500.000	11000.000	10000.000	2	0	2
	2-E34-3	10455.714	14000.000	8760.000	7	0	7
	2-E27-9	10417.778	11100.000	9900.000	9	0	9
	2-E27-14	10300.000	11300.000	9300.000	2	0	2
	6-43-41F	10300.000	10600.000	10000.000	3	0	3
	6-39-39	10290.000	12800.000	7780.000	2	0	2
	2-E24-18	10286.000	11300.000	9400.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 78

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Magnesium, filtered							
	2-E17-17	10248.571	12100.000	8890.000	7	0	7
	6-45-42	10230.000	10800.000	9250.000	5	0	5
	2-E27-5	10100.000	10100.000	10100.000	1	0	1
	6-52-57	10100.000	10100.000	10100.000	1	0	1
	2-E33-1	10076.000	10800.000	9570.000	5	0	5
	6-54-49	10065.000	10200.000	9930.000	2	0	2
	6-26-33	9890.000	10500.000	9230.000	6	0	6
	6-37-43	9873.333	18600.000	5350.000	3	0	3
	2-E33-3	9813.333	10800.000	8910.000	3	0	3
	6-26-34	9790.000	10500.000	8350.000	4	0	4
	2-E33-31	9770.000	11500.000	8610.000	3	0	3
	6-49-55B	9740.000	9740.000	9740.000	1	0	1
	2-E33-24	9610.000	9630.000	9590.000	2	0	2
	2-E33-10	9550.000	9670.000	9430.000	2	0	2
	2-E33-30	9493.000	10500.000	8370.000	10	0	10
	6-55-50C	9486.667	9720.000	9120.000	3	0	3
	2-E17-12	9415.000	11600.000	8240.000	4	0	4
	2-E33-29	9391.429	11300.000	8160.000	7	0	7
	2-E27-11	9170.000	9170.000	9170.000	1	0	1
	2-E33-39	9140.000	9140.000	9140.000	1	0	1
	2-E32-1	9100.000	10300.000	7860.000	3	0	3
	6-55-55	9030.000	9030.000	9030.000	1	0	1
	6-25-33A	8956.000	9550.000	8200.000	5	0	5
	6-43-41E	8895.000	8900.000	8890.000	2	0	2
	6-44-43B	8881.429	9300.000	8760.000	7	0	7
	2-E26-9	8650.000	11000.000	6300.000	2	0	2
	2-E28-27	8648.571	9350.000	8030.000	7	0	7
	2-E28-23	8583.333	9100.000	7790.000	3	0	3
	6-53-50	8500.000	8500.000	8500.000	1	0	1
	6-32-43	8490.000	8490.000	8490.000	1	0	1
	2-E18-4	8442.500	9350.000	7850.000	8	0	8
	2-E33-28	8405.556	9360.000	7600.000	9	0	9
	2-E33-35	8400.000	8400.000	8400.000	1	0	1
	2-E33-8	8340.000	8470.000	8210.000	2	0	2
	2-E25-40	8330.000	8330.000	8330.000	1	0	1
	2-E32-2	8306.667	8580.000	7880.000	6	0	6
	2-E27-10	8283.333	9340.000	7430.000	6	0	6
	2-E24-8	8260.000	8260.000	8260.000	1	0	1
	2-E25-18	8247.778	9510.000	6580.000	9	0	9
	2-E17-13	8216.667	8620.000	7870.000	3	0	3
	2-E33-33	8210.000	8300.000	8120.000	2	0	2
	2-E33-21	8170.000	8830.000	7510.000	2	0	2
	2-E33-32	7910.000	8300.000	7660.000	3	0	3
	2-E18-3	7800.000	8270.000	7200.000	10	0	10
	6-40-39	7602.000	8000.000	7230.000	5	0	5
	6-42-42B	7591.667	8300.000	6940.000	6	0	6
	2-E33-40	7540.000	7540.000	7540.000	1	0	1
	2-E25-31	7539.600	20000.000	5650.000	25	0	25
	2-E26-13	7500.000	7500.000	7500.000	1	0	1
	2-E27-13	7355.000	7400.000	7310.000	2	0	2
	2-E25-41	7330.000	7440.000	7220.000	2	0	2
	2-E18-2	7308.000	8670.000	6710.000	10	0	10

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 79

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Magnesium, filtered							
	2-E17-18	7257.500	8290.000	6350.000	8	0	8
	6-49-57B	7170.000	7170.000	7170.000	1	0	1
	2-E26-12	7100.000	7100.000	7100.000	1	0	1
	2-E34-8	7100.000	7100.000	7100.000	1	0	1
	2-E27-12	7095.000	7200.000	6990.000	2	0	2
	2-E25-43	7000.000	7000.000	7000.000	1	0	1
	2-E25-33	6960.476	9800.000	5820.000	21	0	21
	6-57-29A	6890.000	6890.000	6890.000	1	0	1
	6-59-58	6830.000	6830.000	6830.000	1	0	1
	2-E24-19	6790.000	6790.000	6790.000	1	0	1
	6-54-34	6780.000	6780.000	6780.000	1	0	1
	2-E27-15	6740.000	6740.000	6740.000	1	0	1
	2-E27-7	6620.000	6620.000	6620.000	1	0	1
	2-E25-42	6600.000	6600.000	6600.000	1	0	1
	6-43-45	6592.000	6800.000	6270.000	5	0	5
	2-E26-10	6533.333	7700.000	5900.000	3	0	3
	2-E25-21	6441.667	7500.000	5200.000	6	0	6
	2-E25-36	6317.143	8100.000	5320.000	7	0	7
	6-43-42J	6238.000	6600.000	5850.000	5	0	5
	2-E25-29P	6107.727	7480.000	5350.000	22	0	22
	2-E25-34	5900.000	6600.000	5130.000	7	0	7
	2-E25-27	5770.000	6130.000	5470.000	5	0	5
	2-E25-37	5739.091	6500.000	5350.000	11	0	11
	6-43-43	5737.143	6100.000	5270.000	7	0	7
	2-E25-39	5733.333	6300.000	5400.000	3	0	3
	2-E25-22	5670.000	6110.000	5230.000	8	0	8
	2-E25-26	5604.444	6200.000	5230.000	9	0	9
	2-E25-28	5591.111	6300.000	5120.000	9	0	9
	6-44-42	5565.000	6450.000	3400.000	6	0	6
	2-E25-30P	5545.000	7310.000	4170.000	6	0	6
	6-31-31	5530.000	5530.000	5530.000	1	0	1
	2-E25-24	5461.250	6270.000	4880.000	8	0	8
	2-E25-32P	5436.000	5910.000	4800.000	25	0	25
	2-E25-25	5314.828	6150.000	4680.000	29	0	29
	6-42-40A	5288.571	5740.000	4430.000	7	0	7
	2-E25-38	5272.727	7000.000	4680.000	11	0	11
	6-60-57	4820.000	4820.000	4820.000	1	0	1
	2-E25-23	4480.000	5310.000	3800.000	5	0	5
	6-40-33A	2880.000	2880.000	2880.000	1	0	1
Manganese							
	2-E25-17	6240.000	6240.000	6240.000	1	0	1
	2-E16-2	2375.000	3330.000	1420.000	2	0	2
	2-E25-6	2090.000	2090.000	2090.000	1	0	1
	2-E25-9	1930.000	1930.000	1930.000	1	0	1
	2-E28-12	1430.000	1430.000	1430.000	1	0	1
	2-E25-11	1180.000	1880.000	480.000	2	0	2
	2-E26-5	1090.000	1090.000	1090.000	1	0	1
	6-42-40B	982.000	1790.000	174.000	2	0	2
	6-42-39B	645.000	660.000	630.000	2	0	2
	6-40-40B	470.000	640.000	300.000	2	0	2
	6-43-40	385.000	520.000	250.000	2	0	2
	6-43-41G	335.000	360.000	310.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 80

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Manganese							
	6-40-40A	315.000	370.000	260.000	2	0	2
	6-52-57	313.000	313.000	313.000	1	0	1
	6-42-40A	268.222	2300.000	8.000	8	1	9
	2-E28-7	259.000	259.000	259.000	1	0	1
	6-49-57B	177.000	177.000	177.000	1	0	1
	6-40-39	157.167	252.000	57.000	6	0	6
	6-50-53B	130.000	138.000	122.000	2	0	2
	2-E35-1	116.000	116.000	116.000	1	0	1
	2-E33-40	106.000	106.000	106.000	1	0	1
	6-43-41F	95.500	154.000	22.000	4	0	4
	2-E17-6	70.286	90.000	52.000	7	0	7
	2-E24-19	68.167	99.000	44.000	3	0	3
	6-53-47A	60.000	60.000	60.000	1	0	1
	6-42-39A	51.500	56.000	47.000	2	0	2
	2-E34-6	51.125	91.000	7.000	7	1	8
	6-41-40	50.000	107.000	19.000	6	1	7
	6-26-35C	44.800	90.000	7.000	4	1	5
	6-49-55B	33.100	33.100	33.100	1	0	1
	6-45-69A	33.000	56.000	56.000	1	1	2
	2-E34-1	31.933	37.800	26.000	3	0	3
	6-43-41E	30.200	51.000	11.000	4	1	5
	2-E25-30P	29.600	46.000	9.000	7	0	7
	2-E34-8	28.500	49.000	20.000	3	1	4
	2-E33-39	26.300	26.300	26.300	1	0	1
	6-49-55A	26.300	26.300	26.300	1	0	1
	2-E24-20	24.000	24.000	24.000	1	0	1
	2-E18-1	22.400	70.000	12.000	8	2	10
	2-E34-2	19.220	33.000	6.000	9	1	10
	2-E25-40	18.375	22.000	13.500	4	0	4
	2-E17-12	18.000	39.000	39.000	1	2	3
	2-E26-12	18.000	34.000	34.000	1	2	3
	2-E34-7	17.000	17.000	17.000	1	0	1
	6-52-54	16.900	16.900	16.900	1	0	1
	2-E25-35	15.923	27.000	6.000	11	2	13
	2-E25-39	15.200	22.000	14.000	3	2	5
	2-E33-31	15.150	30.000	4.600	3	1	4
	2-E25-41	15.000	24.500	11.000	4	0	4
	2-E32-5	14.750	28.000	13.500	3	3	6
	2-E25-19	14.625	23.000	15.500	2	2	4
	2-E25-24	14.500	20.000	6.000	4	0	4
	2-E28-13	14.500	24.000	24.000	1	1	2
	6-55-50C	14.500	19.000	19.000	1	1	2
	2-E27-11	14.400	32.000	10.000	2	3	5
	2-E33-36	14.333	23.000	23.000	1	2	3
	2-E17-14	14.000	65.000	5.000	5	3	8
	2-E25-38	14.000	29.000	6.000	7	4	11
	6-42-41	14.000	18.000	18.000	1	1	2
	2-E33-18	13.900	13.900	13.900	1	0	1
	2-E25-42	13.667	16.000	10.000	3	0	3
	2-E33-37	13.250	16.500	16.500	1	1	2
	2-E17-19	13.200	24.000	6.000	5	0	5
	2-E25-29P	13.190	63.000	6.000	14	6	20

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 81

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Manganese							
	2-E26-11	13.000	20.000	12.000	2	2	4
	6-47-50	13.000	13.000	13.000	1	0	1
	2-E25-37	12.917	22.000	7.000	11	1	12
	2-E27-15	12.833	17.000	8.000	3	0	3
	2-E27-14	12.500	14.000	11.000	2	0	2
	2-E25-43	12.333	17.000	17.000	1	2	3
	2-E35-2	12.333	17.000	11.000	3	3	6
	6-45-42	12.333	22.000	22.000	1	2	3
	2-E33-41	12.250	13.500	11.000	2	0	2
	2-E17-15	11.909	40.000	6.000	8	3	11
	6-55-55	11.900	11.900	11.900	1	0	1
	2-E18-3	11.778	22.000	7.000	6	3	9
	2-E18-4	11.667	32.000	5.000	7	2	9
	2-E26-13	11.667	15.000	15.000	1	2	3
	2-E32-4	11.643	26.000	5.000	10	4	14
	2-E24-17	11.429	13.000	10.000	7	0	7
	2-E33-33	11.333	13.000	11.000	2	1	3
	6-44-43B	11.333	19.000	8.000	7	2	9
	2-E26-9	11.250	15.000	15.000	1	3	4
	2-E25-20	11.125	44.000	5.000	2	6	8
	2-E24-18	11.000	18.000	10.000	4	2	6
	6-34-42	11.000	12.000	12.000	1	1	2
	2-E17-20	10.955	30.000	5.000	9	2	11
	2-E25-34	10.889	24.000	9.000	4	5	9
	2-E25-36	10.864	24.000	6.000	7	4	11
	6-43-42J	10.750	18.000	7.000	5	3	8
	6-24-33	10.725	40.800	40.800	1	7	8
	2-E25-31	10.654	32.000	5.000	21	5	26
	6-43-45	10.571	15.000	6.000	5	2	7
	2-E17-16	10.556	34.000	6.000	4	5	9
	2-E17-17	10.556	41.000	5.000	4	5	9
	2-E27-9	10.500	20.000	5.000	6	4	10
	2-E25-25	10.430	47.600	5.000	14	6	20
	2-E27-10	10.313	26.000	7.000	5	3	8
	2-E26-10	10.200	11.000	10.000	2	3	5
	6-50-53A	10.100	10.100	10.100	1	0	1
	2-E27-13	10.000	14.000	6.000	2	1	3
	2-E25-33	9.775	25.000	5.620	8	7	15
	2-E17-1	9.600	20.000	6.000	3	2	5
	2-E34-5	9.378	12.400	6.000	7	2	9
	6-25-34C	8.923	42.000	6.000	4	9	13
	2-E32-2	8.900	17.000	5.000	5	5	10
	2-E33-32	8.825	9.000	6.300	2	2	4
	2-E28-26	8.778	18.000	7.000	3	6	9
	2-E17-13	8.667	6.000	6.000	1	2	3
	2-E24-16	8.625	13.000	6.000	5	3	8
	2-E32-3	8.444	14.000	7.000	3	6	9
	6-24-34B	8.417	36.000	36.000	1	11	12
	2-E33-29	8.400	11.000	8.000	4	6	10
	2-E17-18	8.333	21.000	6.000	3	6	9
	2-E25-32P	8.302	21.000	6.640	12	10	22
	2-E25-18	8.207	9.280	5.000	6	5	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 82

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Manganese							
	2-E33-1	8.000	11.000	11.000	1	1	2
	2-E28-27	7.600	9.000	7.000	2	8	10
	2-E18-2	7.500	13.000	5.000	6	4	10
	6-24-34A	7.408	15.000	5.890	6	6	12
	2-E33-30	7.280	10.000	5.000	6	4	10
	6-26-35A	7.000	7.000	7.000	1	5	6
	2-E33-38	6.900	7.800	6.000	2	0	2
	2-E33-28	6.864	6.000	3.500	3	8	11
	6-42-42B	6.857	7.000	5.000	4	3	7
	6-43-43	6.857	8.000	8.000	1	6	7
	2-E28-18	6.667	5.000	5.000	1	2	3
	6-44-42	6.571	6.000	6.000	1	6	7
	2-E27-8	6.500	7.000	7.000	1	7	8
	6-25-33A	6.200	6.000	5.000	2	3	5
	6-25-34B	6.200	6.000	6.000	1	4	5
	6-24-35	6.154	9.000	6.000	2	11	13
	2-E34-3	6.143	8.000	8.000	1	6	7
	2-E28-21	6.000	6.000	6.000	1	0	1
	6-24-34C	6.000	7.000	6.000	2	11	13
	6-23-34	5.846	6.000	6.000	1	12	13
	2-E25-27	5.600	8.000	8.000	1	4	5
	2-E17-9	5.429	6.000	6.000	3	4	7
	2-E24-2	5.333	7.000	7.000	1	5	6
	2-E25-23	5.000	5.000	5.000	1	0	1
	6-49-57A	3.500	3.500	3.500	1	0	1
	2-E33-15	3.000	3.000	3.000	1	0	1
Manganese, filtered							
	6-52-57	295.000	295.000	295.000	1	0	1
	6-49-57B	169.000	169.000	169.000	1	0	1
	6-40-39	164.400	231.000	88.000	5	0	5
	6-54-34	132.000	132.000	132.000	1	0	1
	6-43-41F	128.000	216.000	79.000	3	0	3
	6-53-47A	77.000	77.000	77.000	1	0	1
	2-E17-6	75.333	101.000	54.000	9	0	9
	2-E35-1	60.000	60.000	60.000	1	0	1
	2-E33-40	55.500	55.500	55.500	1	0	1
	6-41-40	44.800	93.000	11.000	4	1	5
	6-26-35C	43.800	91.000	7.000	4	1	5
	6-40-33A	38.000	38.000	38.000	1	0	1
	2-E34-6	33.167	79.000	5.000	6	0	6
	6-53-50	33.000	33.000	33.000	1	0	1
	6-60-57	28.000	28.000	28.000	1	0	1
	6-49-55A	25.313	33.000	14.500	8	0	8
	6-43-41E	24.500	33.000	16.000	2	0	2
	2-E33-39	21.400	21.400	21.400	1	0	1
	2-E34-1	20.900	22.000	19.800	2	0	2
	6-49-55B	20.200	20.200	20.200	1	0	1
	2-E24-19	17.000	17.000	17.000	1	0	1
	2-E25-39	15.000	25.000	25.000	1	2	3
	2-E34-7	14.000	14.000	14.000	1	0	1
	6-39-39	13.500	22.000	22.000	1	1	2
	6-37-43	13.333	30.000	30.000	1	2	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 83

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Manganese, filtered							
	2-E18-1	13.125	51.000	19.000	2	6	8
	2-E25-42	12.000	12.000	12.000	1	0	1
	2-E34-2	11.822	40.000	2.400	4	5	9
	6-45-42	10.600	26.000	7.000	3	2	5
	6-47-50	10.200	14.000	4.600	3	0	3
	2-E25-21	10.167	23.000	7.000	3	3	6
	2-E32-5	10.000	10.000	10.000	1	1	2
	2-E33-31	10.000	23.000	23.000	1	2	3
	2-E17-15	9.333	30.000	5.000	4	5	9
	2-E17-14	9.125	28.000	5.000	6	2	8
	2-E25-38	8.667	12.000	12.000	1	5	6
	2-E25-30P	8.286	15.000	6.000	5	2	7
	2-E25-37	7.833	7.000	7.000	1	5	6
	2-E25-33	7.400	23.000	6.000	2	8	10
	6-42-40A	7.286	11.000	5.000	5	2	7
	2-E25-35	7.250	8.000	8.000	1	7	8
	6-25-33A	7.000	7.000	6.000	3	2	5
	6-44-43B	7.000	10.000	7.000	2	4	6
	2-E17-16	6.857	17.000	6.000	2	5	7
	2-E25-34	6.833	10.000	6.000	2	4	6
	2-E13-5	6.750	12.000	12.000	1	3	4
	2-E25-18	6.556	9.000	6.000	4	5	9
	6-20-39	6.500	8.000	8.000	1	1	2
	2-E18-4	6.250	11.000	5.000	4	4	8
	2-E27-9	6.250	9.000	6.000	2	6	8
	6-24-34B	6.200	17.000	17.000	1	9	10
	2-E17-18	6.143	13.000	13.000	1	6	7
	2-E25-25	6.071	5.000	5.000	1	13	14
	2-E17-1	6.000	10.000	10.000	1	4	5
	2-E17-20	6.000	6.000	6.000	1	5	6
	2-E24-16	6.000	6.000	6.000	1	5	6
	2-E24-17	6.000	7.000	6.000	4	1	5
	2-E25-40	6.000	6.000	6.000	1	0	1
	6-53-47B	6.000	6.000	6.000	1	0	1
	2-E25-31	5.929	8.000	8.000	1	13	14
	6-43-43	5.833	5.000	5.000	1	5	6
	2-E25-32P	5.733	6.000	5.000	2	13	15
	2-E25-24	5.625	10.000	5.000	2	6	8
	2-E24-18	5.600	6.000	6.000	3	2	5
	2-E25-27	5.600	8.000	8.000	1	4	5
	2-E27-10	5.500	8.000	5.000	2	4	6
	2-E34-5	5.343	7.000	5.000	3	4	7
	2-E25-19	5.333	7.000	7.000	1	5	6
	6-25-34C	5.273	8.000	8.000	1	10	11
	2-E17-19	5.200	6.000	6.000	1	4	5
	2-E17-17	5.167	6.000	6.000	1	5	6
	2-E17-9	5.125	6.000	6.000	1	7	8
	6-23-34	5.091	6.000	6.000	1	10	11
	2-E25-22	5.000	5.000	5.000	1	7	8
	6-43-42J	5.000	5.000	5.000	3	2	5
	6-52-54	3.800	3.800	3.800	1	0	1
	2-E33-38	3.700	3.800	3.600	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 84

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Manganese, filtered							
	6-55-55	3.600	3.600	3.600	1	0	1
	2-E33-15	2.700	2.700	2.700	1	0	1
Mercury							
	2-E27-15	.440	.920	.920	1	2	3
	2-E33-3	.250	.250	.250	1	0	1
Mercury, filtered							
	2-E27-15	.210	.230	.230	1	2	3
	2-E33-3	.170	.170	.170	1	0	1
	2-E24-2	.102	.110	.110	1	5	6
Methyl ethyl ketone							
	2-E33-29	37.000	10.000	10.000	1	9	10
	2-E25-36	35.714	10.000	10.000	1	6	7
	2-E34-3	22.857	10.000	10.000	1	6	7
	2-E13-5	13.000	16.000	16.000	1	1	2
@ Methylene Chloride							
	2-E17-16	1286.000	6400.000	6400.000	1	4	5
	2-E33-30	295.200	2900.000	7.000	2	8	10
	6-24-34A	115.000	1200.000	1200.000	1	10	11
	6-53-55A	75.000	75.000	75.000	1	0	1
	6-55-57	71.000	71.000	71.000	1	0	1
	6-24-35	48.333	510.000	510.000	1	11	12
	2-E25-34	31.667	160.000	160.000	1	5	6
	6-53-55B	29.000	29.000	29.000	1	0	1
	6-53-55C	23.000	23.000	23.000	1	0	1
	6-49-57A	20.000	20.000	20.000	1	0	1
	6-24-34C	18.077	160.000	160.000	1	12	13
	2-E18-3	18.000	75.000	75.000	1	5	6
	6-49-57B	18.000	18.000	18.000	1	0	1
	6-49-55B	17.000	17.000	17.000	1	0	1
	2-E33-28	16.800	130.000	130.000	1	9	10
	2-E24-17	16.143	83.000	83.000	1	6	7
	6-49-55A	13.667	21.000	21.000	1	2	3
	6-54-57	12.000	12.000	12.000	1	0	1
	2-E17-15	9.000	22.000	22.000	1	4	5
	2-E33-35	9.000	17.000	9.000	2	2	4
	2-E34-5	7.778	20.000	20.000	1	8	9
	2-E18-2	7.500	5.000	5.000	1	5	6
	2-E34-2	7.222	18.000	10.000	2	7	9
	2-E33-4	7.000	12.000	12.000	1	1	2
	2-E34-3	7.000	9.000	9.000	1	6	7
	6-50-53B	7.000	7.000	7.000	1	0	1
	6-42-42B	6.200	6.000	6.000	1	4	5
	2-E32-2	6.100	11.000	11.000	1	9	10
	2-E27-8	5.889	6.000	6.000	1	8	9
	2-E28-26	5.764	7.000	1.400	2	9	11
	2-E25-32P	5.700	7.000	7.000	1	9	10
	2-E28-27	5.640	1.400	1.400	1	9	10
	2-E25-25	5.325	1.300	1.300	1	3	4
	2-E33-34	5.250	6.000	6.000	1	3	4
	6-43-42J	5.233	1.400	1.400	1	5	6
	6-44-42	5.233	1.400	1.400	1	5	6
	2-E17-20	5.200	1.400	1.400	1	6	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 85

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Methylene Chloride							
	2-E25-36	5.200	1.400	1.400	1	6	7
	2-E32-4	5.182	5.000	5.000	1	10	11
	6-43-41E	4.417	1.500	1.500	1	5	6
	2-E25-38	4.100	1.400	1.400	1	3	4
	2-E25-37	4.075	1.300	1.300	1	3	4
	2-E25-29P	3.843	.370	.370	1	3	4
	2-E27-11	3.833	1.500	1.500	1	2	3
	2-E28-28	3.833	1.500	1.500	1	2	3
	2-E25-39	3.767	1.300	1.300	1	2	3
	2-E26-11	1.300	1.300	1.300	1	0	1
	2-E26-9	1.300	1.300	1.300	1	0	1
Nickel							
	6-50-53A	590.000	590.000	590.000	1	0	1
	6-40-40B	195.000	360.000	360.000	1	1	2
	2-E25-17	183.000	183.000	183.000	1	0	1
	2-E24-19	135.333	175.000	71.000	3	0	3
	2-E25-30P	135.286	206.000	40.000	7	0	7
	2-E35-1	107.000	107.000	107.000	1	0	1
	2-E24-20	95.000	95.000	95.000	1	0	1
	6-43-41E	91.833	310.000	34.000	5	1	6
	2-E25-6	89.000	89.000	89.000	1	0	1
	2-E34-6	85.125	470.000	10.000	7	1	8
	2-E26-12	83.333	190.000	190.000	1	2	3
	2-E25-9	79.000	79.000	79.000	1	0	1
	6-43-40	70.000	110.000	110.000	1	1	2
	2-E34-8	69.750	120.000	46.000	3	1	4
	6-41-40	68.286	300.000	25.000	3	4	7
	2-E27-11	63.600	160.000	44.000	3	2	5
	6-42-39B	60.500	91.000	91.000	1	1	2
	2-E33-36	59.500	110.000	68.000	2	2	4
	6-40-39	59.333	260.000	13.000	4	2	6
	6-49-55A	55.000	55.000	55.000	1	0	1
	2-E25-39	54.000	98.000	52.000	3	2	5
	2-E26-11	52.833	120.000	32.000	4	2	6
	2-E16-2	52.500	61.000	44.000	2	0	2
	6-50-53B	51.150	84.800	17.500	2	0	2
	2-E33-41	51.000	62.000	40.000	2	0	2
	2-E34-2	48.660	91.000	18.000	10	0	10
	6-47-50	48.200	48.200	48.200	1	0	1
	2-E25-43	48.000	84.000	84.000	1	2	3
	2-E33-37	47.000	75.000	36.000	2	1	3
	2-E34-7	47.000	47.000	47.000	1	0	1
	2-E26-13	46.000	78.000	78.000	1	2	3
	6-43-42J	45.875	98.000	19.000	6	2	8
	2-E27-15	45.167	65.000	30.000	3	0	3
	2-E35-2	45.000	80.000	42.000	3	3	6
	2-E25-42	44.000	56.000	46.000	2	1	3
	2-E32-5	43.917	74.000	41.000	4	2	6
	2-E34-5	43.810	75.100	19.000	10	0	10
	2-E25-40	43.750	62.500	36.000	3	1	4
	2-E25-29P	43.487	200.000	12.000	18	5	23
	2-E17-20	42.727	170.000	11.000	10	1	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 86

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Nickel							
	2-E26-10	41.200	70.000	46.000	2	3	5
	6-40-40A	41.000	52.000	52.000	1	1	2
	6-49-55B	40.500	40.500	40.500	1	0	1
	6-42-39A	39.500	49.000	49.000	1	1	2
	2-E26-9	38.400	65.000	37.000	2	3	5
	6-49-57B	37.800	37.800	37.800	1	0	1
	2-E25-36	37.455	120.000	14.000	6	5	11
	2-E17-15	37.417	108.000	16.000	10	2	12
	2-E17-16	37.300	113.000	11.000	7	3	10
	2-E25-34	36.900	130.000	10.000	7	3	10
	2-E24-17	36.143	59.000	20.000	7	0	7
	2-E32-4	36.143	98.000	15.000	10	4	14
	2-E32-2	35.950	67.000	11.000	7	3	10
	2-E28-28	35.750	53.000	53.000	1	3	4
	2-E25-31	35.650	210.000	11.000	25	3	28
	2-E18-4	35.333	79.000	12.000	9	0	9
	2-E27-9	34.909	70.000	13.000	10	1	11
	2-E24-18	34.833	50.000	16.000	5	1	6
	2-E25-35	34.417	89.000	11.000	9	3	12
	6-43-45	34.286	64.000	20.000	5	2	7
	2-E25-37	34.231	65.000	12.000	10	3	13
	6-42-41	34.000	38.000	38.000	1	1	2
	2-E25-32P	33.448	160.000	11.000	24	3	27
	2-E32-3	33.222	75.000	11.000	6	3	9
	2-E25-41	32.875	49.500	17.000	3	1	4
	2-E27-16	32.833	36.000	32.500	2	1	3
	2-E33-34	32.167	36.500	36.500	1	2	3
	2-E18-3	31.100	54.000	19.000	9	1	10
	2-E25-11	31.000	32.000	32.000	1	1	2
	2-E28-26	31.000	87.000	11.000	7	2	9
	2-E33-30	29.982	61.000	12.000	9	2	11
	2-E18-1	29.909	67.000	13.000	9	2	11
	2-E24-16	29.333	42.000	19.000	8	1	9
	2-E33-29	29.273	61.000	13.000	8	3	11
	2-E17-17	28.700	102.000	10.000	8	2	10
	2-E33-32	28.225	32.400	19.000	3	1	4
	2-E33-28	27.517	65.000	12.000	10	2	12
	2-E27-14	27.500	40.000	15.000	2	0	2
	2-E25-38	27.250	50.000	15.000	9	3	12
	2-E33-31	27.200	26.000	22.800	2	2	4
	2-E17-19	27.167	40.000	14.000	6	0	6
	2-E27-13	27.000	37.000	14.000	2	1	3
	6-44-43B	26.778	69.000	13.000	6	3	9
	2-E27-10	25.625	55.000	12.000	6	2	8
	2-E17-18	25.455	62.000	10.000	8	3	11
	2-E33-33	25.333	16.000	16.000	1	2	3
	2-E28-27	24.273	38.000	10.000	8	3	11
	2-E18-2	23.600	43.000	11.000	8	2	10
	6-43-41F	23.250	35.000	13.000	3	1	4
	6-55-55	23.200	23.200	23.200	1	0	1
	2-E33-40	23.000	23.000	23.000	1	0	1
	6-42-40B	23.000	36.000	36.000	1	1	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Nickel							
	2-E34-3	22.143	42.000	12.000	6	1	7
	2-E25-25	21.950	38.000	11.000	12	10	22
	6-42-42B	21.143	35.000	11.000	3	4	7
	2-E27-8	21.063	35.500	11.000	7	1	8
	2-E34-1	19.933	39.800	39.800	1	2	3
	6-43-43	19.875	32.000	16.000	5	3	8
	2-E25-33	19.860	38.000	10.000	14	6	20
	2-E33-38	19.000	26.100	11.900	2	0	2
	6-44-42	18.571	25.000	15.000	2	5	7
	2-E33-39	17.400	17.400	17.400	1	0	1
	2-E17-14	16.222	27.000	10.000	7	2	9
	6-52-54	14.600	14.600	14.600	1	0	1
	6-24-34C	13.769	19.000	19.000	1	12	13
	6-25-34C	13.231	12.000	12.000	1	12	13
	6-23-34	13.154	11.000	11.000	1	12	13
	2-E28-12	12.000	12.000	12.000	1	0	1
Nickel, filtered							
	2-E24-19	60.000	60.000	60.000	1	0	1
	2-E25-39	43.667	71.000	71.000	1	2	3
	2-E34-5	22.657	44.000	16.000	6	1	7
	6-41-40	22.600	24.000	19.000	2	3	5
	2-E34-2	22.411	47.000	10.700	7	2	9
	2-E25-38	21.167	17.000	17.000	1	5	6
	2-E25-37	20.571	23.000	11.000	2	5	7
	2-E17-15	18.500	49.000	11.000	4	6	10
	2-E27-9	17.750	33.000	19.000	3	5	8
	2-E32-3	17.667	16.000	10.000	2	4	6
	2-E33-31	17.033	11.100	10.000	2	1	3
	6-49-55B	16.200	16.200	16.200	1	0	1
	2-E33-32	16.100	8.300	8.300	1	2	3
	2-E25-36	16.000	12.000	12.000	1	6	7
	2-E25-40	16.000	16.000	16.000	1	0	1
	2-E34-6	16.000	46.000	10.000	2	4	6
	2-E25-30P	15.429	20.000	16.000	5	2	7
	2-E33-28	14.875	12.000	10.000	2	6	8
	6-49-57B	14.800	14.800	14.800	1	0	1
	2-E25-29P	14.462	21.000	17.000	2	11	13
	2-E33-30	14.333	12.000	10.000	2	7	9
	2-E24-16	14.000	14.000	10.000	2	4	6
	2-E17-20	13.714	14.000	12.000	2	5	7
	2-E33-29	13.571	13.000	12.000	2	5	7
	2-E18-1	13.444	16.000	15.000	2	7	9
	2-E25-31	13.429	18.000	18.000	1	13	14
	2-E28-26	13.429	14.000	14.000	1	6	7
	2-E18-2	13.000	17.000	10.000	2	7	9
	2-E18-3	13.000	13.000	12.000	3	6	9
	2-E24-17	12.667	17.000	11.000	5	1	6
	2-E17-16	12.571	19.000	12.000	4	3	7
	2-E17-14	12.500	10.000	10.000	1	7	8
	2-E25-33	12.455	14.000	13.000	2	9	11
	2-E32-4	12.444	12.000	12.000	1	8	9
	2-E18-4	12.250	17.000	11.000	5	3	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Nickel, filtered							
	2-E28-27	11.333	18.000	18.000	1	5	6
	2-E24-18	11.200	13.000	13.000	2	3	5
	2-E17-18	11.125	17.000	12.000	2	6	8
	2-E17-19	11.000	14.000	11.000	3	3	6
	6-43-42J	10.500	12.000	12.000	1	3	4
	2-E25-27	10.200	11.000	11.000	1	4	5
	2-E27-10	10.167	11.000	11.000	1	5	6
	6-23-34	10.100	11.000	11.000	1	9	10
Nitrate							
	6-50-53A	503215.588	625000.000	665.000	17	0	17
	2-E17-15	243818.182	354000.000	41000.000	11	0	11
	2-E17-14	218111.111	300000.000	140000.000	9	0	9
	2-E17-20	202400.000	245000.000	160000.000	10	0	10
	2-E17-1	195777.778	308000.000	139000.000	9	0	9
	2-E24-1	154505.895	334000.000	112.000	19	0	19
	2-E25-20	150477.500	235000.000	1440.000	16	0	16
	2-E25-13	142399.000	370000.000	293.000	7	0	7
	2-E17-19	141440.000	316000.000	88800.000	5	0	5
	6-49-55A	138083.806	242000.000	40.900	16	0	16
	2-E17-8	133844.433	222000.000	66.600	6	0	6
	2-E17-5	129175.000	234000.000	30000.000	28	0	28
	2-E28-12	124073.000	241000.000	219.000	3	0	3
	2-E24-11	123573.600	234000.000	88.800	8	0	8
	2-E17-9	121631.579	146000.000	103000.000	19	0	19
	2-E25-19	118775.000	233000.000	20000.000	16	0	16
	2-E24-12	111676.923	164000.000	87400.000	13	0	13
	2-E24-2	105884.615	176000.000	66400.000	13	0	13
	2-E24-17	102850.000	122000.000	84800.000	6	0	6
	2-E24-16	96557.143	121000.000	18000.000	7	0	7
	6-38-65	91804.154	171000.000	150.000	13	0	13
	2-E17-2	82578.947	121000.000	23000.000	19	0	19
	2-E33-7	75482.250	119000.000	129.000	4	0	4
	2-E17-17	62870.000	105000.000	8400.000	10	0	10
	2-E24-18	61033.333	86300.000	22900.000	6	0	6
	2-E17-13	51810.000	85200.000	24000.000	20	0	20
	6-44-64	50966.667	65200.000	18000.000	12	0	12
	2-E33-34	49200.000	50000.000	48400.000	2	0	2
	6-54-48	49200.000	49200.000	49200.000	1	0	1
	6-62-31	47391.629	64400.000	41.400	7	0	7
	2-E32-5	47320.000	59500.000	11000.000	5	0	5
	2-E25-18	45121.333	88700.000	7920.000	15	0	15
	2-E17-12	43515.000	56600.000	28000.000	20	0	20
	2-E32-3	43388.889	54000.000	10000.000	9	0	9
	2-E28-26	41950.000	52900.000	8500.000	10	0	10
	2-E28-13	41575.000	48700.000	35400.000	4	0	4
	6-61-62	41342.388	52100.000	39.100	8	0	8
	2-E33-3	40776.350	60800.000	58.100	6	0	6
	6-40-62	40691.667	51200.000	11000.000	12	0	12
	2-E17-16	39579.000	128000.000	7290.000	10	0	10
	2-E33-1	38791.429	52300.000	6640.000	7	0	7
	2-E28-21	38000.000	43600.000	34500.000	20	0	20
	2-E28-18	37735.000	42900.000	23300.000	20	0	20

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 89

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Nitrate							
	2-E25-11	35670.476	57300.000	1000.000	21	0	21
	2-E24-7	34444.440	82600.000	22.200	5	0	5
	2-E24-8	33201.667	180000.000	3220.000	6	0	6
	6-64-62	32100.000	37700.000	26400.000	6	0	6
	6-20-20	32015.267	38400.000	37.400	9	0	9
	2-E33-5	31300.000	33700.000	29200.000	6	0	6
	6-24-34C	30961.538	37000.000	7600.000	13	0	13
	6-24-34B	30607.143	35900.000	7100.000	14	0	14
	6-53-47B	30600.000	30600.000	30600.000	1	0	1
	6-25-34B	30414.286	34000.000	27200.000	7	0	7
	6-26-34	30366.667	35400.000	24900.000	6	0	6
	6-25-34C	29738.462	35100.000	7400.000	13	0	13
	6-26-33	29685.714	34200.000	25600.000	7	0	7
	2-E28-17	29000.000	29000.000	29000.000	1	0	1
	6-26-35A	28112.500	33800.000	7300.000	8	0	8
	6-24-34A	27191.667	33300.000	5200.000	12	0	12
	6-24-33	26800.476	37000.000	35.400	21	0	21
	6-25-34A	26641.388	34100.000	31.100	8	0	8
	6-32-62	26450.000	27100.000	25900.000	4	0	4
	2-E23-1	26380.050	58900.000	20.200	4	0	4
	2-E32-4	25161.538	29600.000	5300.000	13	0	13
	6-24-35	24514.286	29400.000	4200.000	14	0	14
	2-E28-27	24481.818	31000.000	5200.000	11	0	11
	2-E17-6	24240.000	115000.000	2690.000	8	7	15
	2-E28-28	23466.667	33000.000	6500.000	3	0	3
	6-23-34	22946.667	29100.000	4000.000	15	0	15
	6-33-42	22585.714	37100.000	5600.000	7	0	7
	2-E25-17	22343.333	46400.000	7490.000	18	0	18
	6-35-66	21718.583	28500.000	23.000	12	0	12
	6-26-35C	21342.857	22300.000	18500.000	7	0	7
	6-32-22	20587.657	27200.000	13.600	7	0	7
	6-41-40	20250.000	22500.000	18800.000	6	0	6
	6-47-60	20222.470	23500.000	24.700	10	0	10
	2-E32-2	19945.455	28200.000	5600.000	11	0	11
	6-45-69A	18740.000	25600.000	6100.000	10	0	10
	6-65-23	18100.000	18300.000	17900.000	2	0	2
	2-E13-8	17950.000	21300.000	15700.000	4	0	4
	6-32-43	17909.162	38700.000	28.400	13	0	13
	6-35-70	17319.900	29200.000	23.200	15	0	15
	6-63-58	17266.438	29600.000	31.500	8	0	8
	2-E33-18	17066.667	19900.000	13700.000	3	0	3
	6-51-63	17050.000	18900.000	14700.000	6	0	6
	6-36-61A	16601.654	21600.000	21.500	13	0	13
	6-46-21B	16442.857	18700.000	14300.000	7	0	7
	6-28-40	16350.000	19600.000	13700.000	6	0	6
	2-E33-14	15550.000	15700.000	15400.000	2	0	2
	2-E33-35	15550.000	17400.000	13700.000	2	0	2
	6-63-25A	14945.457	18900.000	18.200	7	0	7
	2-E13-14	14742.857	16100.000	12900.000	7	0	7
	2-E28-9	14670.550	29300.000	41.100	2	0	2
	6-47-35A	14233.333	14400.000	13900.000	3	0	3
	2-E34-5	14125.000	15000.000	13200.000	8	0	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 90

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
a Nitrate							
	6-25-55	14066.667	15000.000	13200.000	6	0	6
	6-39-39	13993.400	64000.000	54.000	7	3	10
	6-47-46A	13540.000	14700.000	12000.000	10	0	10
	2-E34-2	13200.000	16400.000	10900.000	8	0	8
	2-E33-10	13123.333	44700.000	5920.000	6	0	6
	2-E13-5	12347.143	18700.000	9830.000	7	0	7
	2-E33-24	12200.000	13500.000	11300.000	3	0	3
	2-E18-1	11690.000	13300.000	8400.000	10	0	10
	2-E17-18	11534.000	27700.000	4900.000	10	0	10
	6-41-23	11486.890	15400.000	8.230	7	0	7
	2-E13-19	10866.667	11500.000	10400.000	3	0	3
	2-E33-31	10833.333	15800.000	3700.000	3	0	3
	6-43-41F	10347.500	11700.000	9500.000	4	0	4
	2-E35-1	10200.000	10200.000	10200.000	1	0	1
	2-E24-20	10000.000	10000.000	10000.000	1	0	1
	6-36-61B	9978.750	26100.000	20.000	6	2	8
	2-E32-1	9926.667	13200.000	8360.000	6	0	6
	2-E25-31	9673.333	22400.000	880.000	12	0	12
	6-33-56	9630.000	10400.000	9140.000	5	0	5
	2-E33-9	9598.333	16000.000	7300.000	6	0	6
	6-24-46	9168.000	9700.000	8310.000	5	0	5
	2-E28-23	9135.000	10700.000	7600.000	8	0	8
	2-E33-32	9066.667	15800.000	3200.000	3	0	3
	2-E34-1	8851.815	13400.000	7.260	4	0	4
	6-34-51	8701.667	9300.000	8000.000	6	0	6
	2-E27-14	8556.667	9700.000	7270.000	3	0	3
	2-E25-33	8410.000	12900.000	3800.000	12	0	12
	6-34-42	8305.000	15400.000	4800.000	8	0	8
	2-E33-8	8172.500	9500.000	7700.000	4	0	4
	2-E25-36	8133.333	17000.000	2400.000	9	0	9
	2-E33-41	8000.000	13600.000	2400.000	2	0	2
	6-43-41E	7980.000	10400.000	1400.000	5	0	5
	2-E25-29P	7931.818	12900.000	1300.000	11	0	11
	2-E28-25	7600.000	7600.000	7600.000	1	0	1
	2-E28-7	7576.000	8290.000	7100.000	5	0	5
	2-E27-9	7535.000	8200.000	7230.000	8	0	8
	6-37-43	7505.714	12300.000	1780.000	7	0	7
	2-E33-30	7315.000	8300.000	6600.000	10	0	10
	2-E27-8	7301.111	8000.000	6400.000	9	0	9
	2-E33-29	7134.000	8740.000	1700.000	10	0	10
	6-55-40	7000.000	20500.000	20500.000	1	3	4
	6-28-40P	6766.667	15300.000	15300.000	1	2	3
	6-54-34	6683.333	12600.000	8100.000	3	3	6
	2-E34-6	6600.000	13700.000	6100.000	6	1	7
	6-47-50	6472.857	8120.000	4000.000	7	0	7
	6-45-42	6363.636	8860.000	960.000	22	0	22
	6-42-42B	6268.571	6500.000	5880.000	7	0	7
	6-63-55	6260.000	10000.000	4130.000	7	0	7
	6-44-43B	6027.500	8300.000	940.000	8	0	8
	6-43-40	5900.000	5900.000	5900.000	1	0	1
	6-34-41B	5745.886	10800.000	11.200	7	0	7
	2-E25-35	5741.000	9000.000	890.000	10	0	10

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
@ Nitrate							
	2-E34-3	5722.857	11800.000	3700.000	7	0	7
	2-E27-5	5532.020	11700.000	8.080	4	0	4
	2-E26-11	5436.667	5480.000	5400.000	3	0	3
	2-E34-7	5366.667	7800.000	2500.000	3	0	3
	6-20-39	5156.000	5590.000	4330.000	5	0	5
	6-50-42	5000.000	13300.000	2610.000	5	1	6
	6-54-49	4950.000	5000.000	4900.000	2	0	2
	2-E28-1	4825.000	5900.000	3750.000	2	0	2
	6-61-66	4650.000	5300.000	3820.000	6	0	6
	2-E25-21	4628.333	8400.000	480.000	11	1	12
	2-E33-33	4606.667	6700.000	1300.000	3	0	3
	2-E25-30P	4568.264	8700.000	6.110	8	0	8
	2-E26-6	4520.000	12600.000	12600.000	1	4	5
	6-25-33A	4514.286	5830.000	3600.000	7	0	7
	2-E25-22	4105.385	5880.000	2740.000	13	0	13
	2-E26-10	3945.000	7540.000	350.000	2	0	2
	6-61-37	3810.000	4200.000	3570.000	5	0	5
	2-E27-10	3735.000	7500.000	2600.000	8	0	8
	6-65-50	3668.333	6900.000	3400.000	3	3	6
	2-E33-28	3574.000	4200.000	810.000	10	0	10
	6-52-46A	3560.000	7800.000	7800.000	1	4	5
	2-E25-40	3520.000	5100.000	730.000	4	0	4
	6-53-47A	3445.000	5690.000	1200.000	2	0	2
	2-E33-20	3378.571	4430.000	2500.000	7	0	7
	6-59-58	3366.667	6800.000	3400.000	2	4	6
	2-E24-19	3243.333	5100.000	730.000	3	0	3
	2-E34-8	3240.000	9000.000	350.000	3	0	3
	6-31-31	3228.969	6100.000	2.780	6	1	7
	2-E33-21	3182.500	3500.000	2800.000	4	0	4
	2-E27-11	3133.333	6200.000	1600.000	3	0	3
	2-E28-5	3100.000	3100.000	3100.000	1	0	1
	6-57-29A	3091.667	3500.000	3040.000	5	1	6
	2-E27-1	2960.000	3140.000	2780.000	2	0	2
	6-31-31P	2862.500	6250.000	6250.000	1	3	4
	2-E24-13	2860.000	4300.000	4300.000	1	4	5
	6-43-42J	2733.333	5300.000	1000.000	6	0	6
	6-55-50D	2716.667	3800.000	3800.000	1	5	6
	6-61-41	2602.000	2900.000	2610.000	2	3	5
	6-42-39B	2600.000	2600.000	2600.000	1	0	1
	6-60-57	2574.286	7320.000	7320.000	1	6	7
	2-E25-27	2438.000	4000.000	1520.000	5	0	5
	2-E16-2	2403.684	5240.000	1100.000	5	14	19
	6-42-39A	2400.000	2400.000	2400.000	1	0	1
	2-E25-41	2362.500	3200.000	810.000	4	0	4
	2-E25-6	2362.500	3500.000	1400.000	3	5	8
	2-E24-4	2360.196	4400.000	1.760	6	3	9
	2-E26-2	2350.000	1300.000	1300.000	1	7	8
	2-E33-36	2290.000	3800.000	780.000	2	0	2
	2-E25-9	2275.000	1700.000	1500.000	2	6	8
	2-E25-37	2220.000	4500.000	1200.000	5	0	5
	2-E26-4	2144.579	1800.000	1.210	2	7	9
	6-55-50C	2118.889	2600.000	1500.000	5	4	9

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
@ Nitrate							
	2-E25-38	2032.500	3200.000	1300.000	4	0	4
	2-E25-2	2020.000	1400.000	1200.000	2	3	5
	2-E27-7	2008.333	1650.000	1400.000	3	3	6
	6-58-24	2001.980	4000.000	3.960	2	0	2
	2-E25-23	1998.000	1800.000	1100.000	5	5	10
	2-E25-24	1958.462	3070.000	900.000	9	4	13
	6-42-40A	1920.000	6500.000	110.000	8	6	14
	2-E25-3	1900.368	2000.000	1.840	2	3	5
	6-40-40A	1900.000	1900.000	1900.000	1	0	1
	6-60-60	1800.830	3200.000	3.320	2	2	4
	2-E25-39	1735.000	2400.000	1070.000	2	0	2
	2-E26-9	1690.000	1780.000	1600.000	2	0	2
	2-E35-2	1670.000	2140.000	1200.000	2	0	2
	6-40-33A	1600.057	.283	.283	1	4	5
	2-E33-37	1515.000	2390.000	640.000	2	0	2
	2-E27-15	1500.000	2140.000	560.000	3	0	3
	2-E26-5	1490.000	1490.000	1490.000	1	0	1
	2-E27-12	1403.333	2030.000	580.000	3	0	3
	2-E27-13	1403.333	2000.000	460.000	3	0	3
	6-44-42	1377.143	1600.000	1100.000	7	0	7
	2-E27-16	1360.000	2180.000	540.000	2	0	2
	2-E25-26	1269.000	1600.000	370.000	10	0	10
	6-43-45	1241.667	1500.000	1000.000	6	0	6
	2-E25-34	1072.857	1500.000	320.000	7	0	7
	2-E25-28	1045.273	1600.000	280.000	11	0	11
	6-43-41G	1000.000	1000.000	1000.000	1	0	1
	6-43-43	945.714	1100.000	700.000	7	0	7
	6-42-41	900.000	900.000	900.000	1	0	1
	2-E25-42	835.000	850.000	820.000	2	0	2
	2-E25-32P	825.000	1270.000	340.000	15	0	15
	2-E25-25	756.313	900.000	582.000	16	0	16
	6-40-40B	700.000	700.000	700.000	1	0	1
	2-E18-4	530.027	1000.000	.270	5	5	10
	2-E18-2	462.757	600.000	.328	6	5	11
	2-E18-3	457.309	600.000	.404	6	5	11
	6-40-39	416.667	500.000	220.000	3	3	6
	2-E25-43	340.000	340.000	340.000	1	0	1
	2-E26-13	240.000	240.000	240.000	1	0	1
	2-E26-12	210.000	210.000	210.000	1	0	1
	6-53-48B	113.000	113.000	113.000	1	0	1
Nitrite							
	6-26-35C	1080.000	1400.000	1400.000	1	4	5
	6-24-34C	944.167	1130.000	1130.000	1	11	12
P-chloro-m-cresol							
	2-E33-3	14.667	21.000	13.000	2	1	3
	2-E35-2	6.000	7.000	7.000	1	1	2
Pentachlorophenol							
	2-E33-29	66.667	50.000	50.000	1	5	6
@ Phenol							
	2-E35-2	12.250	8.000	8.000	1	3	4
	2-E33-29	10.091	10.000	10.000	1	10	11
	6-42-41	10.000	10.000	10.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 93

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
2 Phenol							
	6-43-42J	9.000	1.000	1.000	1	7	8
	6-40-40B	8.000	8.000	8.000	1	0	1
Phorate							
	6-43-42J	11.000	11.000	11.000	1	0	1
	6-44-42	4.200	4.200	4.200	1	0	1
Phosphate							
	2-E25-30P	9465.714	24500.000	1100.000	7	0	7
	6-43-41E	1292.857	3200.000	500.000	6	1	7
	6-43-41F	890.000	560.000	560.000	1	3	4
	6-40-40B	200.000	200.000	200.000	1	0	1
Plutonium-238							
	2-E28-23	.358	2.130	.041	7	0	7
	2-E28-24	.180	.787	.256	3	5	8
	2-E28-25	.087	.367	.021	8	1	9
	2-E27-10	.004	.005	.005	1	2	3
	2-E27-8	.001	-.001	-.001	1	2	3
	2-E27-9	-.002	-.002	-.002	1	2	3
Plutonium-239/40							
	2-E28-23	73.856	449.000	7.210	7	0	7
	2-E28-24	34.368	144.000	.082	8	0	8
	2-E28-25	16.674	71.900	1.100	9	0	9
	2-E25-17	.443	.443	.443	1	0	1
	2-E34-1	.067	.067	.067	1	0	1
	2-E28-1	.049	.049	.049	1	0	1
	2-E25-6	.043	.043	.043	1	0	1
	2-E33-3	.040	.040	.040	1	0	1
	6-53-48A	.034	.034	.034	1	0	1
	2-E28-7	.022	.107	.015	3	5	8
	2-E27-5	.020	.020	.020	1	0	1
	2-E25-35	.013	.013	.013	1	0	1
	2-E13-14	.010	.010	.010	1	0	1
	6-44-43B	.005	.015	.015	1	2	3
	2-E27-10	.003	-.000	-.000	1	2	3
	2-E27-8	.003	.004	.004	1	2	3
	2-E17-12	.001	.021	.021	1	15	16
	2-E27-9	.001	-.001	-.001	1	2	3
	2-E17-13	.001	.011	.011	1	17	18
Potassium							
	6-50-53A	16800.000	16800.000	16800.000	1	0	1
	2-E25-20	9960.000	13100.000	4300.000	10	0	10
	6-52-54	9480.000	9480.000	9480.000	1	0	1
	2-E25-19	9246.000	10100.000	8400.000	5	0	5
	6-52-57	8940.000	8940.000	8940.000	1	0	1
	6-49-55A	8870.000	8870.000	8870.000	1	0	1
	2-E16-2	8830.000	9850.000	7810.000	2	0	2
	2-E34-7	8800.000	8800.000	8800.000	1	0	1
	6-50-53B	8305.000	8510.000	8100.000	2	0	2
	2-E34-1	8193.333	8800.000	7710.000	3	0	3
	2-E25-24	8187.500	8540.000	7750.000	4	0	4
	2-E34-5	7751.000	9350.000	6600.000	10	0	10
	2-E17-1	7560.000	8430.000	7200.000	5	0	5
	6-23-34	7485.333	8130.000	6930.000	15	0	15

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 94

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium							
	2-E34-6	7427.500	8390.000	6300.000	8	0	8
	2-E34-2	7403.000	8860.000	6500.000	10	0	10
	6-24-34B	7349.231	8890.000	6910.000	13	0	13
	2-E17-20	7307.500	8630.000	5250.000	12	0	12
	2-E28-12	7280.000	7280.000	7280.000	1	0	1
	6-24-34A	7260.833	8090.000	6910.000	12	0	12
	6-40-40A	7250.000	8000.000	6500.000	2	0	2
	2-E35-1	7170.000	7170.000	7170.000	1	0	1
	2-E28-23	7150.000	7150.000	7150.000	1	0	1
	6-24-35	7082.143	8100.000	6120.000	14	0	14
	6-24-33	7073.333	8100.000	6170.000	9	0	9
	6-24-34C	7050.000	8000.000	6350.000	14	0	14
	6-47-50	7050.000	7050.000	7050.000	1	0	1
	2-E27-8	6858.889	7580.000	6400.000	9	0	9
	2-E25-11	6855.000	7710.000	6000.000	2	0	2
	2-E25-30P	6822.857	9270.000	5280.000	7	0	7
	2-E25-42	6766.667	7000.000	6500.000	3	0	3
	2-E17-9	6662.857	7130.000	6010.000	7	0	7
	2-E17-6	6634.286	7690.000	5790.000	7	0	7
	2-E27-11	6574.000	7000.000	6300.000	5	0	5
	2-E17-19	6571.667	7190.000	6200.000	6	0	6
	2-E17-14	6543.333	7430.000	5200.000	9	0	9
	2-E17-5	6491.000	8590.000	4550.000	10	0	10
	2-E25-23	6480.000	6480.000	6480.000	1	0	1
	2-E28-13	6475.000	6700.000	6250.000	2	0	2
	2-E27-9	6441.818	7310.000	5200.000	11	0	11
	2-E32-4	6417.143	7300.000	5800.000	14	0	14
	2-E35-2	6383.333	6900.000	5700.000	6	0	6
	2-E17-15	6381.667	7440.000	5500.000	12	0	12
	2-E28-7	6370.000	6370.000	6370.000	1	0	1
	6-25-34C	6305.385	7100.000	5460.000	13	0	13
	2-E33-39	6290.000	6290.000	6290.000	1	0	1
	6-49-57A	6250.000	6250.000	6250.000	1	0	1
	2-E34-3	6217.143	7000.000	4880.000	7	0	7
	2-E13-14	6200.000	6200.000	6200.000	1	0	1
	6-25-34B	6124.000	6850.000	5560.000	5	0	5
	2-E33-37	6116.667	7850.000	4900.000	3	0	3
	6-26-35A	6108.333	6900.000	5200.000	6	0	6
	6-25-34A	6066.000	6850.000	5720.000	5	0	5
	2-E17-17	5970.000	6660.000	4700.000	11	0	11
	2-E25-35	5945.000	6800.000	5130.000	12	0	12
	2-E27-10	5850.000	6500.000	5080.000	8	0	8
	2-E25-21	5844.000	6970.000	5300.000	5	0	5
	6-26-34	5817.500	6110.000	5290.000	4	0	4
	2-E18-1	5811.667	7200.000	4900.000	12	0	12
	2-E24-18	5771.667	6280.000	5310.000	6	0	6
	6-43-41G	5750.000	5800.000	5700.000	2	0	2
	2-E27-14	5730.000	6260.000	5200.000	2	0	2
	2-E33-18	5730.000	5730.000	5730.000	1	0	1
	2-E32-3	5728.889	6350.000	4850.000	9	0	9
	2-E33-15	5710.000	5710.000	5710.000	1	0	1
	2-E28-28	5700.000	5900.000	5400.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 95

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium							
	2-E24-16	5680.000	6500.000	5070.000	9	0	9
	2-E24-2	5665.000	6820.000	4820.000	6	0	6
	2-E24-17	5658.571	5990.000	5350.000	7	0	7
	2-E32-2	5637.273	6350.000	4820.000	11	0	11
	6-49-55B	5610.000	5610.000	5610.000	1	0	1
	2-E25-17	5600.000	5600.000	5600.000	1	0	1
	6-34-42	5600.000	5900.000	5300.000	2	0	2
	2-E33-29	5593.333	6250.000	4920.000	12	0	12
	6-43-43	5587.778	6140.000	4700.000	9	0	9
	2-E28-18	5587.500	6980.000	4600.000	4	0	4
	6-55-55	5580.000	5580.000	5580.000	1	0	1
	6-26-35C	5572.000	5960.000	4700.000	5	0	5
	2-E33-34	5550.000	6100.000	4900.000	3	0	3
	2-E33-36	5525.000	5600.000	5400.000	4	0	4
	6-35-70	5500.000	6300.000	4700.000	2	0	2
	6-40-62	5500.000	5600.000	5400.000	2	0	2
	6-26-33	5486.667	5900.000	4600.000	6	0	6
	2-E26-9	5430.000	7100.000	4700.000	5	0	5
	2-E27-15	5430.000	5650.000	5290.000	3	0	3
	2-E33-24	5430.000	5430.000	5430.000	1	0	1
	2-E33-41	5425.000	5550.000	5300.000	2	0	2
	2-E18-4	5418.889	5650.000	5000.000	9	0	9
	2-E27-16	5400.000	6000.000	4800.000	3	0	3
	6-40-40B	5400.000	6800.000	4000.000	2	0	2
	2-E25-22	5378.571	6040.000	4920.000	7	0	7
	2-E28-21	5370.000	5370.000	5370.000	1	0	1
	2-E17-16	5364.545	7390.000	3880.000	11	0	11
	2-E33-33	5356.667	5570.000	5200.000	3	0	3
	6-36-61A	5350.000	5500.000	5200.000	2	0	2
	2-E25-18	5321.667	5890.000	4100.000	12	0	12
	2-E28-27	5315.000	6400.000	4090.000	12	0	12
	2-E33-30	5304.545	5800.000	4500.000	11	0	11
	2-E32-1	5290.000	5510.000	5070.000	2	0	2
	2-E33-31	5275.000	5790.000	4850.000	4	0	4
	2-E17-12	5263.333	5810.000	4980.000	3	0	3
	2-E25-43	5233.333	5900.000	4300.000	3	0	3
	2-E34-8	5233.333	5700.000	4600.000	3	0	3
	2-E33-8	5230.000	5230.000	5230.000	1	0	1
	2-E33-5	5200.000	5210.000	5190.000	2	0	2
	6-42-39B	5200.000	5500.000	4900.000	2	0	2
	2-E25-9	5190.000	5190.000	5190.000	1	0	1
	2-E27-13	5190.000	5500.000	4650.000	3	0	3
	2-E25-6	5180.000	5180.000	5180.000	1	0	1
	2-E17-13	5163.333	5400.000	4990.000	3	0	3
	2-E32-5	5161.667	5850.000	4600.000	6	0	6
	2-E26-11	5141.667	5800.000	4700.000	6	0	6
	2-E27-12	5123.333	5320.000	4950.000	3	0	3
	2-E25-31	5105.000	5970.000	4400.000	28	0	28
	2-E33-35	5100.000	5300.000	4900.000	2	0	2
	6-43-40	5100.000	5700.000	4500.000	2	0	2
	2-E18-2	5091.000	5900.000	4560.000	10	0	10
	6-43-45	5090.000	5580.000	4840.000	6	0	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 96

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium							
	2-E26-13	5066.667	5600.000	4300.000	3	0	3
	2-E27-7	5060.000	5150.000	4970.000	2	0	2
	2-E28-26	5036.000	6490.000	4400.000	10	0	10
	2-E18-3	5021.000	5500.000	4620.000	10	0	10
	2-E33-28	5011.667	5800.000	4420.000	12	0	12
	2-E25-33	4974.231	5740.000	4340.000	26	0	26
	2-E33-1	4965.000	5120.000	4810.000	2	0	2
	6-25-33A	4964.000	5430.000	4200.000	5	0	5
	2-E33-10	4935.000	5450.000	4420.000	2	0	2
	2-E25-40	4922.500	5150.000	4740.000	4	0	4
	2-E26-10	4910.000	5450.000	4600.000	5	0	5
	6-43-42J	4906.250	5350.000	4560.000	8	0	8
	2-E24-20	4900.000	4900.000	4900.000	1	0	1
	2-E33-32	4887.500	5000.000	4750.000	4	0	4
	2-E17-18	4878.182	5500.000	4150.000	11	0	11
	2-E26-5	4870.000	4870.000	4870.000	1	0	1
	2-E33-3	4870.000	4870.000	4870.000	1	0	1
	2-E26-12	4866.667	5000.000	4700.000	3	0	3
	2-E33-38	4850.000	4900.000	4800.000	2	0	2
	2-E25-36	4835.000	5600.000	4230.000	12	0	12
	2-E25-29P	4818.800	5950.000	4210.000	25	0	25
	2-E33-21	4810.000	4810.000	4810.000	1	0	1
	6-43-41E	4806.667	5200.000	4100.000	6	0	6
	6-42-39A	4800.000	4900.000	4700.000	2	0	2
	6-44-42	4732.500	5190.000	4400.000	8	0	8
	6-44-43B	4723.333	5300.000	3500.000	9	0	9
	2-E24-4	4700.000	4700.000	4700.000	1	0	1
	6-40-39	4648.333	5370.000	4100.000	6	0	6
	2-E24-19	4630.000	4940.000	4450.000	3	0	3
	2-E25-41	4582.500	4950.000	4330.000	4	0	4
	6-53-47A	4500.000	4500.000	4500.000	1	0	1
	6-41-40	4251.429	4700.000	3800.000	7	0	7
	6-55-50C	4250.000	4800.000	3700.000	2	0	2
	2-E25-27	4240.000	4420.000	3980.000	5	0	5
	2-E25-34	4142.000	4800.000	3830.000	10	0	10
	2-E25-39	4140.000	4600.000	3500.000	5	0	5
	6-43-41F	4137.500	4280.000	4030.000	4	0	4
	2-E25-26	4106.667	4560.000	3800.000	12	0	12
	2-E25-38	4049.231	5200.000	3750.000	13	0	13
	2-E25-32P	3991.538	4660.000	3150.000	26	0	26
	6-45-42	3973.333	4420.000	3500.000	3	0	3
	2-E25-28	3970.909	4500.000	3520.000	11	0	11
	2-E25-37	3965.385	4300.000	3600.000	13	0	13
	2-E25-25	3908.214	4560.000	3200.000	28	0	28
	6-42-42B	3753.750	4130.000	3200.000	8	0	8
	6-45-69A	3750.000	4000.000	3500.000	2	0	2
	6-42-40B	3675.000	4150.000	3200.000	2	0	2
	6-49-57B	3490.000	3490.000	3490.000	1	0	1
	6-42-40A	2818.889	4100.000	2190.000	9	0	9
	6-42-41	2400.000	2600.000	2200.000	2	0	2
Potassium, filtered							
	6-50-53A	14522.222	15400.000	13500.000	9	0	9

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 97

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium, filtered							
	6-49-55A	11311.000	13100.000	9580.000	10	0	10
	2-E25-20	10411.111	12600.000	4200.000	9	0	9
	2-E25-19	9018.750	10600.000	7800.000	8	0	8
	6-52-54	8990.000	8990.000	8990.000	1	0	1
	2-E34-7	8700.000	8700.000	8700.000	1	0	1
	6-52-57	8530.000	8530.000	8530.000	1	0	1
	2-E25-24	8225.000	8630.000	7630.000	8	0	8
	2-E17-1	8172.000	9450.000	7140.000	5	0	5
	2-E34-5	7945.714	8550.000	7270.000	7	0	7
	2-E17-20	7766.250	8290.000	7100.000	8	0	8
	2-E34-1	7730.000	8130.000	7330.000	2	0	2
	2-E34-6	7696.667	8100.000	7410.000	6	0	6
	6-47-46A	7675.000	8070.000	6960.000	4	0	4
	6-57-29A	7470.000	7470.000	7470.000	1	0	1
	2-E25-30P	7460.000	10100.000	6460.000	7	0	7
	2-E34-2	7436.000	8170.000	6500.000	10	0	10
	6-24-33	7276.667	8110.000	6780.000	9	0	9
	6-60-57	7240.000	7240.000	7240.000	1	0	1
	6-24-34B	7206.923	7550.000	6410.000	13	0	13
	6-24-34A	7188.889	7650.000	6590.000	9	0	9
	2-E33-40	7180.000	7180.000	7180.000	1	0	1
	6-23-34	7141.818	7710.000	6810.000	11	0	11
	2-E27-8	7127.143	7930.000	6520.000	7	0	7
	2-E25-21	7056.667	8410.000	5100.000	6	0	6
	6-24-34C	7047.500	7700.000	6470.000	12	0	12
	2-E17-9	6960.000	7860.000	6420.000	8	0	8
	2-E17-15	6952.000	8210.000	5600.000	10	0	10
	2-E35-1	6920.000	6920.000	6920.000	1	0	1
	6-47-50	6903.333	7220.000	6580.000	3	0	3
	6-53-50	6900.000	6900.000	6900.000	1	0	1
	6-38-65	6885.000	7070.000	6700.000	2	0	2
	2-E25-23	6880.000	7820.000	6350.000	5	0	5
	2-E17-6	6817.778	7470.000	6280.000	9	0	9
	2-E17-14	6815.556	7510.000	4900.000	9	0	9
	2-E28-23	6783.333	7530.000	6260.000	3	0	3
	2-E17-19	6730.000	7240.000	6220.000	6	0	6
	6-24-35	6696.667	7920.000	5940.000	12	0	12
	2-E17-5	6694.444	8120.000	5610.000	9	0	9
	2-E27-9	6570.000	7440.000	5900.000	9	0	9
	2-E34-3	6537.143	7200.000	5800.000	7	0	7
	2-E28-13	6422.500	6570.000	6140.000	4	0	4
	2-E33-39	6410.000	6410.000	6410.000	1	0	1
	6-40-33A	6320.000	6320.000	6320.000	1	0	1
	2-E25-42	6300.000	6300.000	6300.000	1	0	1
	2-E26-9	6300.000	7000.000	5600.000	2	0	2
	2-E27-11	6300.000	6300.000	6300.000	1	0	1
	6-49-57A	6270.000	6270.000	6270.000	1	0	1
	6-25-34C	6253.636	6660.000	5980.000	11	0	11
	6-26-35A	6235.000	6700.000	5780.000	4	0	4
	6-25-34A	6202.500	6590.000	6010.000	4	0	4
	2-E13-5	6190.000	6540.000	5910.000	4	0	4
	2-E17-17	6157.143	6850.000	5710.000	7	0	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 98

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium, filtered							
	2-E32-4	6121.000	6400.000	5950.000	10	0	10
	2-E18-1	6120.000	6980.000	4700.000	9	0	9
	2-E27-10	6118.333	7220.000	5520.000	6	0	6
	6-47-60	6023.333	6390.000	5540.000	3	0	3
	6-37-43	6013.333	8520.000	4550.000	3	0	3
	2-E24-17	5971.667	6660.000	5520.000	6	0	6
	2-E28-18	5970.000	6550.000	5590.000	4	0	4
	2-E24-18	5962.000	6210.000	5620.000	5	0	5
	2-E27-14	5920.000	6240.000	5600:000	2	0	2
	2-E27-5	5900.000	5900.000	5900.000	1	0	1
	6-49-55B	5890.000	5890.000	5890.000	1	0	1
	2-E13-14	5887.500	6090.000	5670.000	4	0	4
	6-26-34	5877.500	6240.000	5320.000	4	0	4
	6-55-55	5830.000	5830.000	5830.000	1	0	1
	6-33-56	5800.000	5800.000	5800.000	1	0	1
	2-E33-33	5780.000	6000.000	5560.000	2	0	2
	2-E33-15	5750.000	5750.000	5750.000	1	0	1
	2-E33-34	5750.000	6200.000	5300.000	2	0	2
	2-E24-12	5740.000	5980.000	5500.000	2	0	2
	2-E25-18	5707.778	6330.000	5120.000	9	0	9
	6-25-34B	5702.500	6090.000	5210.000	4	0	4
	6-34-51	5700.000	5700.000	5700.000	1	0	1
	6-26-33	5695.000	6100.000	5000.000	6	0	6
	2-E25-35	5692.727	6570.000	4880.000	11	0	11
	6-26-35C	5684.000	5930.000	5000.000	5	0	5
	2-E32-3	5676.667	6640.000	5080.000	6	0	6
	2-E33-29	5667.143	6620.000	4970.000	7	0	7
	2-E32-1	5666.667	6200.000	5220.000	3	0	3
	6-43-43	5640.000	5810.000	5480.000	7	0	7
	6-35-70	5633.333	5990.000	5370.000	3	0	3
	6-40-62	5633.333	5890.000	5420.000	3	0	3
	2-E24-16	5618.571	6340.000	5300.000	7	0	7
	2-E24-2	5614.286	7010.000	4810.000	7	0	7
	2-E33-38	5580.000	5670.000	5490.000	2	0	2
	2-E33-18	5565.000	5620.000	5510.000	2	0	2
	2-E18-4	5558.750	5980.000	5390.000	8	0	8
	2-E17-16	5547.500	7020.000	4600.000	8	0	8
	2-E33-3	5520.000	5880.000	5080.000	3	0	3
	2-E33-30	5508.000	5920.000	4700.000	10	0	10
	2-E34-8	5500.000	5500.000	5500.000	1	0	1
	6-35-66	5482.500	5780.000	5220.000	4	0	4
	2-E28-21	5446.000	5730.000	5200.000	5	0	5
	2-E17-12	5442.500	5840.000	4890.000	4	0	4
	2-E32-2	5421.667	5740.000	5080.000	6	0	6
	2-E28-28	5400.000	5400.000	5400.000	1	0	1
	6-24-46	5396.667	5820.000	5080.000	3	0	3
	2-E24-8	5390.000	5390.000	5390.000	1	0	1
	6-59-58	5390.000	5390.000	5390.000	1	0	1
	2-E28-27	5382.857	6050.000	5050.000	7	0	7
	2-E33-10	5365.000	5690.000	5040.000	2	0	2
	6-36-61A	5347.500	5840.000	4980.000	4	0	4
	2-E27-15	5310.000	5310.000	5310.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 99

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium, filtered							
	6-43-42J	5302.000	5610.000	4750.000	5	0	5
	2-E26-11	5300.000	5700.000	4900.000	2	0	2
	2-E32-5	5300.000	5300.000	5300.000	2	0	2
	6-39-39	5300.000	5830.000	4770.000	2	0	2
	2-E25-31	5270.000	5970.000	4640.000	25	0	25
	2-E33-28	5267.778	5980.000	4800.000	9	0	9
	2-E33-5	5255.000	5570.000	4990.000	4	0	4
	2-E27-12	5250.000	5300.000	5200.000	2	0	2
	2-E27-13	5250.000	5400.000	5100.000	2	0	2
	2-E25-22	5242.500	5860.000	4780.000	8	0	8
	2-E28-26	5230.000	5860.000	4620.000	7	0	7
	2-E18-2	5124.000	5770.000	4790.000	10	0	10
	2-E33-24	5120.000	5130.000	5110.000	2	0	2
	2-E33-1	5112.000	5610.000	4650.000	5	0	5
	6-44-64	5068.000	5650.000	4710.000	5	0	5
	6-43-45	5050.000	5340.000	4890.000	5	0	5
	2-E33-21	5045.000	5430.000	4660.000	2	0	2
	6-20-39	5040.000	5160.000	4920.000	2	0	2
	6-25-33A	5026.000	5360.000	4100.000	5	0	5
	2-E17-13	4973.333	5250.000	4830.000	3	0	3
	2-E18-3	4972.000	5310.000	3900.000	10	0	10
	6-54-48	4970.000	4970.000	4970.000	1	0	1
	2-E33-31	4963.333	5020.000	4870.000	3	0	3
	2-E17-18	4952.500	5600.000	4500.000	8	0	8
	6-32-43	4940.000	4940.000	4940.000	1	0	1
	2-E26-10	4933.333	5100.000	4800.000	3	0	3
	6-47-35A	4930.000	4930.000	4930.000	1	0	1
	6-43-41E	4920.000	5060.000	4780.000	2	0	2
	2-E33-35	4900.000	4900.000	4900.000	1	0	1
	2-E33-8	4895.000	4980.000	4810.000	2	0	2
	2-E33-32	4893.333	5000.000	4780.000	3	0	3
	2-E25-29P	4875.000	5700.000	4370.000	22	0	22
	2-E27-7	4870.000	4870.000	4870.000	1	0	1
	2-E25-33	4867.619	5720.000	4200.000	21	0	21
	6-40-39	4858.000	5430.000	4300.000	5	0	5
	2-E24-19	4850.000	4850.000	4850.000	1	0	1
	6-53-47B	4850.000	4850.000	4850.000	1	0	1
	6-44-42	4846.667	5310.000	4200.000	6	0	6
	2-E26-12	4800.000	4800.000	4800.000	1	0	1
	6-44-43B	4792.857	5100.000	4600.000	7	0	7
	2-E25-36	4681.429	6200.000	3780.000	7	0	7
	6-31-31	4590.000	4590.000	4590.000	1	0	1
	6-49-57B	4580.000	4580.000	4580.000	1	0	1
	6-41-40	4544.000	4900.000	4260.000	5	0	5
	2-E26-13	4500.000	4500.000	4500.000	1	0	1
	6-46-21B	4500.000	4500.000	4500.000	1	0	1
	2-E25-40	4460.000	4460.000	4460.000	1	0	1
	2-E25-39	4433.333	4700.000	4300.000	3	0	3
	6-55-50C	4373.333	4580.000	4230.000	3	0	3
	6-53-47A	4360.000	4360.000	4360.000	1	0	1
	2-E25-41	4330.000	4360.000	4300.000	2	0	2
	6-45-42	4290.000	4530.000	3920.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 100

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium, filtered							
	2-E25-27	4260.000	4430.000	4000.000	5	0	5
	2-E25-34	4200.000	4510.000	3980.000	7	0	7
	2-E25-26	4178.889	4730.000	3700.000	9	0	9
	6-43-41F	4126.667	4450.000	3920.000	3	0	3
	2-E25-32P	4085.000	5260.000	3500.000	26	0	26
	2-E25-37	4052.000	4500.000	3810.000	10	0	10
	6-42-42B	4045.000	4400.000	3680.000	6	0	6
	2-E25-38	4031.818	4700.000	3750.000	11	0	11
	2-E25-25	3872.414	4500.000	2900.000	29	0	29
	2-E25-28	3833.333	4200.000	3510.000	9	0	9
	2-E25-43	3800.000	3800.000	3800.000	1	0	1
	6-54-34	3730.000	3730.000	3730.000	1	0	1
	6-54-49	3510.000	3540.000	3480.000	2	0	2
	6-45-69A	3435.000	3490.000	3380.000	2	0	2
	6-42-40A	2667.143	3070.000	2380.000	7	0	7
Potassium-40							
	2-E33-35	240.350	469.000	469.000	1	1	2
	2-E18-2	226.000	226.000	226.000	1	0	1
	2-E13-14	221.000	221.000	221.000	1	0	1
	2-E27-9	221.000	221.000	221.000	1	0	1
	2-E18-4	199.000	199.000	199.000	1	0	1
	2-E17-13	189.500	217.000	162.000	2	0	2
	2-E17-15	186.000	186.000	186.000	1	0	1
	2-E17-18	183.000	183.000	183.000	1	0	1
	2-E17-5	179.000	179.000	179.000	1	0	1
	2-E17-12	175.000	175.000	175.000	1	0	1
	2-E27-10	174.000	174.000	174.000	1	0	1
	2-E24-16	165.000	165.000	165.000	1	0	1
	2-E27-16	164.000	164.000	164.000	1	0	1
	2-E18-1	159.000	159.000	159.000	1	0	1
	2-E25-18	154.000	154.000	154.000	1	0	1
	2-E17-17	150.000	150.000	150.000	1	0	1
	2-E28-18	150.000	150.000	150.000	1	0	1
	2-E33-29	147.700	217.000	78.400	2	0	2
	2-E33-41	146.000	146.000	146.000	1	0	1
	2-E32-3	144.110	218.000	206.000	2	1	3
	2-E24-18	130.000	130.000	130.000	1	0	1
	6-63-25A	126.000	126.000	126.000	1	0	1
	6-40-33A	116.360	234.000	94.900	3	2	5
	2-E28-26	109.350	141.000	77.700	2	0	2
	2-E34-2	107.750	191.000	191.000	1	1	2
	6-35-70	106.575	149.000	125.000	3	1	4
	2-E32-2	104.050	132.000	76.100	2	0	2
	2-E33-36	103.000	103.000	103.000	1	0	1
	6-24-33	98.700	211.000	58.600	4	0	4
	2-E33-34	98.100	110.000	86.200	2	0	2
	2-E32-5	97.500	174.000	174.000	1	1	2
	2-E17-20	90.800	90.800	90.800	1	0	1
	2-E34-8	90.800	90.800	90.800	1	0	1
	2-E17-1	83.900	83.900	83.900	1	0	1
	2-E34-5	81.500	81.500	81.500	1	0	1
	2-E33-10	81.200	81.200	81.200	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Potassium-40							
	2-E33-37	76.900	76.900	76.900	1	0	1
	2-E33-30	73.900	114.000	114.000	1	1	2
	6-38-65	72.175	118.000	105.000	2	2	4
	2-E25-36	62.900	62.900	62.900	1	0	1
	2-E27-8	62.900	62.900	62.900	1	0	1
	2-E25-19	59.300	59.300	59.300	1	0	1
	2-E28-27	59.300	80.500	80.500	1	1	2
	2-E33-28	53.550	82.000	82.000	1	1	2
	6-32-43	51.726	100.000	51.300	2	3	5
Pyrene							
	2-E33-3	8.500	13.000	13.000	1	1	2
Radium							
	2-E25-17	1.650	1.650	1.650	1	0	1
	2-E25-9	1.520	1.520	1.520	1	0	1
	2-E25-43	1.050	1.050	1.050	1	0	1
	2-E27-14	.931	1.580	.282	2	0	2
	2-E16-2	.684	1.190	.177	2	0	2
	6-40-40B	.666	.666	.666	1	0	1
	2-E18-1	.500	2.150	.207	7	1	8
	2-E28-12	.495	.495	.495	1	0	1
	2-E25-6	.493	.493	.493	1	0	1
	6-24-33	.466	.466	.466	1	0	1
	2-E33-32	.450	1.140	1.140	1	2	3
	2-E27-12	.428	1.200	1.200	1	2	3
	2-E17-14	.404	1.080	.188	7	2	9
	2-E25-30P	.390	.517	.295	4	0	4
	2-E27-15	.385	1.060	1.060	1	2	3
	2-E18-2	.372	1.240	.140	7	2	9
	2-E24-19	.365	.757	.210	2	1	3
	2-E17-19	.349	.560	.322	3	1	4
	2-E17-6	.348	.449	.246	2	0	2
	2-E33-33	.347	.871	.871	1	2	3
	2-E34-7	.345	.498	.192	2	0	2
	2-E33-31	.322	1.030	1.030	1	2	3
	2-E27-13	.318	.970	.970	1	2	3
	2-E24-17	.311	.574	.206	4	1	5
	2-E27-11	.301	.705	.705	1	2	3
	6-42-40B	.266	.451	.451	1	1	2
	2-E24-18	.265	.614	.193	3	1	4
	2-E26-5	.264	.264	.264	1	0	1
	2-E24-16	.262	.551	.285	3	2	5
	2-E32-5	.256	.545	.386	2	2	4
	2-E26-11	.255	.457	.167	4	1	5
	2-E26-13	.250	.250	.250	1	0	1
	2-E34-2	.245	.584	.216	5	4	9
	6-43-41E	.244	.416	.163	4	1	5
	2-E35-1	.244	.244	.244	1	0	1
	6-43-40	.244	.244	.244	1	0	1
	2-E18-4	.242	.753	.199	4	4	8
	2-E34-8	.238	.534	.534	1	2	3
	2-E18-3	.237	.701	.138	6	3	9
	6-23-34	.234	.364	.168	2	1	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Radium							
	6-43-41G	.231	.231	.231	1	0	1
	6-43-41F	.218	.413	.154	3	1	4
	2-E25-11	.213	.290	.290	1	1	2
	2-E25-42	.210	.269	.269	1	1	2
	2-E17-20	.194	.561	.297	3	4	7
	2-E26-10	.193	.342	.166	3	1	4
	2-E24-20	.192	.192	.192	1	0	1
	2-E25-35	.192	.551	.140	6	5	11
	6-42-42B	.190	.508	.145	3	4	7
	6-41-40	.189	.414	.116	6	2	8
	2-E25-29P	.189	.498	.238	6	5	11
	2-E27-16	.185	.204	.165	2	0	2
	6-44-42	.175	.579	.189	3	4	7
	6-42-39B	.170	.170	.170	1	0	1
	2-E28-7	.169	.169	.169	1	0	1
	2-E33-29	.168	.373	.146	5	5	10
	6-25-34C	.165	.317	.317	1	2	3
	2-E33-36	.165	.182	.148	2	0	2
	2-E17-18	.163	.580	.398	3	7	10
	2-E26-12	.159	.159	.159	1	0	1
	2-E34-5	.157	.341	.024	5	3	8
	6-40-40A	.152	.152	.152	1	0	1
	2-E27-8	.148	.316	.146	4	4	8
	6-43-42J	.148	.368	.197	3	5	8
	2-E32-4	.145	.412	.185	5	7	12
	2-E34-3	.145	.316	.188	4	3	7
	6-40-39	.144	.373	.373	1	5	6
	2-E32-2	.142	.382	.240	4	5	9
	2-E34-6	.140	.605	-.038	2	5	7
	2-E32-3	.140	.303	.145	5	4	9
	6-24-34A	.137	.312	.312	1	2	3
	2-E25-31	.130	.537	.148	4	10	14
	2-E28-26	.129	.325	.206	2	8	10
	2-E25-41	.128	.411	.411	1	3	4
	6-24-35	.128	.224	.224	1	2	3
	2-E25-33	.127	.296	.155	5	8	13
	6-43-45	.125	.198	.154	3	3	6
	2-E26-9	.125	.219	.219	1	3	4
	2-E25-34	.124	.502	.214	2	6	8
	2-E17-16	.124	.411	.189	3	7	10
	2-E27-9	.124	.337	.235	3	6	9
	2-E17-17	.120	.399	.147	3	6	9
	2-E28-28	.118	.179	.163	2	1	3
	2-E25-40	.116	.336	.336	1	3	4
	6-24-34B	.115	.261	.261	1	2	3
	2-E33-5	.113	.179	.179	1	1	2
	2-E35-2	.113	.251	.170	3	2	5
	2-E33-30	.109	.218	.184	3	6	9
	2-E17-15	.108	.301	.195	4	7	11
	6-44-43B	.103	.286	.205	2	4	6
	2-E27-10	.100	.307	.208	2	6	8
	2-E33-37	.095	.151	.151	1	1	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 103

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Radium							
	2-E17-9	.089	.232	.160	2	5	7
	2-E25-19	.088	.222	.197	2	2	4
	2-E28-13	.084	.160	.160	1	1	2
	2-E17-5	.078	.178	.139	2	8	10
	2-E28-27	.071	.205	.151	2	9	11
	2-E25-32P	.067	.213	.175	2	13	15
	2-E25-18	.065	.275	.173	2	7	9
	2-E25-38	.062	.199	.175	2	3	5
	2-E25-22	.056	.183	.183	1	4	5
	2-E25-20	.040	.167	.167	1	8	9
	2-E33-28	.040	.214	.214	1	10	11
	2-E25-36	.036	.252	.252	1	6	7
	2-E25-28	.035	.186	.186	1	7	8
	2-E25-26	.028	.195	.195	1	7	8
	6-43-43	.024	.194	.194	1	6	7
	2-E25-25	.019	.176	.176	1	12	13
Ruthenium-106							
	2-E17-15	300.630	885.000	87.200	4	2	6
	2-E24-12	195.169	547.000	74.800	9	2	11
	2-E17-5	183.868	399.000	150.000	15	8	23
	2-E17-14	107.271	438.000	65.500	4	3	7
	2-E17-2	75.691	235.000	82.100	3	4	7
	2-E25-30P	60.025	141.000	141.000	1	3	4
	2-E17-13	40.920	116.000	55.900	7	14	21
	2-E25-18	30.686	61.900	61.900	1	6	7
	2-E17-12	28.912	90.600	65.200	4	14	18
	2-E25-37	27.900	27.900	27.900	1	0	1
	6-24-35	25.534	51.000	37.400	2	3	5
	2-E25-33	24.023	74.900	74.900	1	3	4
	2-E24-13	23.000	71.800	71.800	1	2	3
	2-E17-17	21.266	94.100	-41.000	2	5	7
	2-E26-11	16.800	16.800	16.800	1	0	1
	2-E34-7	13.920	34.500	34.500	1	2	3
	6-47-60	13.202	52.200	41.300	2	4	6
	6-54-48	12.195	48.300	48.300	1	5	6
	2-E27-8	11.929	44.800	44.800	1	6	7
	6-24-33	11.375	78.800	56.400	2	10	12
	2-E34-8	10.317	33.800	-11.600	2	1	3
	2-E16-2	6.013	56.400	56.400	1	16	17
	2-E28-27	5.570	59.300	59.300	1	9	10
	6-42-40B	5.069	65.800	65.800	1	17	18
	6-35-70	4.716	46.500	46.500	1	8	9
	2-E25-11	3.851	59.700	47.800	2	16	18
	2-E17-16	3.848	58.100	58.100	1	7	8
	6-55-50C	3.642	50.700	50.700	1	5	6
	6-32-43	3.044	50.500	50.500	1	13	14
	6-34-42	1.450	1.450	1.450	1	0	1
	2-E25-41	.800	36.600	36.600	1	2	3
	2-E24-11	-2.211	50.700	50.700	1	6	7
	2-E33-28	-7.144	62.500	62.500	1	9	10
	2-E27-16	-8.350	3.600	3.600	1	1	2
	6-36-61A	-8.490	-8.490	-8.490	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 104

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Ruthenium-106							
	2-E26-9	-13.800	-13.800	-13.800	1	0	1
	2-E24-16	-20.900	-12.400	-12.400	1	1	2
Selenium							
	6-50-53A	33.000	33.000	33.000	1	0	1
	2-E18-3	11.229	48.600	48.600	1	6	7
	6-52-54	10.800	10.800	10.800	1	0	1
	2-E25-38	8.333	10.000	10.000	1	5	6
	2-E18-1	8.271	14.900	6.000	7	0	7
	2-E33-31	7.600	5.400	5.400	1	3	4
	2-E28-26	7.333	10.000	5.000	5	4	9
	2-E28-18	6.667	5.000	5.000	1	2	3
	2-E32-4	6.417	7.000	7.000	1	11	12
	2-E25-33	6.400	6.800	5.000	2	10	12
	2-E25-29P	6.350	6.200	6.200	1	11	12
	2-E17-16	6.333	6.000	6.000	2	7	9
	2-E34-5	6.333	6.000	5.000	4	5	9
	2-E34-2	6.311	9.000	5.000	6	3	9
	2-E25-31	6.071	5.000	5.000	1	13	14
	2-E33-30	5.600	5.000	5.000	1	9	10
	2-E18-2	5.488	8.900	8.900	1	7	8
	2-E34-7	5.467	6.400	6.400	1	2	3
	6-23-34	5.111	6.000	6.000	1	8	9
	2-E25-20P	5.000	5.000	5.000	1	4	5
	2-E28-21	5.000	5.000	5.000	1	0	1
	6-24-34A	5.000	5.000	5.000	1	8	9
	2-E34-1	3.967	5.000	1.900	2	1	3
	6-52-57	3.400	3.400	3.400	1	0	1
	2-E33-38	2.900	3.200	2.600	2	0	2
	2-E33-39	2.700	2.700	2.700	1	0	1
	6-49-55A	2.400	2.400	2.400	1	0	1
	2-E33-24	2.300	2.300	2.300	1	0	1
	6-47-50	2.000	2.000	2.000	1	0	1
	6-55-55	1.600	1.600	1.600	1	0	1
	6-49-57B	1.500	1.500	1.500	1	0	1
	6-50-53B	1.500	1.600	1.400	2	0	2
	6-49-55B	1.200	1.200	1.200	1	0	1
	6-49-57A	1.100	1.100	1.100	1	0	1
Selenium, filtered							
	6-50-53A	23.500	27.000	19.000	4	0	4
	6-52-54	12.600	12.600	12.600	1	0	1
	2-E18-1	7.413	10.700	6.000	8	0	8
	6-52-57	7.000	7.000	7.000	1	0	1
	2-E33-31	6.950	2.800	2.800	1	3	4
	2-E32-3	6.875	5.000	5.000	1	7	8
	2-E33-32	6.550	1.200	1.200	1	3	4
	2-E28-26	6.500	7.000	5.000	2	6	8
	2-E34-5	6.478	7.300	6.000	2	7	9
	2-E32-4	6.417	7.000	7.000	1	11	12
	2-E17-16	6.250	9.000	6.000	2	6	8
	2-E34-2	6.222	8.000	5.000	4	5	9
	6-47-46A	6.000	7.000	7.000	1	1	2
	2-E34-6	5.714	5.000	5.000	1	6	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 105

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Selenium, filtered							
	2-E34-7	5.500	6.500	6.500	1	2	3
	2-E18-2	5.250	7.000	7.000	1	7	8
	2-E28-21	5.000	5.000	5.000	1	2	3
	6-36-61A	5.000	5.000	5.000	1	1	2
	2-E34-1	4.650	7.000	2.300	2	0	2
	6-49-55A	4.633	6.000	2.900	2	1	3
	6-47-50	4.233	2.700	2.700	1	2	3
	2-E33-38	3.050	3.100	3.000	2	0	2
	2-E33-39	2.400	2.400	2.400	1	0	1
	2-E33-18	2.100	2.100	2.100	1	0	1
	2-E33-24	1.900	1.900	1.900	1	0	1
	2-E33-15	1.400	1.400	1.400	1	0	1
	6-49-57A	1.400	1.400	1.400	1	0	1
	6-55-55	1.300	1.300	1.300	1	0	1
Silicon							
	2-E25-17	73600.000	73600.000	73600.000	1	0	1
	2-E16-2	54300.000	54300.000	54300.000	1	0	1
	2-E25-6	44800.000	44800.000	44800.000	1	0	1
	2-E25-9	35100.000	35100.000	35100.000	1	0	1
	2-E25-23	32200.000	32200.000	32200.000	1	0	1
	2-E25-24	31250.000	32600.000	30000.000	4	0	4
	2-E25-11	28700.000	28700.000	28700.000	1	0	1
	2-E25-21	26600.000	26600.000	26600.000	1	0	1
	2-E25-30P	26500.000	29300.000	23800.000	4	0	4
	2-E25-20	24280.000	27500.000	22500.000	5	0	5
	2-E25-19	22500.000	22500.000	22500.000	1	0	1
	2-E17-6	22475.000	25800.000	20100.000	4	0	4
	6-42-40B	21700.000	21700.000	21700.000	1	0	1
	6-24-34B	20828.571	24600.000	19200.000	7	0	7
	2-E27-9	20700.000	21900.000	20000.000	6	0	6
	6-23-34	20237.500	21700.000	19100.000	8	0	8
	2-E17-9	20200.000	20700.000	19600.000	5	0	5
	6-25-34C	20057.143	22700.000	18400.000	7	0	7
	2-E27-8	20050.000	21400.000	19500.000	4	0	4
	6-24-35	19750.000	21700.000	17800.000	8	0	8
	6-24-33	19716.667	20900.000	18600.000	6	0	6
	6-24-34A	19716.667	21700.000	18700.000	6	0	6
	2-E34-1	19700.000	19700.000	19700.000	1	0	1
	2-E17-20	19616.667	22300.000	18500.000	6	0	6
	6-24-34C	19587.500	21800.000	18800.000	8	0	8
	6-26-33	19550.000	19700.000	19400.000	2	0	2
	2-E25-33	19511.765	21500.000	18200.000	17	0	17
	2-E25-22	19425.000	21200.000	18300.000	4	0	4
	2-E34-2	19420.000	20800.000	17900.000	5	0	5
	2-E25-40	19400.000	19400.000	19400.000	1	0	1
	6-43-41F	19333.333	20100.000	18500.000	3	0	3
	2-E18-2	19260.000	19800.000	18200.000	5	0	5
	6-25-34B	19100.000	19100.000	19100.000	1	0	1
	2-E17-18	19060.000	20100.000	18000.000	5	0	5
	2-E17-1	19033.333	19300.000	18500.000	3	0	3
	6-25-34A	19000.000	19000.000	19000.000	1	0	1
	2-E17-19	18920.000	21100.000	16700.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 106

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Silicon							
	2-E34-3	18850.000	20100.000	17900.000	4	0	4
	2-E34-6	18725.000	19900.000	18100.000	4	0	4
	2-E25-29P	18700.000	22500.000	17500.000	18	0	18
	2-E32-3	18700.000	20000.000	17400.000	2	0	2
	6-26-35A	18700.000	18700.000	18700.000	1	0	1
	2-E17-17	18680.000	19200.000	18500.000	5	0	5
	2-E28-27	18660.000	19900.000	17700.000	5	0	5
	2-E27-11	18600.000	18600.000	18600.000	1	0	1
	2-E27-14	18500.000	18500.000	18500.000	1	0	1
	2-E33-8	18500.000	18500.000	18500.000	1	0	1
	2-E17-14	18440.000	18800.000	18100.000	5	0	5
	2-E34-5	18400.000	19600.000	16900.000	4	0	4
	6-44-43B	18375.000	19200.000	18000.000	4	0	4
	2-E32-5	18300.000	18300.000	18300.000	1	0	1
	2-E17-15	18200.000	19100.000	17300.000	5	0	5
	2-E18-4	18160.000	19100.000	17100.000	5	0	5
	2-E24-2	18150.000	19400.000	17400.000	4	0	4
	2-E24-18	18125.000	18700.000	17500.000	4	0	4
	6-26-34	18100.000	18100.000	18100.000	1	0	1
	6-40-39	18066.667	19100.000	16500.000	3	0	3
	2-E28-26	18025.000	18800.000	17100.000	4	0	4
	2-E17-5	18020.000	19000.000	17300.000	5	0	5
	2-E33-31	18000.000	18000.000	18000.000	1	0	1
	2-E24-17	17975.000	18400.000	17600.000	4	0	4
	2-E25-18	17925.000	18500.000	17100.000	4	0	4
	2-E24-16	17900.000	20300.000	16300.000	5	0	5
	2-E28-12	17900.000	17900.000	17900.000	1	0	1
	2-E25-35	17880.000	19300.000	17000.000	5	0	5
	2-E33-30	17875.000	18800.000	16600.000	4	0	4
	2-E27-10	17850.000	18700.000	17200.000	4	0	4
	2-E33-29	17850.000	18900.000	16800.000	4	0	4
	2-E18-3	17833.333	19600.000	17000.000	6	0	6
	2-E32-2	17800.000	19500.000	16300.000	4	0	4
	2-E33-5	17800.000	17800.000	17800.000	1	0	1
	2-E17-16	17725.000	18000.000	17500.000	4	0	4
	6-42-42B	17700.000	19200.000	16600.000	4	0	4
	2-E33-21	17600.000	17600.000	17600.000	1	0	1
	2-E33-28	17540.000	18500.000	16700.000	5	0	5
	2-E27-13	17500.000	17500.000	17500.000	1	0	1
	2-E33-1	17500.000	17500.000	17500.000	1	0	1
	2-E25-31	17494.444	20200.000	15800.000	18	0	18
	2-E33-32	17400.000	17400.000	17400.000	1	0	1
	6-43-45	17333.333	17800.000	16600.000	3	0	3
	2-E17-12	17300.000	17300.000	17300.000	1	0	1
	2-E25-41	17250.000	17400.000	17100.000	2	0	2
	2-E32-1	17200.000	17200.000	17200.000	1	0	1
	2-E32-4	17166.667	18800.000	16600.000	6	0	6
	2-E17-13	17100.000	17100.000	17100.000	1	0	1
	2-E27-12	17100.000	17100.000	17100.000	1	0	1
	2-E33-33	17100.000	17100.000	17100.000	1	0	1
	2-E35-1	17100.000	17100.000	17100.000	1	0	1
	2-E27-15	17000.000	17000.000	17000.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 107

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Silicon							
	2-E25-36	16950.000	17500.000	16600.000	4	0	4
	2-E24-19	16900.000	16900.000	16900.000	1	0	1
	2-E28-13	16900.000	16900.000	16900.000	1	0	1
	2-E25-38	16600.000	17200.000	16300.000	6	0	6
	2-E28-18	16600.000	16600.000	16600.000	1	0	1
	2-E25-28	16420.000	17900.000	15200.000	5	0	5
	2-E27-7	16300.000	16300.000	16300.000	1	0	1
	6-44-42	16000.000	16300.000	15700.000	4	0	4
	2-E28-21	15900.000	15900.000	15900.000	1	0	1
	6-43-42J	15675.000	16100.000	15000.000	4	0	4
	2-E25-34	15000.000	15700.000	14200.000	5	0	5
	2-E18-1	14925.000	16200.000	13600.000	4	0	4
	6-41-40	14833.333	15300.000	14600.000	3	0	3
	2-E25-37	14716.667	15000.000	14400.000	6	0	6
	2-E25-26	13980.000	14800.000	13200.000	5	0	5
	2-E25-27	13800.000	14100.000	13600.000	3	0	3
	6-43-43	13640.000	14900.000	11400.000	5	0	5
	6-25-33A	13600.000	13600.000	13600.000	1	0	1
	6-26-35C	13300.000	13300.000	13300.000	1	0	1
	6-43-41E	10010.000	10400.000	9620.000	2	0	2
	2-E25-32P	9938.947	12400.000	8140.000	19	0	19
	2-E25-25	8674.444	11500.000	7340.000	18	0	18
	6-42-40A	4932.500	5750.000	3830.000	4	0	4
Silicon, filtered							
	2-E25-23	31600.000	31600.000	31600.000	2	0	2
	2-E25-24	30980.000	32400.000	29300.000	5	0	5
	2-E25-30P	26833.333	31000.000	24800.000	6	0	6
	2-E25-21	26200.000	27800.000	24600.000	2	0	2
	2-E25-20	25066.667	28300.000	23200.000	6	0	6
	2-E25-19	24550.000	25800.000	23300.000	2	0	2
	6-47-46A	23900.000	23900.000	23900.000	1	0	1
	6-44-64	22350.000	23200.000	21500.000	2	0	2
	2-E17-6	22300.000	26300.000	20300.000	4	0	4
	6-36-61A	22300.000	22300.000	22300.000	1	0	1
	6-45-69A	21100.000	21100.000	21100.000	1	0	1
	6-57-29A	21000.000	21000.000	21000.000	1	0	1
	6-26-33	20800.000	21000.000	20600.000	2	0	2
	2-E17-9	20760.000	21600.000	19600.000	5	0	5
	6-24-34B	20642.857	21300.000	20100.000	7	0	7
	6-40-33A	20500.000	20500.000	20500.000	1	0	1
	2-E27-8	20475.000	21700.000	19600.000	4	0	4
	6-24-33	20450.000	23200.000	19500.000	6	0	6
	6-25-34A	20400.000	20400.000	20400.000	1	0	1
	6-25-34C	20357.143	23300.000	18900.000	7	0	7
	6-31-31	20300.000	20300.000	20300.000	1	0	1
	6-38-65	20300.000	20300.000	20300.000	1	0	1
	2-E27-9	20266.667	20800.000	19600.000	6	0	6
	6-24-34C	20212.500	22300.000	18600.000	8	0	8
	6-45-42	20200.000	21700.000	18700.000	2	0	2
	6-23-34	20157.143	21500.000	18600.000	7	0	7
	6-59-58	20100.000	20100.000	20100.000	1	0	1
	2-E34-2	20080.000	21300.000	19100.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 108

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Silicon, filtered							
	2-E18-2	19920.000	22600.000	18300.000	5	0	5
	2-E17-1	19866.667	21600.000	18900.000	3	0	3
	6-26-35A	19800.000	19800.000	19800.000	1	0	1
	6-24-34A	19760.000	20700.000	19100.000	5	0	5
	6-24-35	19637.500	23400.000	17800.000	8	0	8
	2-E32-3	19600.000	20400.000	18800.000	2	0	2
	6-35-70	19600.000	19800.000	19400.000	2	0	2
	6-47-35A	19600.000	19600.000	19600.000	1	0	1
	6-60-57	19600.000	19600.000	19600.000	1	0	1
	2-E17-20	19500.000	20900.000	18900.000	6	0	6
	6-32-43	19500.000	19500.000	19500.000	1	0	1
	2-E25-33	19393.750	20400.000	18300.000	16	0	16
	6-25-34B	19300.000	19300.000	19300.000	1	0	1
	2-E34-3	19275.000	20900.000	18000.000	4	0	4
	2-E24-17	19125.000	21400.000	17400.000	4	0	4
	2-E24-12	19100.000	19100.000	19100.000	1	0	1
	6-44-43B	19100.000	19800.000	18000.000	4	0	4
	2-E17-14	19020.000	19600.000	18400.000	5	0	5
	2-E25-22	19000.000	21100.000	17800.000	5	0	5
	6-35-66	19000.000	19000.000	19000.000	1	0	1
	2-E25-29P	18981.250	21000.000	17500.000	16	0	16
	2-E28-27	18960.000	20900.000	18100.000	5	0	5
	2-E17-16	18800.000	20100.000	18000.000	4	0	4
	2-E17-18	18740.000	20400.000	18100.000	5	0	5
	2-E25-40	18700.000	18700.000	18700.000	1	0	1
	2-E32-2	18675.000	19500.000	17400.000	4	0	4
	6-43-41F	18666.667	19100.000	18400.000	3	0	3
	2-E17-12	18600.000	18800.000	18400.000	2	0	2
	2-E17-17	18580.000	19300.000	18000.000	5	0	5
	2-E24-18	18575.000	20100.000	17100.000	4	0	4
	6-42-42B	18575.000	20000.000	17200.000	4	0	4
	2-E18-4	18560.000	20300.000	17200.000	5	0	5
	2-E33-30	18525.000	20400.000	16700.000	4	0	4
	2-E27-14	18500.000	18500.000	18500.000	1	0	1
	6-26-34	18500.000	18500.000	18500.000	1	0	1
	2-E25-35	18480.000	18900.000	17800.000	5	0	5
	2-E33-29	18400.000	19700.000	17500.000	4	0	4
	2-E17-5	18340.000	18900.000	17300.000	5	0	5
	2-E17-13	18200.000	18600.000	18000.000	3	0	3
	2-E34-5	18200.000	20000.000	17400.000	4	0	4
	2-E24-16	18180.000	20200.000	17200.000	5	0	5
	2-E17-15	18140.000	18700.000	17700.000	5	0	5
	2-E24-2	18125.000	20300.000	17200.000	4	0	4
	2-E25-18	18120.000	18700.000	17700.000	5	0	5
	2-E18-3	18100.000	19300.000	17200.000	6	0	6
	2-E25-31	18012.500	19900.000	15500.000	16	0	16
	2-E27-11	18000.000	18000.000	18000.000	1	0	1
	2-E32-1	18000.000	18000.000	18000.000	1	0	1
	2-E28-26	17975.000	19300.000	16700.000	4	0	4
	2-E33-28	17975.000	18500.000	17600.000	4	0	4
	2-E33-8	17800.000	17800.000	17800.000	1	0	1
	2-E32-5	17700.000	17700.000	17700.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 109

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Silicon, filtered							
	2-E33-31	17700.000	17700.000	17700.000	1	0	1
	6-40-39	17700.000	19100.000	16500.000	3	0	3
	2-E27-10	17650.000	18400.000	17200.000	4	0	4
	6-49-55A	17633.333	18000.000	17300.000	3	0	3
	2-E28-13	17600.000	18500.000	16700.000	2	0	2
	2-E35-1	17600.000	17600.000	17600.000	1	0	1
	2-E34-6	17575.000	18100.000	17200.000	4	0	4
	2-E28-23	17500.000	17500.000	17500.000	1	0	1
	2-E27-12	17400.000	17400.000	17400.000	1	0	1
	2-E33-21	17400.000	17400.000	17400.000	1	0	1
	2-E33-32	17400.000	17400.000	17400.000	1	0	1
	2-E33-5	17400.000	17400.000	17400.000	1	0	1
	6-46-21B	17400.000	17400.000	17400.000	1	0	1
	6-54-34	17400.000	17400.000	17400.000	1	0	1
	2-E27-13	17200.000	17200.000	17200.000	1	0	1
	2-E33-33	17200.000	17200.000	17200.000	1	0	1
	6-43-45	17166.667	17500.000	17000.000	3	0	3
	2-E25-41	17100.000	17100.000	17100.000	1	0	1
	2-E33-1	17050.000	17400.000	16700.000	2	0	2
	2-E24-19	16900.000	16900.000	16900.000	1	0	1
	2-E25-38	16800.000	17300.000	16500.000	8	0	8
	2-E27-15	16800.000	16800.000	16800.000	1	0	1
	2-E25-36	16625.000	17800.000	15800.000	4	0	4
	6-43-42J	16500.000	17000.000	15900.000	3	0	3
	6-44-42	16500.000	17500.000	15800.000	4	0	4
	2-E32-4	16483.333	17000.000	16200.000	6	0	6
	2-E28-21	16400.000	17000.000	15800.000	2	0	2
	2-E28-18	16300.000	16500.000	16100.000	2	0	2
	2-E17-19	16167.200	21900.000	836.000	5	0	5
	2-E25-28	16080.000	16500.000	15700.000	5	0	5
	2-E27-7	16000.000	16000.000	16000.000	1	0	1
	2-E18-1	15900.000	17300.000	14000.000	4	0	4
	6-50-53A	15800.000	15800.000	15800.000	1	0	1
	2-E25-34	15160.000	16300.000	13700.000	5	0	5
	2-E25-37	14875.000	15200.000	14500.000	8	0	8
	6-41-40	14600.000	15900.000	13900.000	3	0	3
	2-E25-26	14480.000	15800.000	13000.000	5	0	5
	6-26-35C	13900.000	13900.000	13900.000	1	0	1
	2-E25-27	13833.333	14300.000	13600.000	3	0	3
	6-25-33A	13700.000	13700.000	13700.000	1	0	1
	6-53-47B	13700.000	13700.000	13700.000	1	0	1
	6-43-43	13660.000	14500.000	12900.000	5	0	5
	6-55-50C	12100.000	12100.000	12100.000	1	0	1
	6-54-48	11200.000	11200.000	11200.000	1	0	1
	6-54-49	10850.000	11000.000	10700.000	2	0	2
	6-43-41E	10180.000	10400.000	9960.000	2	0	2
	2-E25-32P	9911.053	12000.000	9290.000	19	0	19
	2-E25-25	8503.333	11100.000	7060.000	18	0	18
	6-42-40A	5130.000	6850.000	3950.000	4	0	4
Silver							
	2-E33-10	12.500	15.000	15.000	1	1	2
	6-24-34B	11.750	11.000	11.000	1	11	12

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 110

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Silver, filtered							
	6-24-34A	12.125	27.000	27.000	1	7	8
Sodium							
	2-E25-30P	88042.857	107000.000	66400.000	7	0	7
	6-50-53A	49500.000	49500.000	49500.000	1	0	1
	6-52-57	43100.000	43100.000	43100.000	1	0	1
	2-E25-20	42066.667	53500.000	9700.000	9	0	9
	2-E25-35	40369.231	45400.000	36200.000	13	0	13
	6-40-40A	38500.000	39000.000	38000.000	2	0	2
	6-40-40B	38500.000	40000.000	37000.000	2	0	2
	6-49-55A	38100.000	38100.000	38100.000	1	0	1
	6-49-57A	35100.000	35100.000	35100.000	1	0	1
	2-E25-19	32825.000	35300.000	31000.000	4	0	4
	6-40-39	32783.333	34100.000	31000.000	6	0	6
	2-E28-12	32700.000	32700.000	32700.000	1	0	1
	2-E34-6	30987.500	35300.000	27000.000	8	0	8
	6-41-40	30266.667	31100.000	29000.000	6	0	6
	2-E34-5	29800.000	36300.000	25200.000	10	0	10
	6-42-39B	29500.000	30000.000	29000.000	2	0	2
	2-E17-15	29233.333	39100.000	21000.000	12	0	12
	6-42-39A	28000.000	28000.000	28000.000	1	0	1
	2-E25-33	27952.000	32100.000	24000.000	25	0	25
	2-E32-4	27338.462	30600.000	25900.000	13	0	13
	2-E28-13	27100.000	27700.000	26500.000	2	0	2
	2-E34-1	27066.667	30300.000	23900.000	3	0	3
	6-43-41G	27000.000	27000.000	27000.000	1	0	1
	2-E33-3	26900.000	26900.000	26900.000	1	0	1
	2-E17-9	26842.857	29900.000	23700.000	7	0	7
	2-E18-1	26681.818	28800.000	25000.000	11	0	11
	2-E34-2	26566.667	33300.000	22000.000	9	0	9
	6-25-33A	26220.000	31800.000	20000.000	5	0	5
	2-E32-5	26033.333	28000.000	25000.000	6	0	6
	2-E32-3	25544.444	28000.000	23100.000	9	0	9
	6-43-41E	25500.000	28600.000	20000.000	6	0	6
	2-E17-14	25322.222	31200.000	20000.000	9	0	9
	2-E33-15	25100.000	25100.000	25100.000	1	0	1
	2-E13-14	25000.000	25000.000	25000.000	1	0	1
	2-E25-21	24720.000	31600.000	22000.000	5	0	5
	2-E28-7	24700.000	24700.000	24700.000	1	0	1
	2-E28-26	24677.778	29100.000	22000.000	9	0	9
	2-E25-42	24500.000	25000.000	24000.000	2	0	2
	2-E28-21	24000.000	24000.000	24000.000	1	0	1
	6-47-50	24000.000	24000.000	24000.000	1	0	1
	2-E28-18	23666.667	27400.000	20000.000	3	0	3
	2-E33-39	23500.000	23500.000	23500.000	1	0	1
	2-E28-28	23400.000	24000.000	22000.000	5	0	5
	2-E28-27	23375.000	25500.000	17500.000	12	0	12
	2-E32-2	23309.091	26000.000	20700.000	11	0	11
	2-E17-1	23200.000	28100.000	21000.000	5	0	5
	6-26-34	23200.000	24900.000	20800.000	4	0	4
	6-24-35	23178.571	26600.000	20800.000	14	0	14
	6-25-34C	23161.538	27000.000	20600.000	13	0	13
	6-24-34B	23000.000	28600.000	21600.000	13	0	13

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 111

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sodium							
	2-E25-29P	22726.923	34300.000	18000.000	26	0	26
	6-24-34A	22641.667	26100.000	21100.000	12	0	12
	6-24-34C	22507.143	26200.000	20600.000	14	0	14
	6-26-35A	22500.000	24100.000	20500.000	6	0	6
	6-24-33	22477.778	24100.000	20600.000	9	0	9
	6-23-34	22473.333	25000.000	21300.000	15	0	15
	6-25-34B	22280.000	23500.000	20300.000	5	0	5
	6-25-34A	22240.000	23500.000	21000.000	5	0	5
	2-E17-5	22190.000	29200.000	17000.000	10	0	10
	2-E17-19	22133.333	32600.000	18900.000	6	0	6
	6-26-33	22116.667	24300.000	20300.000	6	0	6
	2-E28-23	22100.000	22100.000	22100.000	1	0	1
	2-E17-16	22050.000	33900.000	14700.000	10	0	10
	2-E34-7	22000.000	22000.000	22000.000	1	0	1
	2-E17-20	21900.000	25300.000	18000.000	10	0	10
	2-E17-12	21766.667	24400.000	20000.000	3	0	3
	2-E33-34	21666.667	22000.000	21000.000	3	0	3
	2-E33-10	21550.000	27100.000	16000.000	2	0	2
	2-E17-17	21380.000	24600.000	17500.000	10	0	10
	2-E32-1	21300.000	21600.000	21000.000	2	0	2
	6-44-43B	21200.000	25200.000	19000.000	9	0	9
	6-34-42	21000.000	21000.000	21000.000	1	0	1
	2-E35-2	20700.000	23000.000	18000.000	5	0	5
	2-E25-40	20612.500	23500.000	15450.000	4	0	4
	2-E33-38	20600.000	20900.000	20300.000	2	0	2
	6-43-40	20500.000	21000.000	20000.000	2	0	2
	6-49-57B	20500.000	20500.000	20500.000	1	0	1
	2-E33-5	20250.000	20800.000	19700.000	2	0	2
	6-43-42J	20066.250	34000.000	9830.000	8	0	8
	6-35-70	20000.000	20000.000	20000.000	1	0	1
	2-E17-6	19785.714	24700.000	14600.000	7	0	7
	2-E25-31	19611.538	26000.000	16000.000	26	0	26
	2-E33-29	19480.000	21000.000	18300.000	10	0	10
	6-26-35C	19440.000	20700.000	18000.000	5	0	5
	2-E25-18	19372.727	22000.000	15600.000	11	0	11
	6-43-41F	19175.000	23000.000	17700.000	4	0	4
	2-E25-17	19100.000	19100.000	19100.000	1	0	1
	6-42-42B	19085.714	21800.000	17600.000	7	0	7
	2-E33-1	19000.000	22900.000	15100.000	2	0	2
	2-E17-13	18866.667	19000.000	18600.000	3	0	3
	2-E25-24	18850.000	22300.000	16700.000	4	0	4
	2-E26-11	18800.000	19000.000	18000.000	5	0	5
	2-E33-30	18427.273	23000.000	14400.000	11	0	11
	6-45-42	18400.000	18800.000	18000.000	2	0	2
	2-E16-2	18350.000	19300.000	17400.000	2	0	2
	2-E35-1	18300.000	18300.000	18300.000	1	0	1
	2-E24-18	18266.667	19800.000	16400.000	6	0	6
	2-E17-18	18000.000	20500.000	16600.000	10	0	10
	2-E24-17	17928.571	18400.000	17300.000	7	0	7
	2-E24-16	17825.000	19400.000	16000.000	8	0	8
	2-E33-31	17825.000	26900.000	14400.000	4	0	4
	6-55-55	17800.000	17800.000	17800.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 112

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sodium							
	2-E25-23	17600.000	17600.000	17600.000	1	0	1
	2-E18-2	17540.000	19200.000	14000.000	10	0	10
	2-E24-2	17533.333	20700.000	15800.000	6	0	6
	2-E25-11	17500.000	21000.000	14000.000	2	0	2
	2-E34-8	17333.333	22000.000	14000.000	3	0	3
	6-36-61A	17000.000	17000.000	17000.000	1	0	1
	6-40-62	17000.000	17000.000	17000.000	1	0	1
	2-E33-18	16600.000	16600.000	16600.000	1	0	1
	2-E25-22	16557.143	19900.000	14900.000	7	0	7
	2-E27-14	16550.000	18100.000	15000.000	2	0	2
	2-E26-10	16500.000	19000.000	15000.000	4	0	4
	2-E26-9	16400.000	22000.000	14000.000	5	0	5
	2-E33-41	16250.000	16500.000	16000.000	2	0	2
	2-E27-9	16170.000	19100.000	13000.000	10	0	10
	2-E33-24	15400.000	15400.000	15400.000	1	0	1
	2-E27-11	15250.000	16000.000	15000.000	4	0	4
	2-E25-41	15225.000	17500.000	13400.000	4	0	4
	2-E24-20	15000.000	15000.000	15000.000	1	0	1
	6-44-42	15000.000	16500.000	13000.000	7	0	7
	2-E33-33	14933.333	16300.000	14000.000	3	0	3
	2-E33-8	14900.000	14900.000	14900.000	1	0	1
	2-E33-37	14833.333	19500.000	12000.000	3	0	3
	2-E27-8	14800.000	15600.000	13000.000	8	0	8
	2-E25-36	14727.273	16000.000	12600.000	11	0	11
	2-E33-28	14683.333	18200.000	12600.000	12	0	12
	2-E25-6	14600.000	14600.000	14600.000	1	0	1
	2-E33-35	14500.000	15000.000	14000.000	2	0	2
	2-E25-9	14400.000	14400.000	14400.000	1	0	1
	2-E24-19	13700.000	14100.000	13000.000	3	0	3
	2-E34-3	13594.286	17000.000	9760.000	7	0	7
	2-E33-21	13300.000	13300.000	13300.000	1	0	1
	2-E33-32	13200.000	13500.000	13000.000	4	0	4
	2-E27-10	13162.500	14700.000	10900.000	8	0	8
	2-E24-4	13000.000	13000.000	13000.000	1	0	1
	2-E33-36	12666.667	13000.000	12000.000	3	0	3
	6-50-53B	12350.000	12700.000	12000.000	2	0	2
	2-E33-40	12300.000	12300.000	12300.000	1	0	1
	6-49-55B	11900.000	11900.000	11900.000	1	0	1
	2-E27-13	11400.000	12700.000	10500.000	3	0	3
	2-E25-38	11130.769	12000.000	9900.000	13	0	13
	2-E26-5	11000.000	11000.000	11000.000	1	0	1
	6-45-69A	11000.000	11000.000	11000.000	1	0	1
	2-E25-28	10706.667	12400.000	9780.000	12	0	12
	2-E27-16	10500.000	11000.000	10000.000	2	0	2
	2-E25-27	10218.000	11500.000	8920.000	5	0	5
	6-43-45	10157.143	11000.000	9100.000	7	0	7
	2-E25-37	10022.222	11600.000	8100.000	9	0	9
	2-E25-43	10000.000	10000.000	10000.000	2	0	2
	2-E27-15	9946.667	10500.000	9400.000	3	0	3
	2-E25-34	9683.000	10500.000	9150.000	10	0	10
	2-E27-12	9566.667	10500.000	9000.000	3	0	3
	2-E25-26	9403.636	11200.000	8500.000	11	0	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 113

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sodium							
	2-E26-13	8950.000	9000.000	8900.000	2	0	2
	2-E26-12	8666.667	8800.000	8500.000	3	0	3
	6-43-43	7760.000	8180.000	7400.000	8	0	8
	2-E18-4	7636.667	11400.000	5900.000	9	0	9
	6-53-47A	7040.000	7040.000	7040.000	1	0	1
	2-E27-7	6652.500	9100.000	4205.000	2	0	2
	2-E25-32P	6185.385	7460.000	5260.000	26	0	26
	2-E25-39	5960.000	6100.000	5900.000	5	0	5
	2-E18-3	5686.000	6560.000	5280.000	10	0	10
	6-55-50C	5350.000	5400.000	5300.000	2	0	2
	2-E25-25	5328.966	7630.000	4460.000	29	0	29
	6-42-40B	4455.000	4460.000	4450.000	2	0	2
	6-42-40A	4332.222	5100.000	3540.000	9	0	9
	6-42-41	3850.000	3900.000	3800.000	2	0	2
Sodium, filtered							
	2-E25-30P	74900.000	91600.000	62600.000	7	0	7
	6-50-53A	62444.444	66400.000	58700.000	9	0	9
	6-40-33A	52700.000	52700.000	52700.000	1	0	1
	2-E25-20	43890.000	56700.000	9200.000	10	0	10
	6-49-55A	43840.000	48700.000	38100.000	10	0	10
	2-E25-35	39972.727	48500.000	33900.000	11	0	11
	6-60-57	37500.000	37500.000	37500.000	1	0	1
	6-52-54	36500.000	36500.000	36500.000	1	0	1
	6-37-43	35700.000	54700.000	25100.000	3	0	3
	2-E25-19	34037.500	41000.000	30600.000	8	0	8
	6-40-39	33440.000	34500.000	32300.000	5	0	5
	6-49-57A	32600.000	32600.000	32600.000	1	0	1
	2-E34-6	32550.000	35400.000	29900.000	6	0	6
	2-E17-15	31930.000	44800.000	21000.000	10	0	10
	2-E34-5	30900.000	33400.000	28600.000	7	0	7
	6-41-40	30580.000	31900.000	29000.000	5	0	5
	2-E25-21	30416.667	36900.000	21000.000	6	0	6
	6-59-58	29300.000	29300.000	29300.000	1	0	1
	2-E33-3	29200.000	32100.000	27700.000	3	0	3
	2-E17-9	28250.000	32500.000	25600.000	8	0	8
	6-57-29A	28200.000	28200.000	28200.000	1	0	1
	2-E18-1	28066.667	31500.000	25000.000	9	0	9
	2-E33-15	27900.000	27900.000	27900.000	1	0	1
	2-E28-13	27200.000	28800.000	25700.000	4	0	4
	2-E34-2	26833.333	31300.000	22000.000	9	0	9
	2-E32-4	26722.222	28500.000	24700.000	9	0	9
	6-43-41E	26600.000	27300.000	25900.000	2	0	2
	2-E34-1	26500.000	27100.000	25900.000	2	0	2
	2-E25-33	26427.273	31700.000	24000.000	22	0	22
	2-E17-14	26411.111	32000.000	19000.000	9	0	9
	2-E17-1	26080.000	31000.000	21600.000	5	0	5
	2-E32-3	26000.000	27900.000	25000.000	6	0	6
	6-38-65	25900.000	26400.000	25400.000	2	0	2
	6-47-60	25433.333	27300.000	24100.000	3	0	3
	6-25-33A	25300.000	30200.000	20000.000	5	0	5
	2-E32-5	25250.000	25500.000	25000.000	2	0	2
	2-E28-26	25114.286	26300.000	23000.000	7	0	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 114

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sodium, filtered							
	2-E28-21	25100.000	25800.000	23700.000	5	0	5
	2-E28-18	24900.000	27300.000	22300.000	4	0	4
	2-E33-10	24400.000	30900.000	17900.000	2	0	2
	2-E28-27	24142.857	26100.000	22900.000	7	0	7
	2-E25-42	24000.000	24000.000	24000.000	1	0	1
	2-E28-28	24000.000	24000.000	24000.000	1	0	1
	2-E33-1	23320.000	29900.000	15500.000	5	0	5
	2-E17-16	23312.500	36200.000	18900.000	8	0	8
	6-24-33	23233.333	26200.000	21600.000	9	0	9
	2-E32-2	23200.000	24700.000	22000.000	6	0	6
	2-E33-39	23200.000	23200.000	23200.000	1	0	1
	2-E25-29P	23154.545	31600.000	19600.000	22	0	22
	6-24-34A	23100.000	26900.000	21100.000	9	0	9
	2-E17-20	22825.000	24500.000	20900.000	8	0	8
	6-25-34A	22750.000	25300.000	20300.000	4	0	4
	2-E17-19	22733.333	34400.000	19100.000	6	0	6
	2-E17-5	22655.556	26700.000	19600.000	9	0	9
	6-47-46A	22500.000	23600.000	21600.000	4	0	4
	6-24-34B	22484.615	26300.000	19700.000	13	0	13
	2-E32-1	22433.333	24600.000	21200.000	3	0	3
	6-24-34C	22383.333	25200.000	19600.000	12	0	12
	6-26-34	22325.000	23500.000	21200.000	4	0	4
	6-26-35A	22275.000	24800.000	20900.000	4	0	4
	2-E17-17	22185.714	25700.000	19800.000	7	0	7
	6-25-34C	22172.727	24100.000	19500.000	11	0	11
	6-24-35	22158.333	26500.000	20000.000	12	0	12
	6-26-33	22033.333	23600.000	20700.000	6	0	6
	2-E34-7	22000.000	22000.000	22000.000	1	0	1
	2-E34-8	22000.000	22000.000	22000.000	1	0	1
	2-E17-12	21900.000	22900.000	20300.000	4	0	4
	6-47-50	21766.667	23500.000	20400.000	3	0	3
	6-49-57B	21700.000	21700.000	21700.000	1	0	1
	2-E28-23	21666.667	23600.000	19400.000	3	0	3
	6-23-34	21645.455	24200.000	20400.000	11	0	11
	2-E24-8	21600.000	21600.000	21600.000	1	0	1
	6-31-31	21500.000	21500.000	21500.000	1	0	1
	6-32-43	21500.000	21500.000	21500.000	1	0	1
	6-44-43B	21457.143	24300.000	18000.000	7	0	7
	6-25-34B	21250.000	22600.000	20200.000	4	0	4
	6-35-70	21233.333	22300.000	20600.000	3	0	3
	2-E24-12	21100.000	21600.000	20600.000	2	0	2
	2-E25-24	21062.500	25800.000	16200.000	8	0	8
	2-E33-34	21000.000	21000.000	21000.000	2	0	2
	6-33-56	21000.000	21000.000	21000.000	1	0	1
	6-34-51	21000.000	21000.000	21000.000	1	0	1
	6-35-66	21000.000	21800.000	20200.000	4	0	4
	6-46-21B	20900.000	20900.000	20900.000	1	0	1
	2-E33-38	20750.000	21300.000	20200.000	2	0	2
	2-E25-31	20732.000	40000.000	18000.000	25	0	25
	2-E13-14	20400.000	21300.000	18900.000	4	0	4
	2-E25-40	20400.000	20400.000	20400.000	1	0	1
	6-42-42B	20400.000	22600.000	18000.000	6	0	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 115

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sodium, filtered							
	2-E33-29	20042.857	22100.000	18600.000	7	0	7
	2-E13-5	20025.000	21500.000	19000.000	4	0	4
	6-53-50	20000.000	20000.000	20000.000	1	0	1
	2-E33-5	19850.000	20800.000	19200.000	4	0	4
	2-E33-30	19730.000	24000.000	18200.000	10	0	10
	2-E27-5	19700.000	19700.000	19700.000	1	0	1
	2-E17-6	19555.556	23700.000	17000.000	9	0	9
	2-E25-18	19244.444	21400.000	16800.000	9	0	9
	6-40-62	19000.000	19500.000	18400.000	3	0	3
	6-55-55	19000.000	19000.000	19000.000	1	0	1
	2-E24-17	18980.000	21700.000	17500.000	5	0	5
	6-26-35C	18960.000	20600.000	17700.000	5	0	5
	2-E24-18	18740.000	19800.000	17600.000	5	0	5
	2-E17-13	18700.000	19500.000	18100.000	3	0	3
	2-E17-18	18512.500	20800.000	16300.000	8	0	8
	2-E26-11	18500.000	19000.000	18000.000	2	0	2
	6-36-61A	18500.000	20100.000	17200.000	4	0	4
	6-45-42	18320.000	19300.000	17300.000	5	0	5
	2-E24-16	18157.143	20300.000	16000.000	7	0	7
	2-E18-2	18060.000	20800.000	14000.000	10	0	10
	2-E25-23	18020.000	20900.000	14800.000	5	0	5
	2-E26-9	18000.000	22000.000	14000.000	2	0	2
	2-E35-1	17700.000	17700.000	17700.000	1	0	1
	6-47-35A	17700.000	17700.000	17700.000	1	0	1
	6-43-41F	17433.333	17700.000	17100.000	3	0	3
	2-E24-2	17271.429	21000.000	15500.000	7	0	7
	2-E33-31	16833.333	21500.000	14000.000	3	0	3
	2-E27-14	16600.000	18200.000	15000.000	2	0	2
	2-E27-9	16511.111	19600.000	13000.000	9	0	9
	2-E26-10	16500.000	18000.000	15000.000	2	0	2
	2-E25-22	15962.500	17700.000	13900.000	8	0	8
	6-54-34	15900.000	15900.000	15900.000	1	0	1
	2-E27-11	15700.000	15700.000	15700.000	1	0	1
	6-44-64	15640.000	17300.000	14800.000	5	0	5
	6-20-39	15600.000	16300.000	14900.000	2	0	2
	6-44-42	15566.667	16900.000	14900.000	6	0	6
	2-E27-8	15428.571	16900.000	14100.000	7	0	7
	6-24-46	15400.000	16500.000	14800.000	3	0	3
	6-39-39	15150.000	15700.000	14600.000	2	0	2
	2-E33-33	15100.000	16200.000	14000.000	2	0	2
	2-E33-28	15066.667	17100.000	14000.000	9	0	9
	2-E33-18	14800.000	16200.000	13400.000	2	0	2
	2-E33-24	14500.000	14900.000	14100.000	2	0	2
	2-E34-3	14342.857	17000.000	12500.000	7	0	7
	2-E33-21	14250.000	15200.000	13300.000	2	0	2
	6-43-42J	14240.000	16500.000	10200.000	5	0	5
	2-E33-35	14000.000	14000.000	14000.000	1	0	1
	2-E25-36	13928.571	16000.000	11800.000	7	0	7
	2-E24-19	13900.000	13900.000	13900.000	1	0	1
	2-E25-41	13750.000	14100.000	13400.000	2	0	2
	2-E27-10	13616.667	16000.000	12300.000	6	0	6
	2-E33-32	13400.000	14000.000	12800.000	3	0	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 116

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sodium, filtered							
	2-E33-8	13050.000	14000.000	12100.000	2	0	2
	6-45-69A	11850.000	12100.000	11600.000	2	0	2
	2-E27-13	11650.000	12300.000	11000.000	2	0	2
	2-E25-38	11440.000	12200.000	11000.000	10	0	10
	2-E33-40	11400.000	11400.000	11400.000	1	0	1
	6-49-55B	11200.000	11200.000	11200.000	1	0	1
	2-E25-28	10538.889	11600.000	9700.000	9	0	9
	2-E25-37	10533.333	11600.000	8000.000	9	0	9
	6-43-45	10420.000	11000.000	10000.000	5	0	5
	2-E25-34	10115.714	11400.000	9400.000	7	0	7
	2-E25-27	10112.000	11300.000	8830.000	5	0	5
	2-E25-43	10000.000	10000.000	10000.000	1	0	1
	2-E27-15	9960.000	9960.000	9960.000	1	0	1
	2-E25-26	9651.111	11000.000	8700.000	9	0	9
	2-E27-12	9600.000	10100.000	9100.000	2	0	2
	2-E26-13	9100.000	9100.000	9100.000	1	0	1
	2-E27-7	8990.000	8990.000	8990.000	1	0	1
	6-53-47B	8610.000	8610.000	8610.000	1	0	1
	2-E26-12	8500.000	8500.000	8500.000	1	0	1
	2-E18-4	8167.500	14400.000	6180.000	8	0	8
	6-54-48	7980.000	7980.000	7980.000	1	0	1
	6-43-43	7605.714	8330.000	7020.000	7	0	7
	6-53-47A	7100.000	7100.000	7100.000	1	0	1
	2-E25-32P	6170.000	8540.000	5400.000	26	0	26
	2-E25-39	6033.333	6200.000	5800.000	3	0	3
	2-E18-3	5750.000	6460.000	5100.000	10	0	10
	6-54-49	5540.000	5590.000	5490.000	2	0	2
	2-E25-25	5308.929	7320.000	4310.000	28	0	28
	6-55-50C	5290.000	5650.000	4920.000	3	0	3
	6-42-40A	4452.857	5300.000	3770.000	7	0	7
Specific conductance							
	6-50-53A	1459.750	1621.000	1295.000	4	0	4
	2-E25-13	1409.000	1409.000	1409.000	1	0	1
	6-43-42	899.000	899.000	899.000	1	0	1
	2-E28-24	788.000	788.000	788.000	1	0	1
	2-E28-12	761.000	767.000	755.000	2	0	2
	6-55-57	720.000	720.000	720.000	1	0	1
	2-E25-35	698.607	820.000	330.000	28	0	28
	6-49-55A	659.500	855.000	434.000	6	0	6
	6-24-34B	635.733	1242.000	285.000	30	0	30
	2-E17-15	616.077	750.000	331.000	26	0	26
	2-E25-20	610.308	741.000	202.000	13	0	13
	2-E17-14	608.636	926.000	461.000	22	0	22
	6-52-54	600.000	600.000	600.000	1	0	1
	2-E17-20	598.762	694.000	494.000	21	0	21
	2-E25-27	596.667	1119.000	167.000	9	0	9
	6-54-48	595.000	595.000	595.000	1	0	1
	2-E18-1	582.037	812.000	515.000	27	0	27
	6-24-34C	568.882	726.000	388.000	34	0	34
	6-38-65	553.500	585.000	522.000	2	0	2
	6-23-34	551.207	636.000	265.000	29	0	29
	2-E17-1	547.667	960.000	479.000	18	0	18

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 117

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Specific conductance							
	6-24-33	545.900	580.000	420.000	20	0	20
	2-E13-8	530.000	530.000	530.000	1	0	1
	6-24-34A	528.138	584.000	458.000	29	0	29
	2-E28-17	527.000	531.000	523.000	2	0	2
	2-E32-5	518.933	549.000	491.000	15	0	15
	2-E28-26	516.000	577.000	446.000	29	0	29
	6-53-47B	511.000	511.000	511.000	1	0	1
	2-E25-19	510.444	641.000	381.000	9	0	9
	2-E17-19	504.176	853.000	318.000	17	0	17
	6-53-55B	500.000	500.000	500.000	1	0	1
	6-53-55C	500.000	500.000	500.000	1	0	1
	6-37-43	492.000	783.000	255.000	4	0	4
	2-E34-5	489.400	587.000	423.000	25	0	25
	2-E24-1	482.000	482.000	482.000	1	0	1
	2-E25-30P	476.714	629.000	232.000	14	0	14
	2-E17-9	475.455	534.000	416.000	22	0	22
	2-E28-9	475.000	475.000	475.000	1	0	1
	2-E28-28	465.889	500.000	450.000	9	0	9
	2-E28-21	465.000	505.000	406.000	5	0	5
	2-E24-12	464.000	464.000	464.000	2	0	2
	2-E34-2	459.783	580.000	407.000	23	0	23
	6-47-50	457.000	490.000	400.000	3	0	3
	2-E28-13	455.250	483.000	415.000	4	0	4
	6-48-50	455.000	455.000	455.000	1	0	1
	2-E13-5	451.600	573.000	353.000	5	0	5
	2-E32-3	442.000	500.000	318.000	20	0	20
	2-E34-1	438.167	464.000	410.000	6	0	6
	2-E28-18	437.857	521.000	274.000	7	0	7
	2-E35-1	435.000	437.000	432.000	3	0	3
	2-E17-5	434.000	783.000	296.000	21	0	21
	2-E25-41	428.596	730.000	347.000	13	0	13
	2-E34-6	426.304	526.000	366.000	23	0	23
	2-E13-19	426.000	426.000	426.000	1	0	1
	6-24-35	419.406	485.000	280.000	32	0	32
	2-E33-7	419.000	419.000	419.000	1	0	1
	2-E25-6	417.000	839.000	203.000	3	0	3
	2-E13-14	411.500	473.000	333.000	6	0	6
	2-E32-4	410.939	459.000	343.000	33	0	33
	6-46-21B	410.000	410.000	410.000	1	0	1
	6-25-34C	408.036	520.000	287.000	28	0	28
	6-44-64	407.800	462.000	358.000	5	0	5
	2-E24-7	405.000	405.000	405.000	1	0	1
	6-35-66	404.750	432.000	384.000	4	0	4
	2-E33-15	400.000	400.000	400.000	1	0	1
	2-E24-17	397.706	425.000	319.000	17	0	17
	2-E33-4	396.000	396.000	396.000	1	0	1
	2-E25-31	393.760	1994.000	201.000	52	0	52
	6-40-62	393.333	417.000	368.000	3	0	3
	6-35-70	393.250	434.000	357.000	4	0	4
	6-28-40P	393.000	393.000	393.000	1	0	1
	2-E33-26	391.000	391.000	391.000	1	0	1
	2-E33-38	390.000	390.000	390.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 118

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Specific conductance							
	2-E24-16	389.000	445.000	302.000	23	0	23
	6-36-61A	385.500	465.000	335.000	4	0	4
	6-36-61B	384.500	392.000	377.000	2	0	2
	6-47-46A	384.250	476.000	297.000	4	0	4
	6-25-34B	384.078	522.000	230.000	17	0	17
	2-E17-2	384.000	384.000	384.000	1	0	1
	6-53-55A	380.000	380.000	380.000	1	0	1
	2-E25-40	375.929	410.000	328.000	14	0	14
	2-E33-34	375.700	401.000	299.000	10	0	10
	6-45-69A	373.000	392.000	354.000	2	0	2
	2-E17-6	369.200	484.000	280.000	20	0	20
	2-E23-1	369.000	369.000	369.000	1	0	1
	2-E35-2	366.636	533.000	277.000	11	0	11
	2-E27-14	365.125	403.000	356.000	8	0	8
	6-55-40	365.000	365.000	365.000	1	0	1
	6-53-47A	362.000	362.000	362.000	1	0	1
	2-E24-2	361.579	522.000	304.000	19	0	19
	6-39-39	360.000	444.000	276.000	2	0	2
	6-50-53B	360.000	360.000	360.000	1	0	1
	6-52-57	360.000	360.000	360.000	1	0	1
	2-E33-39	359.000	359.000	359.000	1	0	1
	6-42-39B	357.000	357.000	357.000	1	0	1
	2-E34-3	356.813	484.000	253.000	20	0	20
	6-47-60	356.750	400.000	313.000	4	0	4
	2-E17-13	353.857	388.000	291.000	7	0	7
	2-E33-3	353.750	397.000	335.000	4	0	4
	6-41-40	351.600	384.000	275.000	15	0	15
	6-32-43	351.000	380.000	322.000	2	0	2
	2-E17-16	350.276	513.000	185.000	29	0	29
	6-43-40	350.000	350.000	350.000	1	0	1
	6-54-57	349.500	359.000	340.000	2	0	2
	6-47-35A	346.000	346.000	346.000	1	0	1
	6-26-35C	344.900	443.000	219.000	20	0	20
	2-E17-12	344.571	406.000	297.000	7	0	7
	6-40-40A	344.000	344.000	344.000	1	0	1
	2-E24-18	343.500	408.000	274.000	18	0	18
	2-E34-7	342.795	531.000	196.000	11	0	11
	2-E33-5	341.250	374.000	318.000	4	0	4
	2-E27-9	336.435	373.000	302.000	23	0	23
	2-E28-25	334.000	334.000	334.000	1	0	1
	6-26-35A	333.353	401.000	205.000	17	0	17
	2-E27-11	333.273	342.000	306.000	11	0	11
	6-25-34A	332.333	435.000	221.000	18	0	18
	6-25-33A	331.538	471.000	269.000	26	0	26
	2-E27-8	331.053	357.000	272.000	19	0	19
	2-E26-11	330.286	347.000	317.000	14	0	14
	6-24-46	329.667	385.000	262.000	3	0	3
	2-E28-27	329.529	366.000	245.000	17	0	17
	2-E33-1	328.000	360.000	269.000	4	0	4
	6-40-40B	328.000	328.000	328.000	1	0	1
	6-42-39A	328.000	328.000	328.000	1	0	1
	6-26-33	326.545	419.000	254.000	22	0	22

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 119

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Specific conductance							
	2-E25-33	326.278	448.000	199.000	36	0	36
	6-43-41E	324.688	333.000	316.000	16	0	16
	2-E17-17	322.227	390.000	230.000	22	0	22
	6-57-29A	321.000	321.000	321.000	1	0	1
	2-E25-18	317.389	374.000	196.000	18	0	18
	2-E24-20	316.250	319.000	311.000	4	0	4
	6-55-50A	316.000	316.000	316.000	1	0	1
	2-E33-18	315.000	342.000	288.000	2	0	2
	2-E32-2	314.708	376.000	243.000	24	0	24
	6-52-48	314.000	314.000	314.000	1	0	1
	2-E25-17	313.000	321.000	305.000	2	0	2
	6-26-34	312.813	414.000	187.000	16	0	16
	2-E28-23	311.750	325.000	296.000	4	0	4
	2-E33-31	310.938	484.000	264.000	8	0	8
	6-60-57	310.000	310.000	310.000	1	0	1
	2-E25-2	309.000	368.000	250.000	2	0	2
	6-43-41F	304.357	332.000	279.000	14	0	14
	6-43-41G	304.000	304.000	304.000	1	0	1
	2-E33-29	303.571	334.000	247.000	21	0	21
	6-50-45	303.000	303.000	303.000	1	0	1
	2-E33-41	302.250	305.000	300.000	4	0	4
	6-49-57B	300.000	300.000	300.000	1	0	1
	6-54-49	300.000	300.000	300.000	1	0	1
	2-E25-24	296.692	465.000	241.000	13	0	13
	2-E25-42	296.500	299.000	294.000	2	0	2
	6-20-39	295.000	327.000	263.000	2	0	2
	2-E32-1	294.000	302.000	275.000	5	0	5
	6-54-45A	294.000	294.000	294.000	1	0	1
	2-E33-42	290.667	292.000	289.000	3	0	3
	2-E25-21	290.143	338.000	240.000	7	0	7
	6-59-58	290.000	290.000	290.000	1	0	1
	6-40-39	289.400	336.000	227.000	15	0	15
	6-52-46A	288.000	288.000	288.000	1	0	1
	6-40-33A	287.000	287.000	287.000	1	0	1
	6-44-43B	286.786	322.000	243.000	14	0	14
	2-E33-30	286.762	334.000	170.000	21	0	21
	6-56-43	282.000	282.000	282.000	1	0	1
	2-E33-35	280.188	283.750	278.000	4	0	4
	6-55-55	280.000	280.000	280.000	1	0	1
	2-E18-2	279.625	355.000	243.000	24	0	24
	2-E33-24	279.500	304.000	255.000	2	0	2
	2-E26-9	278.692	424.000	232.000	13	0	13
	2-E27-5	278.000	278.000	278.000	1	0	1
	2-E33-33	275.500	307.000	246.000	9	0	9
	2-E24-8	275.000	275.000	275.000	1	0	1
	2-E27-10	271.867	369.000	206.000	15	0	15
	2-E25-11	270.500	309.000	220.000	6	0	6
	2-E25-29P	270.203	372.000	228.000	37	0	37
	2-E33-32	268.481	291.250	248.000	13	0	13
	2-E33-37	268.300	313.000	234.000	10	0	10
	2-E33-8	266.600	278.000	238.000	5	0	5
	2-E26-8	266.000	266.000	266.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 120

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Specific conductance							
	2-E25-39	265.455	459.000	158.000	11	0	11
	2-E28-7	264.500	335.000	194.000	2	0	2
	2-E33-36	263.750	287.000	253.000	8	0	8
	2-E26-10	263.111	378.000	220.000	9	0	9
	2-E33-43	262.500	263.000	262.000	2	0	2
	6-36-46S	260.000	260.000	260.000	1	0	1
	6-49-55B	260.000	260.000	260.000	1	0	1
	2-E27-7	258.750	305.000	223.000	8	0	8
	2-E33-28	258.059	299.000	140.000	17	0	17
	2-E33-40	255.000	255.000	255.000	1	0	1
	6-45-42	254.000	292.000	219.000	5	0	5
	2-E33-10	253.667	337.000	175.000	3	0	3
	6-56-53	252.000	252.000	252.000	1	0	1
	2-E18-4	251.059	303.000	171.000	17	0	17
	2-E25-3	251.000	251.000	251.000	1	0	1
	2-E24-19	250.667	274.000	230.000	15	0	15
	2-E34-8	250.286	265.000	227.000	7	0	7
	6-34-41B	250.000	250.000	250.000	1	0	1
	6-55-50C	245.500	353.000	178.000	4	0	4
	2-E26-13	244.000	247.000	238.000	4	0	4
	6-60-60	242.000	242.000	242.000	1	0	1
	2-E25-36	241.444	297.000	179.000	18	0	18
	2-E27-12	241.386	255.000	228.000	11	0	11
	2-E27-13	241.295	245.000	236.000	11	0	11
	2-E17-18	241.000	291.000	190.000	17	0	17
	2-E26-2	241.000	241.000	241.000	1	0	1
	6-42-42B	239.857	280.000	172.000	14	0	14
	2-E25-23	239.600	302.000	180.000	5	0	5
	2-E25-9	239.500	256.000	223.000	2	0	2
	2-E26-12	239.400	275.000	222.000	5	0	5
	6-43-42J	239.000	292.000	153.000	12	0	12
	6-43-45	238.417	286.000	210.000	12	0	12
	6-31-31P	236.000	236.000	236.000	1	0	1
	2-E27-15	235.636	251.000	212.000	11	0	11
	6-54-34	235.000	235.000	235.000	1	0	1
	6-31-31	234.000	234.000	234.000	1	0	1
	2-E26-4	233.000	233.000	233.000	1	0	1
	2-E25-43	231.667	232.000	231.000	3	0	3
	2-E24-4	231.500	237.000	226.000	2	0	2
	2-E33-21	231.000	231.000	231.000	1	0	1
	2-E18-3	230.583	287.000	156.000	24	0	24
	6-55-50D	230.500	266.000	195.000	2	0	2
	6-44-42	225.313	323.000	181.000	16	0	16
	6-43-43	219.333	240.000	172.000	12	0	12
	6-51-46	219.000	219.000	219.000	1	0	1
	2-E25-22	218.250	238.000	195.000	12	0	12
	2-E16-2	217.500	246.000	149.000	4	0	4
	2-E27-16	215.000	219.000	211.000	5	0	5
	6-50-48B	212.000	212.000	212.000	1	0	1
	6-55-70	204.000	204.000	204.000	1	0	1
	2-E25-38	201.795	222.000	179.000	22	0	22
	2-E25-37	201.750	211.000	190.000	16	0	16

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 121

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Specific conductance							
	6-50-30	195.000	195.000	195.000	1	0	1
	2-E25-34	194.421	325.000	128.000	19	0	19
	2-E25-26	191.591	220.000	154.000	22	0	22
	2-E26-5	182.000	182.000	182.000	1	0	1
	6-42-41	179.000	179.000	179.000	1	0	1
	2-E25-28	175.739	230.000	100.000	23	0	23
	2-E26-1	173.000	173.000	173.000	1	0	1
	2-E25-32P	169.938	271.000	100.000	32	0	32
	2-E25-25	167.486	255.000	105.000	35	0	35
	2-E28-11	163.000	163.000	163.000	1	0	1
	6-42-40A	162.643	204.000	117.000	14	0	14
	2-E28-15	162.000	162.000	162.000	1	0	1
	2-E26-6	160.000	160.000	160.000	1	0	1
	2-E33-12	149.000	149.000	149.000	1	0	1
	6-42-40B	141.000	160.000	122.000	2	0	2
	6-55-44	80.000	80.000	80.000	1	0	1
Strontium							
	2-E17-14	388.000	488.000	313.000	8	0	8
	2-E17-20	379.429	425.000	343.000	7	0	7
	2-E17-15	370.625	451.000	318.000	8	0	8
	2-E25-35	332.000	385.000	288.000	6	0	6
	2-E28-12	321.000	321.000	321.000	1	0	1
	2-E25-20	309.833	352.000	285.000	6	0	6
	6-23-34	296.250	321.000	273.000	12	0	12
	2-E17-1	295.000	338.000	280.000	4	0	4
	2-E25-17	292.000	292.000	292.000	1	0	1
	2-E25-19	290.000	290.000	290.000	1	0	1
	6-24-34B	287.000	351.000	271.000	11	0	11
	6-24-34C	283.917	324.000	263.000	12	0	12
	6-24-33	277.571	290.000	256.000	7	0	7
	2-E17-19	276.833	393.000	236.000	6	0	6
	2-E17-9	275.857	298.000	261.000	7	0	7
	6-24-34A	268.500	301.000	250.000	10	0	10
	2-E28-26	257.667	299.000	227.000	6	0	6
	2-E34-5	256.000	281.000	242.000	6	0	6
	2-E17-5	250.667	374.000	190.000	9	0	9
	2-E24-16	248.667	272.000	235.000	6	0	6
	2-E18-1	245.286	257.000	231.000	7	0	7
	2-E32-5	243.000	243.000	243.000	1	0	1
	2-E34-2	241.571	283.000	216.000	7	0	7
	2-E35-1	240.000	240.000	240.000	1	0	1
	2-E28-18	236.000	236.000	236.000	1	0	1
	2-E28-13	234.000	234.000	234.000	1	0	1
	2-E34-6	234.000	260.000	220.000	6	0	6
	2-E24-17	231.333	251.000	216.000	6	0	6
	2-E17-6	229.143	265.000	188.000	7	0	7
	6-26-35C	228.750	246.000	218.000	4	0	4
	2-E32-4	228.125	238.000	209.000	8	0	8
	2-E28-21	226.000	226.000	226.000	1	0	1
	6-41-40	220.000	226.000	212.000	3	0	3
	2-E34-1	219.000	219.000	219.000	1	0	1
	6-24-35	217.750	274.000	197.000	12	0	12

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 122

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Strontium							
	2-E27-14	213.000	213.000	213.000	1	0	1
	2-E24-2	209.000	231.000	176.000	5	0	5
	6-25-34C	201.727	224.000	183.000	11	0	11
	6-43-41F	201.000	204.000	199.000	3	0	3
	6-25-33A	198.750	212.000	187.000	4	0	4
	2-E17-17	191.750	220.000	171.000	8	0	8
	2-E32-3	187.500	206.000	165.000	4	0	4
	6-43-41E	185.000	185.000	185.000	2	0	2
	2-E16-2	184.000	189.000	179.000	2	0	2
	2-E27-8	183.167	193.000	170.000	6	0	6
	2-E27-9	183.000	206.000	172.000	8	0	8
	6-25-34B	179.500	184.000	174.000	4	0	4
	2-E24-18	177.600	203.000	156.000	5	0	5
	6-44-43B	177.000	185.000	168.000	4	0	4
	2-E34-3	176.833	192.000	163.000	6	0	6
	6-26-35A	176.750	192.000	161.000	4	0	4
	2-E33-5	176.500	183.000	170.000	2	0	2
	2-E17-16	174.500	261.000	112.000	8	0	8
	2-E27-11	174.000	174.000	174.000	1	0	1
	2-E25-9	173.000	173.000	173.000	1	0	1
	6-40-39	170.667	173.000	169.000	3	0	3
	2-E25-40	170.000	170.000	170.000	1	0	1
	2-E33-3	169.000	169.000	169.000	1	0	1
	6-25-34A	168.500	177.000	161.000	4	0	4
	2-E28-7	166.000	166.000	166.000	1	0	1
	2-E25-11	164.000	164.000	164.000	1	0	1
	6-26-33	161.800	169.000	154.000	5	0	5
	2-E33-1	161.500	179.000	144.000	2	0	2
	2-E25-6	161.000	161.000	161.000	1	0	1
	2-E33-8	159.000	159.000	159.000	1	0	1
	2-E18-4	158.429	173.000	146.000	7	0	7
	2-E33-31	158.000	158.000	158.000	1	0	1
	6-26-34	156.000	169.000	136.000	4	0	4
	2-E33-29	154.000	168.000	144.000	6	0	6
	2-E27-10	153.833	174.000	144.000	6	0	6
	6-42-42B	148.800	162.000	130.000	5	0	5
	2-E33-10	148.500	150.000	147.000	2	0	2
	2-E27-13	148.000	148.000	148.000	1	0	1
	2-E33-33	148.000	148.000	148.000	1	0	1
	2-E33-30	145.429	167.000	134.000	7	0	7
	2-E25-18	144.667	178.000	111.000	6	0	6
	2-E28-27	144.143	154.000	128.000	7	0	7
	2-E18-3	144.125	161.000	128.000	8	0	8
	2-E18-2	143.875	161.000	129.000	8	0	8
	2-E17-12	141.000	141.000	141.000	1	0	1
	2-E25-33	139.263	176.000	121.000	19	0	19
	2-E26-5	139.000	139.000	139.000	1	0	1
	2-E25-24	137.250	163.000	122.000	4	0	4
	2-E17-13	137.000	137.000	137.000	1	0	1
	2-E25-41	137.000	138.000	136.000	2	0	2
	6-43-45	136.667	142.000	133.000	3	0	3
	2-E25-30P	136.000	207.000	92.000	7	0	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 123

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Strontium							
	2-E33-28	135.571	143.000	126.000	7	0	7
	2-E32-2	134.833	142.000	125.000	6	0	6
	2-E27-12	134.000	134.000	134.000	1	0	1
	2-E32-1	132.500	144.000	121.000	2	0	2
	2-E27-15	132.000	132.000	132.000	1	0	1
	2-E33-21	131.000	131.000	131.000	1	0	1
	2-E24-19	130.000	130.000	130.000	1	0	1
	2-E27-7	129.000	129.000	129.000	1	0	1
	2-E33-32	129.000	129.000	129.000	1	0	1
	2-E17-18	128.000	139.000	117.000	8	0	8
	2-E25-31	127.773	157.000	101.000	22	0	22
	6-42-40B	124.000	156.000	92.000	2	0	2
	2-E25-21	122.000	122.000	122.000	1	0	1
	6-44-42	121.400	128.000	108.000	5	0	5
	6-43-43	118.167	126.000	109.000	6	0	6
	2-E25-29P	118.053	138.000	101.000	19	0	19
	2-E25-32P	112.140	131.000	99.800	20	0	20
	2-E25-23	112.000	112.000	112.000	1	0	1
	2-E25-25	111.522	118.000	101.000	23	0	23
	6-43-42J	110.400	124.000	98.000	5	0	5
	2-E25-34	108.500	119.000	101.000	6	0	6
	2-E25-27	108.400	117.000	102.000	5	0	5
	2-E25-22	108.200	113.000	103.000	5	0	5
	2-E25-36	108.200	117.000	100.000	5	0	5
	2-E25-26	105.500	119.000	95.000	8	0	8
	2-E25-28	102.788	110.000	95.000	8	0	8
	2-E25-37	101.167	104.000	98.000	6	0	6
	6-42-40A	96.600	113.000	78.000	5	0	5
	2-E25-38	92.429	99.000	87.000	7	0	7
Strontium, filtered							
	6-50-53A	1009.000	1150.000	944.000	9	0	9
	6-53-47B	400.000	400.000	400.000	1	0	1
	6-49-55A	397.333	487.000	311.000	9	0	9
	2-E17-14	397.000	505.000	311.000	8	0	8
	6-54-48	396.000	396.000	396.000	1	0	1
	2-E17-15	388.250	462.000	317.000	8	0	8
	2-E17-20	369.857	388.000	344.000	7	0	7
	6-38-65	333.000	338.000	328.000	2	0	2
	2-E17-1	328.600	442.000	279.000	5	0	5
	2-E25-35	321.333	403.000	255.000	6	0	6
	6-47-35A	320.000	320.000	320.000	1	0	1
	6-47-46A	309.500	331.000	289.000	4	0	4
	6-46-21B	308.000	308.000	308.000	1	0	1
	2-E25-20	305.750	336.000	267.000	8	0	8
	6-23-34	292.091	317.000	257.000	11	0	11
	6-53-47A	291.000	291.000	291.000	1	0	1
	2-E17-9	290.125	338.000	259.000	8	0	8
	6-24-34C	287.182	324.000	264.000	11	0	11
	2-E34-1	283.000	283.000	283.000	1	0	1
	6-24-34B	282.154	301.000	248.000	13	0	13
	6-24-33	281.889	321.000	268.000	9	0	9
	2-E17-19	280.167	384.000	240.000	6	0	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 124

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Strontium, filtered							
	6-45-69A	271.500	273.000	270.000	2	0	2
	6-47-50	269.500	285.000	254.000	2	0	2
	6-24-34A	267.667	284.000	252.000	9	0	9
	6-39-39	265.000	361.000	169.000	2	0	2
	2-E18-1	260.143	283.000	241.000	7	0	7
	2-E24-12	259.500	278.000	241.000	2	0	2
	2-E17-5	252.444	370.000	198.000	9	0	9
	2-E34-5	251.500	274.000	239.000	6	0	6
	2-E24-16	249.500	268.000	229.000	6	0	6
	2-E28-26	248.167	264.000	224.000	6	0	6
	2-E28-21	243.600	260.000	231.000	5	0	5
	2-E34-2	243.429	269.000	219.000	7	0	7
	2-E24-17	242.833	266.000	214.000	6	0	6
	2-E25-19	242.000	335.000	182.000	8	0	8
	2-E28-13	238.250	268.000	227.000	4	0	4
	2-E35-1	237.000	237.000	237.000	1	0	1
	2-E34-6	233.833	247.000	213.000	6	0	6
	2-E32-5	232.000	232.000	232.000	1	0	1
	2-E17-6	231.222	267.000	209.000	9	0	9
	2-E28-18	229.500	247.000	212.000	4	0	4
	6-26-35C	227.250	235.000	221.000	4	0	4
	2-E13-5	220.750	230.000	212.000	4	0	4
	2-E32-4	220.625	231.000	212.000	8	0	8
	2-E24-2	219.286	312.000	177.000	7	0	7
	2-E27-14	217.000	217.000	217.000	1	0	1
	6-40-62	216.667	226.000	207.000	3	0	3
	6-41-40	216.000	224.000	206.000	3	0	3
	2-E13-14	213.750	220.000	203.000	4	0	4
	6-37-43	212.667	404.000	113.000	3	0	3
	6-24-35	210.500	257.000	189.000	12	0	12
	6-47-60	208.667	226.000	196.000	3	0	3
	6-35-66	208.500	211.000	207.000	4	0	4
	6-44-64	203.600	218.000	194.000	5	0	5
	6-25-34C	200.818	221.000	188.000	11	0	11
	6-25-33A	199.000	208.000	184.000	4	0	4
	6-54-49	195.500	198.000	193.000	2	0	2
	6-43-41F	194.333	203.000	190.000	3	0	3
	2-E32-3	194.250	209.000	172.000	4	0	4
	6-35-70	192.000	194.000	188.000	3	0	3
	2-E33-3	190.000	201.000	173.000	3	0	3
	6-20-39	190.000	194.000	186.000	2	0	2
	6-36-61A	189.250	197.000	173.000	4	0	4
	6-45-42	189.000	198.000	176.000	5	0	5
	2-E17-17	186.857	212.000	167.000	7	0	7
	2-E27-8	186.000	199.000	166.000	7	0	7
	2-E34-3	184.667	199.000	168.000	6	0	6
	2-E27-9	180.750	192.000	172.000	8	0	8
	6-26-35A	180.250	193.000	171.000	4	0	4
	2-E17-16	179.750	256.000	121.000	8	0	8
	6-25-34A	179.000	190.000	171.000	4	0	4
	6-43-41E	179.000	181.000	177.000	2	0	2
	2-E24-18	178.000	202.000	159.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 125

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Strontium, filtered							
	2-E33-18	178.000	178.000	178.000	1	0	1
	6-44-43B	177.750	182.000	171.000	4	0	4
	6-25-34B	175.000	180.000	173.000	4	0	4
	2-E33-5	174.500	181.000	166.000	4	0	4
	2-E27-11	172.000	172.000	172.000	1	0	1
	6-40-39	169.000	175.000	163.000	3	0	3
	2-E33-1	168.000	184.000	153.000	5	0	5
	6-26-33	166.200	170.000	161.000	5	0	5
	2-E18-4	164.000	183.000	145.000	7	0	7
	6-24-46	163.333	172.000	152.000	3	0	3
	2-E33-29	160.833	181.000	145.000	6	0	6
	6-57-29A	160.000	160.000	160.000	1	0	1
	2-E27-10	158.500	174.000	147.000	6	0	6
	2-E33-31	156.000	156.000	156.000	1	0	1
	6-26-34	155.750	162.000	139.000	4	0	4
	2-E33-10	155.000	155.000	155.000	2	0	2
	2-E33-30	154.571	169.000	143.000	7	0	7
	2-E25-40	154.000	154.000	154.000	1	0	1
	6-42-42B	153.400	163.000	142.000	5	0	5
	2-E17-12	153.000	187.000	131.000	4	0	4
	2-E18-2	150.500	184.000	136.000	8	0	8
	2-E25-18	149.857	170.000	118.000	7	0	7
	2-E33-33	149.000	149.000	149.000	1	0	1
	2-E28-27	148.000	165.000	142.000	6	0	6
	2-E33-24	148.000	148.000	148.000	1	0	1
	2-E18-3	147.571	156.000	138.000	7	0	7
	2-E27-5	147.000	147.000	147.000	1	0	1
	2-E25-30P	144.714	211.000	114.000	7	0	7
	2-E24-8	144.000	144.000	144.000	1	0	1
	2-E32-1	144.000	158.000	130.000	3	0	3
	2-E33-8	143.500	148.000	139.000	2	0	2
	6-55-50C	142.000	146.000	138.000	3	0	3
	2-E33-21	141.500	146.000	137.000	2	0	2
	2-E27-13	141.000	141.000	141.000	1	0	1
	2-E33-28	140.833	149.000	134.000	6	0	6
	2-E17-13	140.000	148.000	132.000	3	0	3
	2-E25-24	139.750	161.000	119.000	8	0	8
	2-E32-2	138.167	142.000	132.000	6	0	6
	2-E27-12	138.000	138.000	138.000	1	0	1
	2-E25-21	136.800	152.000	125.000	5	0	5
	2-E25-33	136.111	174.000	118.000	18	0	18
	6-43-45	135.667	138.000	133.000	3	0	3
	2-E25-41	134.500	138.000	131.000	2	0	2
	2-E28-23	132.333	137.000	127.000	3	0	3
	2-E33-32	132.000	132.000	132.000	1	0	1
	6-32-43	132.000	132.000	132.000	1	0	1
	2-E27-15	131.000	131.000	131.000	1	0	1
	2-E24-19	130.000	130.000	130.000	1	0	1
	6-54-34	129.000	129.000	129.000	1	0	1
	2-E27-7	128.000	128.000	128.000	1	0	1
	2-E17-18	127.000	143.000	114.000	8	0	8
	2-E25-31	125.429	146.000	97.000	21	0	21

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 126

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Strontium, filtered							
	6-44-42	124.200	129.000	116.000	5	0	5
	2-E25-23	122.200	139.000	109.000	5	0	5
	6-43-42J	119.800	127.000	107.000	5	0	5
	2-E25-29P	119.778	135.000	103.000	18	0	18
	6-43-43	116.400	126.000	105.000	5	0	5
	6-59-58	111.000	111.000	111.000	1	0	1
	2-E25-34	110.667	121.000	99.000	6	0	6
	2-E25-32P	110.364	125.000	87.000	22	0	22
	2-E25-26	109.000	123.000	98.000	8	0	8
	2-E25-27	108.800	120.000	103.000	5	0	5
	6-40-33A	108.000	108.000	108.000	1	0	1
	2-E25-25	107.875	120.000	91.000	24	0	24
	2-E25-22	107.286	115.000	96.000	7	0	7
	2-E25-36	103.200	114.000	92.000	5	0	5
	6-31-31	102.000	102.000	102.000	1	0	1
	2-E25-37	100.800	105.000	97.000	5	0	5
	6-42-40A	100.000	113.000	84.000	6	0	6
	2-E25-28	99.625	106.000	92.000	8	0	8
	2-E25-38	92.857	101.000	87.000	7	0	7
	6-60-57	81.000	81.000	81.000	1	0	1
Strontium-90							
	2-E28-25	5148.571	6270.000	3150.000	7	0	7
	2-E28-23	4281.429	6150.000	2330.000	7	0	7
	6-53-48B	310.714	477.000	171.000	7	0	7
	2-E28-24	196.167	328.000	146.000	6	0	6
	2-E24-19	194.000	194.000	194.000	1	0	1
	6-53-47B	100.300	116.000	85.500	7	0	7
	2-E28-7	75.589	113.000	46.000	9	0	9
	6-53-47A	59.694	78.800	38.700	16	0	16
	6-53-48A	55.500	124.000	10.100	6	0	6
	6-54-48	54.043	126.000	29.300	7	0	7
	6-54-49	22.438	30.800	10.400	8	0	8
	2-E17-14	18.700	28.100	14.100	4	0	4
	2-E17-20	12.800	12.800	12.800	1	0	1
	2-E24-1	10.353	14.300	5.360	4	0	4
	2-E17-15	6.560	6.560	6.560	1	0	1
	2-E24-12	6.460	18.500	2.040	5	0	5
	2-E17-1	4.158	6.340	3.180	4	0	4
	2-E24-17	3.420	3.420	3.420	1	0	1
	2-E17-5	3.335	4.380	1.360	10	0	10
	2-E17-16	3.295	3.620	2.690	4	0	4
	2-E24-2	2.910	3.330	2.480	6	0	6
	2-E17-9	2.880	4.020	1.930	8	0	8
	2-E17-2	2.470	3.110	2.050	7	0	7
	2-E17-8	2.290	2.920	1.320	6	0	6
	2-E33-20	2.072	3.630	.797	4	0	4
	2-E13-5	2.060	3.900	3.900	1	1	2
	2-E24-11	1.083	1.660	.862	6	1	7
	6-47-50	1.067	3.770	.921	2	3	5
	2-E33-7	.823	2.610	2.610	1	7	8
	2-E33-9	.752	1.140	.900	2	4	6
	6-42-40C	.595	3.220	3.220	1	4	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 127

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Strontium-90							
	2-E33-41	.487	1.910	1.910	1	2	3
	2-E26-4	.459	.897	.897	1	2	3
	6-54-57	.369	1.380	1.380	1	7	8
	2-E34-1	.351	.439	.439	1	3	4
	6-42-40B	.289	.929	.929	1	7	8
	6-24-34B	.269	1.230	1.230	1	3	4
	2-E13-14	.254	.958	.958	1	2	3
	2-E33-34	.227	.350	.350	1	3	4
	2-E17-18	.168	.271	.271	1	2	3
	2-E34-5	.092	-.429	-.429	1	9	10
	6-23-34	.077	.878	.878	1	3	4
	2-E34-6	.009	-.245	-.245	1	6	7
	2-E25-9	.000	.821	.821	1	6	7
	2-E28-26	-.076	1.110	1.110	1	8	9
Styrene							
	2-E25-23	9.500	14.000	5.000	2	0	2
	2-E24-2	7.000	7.000	7.000	1	0	1
Sulfate							
	6-50-53A	404818.182	434000.000	386000.000	11	0	11
	2-E25-13	306000.000	306000.000	306000.000	1	0	1
	2-E25-35	174888.889	236000.000	19000.000	9	0	9
	2-E18-1	139454.545	172000.000	12000.000	11	0	11
	6-37-43	138875.000	250000.000	23300.000	4	0	4
	6-49-55A	129625.000	144000.000	106000.000	8	0	8
	2-E34-1	120233.333	153000.000	96700.000	3	0	3
	6-39-39	116033.333	210000.000	28100.000	3	0	3
	2-E34-2	113888.889	150000.000	85000.000	9	0	9
	2-E13-8	111000.000	111000.000	111000.000	1	0	1
	2-E34-5	106375.000	110000.000	100000.000	8	0	8
	2-E28-21	99080.000	116000.000	87300.000	5	0	5
	6-47-50	96650.000	98200.000	95100.000	2	0	2
	6-47-46A	95825.000	100000.000	89800.000	4	0	4
	2-E28-17	95300.000	95300.000	95300.000	1	0	1
	2-E35-1	85900.000	85900.000	85900.000	1	0	1
	6-54-48	83500.000	83500.000	83500.000	1	0	1
	2-E28-26	81960.000	100000.000	62000.000	10	0	10
	2-E17-16	80670.000	296000.000	30100.000	10	0	10
	2-E28-18	79260.000	96300.000	57000.000	5	0	5
	2-E32-5	78600.000	81000.000	76000.000	5	0	5
	2-E34-6	73638.571	107000.000	5170.000	7	0	7
	2-E35-2	73000.000	88000.000	45000.000	4	0	4
	2-E34-7	69433.333	100000.000	53600.000	3	0	3
	2-E28-9	66900.000	66900.000	66900.000	1	0	1
	2-E13-14	66833.333	114000.000	33300.000	6	0	6
	2-E27-14	66600.000	74800.000	59000.000	3	0	3
	2-E13-5	63960.000	140000.000	42500.000	5	0	5
	2-E25-30P	63812.500	84200.000	47600.000	8	0	8
	2-E32-4	62800.000	70300.000	55900.000	13	0	13
	2-E28-28	62000.000	63000.000	61000.000	3	0	3
	2-E28-12	60300.000	62700.000	57900.000	2	0	2
	2-E32-3	58125.000	71000.000	43000.000	8	0	8
	2-E26-11	56500.000	75000.000	48000.000	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 128

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sulfate							
	2-E25-20	56090.909	78400.000	12000.000	11	0	11
	6-53-47B	55200.000	55200.000	55200.000	1	0	1
	2-E28-13	55150.000	61800.000	48000.000	4	0	4
	6-46-21B	54400.000	54400.000	54400.000	1	0	1
	2-E25-40	53475.000	59000.000	44900.000	4	0	4
	6-26-35C	52628.571	60600.000	46000.000	7	0	7
	6-61-62	50000.000	50000.000	50000.000	1	0	1
	2-E27-9	48810.000	53100.000	45000.000	10	0	10
	2-E25-33	48266.667	70900.000	33000.000	12	0	12
	6-24-35	47084.615	49800.000	44000.000	13	0	13
	2-E34-3	46985.714	110000.000	33000.000	7	0	7
	2-E27-8	46455.556	49100.000	41700.000	9	0	9
	6-23-34	46450.000	49000.000	43000.000	14	0	14
	6-24-34A	46008.333	57700.000	42000.000	12	0	12
	2-E25-42	46000.000	47000.000	45000.000	2	0	2
	2-E26-9	44666.667	76000.000	28000.000	3	0	3
	6-47-60	44666.667	46300.000	42400.000	3	0	3
	2-E23-1	44600.000	44600.000	44600.000	1	0	1
	6-20-20	44000.000	44000.000	44000.000	1	0	1
	2-E27-11	43233.333	44000.000	41700.000	3	0	3
	6-64-62	43000.000	43000.000	43000.000	1	0	1
	6-24-34B	42714.286	45100.000	37000.000	14	0	14
	2-E25-19	42209.091	55400.000	29300.000	11	0	11
	2-E17-12	42000.000	66600.000	23700.000	5	0	5
	2-E26-10	42000.000	68000.000	25000.000	3	0	3
	6-24-33	41116.667	48300.000	37000.000	12	0	12
	6-24-34C	41092.857	44700.000	36200.000	14	0	14
	2-E17-9	39477.778	42000.000	36900.000	9	0	9
	2-E28-7	39300.000	40500.000	38100.000	2	0	2
	6-25-34C	39230.769	43000.000	35600.000	13	0	13
	6-40-62	38783.333	44200.000	35000.000	6	0	6
	2-E25-41	38150.000	49000.000	27400.000	4	0	4
	6-42-39B	38000.000	38000.000	38000.000	1	0	1
	6-62-31	38000.000	38000.000	38000.000	1	0	1
	6-26-35A	37987.500	43000.000	34000.000	8	0	8
	2-E24-7	37900.000	37900.000	37900.000	1	0	1
	2-E25-29P	37250.000	50800.000	30000.000	12	0	12
	2-E28-27	35754.545	37600.000	32100.000	11	0	11
	2-E27-5	35700.000	35700.000	35700.000	1	0	1
	2-E17-15	35581.818	41000.000	27000.000	11	0	11
	6-25-34B	35428.571	38900.000	32000.000	7	0	7
	2-E24-12	35350.000	36400.000	34300.000	2	0	2
	6-25-34A	35228.571	42200.000	31000.000	7	0	7
	6-42-39A	35000.000	35000.000	35000.000	1	0	1
	6-45-69A	34825.000	41500.000	31000.000	4	0	4
	6-47-35A	34400.000	34400.000	34400.000	1	0	1
	6-26-34	34083.333	40000.000	30000.000	6	0	6
	2-E18-2	33988.889	45000.000	23000.000	9	0	9
	2-E17-14	33677.778	40000.000	29000.000	9	0	9
	6-26-33	33675.000	40600.000	30500.000	8	0	8
	2-E33-34	33500.000	34000.000	33000.000	2	0	2
	2-E33-5	33325.000	35400.000	31600.000	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 129

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sulfate							
	2-E17-20	33200.000	41000.000	31000.000	10	0	10
	2-E32-2	33118.182	41000.000	28800.000	11	0	11
	2-E17-19	33100.000	34600.000	32300.000	5	0	5
	6-63-58	33000.000	33000.000	33000.000	1	0	1
	2-E17-2	32700.000	33400.000	32000.000	2	0	2
	2-E33-10	32700.000	33600.000	31600.000	3	0	3
	6-25-33A	32625.000	48800.000	20000.000	8	0	8
	6-41-40	32600.000	34000.000	31000.000	6	0	6
	2-E33-36	32500.000	34000.000	31000.000	2	0	2
	6-45-42	32383.333	36000.000	28000.000	6	0	6
	6-32-43	32166.667	37000.000	29600.000	3	0	3
	2-E25-21	32085.714	46700.000	20000.000	7	0	7
	2-E28-23	32000.000	39300.000	27800.000	3	0	3
	2-E17-1	31542.857	35100.000	29000.000	7	0	7
	2-E13-19	31200.000	31200.000	31200.000	1	0	1
	6-43-41E	31171.429	35400.000	29000.000	7	0	7
	6-44-64	31083.333	35200.000	27700.000	6	0	6
	2-E17-13	30850.000	35400.000	27000.000	4	0	4
	6-36-61A	30280.000	32000.000	29200.000	5	0	5
	2-E17-5	30263.636	38100.000	24000.000	11	0	11
	2-E32-1	30166.667	32500.000	28200.000	3	0	3
	2-E33-1	30040.000	35400.000	26500.000	5	0	5
	2-E33-3	29966.667	30600.000	29400.000	3	0	3
	6-38-65	29933.333	31400.000	28000.000	3	0	3
	2-E33-30	29930.000	33200.000	28000.000	10	0	10
	6-53-47A	29550.000	42100.000	17000.000	2	0	2
	2-E24-18	28900.000	36000.000	25600.000	6	0	6
	2-E24-8	28600.000	28600.000	28600.000	1	0	1
	2-E17-17	28400.000	33400.000	22000.000	9	0	9
	2-E28-25	28400.000	28400.000	28400.000	1	0	1
	6-44-43B	28375.000	35700.000	22000.000	8	0	8
	2-E33-29	28280.000	29800.000	26000.000	10	0	10
	2-E24-16	28162.500	33000.000	25000.000	8	0	8
	6-43-41G	28000.000	28000.000	28000.000	1	0	1
	6-36-61B	27900.000	27900.000	27900.000	1	0	1
	6-52-48	27900.000	27900.000	27900.000	1	0	1
	2-E24-17	27883.333	29400.000	26300.000	6	0	6
	6-24-46	27800.000	28400.000	26700.000	3	0	3
	6-35-70	27560.000	29200.000	23000.000	5	0	5
	6-35-66	27360.000	29700.000	25700.000	5	0	5
	6-20-39	27250.000	27500.000	27000.000	2	0	2
	2-E25-18	27190.000	32000.000	23400.000	10	0	10
	2-E24-2	27114.286	33500.000	23300.000	7	0	7
	2-E34-8	26500.000	34000.000	19000.000	2	0	2
	2-E25-31	26350.000	31900.000	22000.000	14	0	14
	6-43-41F	26325.000	27000.000	25800.000	4	0	4
	2-E25-24	26075.000	30700.000	20800.000	8	0	8
	2-E25-36	26066.667	34000.000	19900.000	9	0	9
	6-33-42	26000.000	26000.000	26000.000	1	0	1
	2-E33-41	25500.000	26000.000	25000.000	2	0	2
	2-E26-8	25300.000	25300.000	25300.000	1	0	1
	2-E33-24	25300.000	25300.000	25300.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 130

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sulfate							
	6-43-40	25000.000	25000.000	25000.000	1	0	1
	2-E25-17	24850.000	26400.000	23300.000	2	0	2
	2-E33-18	24600.000	24600.000	24600.000	1	0	1
	6-34-42	24500.000	25000.000	24000.000	2	0	2
	2-E33-31	24400.000	26200.000	23000.000	3	0	3
	2-E33-28	24120.000	25900.000	22700.000	10	0	10
	2-E17-18	24088.889	27100.000	20000.000	9	0	9
	2-E33-33	23466.667	34200.000	3200.000	3	0	3
	2-E33-21	23050.000	23100.000	23000.000	2	0	2
	2-E17-6	22911.111	27100.000	19400.000	9	0	9
	2-E25-22	22525.000	27000.000	20900.000	8	0	8
	2-E27-10	22487.500	54000.000	16200.000	8	0	8
	2-E33-8	22300.000	23000.000	21600.000	2	0	2
	6-63-55	22000.000	22000.000	22000.000	1	0	1
	2-E24-20	21000.000	21000.000	21000.000	1	0	1
	6-40-40B	21000.000	21000.000	21000.000	1	0	1
	6-58-24	21000.000	21000.000	21000.000	1	0	1
	2-E33-37	20500.000	27000.000	14000.000	2	0	2
	6-59-58	20300.000	20300.000	20300.000	1	0	1
	2-E24-19	20200.000	22000.000	17000.000	3	0	3
	6-57-29A	20100.000	20100.000	20100.000	1	0	1
	2-E25-9	19900.000	23400.000	16400.000	2	0	2
	6-50-45	19600.000	19600.000	19600.000	1	0	1
	6-54-34	19600.000	19600.000	19600.000	1	0	1
	6-42-42B	18957.143	19600.000	18400.000	7	0	7
	2-E25-11	18900.000	24300.000	13000.000	3	0	3
	2-E26-1	18900.000	18900.000	18900.000	1	0	1
	2-E27-12	18766.667	20000.000	18000.000	3	0	3
	2-E25-27	18740.000	22700.000	16700.000	5	0	5
	2-E18-4	18644.444	35400.000	12000.000	9	0	9
	2-E33-35	18500.000	19000.000	18000.000	2	0	2
	2-E27-15	18466.667	19000.000	17400.000	3	0	3
	2-E25-23	18280.000	20100.000	15400.000	5	0	5
	2-E16-2	18150.000	20800.000	15800.000	4	0	4
	2-E33-32	17566.667	18700.000	17000.000	3	0	3
	2-E27-16	17500.000	19000.000	16000.000	2	0	2
	2-E27-13	17466.667	19400.000	15000.000	3	0	3
	2-E27-7	17200.000	17300.000	17000.000	3	0	3
	6-40-40A	17000.000	17000.000	17000.000	1	0	1
	2-E25-3	16800.000	16800.000	16800.000	1	0	1
	2-E33-12	16800.000	16800.000	16800.000	1	0	1
	2-E25-2	16250.000	16400.000	16100.000	2	0	2
	2-E25-38	15740.000	17900.000	12000.000	5	0	5
	6-31-31	15675.000	22000.000	1700.000	4	0	4
	2-E25-6	15650.000	17200.000	14100.000	2	0	2
	6-54-57	15500.000	15500.000	15500.000	1	0	1
	6-55-50C	15400.000	16700.000	14000.000	4	0	4
	6-43-42J	14985.714	20300.000	11300.000	7	0	7
	2-E25-26	14550.000	17500.000	11000.000	10	0	10
	2-E25-37	14533.333	17100.000	12000.000	6	0	6
	2-E24-4	14333.333	15600.000	12000.000	3	0	3
	2-E26-4	13500.000	13500.000	13500.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 131

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Sulfate							
	2-E18-3	13455.556	15500.000	11000.000	9	0	9
	2-E26-2	13400.000	13400.000	13400.000	1	0	1
	2-E25-34	13328.571	15000.000	11000.000	7	0	7
	6-60-57	13100.000	13200.000	13000.000	2	0	2
	6-42-41	13000.000	13000.000	13000.000	1	0	1
	2-E26-5	12900.000	12900.000	12900.000	1	0	1
	6-52-46A	12900.000	12900.000	12900.000	1	0	1
	2-E25-28	12818.182	14200.000	12000.000	11	0	11
	6-42-40A	12812.500	19100.000	9300.000	8	0	8
	6-44-42	12785.714	15700.000	11000.000	7	0	7
	6-43-45	12350.000	14900.000	9400.000	6	0	6
	2-E25-25	12161.538	14000.000	9300.000	13	0	13
	2-E25-32P	12076.923	13300.000	9800.000	13	0	13
	2-E25-39	11233.333	12000.000	9700.000	3	0	3
	2-E25-43	11000.000	11000.000	11000.000	1	0	1
	6-51-46	10600.000	10600.000	10600.000	1	0	1
	6-43-43	10157.143	12100.000	8000.000	7	0	7
	6-54-49	9050.000	9100.000	9000.000	2	0	2
	6-50-48B	8600.000	8600.000	8600.000	1	0	1
	2-E26-13	7400.000	7400.000	7400.000	1	0	1
	2-E26-12	6600.000	6600.000	6600.000	1	0	1
	6-42-40B	6400.000	7200.000	5600.000	2	0	2
	6-40-39	3883.333	4500.000	3400.000	6	0	6
	6-40-33A	1300.000	1300.000	1300.000	1	0	1
	2-E28-24	900.000	900.000	900.000	1	0	1
Technetium-99							
	6-50-53A	21665.167	32700.000	391.000	6	0	6
	6-49-55A	5061.000	12500.000	125.000	5	0	5
	2-E33-7	3245.000	4460.000	470.000	4	0	4
	6-55-57	2150.000	2400.000	1900.000	2	0	2
	2-E33-24	1110.000	1550.000	270.000	4	0	4
	2-E33-5	1025.000	1610.000	180.000	4	0	4
	2-E33-13	770.000	770.000	770.000	1	0	1
	2-E33-26	770.000	980.000	560.000	2	0	2
	2-E33-12	704.967	1900.000	82.900	3	0	3
	6-49-57A	650.000	650.000	650.000	1	0	1
	2-E33-34	624.250	680.000	467.000	4	0	4
	2-E33-1	551.500	880.000	91.000	4	0	4
	6-61-62	491.725	740.000	93.900	4	0	4
	6-64-62	475.750	637.000	307.000	4	0	4
	2-E17-14	443.500	599.000	288.000	2	0	2
	2-E33-38	356.500	680.000	33.000	2	0	2
	2-E33-8	343.000	399.000	287.000	2	0	2
	2-E17-12	341.667	755.000	128.000	3	0	3
	2-E33-4	300.000	300.000	300.000	1	0	1
	2-E33-31	294.500	370.000	236.000	4	0	4
	2-E33-35	244.500	280.000	222.000	4	0	4
	2-E33-41	210.667	333.000	116.000	3	0	3
	2-E17-5	209.333	312.000	117.000	3	0	3
	6-63-58	205.000	205.000	205.000	1	0	1
	2-E17-17	201.000	238.000	164.000	2	0	2
	6-32-22	181.025	244.000	48.100	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 132

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Technetium-99							
	6-47-50	153.425	610.000	610.000	1	3	4
	2-E27-14	140.000	140.000	140.000	1	0	1
	2-E17-15	110.000	110.000	110.000	1	0	1
	2-E32-1	110.000	110.000	110.000	1	0	1
	2-E28-27	106.900	171.000	33.900	10	0	10
	2-E32-2	105.530	159.000	57.200	10	0	10
	6-60-60	100.850	139.000	62.700	2	0	2
	6-53-55C	98.000	98.000	98.000	1	0	1
	2-E17-9	96.200	126.000	70.400	3	0	3
	2-E28-7	92.433	136.000	61.400	3	0	3
	6-35-70	89.700	135.000	26.800	6	0	6
	2-E28-23	88.300	142.000	21.900	3	0	3
	6-63-55	87.150	96.400	77.900	2	0	2
	2-E33-21	83.850	110.000	57.700	2	0	2
	2-E32-3	74.400	156.000	28.900	8	0	8
	2-E17-1	68.400	68.400	68.400	1	0	1
	2-E27-5	65.833	101.000	39.000	3	0	3
	2-E17-13	60.667	84.700	37.700	3	0	3
	2-E33-30	59.155	112.000	24.000	11	0	11
	6-65-50	58.500	58.500	58.500	1	0	1
	2-E33-3	57.750	89.500	26.000	2	0	2
	2-E28-12	54.800	54.800	54.800	1	0	1
	2-E33-26	51.859	114.000	26.000	10	1	11
	6-32-43	50.850	125.000	21.100	6	0	6
	2-E33-29	46.975	87.900	25.200	12	0	12
	6-41-23	46.450	68.200	14.300	4	0	4
	2-E33-14	44.000	44.000	44.000	1	0	1
	2-E28-16	42.600	42.600	42.600	1	0	1
	2-E27-13	41.850	43.100	40.600	2	0	2
	6-38-65	40.633	92.400	40.700	2	1	3
	2-E33-32	39.450	64.000	16.200	4	0	4
	6-53-55A	35.000	100.000	100.000	1	2	3
	2-E33-10	34.500	34.500	34.500	1	0	1
	2-E13-5	33.887	67.700	67.700	1	1	2
	6-35-66	32.113	44.700	5.850	4	0	4
	6-34-51	31.600	31.600	31.600	1	0	1
	6-40-33A	31.505	93.900	93.900	1	2	3
	2-E28-1	28.900	28.900	28.900	1	0	1
	2-E33-20	27.433	34.100	18.000	3	0	3
	2-E33-18	26.750	32.300	21.200	2	0	2
	2-E24-8	24.300	32.900	15.700	2	0	2
	2-E24-19	22.875	39.000	6.750	2	0	2
	6-59-58	22.103	40.800	18.100	3	1	4
	2-E32-5	21.300	35.600	13.200	4	0	4
	2-E34-8	20.300	20.300	20.300	1	0	1
	6-54-57	20.163	71.700	23.300	2	3	5
	6-55-55	19.250	37.000	1.500	2	0	2
	6-55-50C	19.111	38.700	38.700	1	1	2
	6-33-42	16.000	16.000	16.000	1	0	1
	6-34-42	13.725	18.700	8.750	2	0	2
	6-49-55B	13.139	48.000	48.000	1	3	4
	2-E17-8	13.100	13.100	13.100	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 133

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Technetium-99							
	2-E25-22	13.040	29.970	1.330	3	0	3
	2-E28-26	12.822	26.900	3.900	7	2	9
	6-46-21B	12.200	12.200	12.200	1	0	1
	2-E28-18	10.300	10.300	10.300	1	0	1
	2-E17-16	8.766	14.100	12.700	2	1	3
	2-E28-21	7.840	7.840	7.840	1	0	1
	6-31-31	7.730	7.730	7.730	1	0	1
	2-E25-11	7.620	7.620	7.620	1	0	1
	6-61-37	7.370	7.370	7.370	1	0	1
	2-E33-15	6.300	6.300	6.300	1	0	1
	2-E27-12	5.535	9.220	9.220	1	1	2
	2-E33-33	5.440	9.000	3.550	4	0	4
	2-E32-4	5.365	13.800	3.690	3	5	8
	6-40-62	5.310	5.310	5.310	1	0	1
	6-50-48B	5.303	16.500	16.500	1	2	3
	6-42-40C	4.837	13.200	13.200	1	2	3
	6-37-43	4.815	8.220	8.220	1	1	2
	2-E26-9	4.780	4.780	4.780	1	0	1
	2-E28-19	4.380	4.380	4.380	1	0	1
	2-E28-28	4.130	4.770	4.770	1	1	2
	6-36-61A	3.705	6.080	6.080	1	1	2
	2-E25-40	3.393	4.000	2.800	3	0	3
	2-E33-40	3.200	3.200	3.200	1	0	1
	6-52-57	3.100	3.100	3.100	1	0	1
	2-E25-30P	2.997	5.430	1.480	3	0	3
	2-E34-2	2.944	21.000	21.000	1	10	11
	6-49-28	2.920	2.920	2.920	1	0	1
	2-E25-27	2.905	4.410	1.400	2	0	2
	6-34-39A	2.760	2.760	2.760	1	0	1
	2-E34-1	2.706	5.340	5.340	1	3	4
	6-51-63	2.600	2.600	2.600	1	0	1
	6-53-47A	2.590	2.590	2.590	1	0	1
	2-E25-29P	2.454	7.180	.730	5	3	8
	2-E34-6	2.357	17.600	17.600	1	6	7
	2-E25-18	2.303	2.110	1.290	2	2	4
	2-E25-23	2.140	2.140	2.140	1	0	1
	6-61-41	1.910	1.910	1.910	1	0	1
	2-E25-33	1.828	6.220	.100	4	4	8
	2-E25-39	1.344	2.190	2.190	1	2	3
	2-E24-20	1.330	1.330	1.330	1	0	1
	2-E25-32P	1.275	2.750	.540	5	2	7
	2-E25-31	1.183	2.440	.320	4	3	7
	2-E25-28	.917	2.810	.620	2	1	3
	6-57-29A	.872	.872	.872	1	0	1
	2-E25-26	.843	3.140	.570	2	1	3
	2-E25-25	.727	1.430	.100	8	4	12
	6-61-66	.668	.649	.649	1	3	4
	6-63-25A	.114	.114	.114	1	0	1
	2-E27-8	-.092	1.330	1.330	1	7	8
	2-E26-11	-.246	-.246	-.246	1	0	1
	2-E27-11	-.864	-.896	-.896	1	2	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 134

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
@ Tetrachloroethylene							
	6-24-34B	8.192	11.000	6.300	12	0	12
	6-23-34	7.793	12.000	5.400	14	0	14
	6-24-34A	6.164	8.200	4.600	11	0	11
	6-24-34C	5.823	7.800	3.000	10	3	13
	6-25-34A	4.280	1.400	1.400	1	4	5
	6-26-35A	4.160	.800	.800	1	4	5
	6-26-33	4.120	.600	.600	1	4	5
	6-24-33	4.060	6.000	3.300	6	4	10
	6-25-34C	2.718	2.500	.530	8	5	13
	6-24-35	2.336	1.400	.500	6	7	13
Thallium							
	6-49-57A	50.000	50.000	50.000	1	0	1
Thallium, filtered							
	6-49-57A	50.000	50.000	50.000	1	0	1
Titanium							
	2-E16-2	1120.000	1120.000	1120.000	1	0	1
	6-42-40B	488.000	488.000	488.000	1	0	1
	2-E25-6	461.000	461.000	461.000	1	0	1
	2-E25-9	423.000	423.000	423.000	1	0	1
	2-E25-11	228.000	228.000	228.000	1	0	1
	2-E25-17	128.000	128.000	128.000	1	0	1
	6-43-41F	85.000	135.000	135.000	1	2	3
	2-E34-6	71.000	104.000	104.000	1	3	4
	2-E27-10	63.750	75.000	75.000	1	3	4
	6-44-43B	60.333	61.000	61.000	1	2	3
Toluene							
	2-E23-1	30.000	30.000	30.000	1	0	1
	2-E28-7	20.000	20.000	20.000	1	0	1
	6-43-41E	18.714	54.000	52.000	2	5	7
	2-E16-2	15.667	37.000	37.000	1	2	3
	6-43-41F	14.800	54.000	54.000	1	4	5
	2-E25-17	12.000	19.000	19.000	1	1	2
	2-E33-29	4.552	.520	.520	1	9	10
	2-E17-20	4.391	.740	.740	1	6	7
	2-E25-36	4.380	.660	.660	1	6	7
	2-E27-11	3.527	.580	.580	1	2	3
Total Organic Halogen, Low Det. Level							
	2-E17-14	2416.845	19300.000	10.000	5	20	25
	2-E25-31	1556.576	45300.000	10.000	43	8	51
	6-40-40A	930.000	930.000	930.000	1	0	1
	2-E17-5	626.431	5590.000	10.000	6	20	26
	6-40-40B	510.000	510.000	510.000	1	0	1
	6-43-41F	481.700	1310.000	11.000	7	3	10
	2-E17-15	427.067	3310.000	10.000	14	13	27
	6-43-41G	360.000	360.000	360.000	1	0	1
	6-43-41E	359.462	1260.000	21.000	13	0	13
	2-E17-16	284.224	2860.000	10.000	6	23	29
	2-E25-29P	245.622	1460.000	12.000	41	4	45
	6-24-35	172.471	1840.000	10.000	9	22	31
	6-24-34A	166.438	1810.000	20.000	37	0	37
	6-24-34C	109.223	1360.000	10.000	34	1	35
	6-24-34B	69.747	373.000	20.000	30	0	30

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 135

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Total Organic Halogen, Low Det. Level							
	6-23-34	44.222	56.600	20.000	36	0	36
	2-E25-32P	43.013	329.000	16.000	12	36	48
	2-E25-25	41.606	282.000	10.000	12	23	35
	2-E25-30P	39.417	380.000	10.000	5	7	12
	2-E25-27	31.600	271.000	11.000	3	7	10
	6-24-33	31.161	103.000	10.000	31	0	31
	2-E33-36	30.000	70.000	20.000	3	2	5
	2-E25-34	29.051	136.000	21.000	5	15	20
	6-25-34B	22.921	232.000	10.000	9	24	33
	2-E32-3	22.620	389.000	389.000	1	20	21
	2-E25-19	20.457	106.000	106.000	1	6	7
	2-E33-37	20.000	40.000	40.000	1	2	3
	2-E25-39	18.714	60.000	10.500	4	3	7
	6-42-42B	18.278	72.000	62.000	4	14	18
	2-E28-24	17.000	17.000	17.000	1	0	1
	2-E27-13	16.333	60.000	60.000	1	5	6
	2-E28-23	16.100	29.300	10.000	2	1	3
	6-42-40B	15.000	47.000	47.000	1	4	5
	2-E34-1	14.750	26.500	26.500	1	1	2
	2-E28-7	14.250	21.500	21.500	1	1	2
	2-E27-16	12.000	20.000	10.000	2	3	5
	2-E17-18	11.624	60.100	40.800	4	21	25
	6-25-34C	11.166	21.000	10.000	9	20	29
	2-E28-21	10.600	20.400	20.400	1	3	4
	2-E33-35	10.333	11.000	11.000	1	2	3
	2-E25-21	10.214	29.000	29.000	1	6	7
	2-E28-13	10.067	23.200	23.200	1	2	3
	2-E17-13	10.000	15.000	15.000	1	3	4
	2-E26-11	10.000	10.000	10.000	1	3	4
	2-E26-12	10.000	10.000	10.000	1	2	3
	2-E28-28	10.000	10.000	10.000	1	4	5
	6-43-40	10.000	10.000	10.000	1	0	1
	2-E32-4	9.912	74.000	12.000	5	29	34
	2-E25-33	9.674	66.000	10.000	7	27	34
	2-E18-3	9.430	37.200	11.000	6	17	23
	6-42-40A	9.374	54.100	11.000	4	15	19
	2-E25-6	9.333	20.000	20.000	1	2	3
	2-E25-40	9.286	20.000	10.000	2	5	7
	6-26-33	8.600	26.800	25.200	2	27	29
	2-E27-12	8.500	20.000	10.000	2	6	8
	2-E25-11	8.333	12.000	12.000	1	2	3
	6-25-34A	7.700	13.000	10.000	2	24	26
	2-E18-4	7.700	18.000	10.000	6	17	23
	6-25-33A	7.613	48.000	10.000	3	30	33
	6-41-40	7.227	20.000	10.000	3	8	11
	2-E27-11	7.143	10.000	10.000	1	6	7
	2-E18-2	6.438	15.000	12.000	6	18	24
	2-E25-36	6.410	20.000	20.000	1	21	22
	2-E17-9	6.405	25.000	10.000	4	15	19
	2-E32-2	6.397	16.500	11.000	4	25	29
	2-E33-28	6.259	29.000	29.000	1	26	27
	2-E25-26	6.107	16.000	10.000	4	24	28

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 136

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Total Organic Halogen, Low Det. Level							
	2-E33-30	6.074	13.000	11.000	2	25	27
	6-44-42	6.059	23.000	20.000	2	15	17
	2-E24-16	6.050	11.000	10.000	2	18	20
	2-E25-18	6.040	26.600	26.600	1	14	15
	2-E24-18	6.000	11.000	10.000	2	16	18
	2-E28-27	5.821	14.000	10.000	2	26	28
	6-43-43	5.801	14.000	10.000	3	17	20
	2-E25-28	5.792	14.000	14.000	1	23	24
	2-E33-29	5.643	12.000	10.000	2	26	28
	2-E17-19	5.563	20.000	10.000	3	13	16
	2-E24-2	5.547	20.000	10.000	2	17	19
	6-43-45	5.545	10.000	10.000	1	10	11
	2-E25-22	5.426	15.000	15.000	1	11	12
	6-43-42J	5.351	13.000	11.000	2	18	20
	2-E17-6	5.350	20.000	10.000	3	19	22
	6-44-43B	5.333	15.000	15.000	1	11	12
	6-26-34	5.230	15.000	15.000	1	26	27
	2-E17-20	5.212	15.000	15.000	1	18	19
	2-E25-35	5.151	10.000	10.000	2	18	20
	2-E28-26	5.138	22.000	15.000	4	25	29
	6-26-35A	4.926	10.000	10.000	1	26	27
	2-E17-1	4.788	16.000	11.000	2	14	16
	2-E18-1	4.322	10.000	10.000	1	22	23
Total carbon							
	6-24-34B	56560.833	91000.000	65.000	6	0	6
	6-24-34C	51193.833	89000.000	63.000	6	0	6
	6-24-34A	50194.000	89000.000	70.000	5	0	5
	6-23-34	46023.556	85000.000	68.000	9	0	9
	2-E13-5	37025.000	40000.000	35000.000	4	0	4
	6-24-33	36803.833	72000.000	60.000	6	0	6
	6-35-66	35925.000	37300.000	33800.000	4	0	4
	6-40-39	35300.000	36500.000	34600.000	3	0	3
	6-49-57B	35000.000	35000.000	35000.000	1	0	1
	6-53-47A	34900.000	34900.000	34900.000	1	0	1
	6-36-61A	34533.333	35100.000	33800.000	3	0	3
	2-E25-30P	34100.000	35500.000	32700.000	2	0	2
	6-36-61B	33100.000	33100.000	33100.000	1	0	1
	2-E28-13	32333.333	34100.000	30200.000	3	0	3
	6-40-62	32066.667	33000.000	31600.000	3	0	3
	6-54-57	32000.000	32000.000	32000.000	1	0	1
	2-E13-14	31550.000	33300.000	28900.000	4	0	4
	6-24-46	30933.333	31300.000	30600.000	3	0	3
	6-25-34C	30907.500	53000.000	45.000	6	0	6
	2-E25-35	30580.000	33700.000	28900.000	5	0	5
	6-41-40	30500.000	31400.000	30000.000	3	0	3
	6-50-53B	30000.000	30000.000	30000.000	1	0	1
	2-E17-6	29955.556	37600.000	24100.000	9	0	9
	6-25-33A	29925.000	30200.000	29700.000	4	0	4
	6-35-70	29250.000	30200.000	28300.000	2	0	2
	6-38-65	29100.000	29100.000	29100.000	1	0	1
	6-25-34B	28700.000	30500.000	27200.000	4	0	4
	6-20-39	28600.000	28800.000	28400.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 137

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Total carbon							
	2-E33-34	28500.000	29000.000	28000.000	2	0	2
	2-E33-35	28500.000	29000.000	28000.000	2	0	2
	6-26-35C	28100.000	29800.000	27100.000	4	0	4
	2-E28-18	28066.667	32400.000	24600.000	3	0	3
	2-E28-12	28000.000	28000.000	28000.000	1	0	1
	6-55-50C	27700.000	27800.000	27600.000	2	0	2
	6-45-69A	27500.000	27500.000	27500.000	1	0	1
	6-25-34A	27425.000	28400.000	26400.000	4	0	4
	6-47-60	27333.333	27900.000	26700.000	3	0	3
	2-E25-24	27125.000	29500.000	24200.000	4	0	4
	2-E25-21	27066.667	30800.000	24700.000	3	0	3
	6-26-34	26920.000	32000.000	24800.000	5	0	5
	6-43-41E	26833.333	28700.000	25600.000	3	0	3
	2-E24-12	26500.000	26500.000	26500.000	1	0	1
	6-44-64	26350.000	28200.000	24500.000	4	0	4
	2-E32-4	26082.700	35000.000	27.000	10	0	10
	2-E33-1	25960.000	27000.000	24600.000	5	0	5
	6-43-41F	25733.333	26100.000	25100.000	3	0	3
	6-26-33	25725.000	26300.000	24900.000	4	0	4
	2-E33-5	25575.000	26300.000	24500.000	4	0	4
	2-E28-26	25541.250	33000.000	30.000	8	0	8
	6-24-35	25383.286	47000.000	38.000	7	0	7
	6-44-43B	25366.667	26300.000	24700.000	3	0	3
	2-E25-20	24866.667	27900.000	22800.000	3	0	3
	2-E32-5	24785.200	34000.000	26.000	5	0	5
	2-E33-3	24600.000	25400.000	24000.000	3	0	3
	2-E28-7	24200.000	24200.000	24200.000	1	0	1
	2-E33-8	24200.000	25100.000	23300.000	2	0	2
	2-E33-10	24166.667	25700.000	22000.000	3	0	3
	6-43-45	24133.333	25400.000	23400.000	3	0	3
	2-E28-21	24000.000	28700.000	14700.000	4	0	4
	6-26-35A	23905.167	34000.000	31.000	6	0	6
	2-E34-3	23720.000	24800.000	22400.000	5	0	5
	2-E18-3	23666.667	25000.000	21200.000	3	0	3
	6-42-42B	23600.000	24200.000	23100.000	4	0	4
	2-E17-9	23587.500	26400.000	22000.000	8	0	8
	2-E18-1	23525.000	24600.000	21500.000	4	0	4
	6-49-55A	23480.000	25600.000	21600.000	5	0	5
	2-E25-23	23475.000	26200.000	21700.000	4	0	4
	2-E26-5	23400.000	23400.000	23400.000	1	0	1
	2-E33-24	23400.000	23400.000	23400.000	1	0	1
	2-E17-14	23387.500	27300.000	19000.000	8	0	8
	2-E33-18	23300.000	23300.000	23300.000	1	0	1
	6-37-43	23266.667	25300.000	20300.000	3	0	3
	2-E16-2	23200.000	24500.000	22300.000	3	0	3
	2-E32-3	23114.111	31000.000	27.000	9	0	9
	2-E18-4	23000.000	23800.000	22200.000	2	0	2
	2-E25-11	23000.000	23000.000	23000.000	1	0	1
	2-E34-2	22980.000	26000.000	20900.000	5	0	5
	2-E33-21	22950.000	24100.000	21800.000	2	0	2
	6-45-42	22950.000	23900.000	22000.000	4	0	4
	2-E35-1	22600.000	22600.000	22600.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 138

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Total carbon							
	2-E27-7	22550.000	23000.000	22100.000	2	0	2
	2-E17-19	22400.000	23000.000	21600.000	5	0	5
	2-E28-23	22400.000	24300.000	20500.000	2	0	2
	6-43-43	22375.000	23600.000	20500.000	4	0	4
	2-E32-1	22366.667	24300.000	21100.000	3	0	3
	2-E33-30	22350.000	26000.000	19700.000	8	0	8
	6-47-50	22350.000	22900.000	21800.000	2	0	2
	2-E28-28	22344.667	34000.000	34.000	3	0	3
	2-E27-10	22321.167	30000.000	27.000	6	0	6
	2-E18-2	22200.000	22900.000	21500.000	2	0	2
	2-E27-5	22200.000	22200.000	22200.000	1	0	1
	2-E25-19	22080.000	23400.000	19800.000	5	0	5
	2-E17-13	22000.000	22000.000	22000.000	1	0	1
	2-E25-33	21828.375	29900.000	27.000	8	0	8
	2-E17-15	21812.500	24100.000	20000.000	8	0	8
	2-E17-5	21788.889	24000.000	19600.000	9	0	9
	2-E24-8	21700.000	21700.000	21700.000	1	0	1
	2-E34-1	21650.000	23000.000	20300.000	2	0	2
	2-E17-12	21500.000	22300.000	20700.000	2	0	2
	2-E24-18	21416.667	24000.000	20500.000	6	0	6
	2-E17-18	21328.571	22400.000	20500.000	7	0	7
	2-E25-9	21300.000	21300.000	21300.000	1	0	1
	2-E27-9	21254.167	29000.000	25.000	6	0	6
	2-E25-18	21166.667	23000.000	18500.000	3	0	3
	2-E25-31	20935.667	25000.000	21.000	9	0	9
	2-E17-17	20900.000	21800.000	20000.000	7	0	7
	2-E34-5	20703.833	29000.000	23.000	6	0	6
	2-E24-17	20650.000	24000.000	19200.000	6	0	6
	2-E27-8	20470.833	29000.000	25.000	6	0	6
	2-E24-2	20400.000	23700.000	19100.000	7	0	7
	2-E25-6	20300.000	20300.000	20300.000	1	0	1
	2-E34-6	20164.200	25800.000	21.000	5	0	5
	2-E25-22	20100.000	22100.000	18500.000	4	0	4
	2-E32-2	19777.375	26000.000	19.000	8	0	8
	6-43-42J	19746.000	26200.000	30.000	5	0	5
	6-47-46A	19500.000	20400.000	19000.000	3	0	3
	2-E28-27	19378.125	25000.000	25.000	8	0	8
	2-E17-16	19128.571	20700.000	17900.000	7	0	7
	2-E17-1	19117.571	24400.000	23.000	7	0	7
	2-E25-17	19000.000	19000.000	19000.000	1	0	1
	2-E33-28	18490.125	26000.000	21.000	8	0	8
	2-E25-28	18471.429	19000.000	17900.000	7	0	7
	6-44-42	18324.400	23200.000	22.000	5	0	5
	2-E25-34	18280.000	20000.000	17300.000	5	0	5
	2-E24-16	18160.857	24000.000	26.000	7	0	7
	2-E17-20	18074.714	23000.000	23.000	7	0	7
	6-39-39	17750.000	21000.000	14500.000	2	0	2
	2-E25-26	17742.857	18900.000	16700.000	7	0	7
	6-42-40A	17180.000	18400.000	15300.000	5	0	5
	2-E33-29	17093.889	26000.000	22.000	9	0	9
	2-E25-36	17046.286	24000.000	24.000	7	0	7
	2-E25-27	16950.000	17000.000	16900.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 139

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Total carbon							
	2-E27-13	16941.667	27000.000	25.000	3	0	3
	2-E27-14	16641.333	26000.000	24.000	3	0	3
	2-E25-37	16385.000	22000.000	25.000	5	0	5
	2-E26-1	16100.000	16100.000	16100.000	1	0	1
	2-E25-29P	15877.714	25400.000	22.000	7	0	7
	2-E25-40	15850.600	28000.000	26.000	5	0	5
	2-E34-7	15774.333	24500.000	23.000	3	0	3
	6-50-53A	15650.000	17200.000	14600.000	4	0	4
	2-E27-15	15408.667	24000.000	26.000	3	0	3
	2-E25-32P	15392.000	20000.000	20.000	10	0	10
	2-E27-12	15307.667	24000.000	23.000	3	0	3
	2-E25-25	15179.778	19000.000	18.000	9	0	9
	2-E33-37	15013.000	30000.000	26.000	2	0	2
	2-E25-38	14923.800	20000.000	19.000	5	0	5
	2-E33-32	13963.750	29000.000	26.000	4	0	4
	2-E33-33	13412.000	27000.000	23.000	4	0	4
	2-E33-31	13313.250	29000.000	26.000	4	0	4
	2-E34-8	13014.000	26000.000	28.000	2	0	2
	2-E25-41	12914.000	29000.000	28.000	4	0	4
	2-E24-19	12588.250	28000.000	26.000	4	0	4
	2-E27-16	12514.000	25000.000	28.000	2	0	2
	2-E33-36	12513.000	25000.000	26.000	2	0	2
	2-E25-39	12006.000	18000.000	18.000	3	0	3
	2-E27-11	8684.000	26000.000	26.000	3	0	3
	2-E33-41	29.500	30.000	29.000	2	0	2
	2-E24-20	25.500	26.000	25.000	2	0	2
	2-E33-42	25.000	25.000	25.000	1	0	1
	2-E33-43	25.000	25.000	25.000	1	0	1
Total dissolved solids							
	2-E25-35	444000.000	444000.000	444000.000	1	0	1
	6-23-34	434250.000	668000.000	347000.000	4	0	4
	6-24-33	367000.000	367000.000	367000.000	1	0	1
	6-24-34C	366000.000	377000.000	359000.000	4	0	4
	6-24-34B	365500.000	383000.000	357000.000	4	0	4
	6-24-34A	356000.000	367000.000	350000.000	4	0	4
	2-E18-1	347000.000	347000.000	347000.000	1	0	1
	2-E34-1	289000.000	289000.000	289000.000	1	0	1
	6-24-35	287000.000	295000.000	276000.000	4	0	4
	2-E34-2	286000.000	286000.000	286000.000	1	0	1
	6-25-34B	271333.333	278000.000	264000.000	3	0	3
	6-26-35C	268666.667	281000.000	255000.000	3	0	3
	6-26-35A	266333.333	269000.000	263000.000	3	0	3
	6-25-34C	261250.000	306000.000	173000.000	4	0	4
	6-26-34	259333.333	262000.000	256000.000	3	0	3
	6-26-33	256666.667	268000.000	245000.000	3	0	3
	6-25-33A	247000.000	259000.000	235000.000	3	0	3
	6-25-34A	227333.333	284000.000	146000.000	3	0	3
	6-41-40	216000.000	216000.000	216000.000	1	0	1
	2-E25-21	208000.000	208000.000	208000.000	1	0	1
	6-44-43B	192000.000	192000.000	192000.000	1	0	1
	6-43-41E	190000.000	190000.000	190000.000	1	0	1
	6-40-39	183000.000	183000.000	183000.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 140

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Total dissolved solids							
	6-43-41F	181000.000	181000.000	181000.000	1	0	1
	6-43-45	144000.000	144000.000	144000.000	1	0	1
	2-E25-28	129000.000	129000.000	129000.000	1	0	1
	2-E25-34	117000.000	117000.000	117000.000	1	0	1
	2-E17-12	114120.000	228000.000	240.000	2	0	2
	2-E25-26	95000.000	95000.000	95000.000	1	0	1
	6-42-40B	68000.000	68000.000	68000.000	1	0	1
	2-E17-13	67146.667	201000.000	220.000	3	0	3
	2-E25-32P	25000.000	25000.000	25000.000	1	0	1
	2-E25-19	340.000	340.000	340.000	1	0	1
	2-E13-14	310.000	310.000	310.000	1	0	1
	6-40-62	310.000	310.000	310.000	1	0	1
	6-35-70	300.000	300.000	300.000	1	0	1
	2-E28-18	290.000	290.000	290.000	1	0	1
	2-E25-41	270.000	270.000	270.000	1	0	1
	6-36-61A	270.000	270.000	270.000	1	0	1
	6-45-69A	260.000	260.000	260.000	1	0	1
	2-E25-18	240.000	240.000	240.000	1	0	1
	6-34-42	200.000	200.000	200.000	1	0	1
	2-E27-15	190.000	190.000	190.000	1	0	1
	6-43-42J	190.000	190.000	190.000	1	0	1
	6-45-42	180.000	180.000	180.000	1	0	1
	2-E34-8	170.000	170.000	170.000	1	0	1
	2-E33-37	160.000	160.000	160.000	1	0	1
	6-55-50C	160.000	160.000	160.000	1	0	1
	6-44-42	150.000	150.000	150.000	1	0	1
	2-E24-19	140.000	140.000	140.000	1	0	1
	2-E25-20	130.000	130.000	130.000	1	0	1
Total organic carbon							
	2-E25-31	1550.000	3790.000	1000.000	13	16	29
	2-E27-13	1321.429	4450.000	4450.000	1	6	7
	6-25-34A	1279.567	22900.000	1.000	3	27	30
	6-42-40B	1100.000	1300.000	1200.000	2	1	3
	2-E33-37	1050.000	1200.000	1200.000	1	3	4
	6-50-53B	1000.000	1000.000	1000.000	1	0	1
	2-E27-15	900.000	1000.000	1000.000	1	4	5
	2-E33-33	900.000	1000.000	1000.000	1	4	5
	6-43-41E	885.714	1200.000	1100.000	2	5	7
	6-42-40A	874.500	1400.000	1.000	2	8	10
	2-E25-29P	846.261	1460.000	1220.000	2	21	23
	6-41-40	828.571	1400.000	1400.000	1	6	7
	2-E26-9	820.000	800.000	600.000	3	2	5
	2-E17-14	816.429	1130.000	1050.000	2	19	21
	6-40-40B	800.000	800.000	800.000	1	0	1
	2-E25-19	796.125	1040.000	1040.000	1	7	8
	2-E17-15	783.909	1200.000	1000.000	3	19	22
	6-43-41F	771.429	1200.000	1000.000	3	4	7
	2-E25-25	767.800	1390.000	1.000	4	31	35
	2-E25-26	759.087	1100.000	500.000	2	21	23
	2-E26-11	750.250	1.000	1.000	1	3	4
	2-E25-38	733.333	600.000	600.000	1	8	9
	2-E17-16	728.818	1100.000	1100.000	1	21	22

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Total organic carbon							
	2-E25-37	700.100	1.000	1.000	1	9	10
	2-E32-2	680.000	2300.000	2300.000	1	14	15
	6-43-43	680.000	1000.000	1000.000	1	9	10
	2-E17-5	668.120	1125.000	1125.000	1	24	25
	6-43-42J	648.214	1075.000	1075.000	1	13	14
	6-43-45	625.000	700.000	700.000	1	7	8
	2-E25-33	621.724	1025.000	1025.000	1	28	29
	6-42-39B	600.000	600.000	600.000	1	0	1
	6-43-41G	600.000	600.000	600.000	1	0	1
	6-37-43	580.333	1000.000	1000.000	1	2	3
	2-E27-12	580.200	1.000	1.000	1	4	5
	2-E33-31	580.200	1.000	1.000	1	4	5
	2-E27-9	548.438	1175.000	1175.000	1	15	16
	2-E27-11	533.833	3.000	3.000	1	5	6
	6-25-34C	519.655	3.000	3.000	1	28	29
	6-26-34	512.958	1000.000	1000.000	1	23	24
	6-25-34B	512.161	1375.000	2.000	6	25	31
	6-24-34A	495.931	2.000	2.000	1	28	29
	2-E18-1	495.050	1000.000	1000.000	1	19	20
	6-23-34	480.346	1080.000	1080.000	1	25	26
	6-24-34B	441.379	2.000	2.000	1	28	29
	6-40-40A	1.000	1.000	1.000	1	0	1
	6-42-41	1.000	1.000	1.000	1	0	1
a Trans-1,2 Dichloroethylene							
	6-24-34A	4.727	2.000	2.000	1	10	11
	6-24-34C	4.131	1.700	1.700	1	12	13
a Trichloroethylene							
	6-31-31P	12.000	12.000	12.000	1	0	1
	6-23-34	5.221	9.000	3.800	14	0	14
	6-24-34B	4.762	8.000	3.000	12	1	13
	6-24-34A	4.292	7.000	2.000	11	1	12
	6-25-34B	4.220	1.100	1.100	1	4	5
	6-24-34C	3.000	4.000	1.800	7	6	13
	6-24-33	2.850	2.600	1.900	5	5	10
	6-25-34C	2.512	1.500	1.000	2	11	13
Trichloromonofluoromethane							
	2-E17-17	10.750	13.000	13.000	1	3	4
	2-E27-10	7.000	4.000	4.000	1	1	2
Triethylene glycol							
	2-E33-35	10.000	10.000	10.000	1	0	1
Tritium							
	2-E24-11	4270000.000	8070000.000	2250000.000	7	0	7
	2-E17-9	4155625.000	5200000.000	3180000.000	16	0	16
	2-E24-1	3707500.000	7810000.000	1920000.000	16	0	16
	2-E17-8	3591666.923	5830000.000	2780000.000	5	1	6
	2-E17-1	3277500.726	8050000.000	2730000.000	6	2	8
	2-E24-2	2154545.579	4630000.000	1370000.000	10	1	11
	2-E24-17	2142000.310	2990000.000	2350000.000	4	1	5
	2-E25-19	2061200.513	4750000.000	596000.000	7	3	10
	2-E17-20	2024992.541	4600000.000	2800000.000	4	4	8
	2-E24-16	1875000.474	3050000.000	2580000.000	4	2	6
	2-E17-12	1508157.957	3460000.000	641000.000	18	1	19

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992).

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Tritium							
	2-E17-14	1418714.669	2700000.000	217000.000	6	1	7
	2-E17-19	1360249.280	2620000.000	261000.000	3	1	4
	2-E24-18	1339000.000	2320000.000	145000.000	5	0	5
	2-E24-7	1174500.000	1950000.000	418000.000	4	0	4
	2-E17-13	1160200.000	3340000.000	291000.000	20	0	20
	6-35-66	1127714.286	1210000.000	964000.000	7	0	7
	2-E17-5	1109869.620	4210000.000	118000.000	22	1	23
	2-E25-20	1047142.727	1740000.000	1570.000	11	0	11
	2-E24-8	972254.000	4820000.000	7570.000	5	0	5
	6-35-70	786389.077	1180000.000	620000.000	12	1	13
	6-25-34B	732000.000	2600000.000	247000.000	5	0	5
	2-E17-15	648898.984	1800000.000	291.000	6	1	7
	2-E23-1	646333.333	1260000.000	135000.000	3	0	3
	2-E17-17	611428.571	1100000.000	201000.000	7	0	7
	2-E25-11	480319.048	777000.000	68500.000	21	0	21
	6-38-65	435615.385	472000.000	397000.000	13	0	13
	2-E25-18	403809.091	627000.000	93900.000	11	0	11
	2-E25-17	360055.556	580000.000	163000.000	18	0	18
	6-24-34C	306166.667	326000.000	279000.000	6	0	6
	6-32-43	298000.000	427000.000	212000.000	14	0	14
	2-E32-3	294255.556	652000.000	62300.000	9	0	9
	6-25-34C	286333.333	298000.000	268000.000	6	0	6
	6-26-35A	285400.000	297000.000	275000.000	5	0	5
	6-24-33	284411.765	330000.000	127000.000	17	0	17
	6-33-42	283375.000	384000.000	189000.000	8	0	8
	6-24-34B	282857.143	303000.000	243000.000	7	0	7
	2-E24-12	270591.667	2360000.000	45000.000	12	0	12
	6-25-34A	255500.000	269000.000	241000.000	4	0	4
	6-26-34	255500.000	270000.000	240000.000	4	0	4
	2-E28-27	253830.000	417000.000	65300.000	10	0	10
	6-26-33	244600.000	258000.000	232000.000	5	0	5
	2-E17-16	237012.500	947000.000	27400.000	8	0	8
	2-E32-5	213666.667	442000.000	102000.000	6	0	6
	2-E17-18	182337.500	705000.000	35600.000	8	0	8
	6-24-34A	176750.000	216000.000	139000.000	4	0	4
	6-41-40	175288.186	232000.000	181000.000	6	1	7
	6-32-22	169287.500	226000.000	91300.000	8	0	8
	2-E32-2	163525.000	245000.000	36300.000	12	0	12
	6-20-20	141500.000	165000.000	113000.000	8	0	8
	6-24-35	129142.857	163000.000	68200.000	7	0	7
	2-E28-12	122580.000	277000.000	70400.000	20	0	20
	6-42-39B	121000.000	121000.000	121000.000	1	0	1
	6-23-34	119350.000	158000.000	73300.000	8	0	8
	6-42-39A	98800.000	98800.000	98800.000	1	0	1
	6-41-23	90062.500	135000.000	44500.000	8	0	8
	2-E28-26	80920.000	169000.000	29100.000	10	0	10
	6-40-62	78042.857	88100.000	55700.000	7	0	7
	6-34-42	75850.000	168000.000	31300.000	8	0	8
	6-43-41E	74910.733	100000.000	83600.000	5	1	6
	2-E28-18	73978.333	300000.000	8410.000	18	0	18
	2-E28-17	73800.000	74900.000	72700.000	2	0	2
	6-42-42B	73628.571	79500.000	63800.000	7	0	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 143

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Tritium							
	6-43-41G	72300.000	72300.000	72300.000	1	0	1
	2-E28-21	71546.471	209000.000	9590.000	17	0	17
	6-36-46S	70073.000	140000.000	140000.000	1	1	2
	6-43-40	66300.000	66300.000	66300.000	1	0	1
	2-E28-24	64866.667	71100.000	58700.000	3	0	3
	2-E25-29P	61071.429	104000.000	36400.000	7	0	7
	2-E25-35	60409.091	69900.000	51500.000	11	0	11
	6-28-40	59816.667	98800.000	18500.000	6	0	6
	6-26-35C	52450.000	57300.000	47300.000	4	0	4
	6-46-21B	48157.143	49600.000	46000.000	7	0	7
	6-45-42	45688.889	52300.000	30200.000	18	0	18
	6-37-43	45533.333	58300.000	38500.000	3	0	3
	2-E17-2	44726.316	131000.000	22300.000	19	0	19
	6-40-39	40642.243	226000.000	334.000	4	3	7
	6-34-41B	36971.429	53900.000	15900.000	7	0	7
	2-E25-13	36750.000	37500.000	36000.000	2	0	2
	6-44-43B	35850.000	45000.000	21900.000	8	0	8
	6-43-41F	34013.320	60400.000	51200.000	3	2	5
	2-E32-1	32997.500	85400.000	9390.000	4	0	4
	2-E17-6	30713.363	228000.000	2120.000	4	4	8
	6-36-61A	30666.667	31400.000	29500.000	3	0	3
	2-E25-33	26591.750	47300.000	234.000	8	0	8
	2-E28-28	23800.000	29400.000	18500.000	4	0	4
	2-E26-4	23487.500	42800.000	5700.000	8	0	8
	2-E25-42	22300.000	22300.000	22300.000	1	0	1
	2-E25-31	16830.700	28100.000	107.000	10	0	10
	6-36-61B	16769.829	41900.000	1340.000	5	2	7
	2-E28-9	16500.000	19100.000	13900.000	2	0	2
	2-E26-1	14866.667	16700.000	12700.000	3	0	3
	2-E33-24	14500.000	16100.000	13400.000	3	0	3
	6-31-31	14467.500	19600.000	8570.000	4	0	4
	6-61-62	13731.429	43700.000	7350.000	7	0	7
	2-E27-9	11618.750	14200.000	8780.000	8	0	8
	2-E25-40	11417.500	12100.000	9970.000	4	0	4
	2-E27-8	10933.750	12300.000	9380.000	8	0	8
	2-E32-4	9827.175	41700.000	320.000	11	1	12
	2-E27-11	9053.333	10200.000	8350.000	3	0	3
	2-E28-13	8752.857	15200.000	5880.000	7	0	7
	6-49-55A	8443.636	14800.000	1220.000	11	0	11
	2-E24-4	8361.429	10800.000	5110.000	7	0	7
	2-E33-26	8200.000	8200.000	8200.000	1	0	1
	6-55-57	8200.000	8200.000	8200.000	1	0	1
	6-64-62	8007.143	8610.000	7080.000	7	0	7
	2-E27-10	8006.250	11800.000	6360.000	8	0	8
	2-E25-2	7266.667	9650.000	5940.000	3	0	3
	2-E28-7	7142.500	7940.000	6430.000	4	0	4
	2-E28-23	7139.000	8170.000	5970.000	10	0	10
	2-E28-15	7050.000	7050.000	7050.000	1	0	1
	2-E34-3	7038.429	9480.000	829.000	7	0	7
	2-E33-7	7002.000	10900.000	4800.000	5	0	5
	2-E25-22	6878.889	10100.000	5070.000	9	0	9
	2-E33-34	6806.667	7300.000	6540.000	3	0	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 144

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Tritium							
	2-E25-36	6645.714	9380.000	4680.000	7	0	7
	2-E28-1	6636.667	7390.000	5400.000	3	0	3
	6-60-60	6603.333	7640.000	5660.000	3	0	3
	2-E25-6	6528.235	17900.000	3350.000	17	0	17
	2-E33-13	6300.000	6300.000	6300.000	1	0	1
	2-E28-25	6280.000	6280.000	6280.000	1	0	1
	2-E24-13	6273.333	6390.000	6120.000	3	0	3
	2-E25-3	6147.500	10800.000	3940.000	4	0	4
	2-E24-20	6140.000	6140.000	6140.000	1	0	1
	6-34-39A	6006.667	8230.000	2030.000	3	0	3
	2-E33-30	5542.000	6790.000	4250.000	10	0	10
	2-E33-29	5256.667	7150.000	2900.000	12	0	12
	2-E25-41	5157.500	5570.000	4660.000	4	0	4
	6-43-42J	5140.000	13000.000	1080.000	8	0	8
	2-E33-18	5130.000	5470.000	4920.000	3	0	3
	2-E33-1	4928.000	5230.000	4500.000	5	0	5
	2-E33-20	4810.000	5070.000	4380.000	3	0	3
	2-E33-5	4750.000	5040.000	4200.000	5	0	5
	2-E33-27	4700.000	4700.000	4700.000	1	0	1
	2-E27-5	4580.000	5990.000	3400.000	3	0	3
	2-E26-3	4395.000	4650.000	4140.000	2	0	2
	6-50-53A	4314.000	8400.000	3070.000	10	0	10
	2-E25-21	4276.667	8680.000	2590.000	9	0	9
	2-E33-10	4207.500	4740.000	3350.000	4	0	4
	2-E24-19	4200.000	4760.000	3720.000	3	0	3
	2-E33-33	4080.000	5450.000	2960.000	4	0	4
	2-E33-3	4066.000	5230.000	2570.000	5	0	5
	2-E33-15	4000.000	4000.000	4000.000	1	0	1
	6-50-42	3947.143	4540.000	2490.000	7	0	7
	2-E33-8	3473.333	4990.000	2350.000	3	0	3
	2-E25-27	3445.000	3770.000	3120.000	2	0	2
	2-E33-41	3326.667	3450.000	3210.000	3	0	3
	2-E33-36	3180.000	3870.000	2490.000	2	0	2
	2-E25-9	3134.444	4070.000	2600.000	9	0	9
	2-E34-2	2966.000	3900.000	2090.000	10	0	10
	2-E33-9	2923.917	4580.000	2380.000	5	1	6
	2-E33-35	2890.000	4240.000	2030.000	3	0	3
	2-E25-26	2714.286	3590.000	1840.000	7	0	7
	2-E16-2	2705.111	17300.000	470.000	16	2	18
	2-E33-28	2657.000	3440.000	1870.000	10	0	10
	2-E26-6	2633.667	4130.000	932.000	6	0	6
	6-42-40C	2612.500	3830.000	1430.000	4	0	4
	2-E26-2	2416.250	3370.000	1580.000	8	0	8
	2-E33-31	2402.500	2480.000	2290.000	4	0	4
	2-E33-37	2400.000	3090.000	1710.000	2	0	2
	2-E34-1	2392.500	3520.000	1460.000	8	0	8
	6-32-62	2383.333	3680.000	1990.000	6	0	6
	2-E33-21	2200.000	2280.000	2080.000	3	0	3
	2-E28-5	2180.000	2180.000	2180.000	1	0	1
	2-E33-32	2177.500	2300.000	2040.000	4	0	4
	2-E26-10	2173.050	8210.000	294.000	2	2	4
	2-E26-11	2112.000	2560.000	1890.000	5	0	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 145

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Tritium							
	2-E25-28	1977.143	3050.000	1350.000	7	0	7
	2-E25-38	1868.033	3650.000	24.100	3	0	3
	2-E25-39	1762.767	2830.000	28.300	3	0	3
	2-E25-43	1700.000	1700.000	1700.000	1	0	1
	6-63-58	1668.571	1940.000	1440.000	7	0	7
	6-49-28	1615.000	2000.000	1340.000	6	0	6
	2-E34-7	1525.333	2190.000	406.000	3	0	3
	2-E25-34	1500.125	2210.000	922.000	8	0	8
	6-40-33A	1465.718	15700.000	26.800	2	9	11
	2-E27-1	1305.000	1470.000	1140.000	2	0	2
	2-E27-13	1247.000	1680.000	981.000	3	0	3
	2-E27-14	1091.000	1440.000	742.000	2	0	2
	2-E25-30P	1062.750	2160.000	306.000	4	0	4
	2-E25-37	942.167	1540.000	16.500	3	0	3
	2-E25-32P	909.111	1150.000	670.000	9	0	9
	6-25-55	904.986	6080.000	271.000	2	5	7
	2-E18-3	896.275	3910.000	3910.000	1	3	4
	6-25-33A	888.400	1000.000	652.000	5	0	5
	2-E27-15	829.333	1050.000	714.000	3	0	3
	6-44-42	808.286	1140.000	346.000	7	0	7
	2-E26-12	795.000	795.000	795.000	1	0	1
	6-63-55	774.571	1230.000	436.000	7	0	7
	6-59-58	754.500	1110.000	530.000	5	1	6
	6-40-40A	739.000	739.000	739.000	1	0	1
	2-E18-4	697.725	1940.000	847.000	2	2	4
	2-E27-16	690.000	800.000	580.000	2	0	2
	6-52-46A	677.240	3010.000	3010.000	1	4	5
	6-44-64	664.714	814.000	511.000	7	0	7
	2-E27-12	663.333	872.000	532.000	3	0	3
	2-E35-1	654.000	654.000	654.000	1	0	1
	6-65-50	646.000	1220.000	352.000	7	0	7
	6-57-29A	593.333	890.000	373.000	6	0	6
	6-42-40B	573.837	4510.000	390.000	7	13	20
	2-E33-12	497.500	820.000	351.000	6	0	6
	6-55-55	465.000	730.000	730.000	1	1	2
	2-E26-13	460.000	460.000	460.000	1	0	1
	6-61-37	456.180	679.000	515.000	4	1	5
	6-43-45	426.667	506.000	342.000	6	0	6
	2-E33-4	420.000	420.000	420.000	1	0	1
	2-E25-24	418.143	1040.000	320.000	4	3	7
	6-48-50	400.000	400.000	400.000	1	0	1
	6-43-43	386.125	539.000	283.000	8	0	8
	2-E27-7	386.000	426.000	346.000	2	0	2
	6-60-57	370.429	505.000	479.000	4	3	7
	2-E26-9	351.500	1080.000	1080.000	1	3	4
	2-E34-6	315.629	476.000	369.000	4	3	7
	2-E25-25	300.622	558.000	290.000	6	3	9
	6-24-46	292.927	982.000	982.000	1	2	3
	2-E25-23	259.829	603.000	409.000	2	5	7
	6-63-25A	253.300	1670.000	1670.000	1	6	7
	6-53-48B	245.000	245.000	245.000	1	0	1
	6-53-55A	244.600	340.000	330.000	2	1	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 146

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Tritium							
	6-47-50	230.833	288.000	230.000	2	4	6
	2-E34-5	208.389	617.000	290.000	2	7	9
	6-55-40	203.588	862.000	862.000	1	4	5
	2-E34-8	190.267	288.000	288.000	1	2	3
	6-55-50D	171.587	291.000	291.000	1	5	6
	6-42-40A	169.777	1740.000	426.000	2	11	13
	6-55-50A	167.250	552.000	408.000	2	4	6
	2-E35-2	165.025	417.000	417.000	1	3	4
	6-54-57	146.400	445.000	247.000	2	4	6
	6-36-46Q	144.800	375.000	375.000	1	3	4
	6-54-34	132.867	792.000	792.000	1	5	6
	6-34-51	130.114	436.000	397.000	2	5	7
	6-61-41	115.800	239.000	239.000	1	4	5
	6-36-46P	82.825	335.000	335.000	1	3	4
Turbidity							
	2-E16-2	200.000	200.000	200.000	1	0	1
	2-E25-17	200.000	200.000	200.000	1	0	1
	2-E25-6	200.000	200.000	200.000	1	0	1
	6-42-40B	141.000	200.000	82.000	2	0	2
	2-E25-9	111.000	111.000	111.000	1	0	1
	6-40-40B	60.000	60.000	60.000	1	0	1
	2-E28-12	46.000	46.000	46.000	1	0	1
	2-E25-11	40.500	44.000	37.000	2	0	2
	6-40-40A	36.000	36.000	36.000	1	0	1
	6-43-41G	28.000	28.000	28.000	1	0	1
	6-43-41F	11.475	27.000	1.400	4	0	4
	2-E34-6	10.300	24.000	1.000	3	0	3
	6-42-39B	9.100	9.100	9.100	1	0	1
	2-E18-1	8.386	19.500	1.100	7	0	7
	2-E24-19	5.533	7.500	2.700	3	0	3
	6-24-34A	5.433	11.200	2.100	3	0	3
	6-43-40	5.300	5.300	5.300	1	0	1
	2-E34-2	5.120	11.200	2.900	5	0	5
	6-40-39	4.217	10.500	1.100	6	0	6
	2-E27-14	4.150	4.400	3.900	2	0	2
	6-42-41	4.100	4.100	4.100	1	0	1
	6-41-40	4.000	6.600	1.900	6	0	6
	6-44-43B	4.000	7.000	.900	6	0	6
	2-E25-41	3.733	4.300	2.900	3	0	3
	6-43-41E	3.733	5.500	2.400	6	0	6
	2-E32-4	3.594	9.600	.700	9	0	9
	2-E25-40	3.433	4.200	2.300	3	0	3
	2-E17-19	3.337	4.800	.850	4	0	4
	6-42-39A	3.100	3.100	3.100	1	0	1
	2-E32-1	3.000	3.000	3.000	1	0	1
	2-E27-15	2.967	4.200	1.500	3	0	3
	2-E33-31	2.800	4.500	1.000	3	0	3
	2-E25-39	2.550	4.100	1.200	4	0	4
	2-E25-37	2.533	5.100	1.000	6	0	6
	2-E33-33	2.533	4.800	.400	3	0	3
	6-25-34C	2.533	3.400	1.600	3	0	3
	2-E25-19	2.375	4.600	.900	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 147

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Turbidity							
	2-E25-38	2.150	8.700	.400	6	0	6
	2-E25-35	2.042	5.200	1.200	12	0	12
	2-E27-9	2.025	3.400	.900	4	0	4
	2-E13-14	2.000	2.000	2.000	1	0	1
	2-E33-21	2.000	2.000	2.000	1	0	1
	2-E35-1	2.000	2.000	2.000	1	0	1
	2-E33-30	1.983	7.000	.400	6	0	6
	2-E18-3	1.900	3.000	.900	5	0	5
	2-E25-34	1.863	7.200	.700	8	0	8
	2-E25-43	1.850	3.300	.400	2	0	2
	2-E24-20	1.800	1.800	1.800	1	0	1
	2-E28-28	1.750	5.300	.400	4	0	4
	2-E27-13	1.733	3.000	.700	3	0	3
	2-E33-29	1.675	6.400	.200	8	0	8
	2-E25-31	1.643	3.200	.800	7	0	7
	2-E33-32	1.633	3.000	.600	3	0	3
	2-E17-20	1.600	3.200	.600	8	0	8
	2-E34-1	1.600	1.600	1.600	1	0	1
	2-E27-10	1.575	3.000	.800	4	0	4
	2-E24-18	1.540	1.900	.900	5	0	5
	2-E32-5	1.517	3.000	.500	6	0	6
	2-E24-16	1.467	2.400	.700	6	0	6
	6-42-42B	1.467	2.500	.700	6	0	6
	2-E24-17	1.460	2.200	.900	5	0	5
	2-E34-7	1.400	2.500	.900	4	0	4
	2-E18-4	1.380	2.100	.700	5	0	5
	6-24-35	1.367	2.000	.600	3	0	3
	2-E33-35	1.275	2.200	.400	4	0	4
	6-43-45	1.267	3.800	.600	6	0	6
	2-E18-2	1.250	2.700	.600	6	0	6
	2-E25-24	1.200	1.200	1.200	1	0	1
	2-E28-27	1.186	3.000	.300	7	0	7
	6-24-34B	1.167	2.800	.200	3	0	3
	2-E25-29P	1.114	2.100	.300	7	0	7
	6-43-42J	1.114	2.000	.700	7	0	7
	2-E32-3	1.057	1.600	.300	7	0	7
	2-E27-7	1.050	1.900	.200	2	0	2
	2-E25-25	1.043	2.600	.300	7	0	7
	6-24-34C	1.033	1.700	.300	3	0	3
	2-E28-26	1.029	3.200	.400	7	0	7
	2-E26-12	1.000	1.100	.900	2	0	2
	2-E28-21	1.000	1.000	1.000	1	0	1
	2-E34-8	1.000	1.100	.900	2	0	2
	2-E33-41	.950	1.000	.900	2	0	2
	2-E17-15	.943	1.300	.400	7	0	7
	2-E17-1	.925	2.300	.100	4	0	4
	2-E25-36	.911	1.900	.100	9	0	9
	2-E27-8	.900	1.300	.400	4	0	4
	2-E25-18	.900	1.300	.300	5	0	5
	2-E33-36	.900	1.200	.600	2	0	2
	6-42-40A	.892	3.200	.250	6	0	6
	2-E26-10	.850	1.900	.300	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 148

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Turbidity							
	2-E35-2	.820	1.800	.200	5	0	5
	2-E25-33	.817	1.800	.200	6	0	6
	2-E34-5	.800	1.000	.500	4	0	4
	2-E27-12	.800	1.400	.200	3	0	3
	2-E25-32P	.796	2.000	.300	12	0	12
	2-E25-21	.775	1.600	.300	4	0	4
	2-E33-28	.771	1.100	.300	7	0	7
	2-E17-18	.767	1.400	.400	6	0	6
	2-E34-3	.700	1.200	.400	3	0	3
	2-E27-11	.700	1.100	.300	4	0	4
	2-E17-17	.683	1.000	.400	6	0	6
	2-E26-11	.680	.900	.600	5	0	5
	2-E17-16	.667	1.200	.400	5	1	6
	2-E17-14	.660	1.100	.300	5	0	5
	6-44-42	.657	1.300	.300	7	0	7
	2-E27-16	.650	.700	.600	2	0	2
	2-E32-2	.643	1.100	.300	7	0	7
	2-E25-42	.600	.700	.500	2	0	2
	6-23-34	.600	1.200	.300	3	0	3
	2-E17-9	.580	1.100	.100	5	0	5
	2-E26-9	.575	.900	.200	4	0	4
	2-E33-37	.550	.700	.400	2	0	2
	2-E25-20	.533	.600	.500	3	0	3
	6-25-33A	.533	.700	.400	3	0	3
	2-E25-23	.500	.500	.500	1	0	1
	2-E26-13	.500	.700	.300	2	0	2
	6-43-43	.414	.800	.200	7	0	7
	2-E17-6	.400	.600	.300	4	0	4
	2-E25-22	.400	.400	.400	1	0	1
	2-E33-8	.400	.400	.400	1	0	1
	2-E33-34	.400	.700	.200	3	0	3
	2-E17-13	.367	.700	.100	3	0	3
	2-E28-18	.350	.400	.300	2	0	2
	2-E28-13	.300	.300	.300	1	0	1
	2-E33-5	.300	.300	.300	1	0	1
	2-E25-26	.283	.500	.100	9	0	9
	6-26-35A	.267	.400	.100	3	0	3
	6-26-35C	.267	.300	.200	3	0	3
	2-E33-1	.200	.200	.200	1	0	1
	2-E17-5	.167	.200	.200	4	2	6
	6-24-33	.167	.300	.300	1	2	3
	6-25-34A	.133	.200	.200	1	2	3
	2-E25-28	.111	.200	.100	6	3	9
	6-26-34	.100	.100	.100	1	2	3
	2-E17-12	.100	.100	.100	1	1	2
	2-E24-2	.100	.100	.100	3	1	4
Unknown							
	2-E25-31	841.600	4100.000	14.000	5	0	5
	2-E25-33	87.000	87.000	87.000	1	0	1
	2-E34-6	46.000	46.000	46.000	1	0	1
	6-43-41F	45.000	45.000	45.000	1	0	1
	2-E27-8	35.000	35.000	35.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 149

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Unknown							
	2-E28-28	35.000	35.000	35.000	1	0	1
	2-E28-26	34.000	34.000	34.000	1	0	1
	2-E27-10	33.000	33.000	33.000	1	0	1
	2-E25-32P	28.500	32.000	25.000	2	0	2
	2-E32-5	28.000	28.000	28.000	1	0	1
	2-E28-27	26.000	26.000	26.000	1	0	1
	2-E33-34	25.000	25.000	25.000	1	0	1
	2-E25-30P	23.000	23.000	23.000	1	0	1
	6-43-41E	21.667	32.000	15.000	3	0	3
	2-E27-9	21.000	28.000	14.000	2	0	2
	2-E25-25	19.000	23.000	15.000	2	0	2
	2-E33-29	19.000	19.000	19.000	1	0	1
	2-E25-29P	18.000	18.000	18.000	1	0	1
	2-E33-28	16.000	16.000	16.000	1	0	1
	2-E25-38	15.000	15.000	15.000	1	0	1
	2-E34-3	13.000	13.000	13.000	1	0	1
	2-E32-2	12.000	12.000	12.000	1	0	1
	2-E34-5	12.000	12.000	12.000	1	0	1
	2-E34-2	11.500	13.000	10.000	2	0	2
	2-E32-4	11.000	11.000	11.000	1	0	1
	2-E25-37	10.000	10.000	10.000	1	0	1
	2-E25-39	9.000	9.000	9.000	1	0	1
	2-E32-3	9.000	9.000	9.000	1	0	1
	2-E33-30	9.000	9.000	9.000	1	0	1
	2-E33-35	9.000	9.000	9.000	1	0	1
	2-E17-6	1.000	1.000	1.000	1	0	1
Unknown Aliphatic Hydrocarbon							
	2-E32-4	6.000	6.000	6.000	1	0	1
	2-E17-6	2.000	2.000	2.000	1	0	1
Unknown Halogenated Hydrocarbon							
	2-E25-32P	14.000	14.000	14.000	1	0	1
Uranium							
	2-E28-26	21.233	28.500	15.900	6	0	6
	2-E32-5	19.300	19.900	18.700	2	0	2
	2-E28-21	19.100	19.100	19.100	1	0	1
	2-E28-18	17.100	17.100	17.100	1	0	1
	2-E28-25	12.050	12.300	11.800	2	0	2
	2-E32-3	9.550	11.400	7.750	4	0	4
	2-E25-17	8.730	8.730	8.730	1	0	1
	2-E24-18	7.600	20.400	3.280	4	0	4
	2-E28-12	7.540	7.540	7.540	1	0	1
	2-E32-4	4.626	9.320	2.190	7	0	7
	2-E18-1	4.560	4.560	4.560	1	0	1
	2-E17-5	4.520	4.520	4.520	1	0	1
	2-E17-19	3.532	4.550	2.770	5	0	5
	2-E24-16	3.390	3.530	3.000	5	0	5
	2-E34-5	3.346	4.260	2.930	5	0	5
	2-E28-27	3.250	3.660	2.510	7	0	7
	2-E17-20	3.245	3.760	2.430	6	0	6
	2-E24-2	3.121	5.670	2.360	8	0	8
	2-E34-6	3.030	3.710	2.650	5	0	5
	6-49-55A	2.912	3.830	1.960	10	0	10

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 150

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Uranium							
	2-E17-13	2.900	2.900	2.900	1	0	1
	6-32-43	2.880	2.880	2.880	1	0	1
	6-20-20	2.823	3.380	2.280	6	0	6
	2-E13-19	2.710	3.040	2.380	2	0	2
	2-E17-12	2.700	2.700	2.700	1	0	1
	2-E17-1	2.633	4.080	2.050	4	0	4
	2-E32-2	2.611	3.240	1.860	7	0	7
	2-E24-17	2.593	2.960	2.020	4	0	4
	2-E25-35	2.560	2.560	2.560	1	0	1
	6-47-35A	2.560	2.560	2.560	1	0	1
	6-35-70	2.541	3.950	1.750	7	0	7
	6-41-40	2.510	2.510	2.510	1	0	1
	2-E25-25	2.410	2.410	2.410	1	0	1
	6-43-41F	2.390	2.390	2.390	1	0	1
	6-47-46A	2.297	2.750	1.800	7	0	7
	2-E13-8	2.277	2.510	2.100	3	0	3
	6-40-33A	2.210	2.210	2.210	1	0	1
	2-E33-5	2.170	2.250	2.090	2	0	2
	2-E17-9	2.110	2.110	2.110	1	0	1
	6-35-66	2.103	2.390	1.840	6	0	6
	2-E28-13	2.100	2.100	2.100	1	0	1
	2-E27-10	2.094	2.400	1.850	5	0	5
	6-51-63	2.093	5.900	1.120	6	0	6
	2-E34-2	2.063	3.000	1.570	6	0	6
	2-E27-8	2.060	2.520	1.690	5	0	5
	2-E33-8	2.050	2.440	1.660	2	0	2
	6-65-50	2.040	6.560	.759	6	0	6
	2-E27-9	2.017	2.790	1.740	6	0	6
	2-E33-3	1.965	2.190	1.740	2	0	2
	2-E33-7	1.940	2.460	1.500	3	0	3
	2-E25-9	1.940	1.940	1.940	1	0	1
	6-40-39	1.920	1.920	1.920	1	0	1
	6-47-60	1.883	2.280	1.440	6	0	6
	2-E24-8	1.880	2.290	1.470	2	0	2
	2-E33-20	1.877	2.230	1.240	3	0	3
	6-55-50D	1.847	2.560	1.680	4	1	5
	6-43-41E	1.840	1.840	1.840	1	0	1
	2-E33-24	1.830	1.900	1.760	2	0	2
	2-E33-9	1.825	2.230	1.420	2	0	2
	2-E33-1	1.805	2.200	1.410	2	0	2
	2-E34-3	1.798	2.430	1.280	5	0	5
	2-E27-5	1.770	2.040	1.500	2	0	2
	2-E13-14	1.765	1.780	1.750	2	0	2
	6-45-42	1.750	1.750	1.750	1	0	1
	6-42-40B	1.730	1.730	1.730	1	0	1
	6-38-65	1.714	2.180	1.460	5	0	5
	2-E35-1	1.700	1.700	1.700	1	0	1
	6-44-43B	1.700	1.890	1.510	2	0	2
	2-E25-20	1.675	1.930	1.420	2	0	2
	6-46-21B	1.670	1.870	1.470	2	0	2
	2-E13-5	1.660	1.710	1.610	2	0	2
	6-57-29A	1.650	1.650	1.650	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 151

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Uranium							
	2-E33-18	1.645	1.660	1.630	2	0	2
	2-E27-11	1.640	1.640	1.640	1	0	1
	2-E33-27	1.590	1.590	1.590	1	0	1
	2-E33-10	1.545	1.660	1.430	2	0	2
	6-64-62	1.538	1.840	1.290	5	0	5
	2-E33-29	1.530	1.860	1.220	6	0	6
	2-E25-6	1.520	1.520	1.520	1	0	1
	6-43-42J	1.510	1.510	1.510	1	0	1
	6-61-66	1.502	1.920	1.280	6	0	6
	2-E33-28	1.459	1.750	1.070	7	0	7
	2-E33-30	1.417	1.540	1.210	7	0	7
	2-E32-1	1.390	1.390	1.390	1	0	1
	6-42-42B	1.360	1.360	1.360	1	0	1
	2-E33-21	1.320	1.350	1.290	2	0	2
	2-E33-14	1.320	1.490	1.150	2	0	2
	2-E25-29P	1.310	1.310	1.310	1	0	1
	2-E34-1	1.300	1.300	1.300	1	0	1
	6-61-62	1.298	1.720	.386	6	0	6
	2-E25-18	1.260	1.260	1.260	1	0	1
	6-36-61A	1.260	1.260	1.260	1	0	1
	6-43-45	1.210	1.210	1.210	1	0	1
	2-E25-32P	1.192	1.700	.683	2	0	2
	6-31-31	1.140	1.140	1.140	1	0	1
	6-54-34	1.130	1.130	1.130	1	0	1
	2-E34-7	1.106	1.420	.792	2	0	2
	2-E25-26	1.073	1.200	.978	3	0	3
	2-E25-36	1.068	1.400	.931	4	0	4
	2-E16-2	1.050	1.050	1.050	1	0	1
	2-E25-19	1.030	1.030	1.030	1	0	1
	6-44-64	.956	.956	.956	1	0	1
	6-55-70	.953	1.590	.316	2	0	2
	6-63-58	.950	1.090	.770	6	0	6
	2-E25-11	.950	.950	.950	1	0	1
	2-E25-21	.947	.947	.947	1	0	1
	2-E27-1	.947	.958	.935	2	0	2
	6-63-55	.935	1.250	.762	6	0	6
	2-E25-28	.901	.925	.877	2	0	2
	2-E25-22	.835	.835	.835	1	0	1
	6-55-50C	.835	.970	.761	6	0	6
	2-E25-34	.832	.832	.832	1	0	1
	6-59-58	.747	.866	.566	6	0	6
	2-E25-24	.715	.715	.715	1	0	1
	6-42-40A	.703	.703	.703	1	0	1
	6-45-69A	.691	.691	.691	1	0	1
	2-E28-24	.677	1.060	.294	2	0	2
	6-60-60	.635	.740	.530	2	0	2
	2-E25-23	.502	.502	.502	1	0	1
	2-E25-30P	.408	.458	.357	2	0	2
	6-55-50A	.301	1.550	.118	2	4	6
	6-60-57	.277	.557	.137	6	0	6
	2-E33-12	.167	.236	.236	1	1	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 152

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Uranium, chemical							
	2-E28-18	38.011	58.500	9.060	15	0	15
	2-E28-21	36.931	47.200	24.600	16	0	16
	2-E28-26	31.475	53.300	16.500	4	0	4
	2-E32-5	28.467	33.400	21.600	3	0	3
	2-E32-3	22.300	26.300	15.500	5	0	5
	2-E28-23	21.667	27.600	14.500	6	0	6
	2-E28-12	20.200	20.200	20.200	1	0	1
	2-E28-28	19.867	25.200	13.100	3	0	3
	2-E28-25	15.153	30.600	7.660	6	0	6
	2-E28-17	12.089	22.100	8.000	7	0	7
	2-E28-19	11.950	15.300	6.520	5	0	5
	2-E17-14	11.400	11.400	11.400	1	0	1
	2-E28-16	10.507	11.300	9.220	3	0	3
	2-E28-9	10.182	15.600	4.310	6	0	6
	2-E17-2	8.766	13.500	4.950	7	0	7
	2-E17-15	8.300	10.100	6.500	2	0	2
	2-E32-4	8.033	12.200	2.770	4	0	4
	2-E17-5	7.662	9.350	4.600	17	0	17
	2-E32-2	7.063	9.020	5.320	4	0	4
	2-E24-18	6.710	9.210	4.210	2	0	2
	2-E18-1	6.130	6.130	6.130	1	0	1
	2-E17-16	5.925	6.950	4.900	2	0	2
	2-E17-18	5.375	6.510	4.240	2	0	2
	2-E24-16	5.210	5.910	4.510	2	0	2
	2-E17-17	5.185	5.920	4.450	2	0	2
	2-E17-13	5.089	7.050	2.990	16	0	16
	2-E28-27	5.033	7.430	2.580	4	0	4
	6-20-20	4.660	4.660	4.660	1	0	1
	2-E17-12	4.641	5.800	3.220	15	0	15
	2-E18-4	4.450	4.450	4.450	1	0	1
	2-E34-5	4.197	4.430	3.890	3	0	3
	2-E24-17	4.040	5.170	2.910	2	0	2
	2-E33-34	4.040	4.460	3.620	2	0	2
	2-E17-20	3.705	4.580	2.830	2	0	2
	2-E33-41	3.647	4.010	2.990	3	0	3
	2-E18-2	3.620	3.620	3.620	1	0	1
	6-33-42	3.570	3.570	3.570	1	0	1
	2-E34-6	3.475	3.870	3.080	2	0	2
	2-E28-13	3.440	3.440	3.440	1	0	1
	2-E17-1	3.435	3.880	2.990	2	0	2
	2-E27-10	3.347	3.900	2.600	3	0	3
	2-E27-9	3.273	3.780	2.850	3	0	3
	6-34-42	3.245	3.450	3.040	2	0	2
	6-40-33A	3.170	3.170	3.170	1	0	1
	2-E33-35	3.125	3.610	2.640	2	0	2
	6-32-43	3.100	3.100	3.100	1	0	1
	2-E26-11	2.970	2.970	2.970	1	0	1
	6-35-70	2.970	3.020	2.920	2	0	2
	2-E34-3	2.880	3.270	2.490	2	0	2
	2-E27-11	2.845	3.420	2.270	2	0	2
	2-E33-30	2.840	3.010	2.670	3	0	3
	2-E25-40	2.809	6.360	.628	3	0	3

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 153

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Uranium, chemical							
	2-E18-3	2.760	2.760	2.760	1	0	1
	2-E25-41	2.745	3.300	2.190	2	0	2
	2-E13-14	2.730	2.730	2.730	1	0	1
	2-E34-2	2.720	4.440	.269	3	0	3
	6-33-56	2.690	2.690	2.690	1	0	1
	6-25-55	2.680	2.680	2.680	1	0	1
	2-E33-33	2.670	2.890	2.450	2	0	2
	2-E27-8	2.643	3.250	1.870	4	0	4
	2-E34-7	2.580	2.580	2.580	1	0	1
	2-E33-28	2.495	2.940	2.050	4	0	4
	2-E34-1	2.490	2.490	2.490	1	0	1
	2-E28-7	2.416	4.860	.701	7	0	7
	6-38-65	2.400	2.400	2.400	1	0	1
	2-E33-29	2.348	3.550	1.860	5	0	5
	2-E33-3	2.320	2.320	2.320	1	0	1
	2-E25-36	2.300	2.820	1.780	2	0	2
	6-45-42	2.215	2.820	1.770	17	0	17
	2-E27-15	2.210	2.960	1.460	2	0	2
	2-E33-37	2.200	2.710	1.690	2	0	2
	2-E28-1	2.180	2.180	2.180	1	0	1
	2-E34-8	2.153	2.980	1.660	3	0	3
	2-E24-19	2.140	2.460	1.820	2	0	2
	2-E33-36	2.135	2.620	1.650	2	0	2
	2-E25-18	2.130	2.130	2.130	1	0	1
	2-E27-14	2.130	2.130	2.130	1	0	1
	2-E25-37	2.110	2.110	2.110	1	0	1
	6-36-61A	2.060	2.060	2.060	1	0	1
	2-E27-13	2.040	2.250	1.830	2	0	2
	2-E27-5	1.970	1.970	1.970	1	0	1
	6-64-62	1.970	1.970	1.970	1	0	1
	2-E33-32	1.965	2.390	1.540	2	0	2
	6-39-39	1.960	1.960	1.960	1	0	1
	6-45-69A	1.920	1.920	1.920	1	0	1
	6-40-62	1.860	1.860	1.860	1	0	1
	2-E25-10	1.805	2.040	1.570	2	0	2
	2-E33-31	1.755	2.450	1.060	2	0	2
	2-E27-16	1.700	1.900	1.500	2	0	2
	6-24-46	1.670	1.670	1.670	1	0	1
	6-34-39A	1.650	1.650	1.650	1	0	1
	2-E33-10	1.600	1.600	1.600	1	0	1
	2-E27-12	1.590	1.610	1.570	2	0	2
	6-65-50	1.570	1.570	1.570	1	0	1
	2-E25-9	1.534	3.760	.746	5	1	6
	2-E24-20	1.410	1.410	1.410	1	0	1
	6-50-42	1.400	1.400	1.400	1	0	1
	2-E26-9	1.390	1.390	1.390	1	0	1
	6-55-50C	1.280	1.280	1.280	1	0	1
	2-E25-39	1.220	1.220	1.220	1	0	1
	6-42-40A	.826	1.020	.489	6	0	6
	2-E27-7	.793	.793	.793	1	0	1
	2-E26-6	.689	.689	.689	1	0	1
	2-E28-24	.564	1.720	.268	3	2	5

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 154

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Uranium, chemical							
	2-E28-15	.554	.554	.554	1	0	1
	2-E28-11	.469	.469	.469	1	0	1
	6-34-51	.302	.302	.302	1	0	1
	6-41-23	.174	.174	.174	1	0	1
	6-32-22	.156	.156	.156	1	0	1
	2-E17-9	-27.876	5.520	1.950	9	1	10
Uranium-234							
	2-E28-21	33.067	70.800	12.000	3	0	3
	2-E28-18	10.880	16.600	3.940	3	0	3
	2-E28-23	7.067	9.800	2.910	3	0	3
	2-E28-25	6.603	7.730	5.350	3	0	3
	2-E17-13	1.943	2.360	1.630	16	0	16
	2-E17-12	1.743	1.930	1.440	15	0	15
	2-E28-7	1.284	2.330	.542	4	0	4
	6-45-42	1.032	1.270	.849	16	0	16
	6-42-40A	.370	.475	.212	6	0	6
	2-E28-24	.192	.436	.065	3	0	3
Uranium-235							
	2-E28-21	1.568	3.210	.554	3	0	3
	2-E28-18	.496	.755	.126	3	0	3
	2-E28-23	.338	.428	.167	3	0	3
	2-E28-25	.309	.376	.228	3	0	3
	2-E17-13	.099	.576	.037	16	0	16
	2-E17-12	.073	.134	.045	14	1	15
	2-E28-7	.043	.091	.031	3	1	4
	6-45-42	.030	.065	.017	13	3	16
	6-42-40A	.020	.064	.037	2	4	6
Uranium-238							
	2-E28-21	31.400	67.200	11.700	3	0	3
	2-E28-18	10.510	16.600	3.230	3	0	3
	2-E28-23	7.093	9.720	2.910	3	0	3
	2-E28-25	6.470	7.550	5.170	3	0	3
	2-E17-13	1.823	2.210	1.170	16	0	16
	2-E17-12	1.621	1.830	1.210	15	0	15
	2-E28-7	1.016	1.810	.434	4	0	4
	6-45-42	.798	1.190	.533	16	0	16
	6-42-40A	.300	.445	.177	6	0	6
	2-E28-24	.193	.403	.077	3	0	3
Vanadium							
	2-E25-17	656.000	656.000	656.000	1	0	1
	2-E25-9	336.000	336.000	336.000	1	0	1
	2-E25-6	335.000	335.000	335.000	1	0	1
	2-E16-2	255.000	261.000	249.000	2	0	2
	2-E25-23	139.000	139.000	139.000	1	0	1
	2-E25-24	131.250	139.000	126.000	4	0	4
	2-E26-5	128.000	128.000	128.000	1	0	1
	2-E25-30P	83.929	104.000	66.000	7	0	7
	6-49-57A	77.700	77.700	77.700	1	0	1
	2-E25-11	68.000	84.000	52.000	2	0	2
	6-43-42J	58.875	69.000	48.000	8	0	8
	2-E25-21	57.900	66.000	47.000	5	0	5
	6-44-42	46.500	56.000	40.000	8	0	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 155

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Vanadium							
	2-E25-22	45.957	53.000	42.000	7	0	7
	2-E25-20	38.900	46.000	32.000	10	0	10
	2-E25-28	38.250	44.000	33.000	12	0	12
	2-E25-43	38.000	39.000	36.000	3	0	3
	2-E25-38	36.667	40.000	32.000	9	0	9
	2-E24-4	36.000	36.000	36.000	1	0	1
	2-E28-7	36.000	36.000	36.000	1	0	1
	6-43-45	35.429	39.000	31.000	7	0	7
	2-E25-29P	35.367	40.000	30.000	23	1	24
	2-E26-12	35.333	37.000	33.000	3	0	3
	2-E25-34	35.150	38.000	31.000	10	0	10
	2-E25-19	35.000	39.000	31.000	5	0	5
	6-44-43B	35.000	43.000	33.000	7	1	8
	6-43-43	34.625	43.000	28.000	8	0	8
	2-E24-20	34.500	34.500	34.500	1	0	1
	2-E33-37	33.750	37.500	37.500	1	1	2
	2-E25-36	33.208	43.000	30.500	9	3	12
	2-E25-18	33.042	39.000	30.500	10	2	12
	2-E26-10	32.800	36.000	30.000	4	1	5
	2-E26-9	32.625	39.500	31.000	2	2	4
	2-E25-31	32.329	39.000	27.000	21	3	24
	2-E25-41	32.125	34.000	31.000	4	0	4
	2-E33-18	32.100	32.100	32.100	1	0	1
	2-E33-41	31.750	33.500	33.500	1	1	2
	2-E26-13	31.667	35.000	35.000	1	2	3
	2-E27-9	31.600	35.000	28.000	9	1	10
	6-42-42B	31.571	35.000	25.000	7	0	7
	6-40-40B	31.500	33.000	33.000	1	1	2
	6-45-69A	31.500	33.000	33.000	1	1	2
	2-E35-2	31.333	33.000	32.000	3	3	6
	6-34-42	31.000	32.000	32.000	1	1	2
	6-35-70	31.000	32.000	32.000	1	1	2
	2-E27-13	30.500	33.500	28.000	2	1	3
	2-E33-24	30.400	30.400	30.400	1	0	1
	2-E26-11	30.100	30.500	30.500	1	4	5
	2-E24-2	30.000	34.000	21.000	6	0	6
	2-E25-40	30.000	32.000	27.000	3	1	4
	2-E33-36	30.000	30.000	30.000	1	2	3
	2-E17-18	29.900	36.000	17.000	8	2	10
	2-E27-8	29.778	33.000	26.000	7	2	9
	2-E33-32	29.500	32.000	26.000	2	2	4
	6-42-40B	29.500	49.000	10.000	2	0	2
	2-E17-13	29.333	28.000	28.000	1	2	3
	2-E24-19	29.333	28.000	28.000	1	2	3
	2-E24-16	29.000	31.000	26.000	6	2	8
	6-45-42	29.000	28.000	28.000	1	1	2
	2-E33-15	28.700	28.700	28.700	1	0	1
	2-E25-33	28.695	38.000	7.000	20	1	21
	2-E27-15	28.667	26.000	26.000	1	2	3
	2-E27-11	28.250	23.000	23.000	1	3	4
	2-E33-38	28.150	28.400	27.900	2	0	2
	2-E25-26	28.100	43.000	15.000	8	3	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 156

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Vanadium							
	2-E27-12	28.000	24.000	24.000	1	2	3
	2-E27-14	28.000	26.000	26.000	1	1	2
	2-E27-7	28.000	26.000	26.000	1	1	2
	2-E33-33	28.000	24.000	24.000	1	2	3
	2-E25-37	27.889	30.000	24.000	6	3	9
	2-E18-3	27.800	32.000	22.000	9	1	10
	2-E32-5	27.800	19.000	19.000	1	4	5
	6-47-50	27.800	27.800	27.800	1	0	1
	2-E24-17	27.643	31.000	24.000	7	0	7
	2-E17-16	27.636	35.000	15.000	9	2	11
	2-E33-31	27.050	29.200	19.000	2	2	4
	2-E27-10	27.000	30.000	22.000	6	2	8
	2-E33-3	27.000	27.000	27.000	1	0	1
	2-E33-28	26.309	35.400	19.000	7	4	11
	2-E33-39	26.100	26.100	26.100	1	0	1
	2-E32-3	25.750	27.000	17.000	4	4	8
	6-25-34C	25.385	70.000	16.000	11	2	13
	2-E18-4	25.375	31.000	20.000	8	0	8
	2-E32-2	25.200	27.000	16.000	6	4	10
	2-E33-40	25.200	25.200	25.200	1	0	1
	2-E28-27	25.182	28.000	11.000	7	4	11
	2-E17-12	25.000	24.000	21.000	2	1	3
	2-E34-3	25.000	27.000	22.000	6	1	7
	6-25-34B	25.000	26.000	23.000	4	1	5
	6-26-33	25.000	27.000	23.000	5	1	6
	2-E34-2	24.900	35.100	19.000	8	1	9
	2-E25-35	24.818	31.000	15.000	7	4	11
	2-E17-9	24.714	27.000	23.000	7	0	7
	2-E25-27	24.640	34.000	18.000	5	0	5
	2-E33-29	24.600	23.000	20.000	6	4	10
	2-E34-5	24.333	34.000	18.000	7	2	9
	6-25-34A	24.200	25.000	21.000	4	1	5
	2-E17-17	24.000	28.000	17.000	8	2	10
	6-26-35A	23.833	23.000	18.000	4	2	6
	2-E33-30	23.791	33.700	17.000	8	3	11
	6-26-34	23.750	25.000	21.000	4	0	4
	2-E17-20	23.636	24.000	14.000	7	4	11
	2-E17-15	22.727	28.000	14.000	8	3	11
	2-E28-26	22.556	25.000	15.000	6	3	9
	2-E33-10	22.500	23.000	22.000	2	0	2
	2-E32-4	22.333	22.000	16.000	8	4	12
	2-E17-5	22.300	26.000	17.000	9	1	10
	6-43-41E	22.200	41.000	41.000	1	4	5
	2-E33-21	22.000	22.000	22.000	1	0	1
	2-E18-2	21.600	29.000	12.000	9	1	10
	2-E24-18	21.333	20.000	19.000	5	1	6
	2-E28-18	21.000	18.000	15.000	2	1	3
	2-E33-8	21.000	21.000	21.000	1	0	1
	2-E17-14	20.667	25.000	16.000	8	1	9
	6-24-35	20.538	24.000	16.000	11	2	13
	2-E33-5	20.500	22.000	19.000	2	0	2
	2-E33-1	20.000	22.000	18.000	2	0	2

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 157

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Vanadium							
	6-49-55B	20.000	20.000	20.000	1	0	1
	2-E17-1	19.800	20.000	12.000	4	1	5
	2-E17-19	19.800	23.000	16.000	5	0	5
	6-43-41F	19.750	22.000	12.000	3	1	4
	6-24-33	19.525	17.000	14.000	6	2	8
	6-41-40	19.500	10.000	8.000	3	3	6
	2-E28-12	19.000	19.000	19.000	1	0	1
	2-E28-23	19.000	19.000	19.000	1	0	1
	6-42-40A	18.111	68.000	10.000	2	7	9
	2-E32-1	18.000	19.000	17.000	2	0	2
	2-E34-1	17.767	25.300	9.000	3	0	3
	2-E34-6	17.571	19.000	11.000	6	1	7
	6-24-34A	16.725	20.000	9.000	10	2	12
	6-24-34B	16.067	19.000	8.000	10	2	12
	2-E28-13	16.000	17.000	15.000	2	0	2
	2-E28-21	16.000	16.000	16.000	1	0	1
	2-E25-32P	15.600	20.000	8.000	17	4	21
	6-24-34C	15.443	16.000	7.000	12	2	14
	2-E25-25	15.332	21.000	7.000	18	4	22
	6-40-39	15.200	6.000	5.000	2	3	5
	2-E35-1	15.000	15.000	15.000	1	0	1
	6-26-35C	14.400	11.000	9.000	4	1	5
	6-23-34	13.431	18.000	6.000	12	2	14
	2-E18-1	13.000	12.000	5.000	5	6	11
	6-25-33A	12.000	10.000	7.000	3	2	5
	2-E17-6	5.429	7.000	6.000	2	5	7
Vanadium, filtered							
	2-E25-23	135.400	145.000	123.000	5	0	5
	2-E25-24	130.500	138.000	123.000	8	0	8
	2-E25-30P	80.500	89.000	75.000	6	0	6
	6-49-57A	76.100	76.100	76.100	1	0	1
	2-E25-21	63.333	72.000	45.000	6	0	6
	6-43-42J	58.400	64.000	51.000	5	0	5
	6-44-42	47.500	53.000	44.000	6	0	6
	2-E25-22	43.375	51.000	39.000	8	0	8
	2-E25-19	40.875	49.000	33.000	8	0	8
	2-E25-28	38.667	43.000	36.000	8	1	9
	2-E25-20	37.900	49.000	33.000	9	1	10
	6-43-45	35.800	41.000	32.000	5	0	5
	2-E25-29P	35.611	44.000	27.000	18	0	18
	2-E25-38	35.000	37.000	30.000	7	0	7
	2-E25-43	35.000	35.000	35.000	1	0	1
	2-E25-18	34.889	41.000	30.000	9	0	9
	6-44-43B	34.200	40.000	32.000	4	1	5
	6-43-43	34.167	40.000	32.000	6	0	6
	2-E26-12	34.000	34.000	34.000	1	0	1
	2-E25-34	33.333	38.000	29.000	5	1	6
	2-E26-10	33.000	35.000	34.000	2	1	3
	2-E25-31	32.909	40.000	27.000	20	2	22
	6-42-42B	32.000	38.000	27.000	6	0	6
	2-E25-41	31.500	32.000	31.000	2	0	2
	2-E33-15	31.500	31.500	31.500	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 158

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Vanadium, filtered							
	2-E26-11	31.000	32.000	32.000	1	1	2
	2-E25-36	30.857	37.000	25.000	5	2	7
	6-35-66	30.750	31.000	30.000	4	0	4
	2-E24-2	30.286	40.000	23.000	7	0	7
	6-31-31	30.000	30.000	30.000	1	0	1
	6-33-56	30.000	30.000	30.000	1	0	1
	2-E24-17	29.400	34.000	22.000	5	0	5
	2-E18-3	29.100	35.000	21.000	9	1	10
	2-E17-16	29.000	37.000	17.000	8	0	8
	6-32-43	29.000	29.000	29.000	1	0	1
	2-E17-18	28.750	33.000	24.000	8	0	8
	2-E27-9	28.333	32.000	24.000	9	0	9
	2-E24-16	28.167	33.000	22.000	5	1	6
	2-E25-33	28.053	34.000	15.000	18	1	19
	2-E17-13	28.000	30.000	26.000	2	0	2
	2-E24-19	28.000	28.000	28.000	1	0	1
	2-E27-12	28.000	26.000	26.000	1	1	2
	2-E27-13	28.000	26.000	26.000	1	1	2
	6-59-58	28.000	28.000	28.000	1	0	1
	2-E33-38	27.800	27.800	27.800	1	0	1
	2-E25-26	27.778	34.000	19.000	8	1	9
	6-44-64	27.600	33.000	24.000	5	0	5
	6-45-69A	27.500	29.000	26.000	2	0	2
	6-40-62	27.333	29.000	26.000	3	0	3
	2-E27-8	27.286	32.000	23.000	7	0	7
	2-E33-32	27.000	30.000	21.000	2	1	3
	2-E25-37	26.889	28.000	23.000	6	3	9
	2-E25-39	26.667	20.000	20.000	1	2	3
	2-E17-9	26.500	37.000	22.000	8	0	8
	2-E33-31	26.167	30.500	18.000	2	1	3
	2-E34-3	26.143	29.000	21.000	6	1	7
	2-E33-28	26.111	35.000	20.000	7	2	9
	2-E25-40	26.000	26.000	26.000	1	0	1
	2-E27-14	26.000	22.000	22.000	1	1	2
	2-E33-33	26.000	22.000	22.000	1	1	2
	6-26-33	26.000	26.000	24.000	4	1	5
	6-45-42	26.000	34.000	19.000	5	0	5
	6-36-61A	25.750	26.000	25.000	4	0	4
	6-35-70	25.667	27.000	25.000	3	0	3
	2-E33-18	25.550	31.100	20.000	2	0	2
	2-E27-10	25.500	32.000	20.000	6	0	6
	2-E25-35	25.111	36.000	17.000	6	3	9
	2-E33-39	25.100	25.100	25.100	1	0	1
	2-E33-30	25.080	33.800	17.000	8	2	10
	2-E25-27	25.000	35.000	19.000	5	0	5
	2-E27-15	25.000	25.000	25.000	1	0	1
	6-38-65	25.000	26.000	24.000	2	0	2
	2-E33-24	24.800	31.600	18.000	2	0	2
	2-E33-3	24.667	25.000	24.000	3	0	3
	6-25-34A	24.500	25.000	23.000	4	0	4
	2-E18-4	24.286	32.000	19.000	7	0	7
	2-E32-3	24.000	23.000	19.000	4	2	6

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 159

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Vanadium, filtered							
	6-26-34	23.750	26.000	21.000	4	0	4
	6-26-35A	23.750	26.000	21.000	4	0	4
	2-E34-2	23.200	34.800	17.000	8	1	9
	2-E27-7	23.000	23.000	23.000	1	0	1
	2-E32-5	23.000	16.000	16.000	1	1	2
	6-25-34B	23.000	24.000	21.000	4	0	4
	2-E28-27	22.857	31.000	19.000	7	0	7
	2-E17-14	22.667	27.000	18.000	8	1	9
	2-E33-21	22.500	25.000	20.000	2	0	2
	2-E33-10	22.000	23.000	21.000	2	0	2
	2-E33-29	22.000	24.000	17.000	6	1	7
	6-37-43	22.000	32.000	29.000	2	1	3
	2-E17-15	21.889	24.000	14.000	7	2	9
	2-E34-5	21.886	34.200	18.000	7	0	7
	2-E18-2	21.800	27.000	13.000	9	1	10
	2-E32-2	21.500	25.000	17.000	6	0	6
	2-E17-17	21.286	24.000	17.000	7	0	7
	2-E27-11	21.000	21.000	21.000	1	0	1
	2-E32-1	21.000	24.000	18.000	3	0	3
	6-47-35A	21.000	21.000	21.000	1	0	1
	2-E17-12	20.750	26.000	12.000	4	0	4
	2-E17-20	20.714	23.000	13.000	6	1	7
	2-E33-5	20.500	22.000	19.000	4	0	4
	2-E33-8	20.500	23.000	18.000	2	0	2
	2-E17-19	20.400	24.000	14.000	5	0	5
	2-E17-5	20.333	24.000	14.000	9	0	9
	2-E24-8	20.000	20.000	20.000	1	0	1
	2-E27-5	20.000	20.000	20.000	1	0	1
	2-E33-1	20.000	25.000	15.000	5	0	5
	6-49-55B	19.800	19.800	19.800	1	0	1
	6-47-46A	19.750	21.000	17.000	4	0	4
	2-E28-23	19.333	22.000	17.000	3	0	3
	6-25-34C	19.091	24.000	14.000	11	0	11
	6-57-29A	19.000	19.000	19.000	1	0	1
	6-47-60	18.667	21.000	17.000	3	0	3
	2-E24-12	18.500	19.000	18.000	2	0	2
	6-24-35	18.417	26.000	15.000	12	0	12
	2-E24-18	18.400	26.000	14.000	5	0	5
	2-E28-26	18.143	19.000	11.000	6	1	7
	2-E17-1	18.000	20.000	15.000	5	0	5
	6-46-21B	18.000	18.000	18.000	1	0	1
	2-E33-40	17.600	17.600	17.600	1	0	1
	2-E28-13	17.500	19.000	16.000	4	0	4
	6-41-40	17.200	10.000	7.000	3	2	5
	2-E28-18	16.750	18.000	15.000	4	0	4
	2-E32-4	16.556	18.000	12.000	8	1	9
	2-E34-1	15.750	24.500	7.000	2	0	2
	6-40-39	15.600	7.000	6.000	2	3	5
	6-24-33	15.111	21.000	11.000	9	0	9
	2-E25-32P	15.048	25.000	8.000	18	3	21
	2-E13-5	15.000	17.000	13.000	4	0	4
	2-E35-1	15.000	15.000	15.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 160

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Vanadium, filtered							
	6-26-35C	14.400	12.000	8.000	4	1	5
	2-E28-21	14.200	16.000	11.000	5	0	5
	6-24-34C	14.167	17.000	9.000	12	0	12
	6-49-55A	14.143	32.000	8.000	7	0	7
	6-43-41F	14.000	17.000	12.000	3	0	3
	2-E34-6	13.833	19.000	8.000	6	0	6
	6-47-50	13.700	24.100	8.000	3	0	3
	6-24-34A	13.500	17.000	9.000	8	0	8
	2-E13-14	13.250	15.000	9.000	4	0	4
	6-25-33A	13.200	11.000	7.000	4	1	5
	2-E25-25	13.038	24.000	5.000	21	5	26
	6-24-34B	12.250	16.000	8.000	12	0	12
	6-23-34	11.500	14.000	9.000	10	0	10
	2-E18-1	10.875	14.000	6.000	4	4	8
	6-42-40A	10.143	12.000	5.000	3	4	7
	6-55-50C	8.000	9.000	6.000	3	0	3
	6-24-46	7.333	8.000	6.000	3	0	3
	6-40-33A	7.000	7.000	7.000	1	0	1
	6-39-39	6.500	8.000	8.000	1	1	2
	6-20-39	6.000	7.000	7.000	1	1	2
	6-50-53A	5.667	7.000	5.000	3	3	6
	6-54-49	5.500	6.000	6.000	1	1	2
	2-E17-6	5.222	6.000	6.000	2	7	9
Zinc							
	6-40-40B	547.000	1000.000	94.000	2	0	2
	6-40-40A	259.500	490.000	29.000	2	0	2
	6-50-53B	256.500	330.000	183.000	2	0	2
	6-43-41F	149.375	448.000	19.500	4	0	4
	6-49-57B	147.000	147.000	147.000	1	0	1
	6-43-41G	145.000	280.000	280.000	1	1	2
	2-E33-40	128.000	128.000	128.000	1	0	1
	6-40-62	95.000	180.000	180.000	1	1	2
	2-E16-2	77.500	79.000	76.000	2	0	2
	2-E26-5	57.000	57.000	57.000	1	0	1
	6-25-34C	53.538	455.000	6.000	12	1	13
	2-E18-2	53.100	332.000	5.000	8	2	10
	2-E27-11	52.700	183.000	11.500	4	1	5
	6-42-40B	50.000	81.000	19.000	2	0	2
	2-E18-1	47.182	181.000	11.000	10	1	11
	6-42-39A	43.000	52.000	34.000	2	0	2
	2-E25-17	42.000	42.000	42.000	1	0	1
	6-24-34C	41.600	68.000	12.400	14	0	14
	2-E25-11	41.000	70.000	12.000	2	0	2
	2-E34-8	39.750	68.000	20.000	3	1	4
	2-E17-17	39.300	177.000	9.000	6	4	10
	2-E33-24	38.000	38.000	38.000	1	0	1
	2-E25-9	36.000	36.000	36.000	1	0	1
	2-E25-40	35.125	40.000	27.500	4	0	4
	2-E17-19	34.667	110.000	11.000	6	0	6
	2-E25-19	34.300	68.000	10.000	5	0	5
	6-36-61A	32.500	55.000	55.000	1	1	2
	6-42-42B	31.857	109.000	13.000	5	2	7

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 161

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Zinc							
	2-E27-10	30.000	157.000	23.000	3	5	8
	6-42-39B	30.000	42.000	18.000	2	0	2
	6-43-40	29.000	38.000	20.000	2	0	2
	2-E24-19	27.667	55.500	10.500	3	0	3
	2-E24-17	27.429	68.000	10.000	7	0	7
	2-E33-18	25.700	25.700	25.700	1	0	1
	6-44-43B	25.125	57.000	12.000	8	0	8
	2-E28-18	25.000	34.000	28.000	3	1	4
	2-E27-9	24.800	103.000	5.000	7	3	10
	2-E18-3	24.200	64.000	6.000	10	0	10
	2-E25-6	24.000	24.000	24.000	1	0	1
	2-E28-27	23.955	180.000	5.000	7	4	11
	6-40-39	22.167	31.000	18.000	5	1	6
	2-E25-21	21.400	41.000	15.000	4	1	5
	6-43-41E	20.200	28.500	18.500	4	1	5
	2-E17-12	20.000	27.000	12.000	3	0	3
	2-E34-7	20.000	20.000	20.000	1	0	1
	2-E25-26	19.036	49.000	10.000	9	2	11
	2-E25-36	18.818	130.000	5.000	4	7	11
	2-E17-1	18.500	35.000	12.000	5	0	5
	2-E25-28	18.427	52.000	9.000	10	1	11
	2-E24-2	18.167	46.000	10.000	6	0	6
	2-E17-18	17.800	107.000	5.000	7	3	10
	2-E25-20	17.250	40.000	9.000	7	1	8
	2-E33-15	17.200	17.200	17.200	1	0	1
	2-E25-35	16.182	38.000	6.000	9	2	11
	2-E33-28	16.167	107.000	5.000	3	9	12
	2-E28-7	16.000	16.000	16.000	1	0	1
	2-E17-20	15.091	60.000	7.000	8	3	11
	2-E25-42	15.000	20.000	20.000	1	1	2
	2-E26-13	15.000	20.000	20.000	1	1	2
	2-E28-12	15.000	15.000	15.000	1	0	1
	2-E25-18	14.791	33.000	7.000	10	1	11
	6-24-34A	14.675	30.000	10.000	11	1	12
	2-E25-43	14.500	19.000	19.000	1	1	2
	2-E27-14	14.500	19.000	19.000	1	1	2
	6-23-34	14.461	45.000	7.000	9	6	15
	2-E27-15	14.167	18.000	11.000	3	0	3
	6-41-40	14.167	20.000	14.000	4	2	6
	2-E17-13	14.000	16.000	13.000	3	0	3
	2-E17-9	14.000	43.000	7.000	5	2	7
	2-E25-31	13.919	57.000	5.000	21	5	26
	2-E34-2	13.540	21.000	7.000	8	2	10
	2-E18-4	13.500	32.000	6.000	7	1	8
	2-E33-39	13.400	13.400	13.400	1	0	1
	2-E24-16	13.375	33.000	6.000	6	2	8
	2-E34-5	13.222	27.000	5.000	7	2	9
	2-E33-8	13.000	13.000	13.000	1	0	1
	2-E32-4	12.769	23.000	6.000	10	3	13
	2-E17-16	12.667	25.000	7.000	7	2	9
	2-E25-34	12.650	33.000	8.000	7	3	10
	2-E25-38	12.545	26.000	5.000	6	5	11

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 162

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Zinc							
	2-E27-13	12.500	14.000	13.500	2	1	3
	2-E33-41	12.500	12.500	12.500	1	0	1
	2-E26-10	12.375	19.500	19.500	1	3	4
	2-E25-37	12.364	20.000	10.000	8	3	11
	2-E34-6	12.143	29.000	10.000	4	3	7
	2-E25-29P	12.101	61.000	5.000	12	7	19
	2-E25-41	12.000	18.000	8.000	2	1	3
	2-E28-13	12.000	13.000	11.000	2	0	2
	2-E33-31	11.975	14.900	13.000	2	2	4
	2-E17-14	11.778	42.000	6.000	5	4	9
	2-E26-9	11.750	17.000	17.000	1	3	4
	2-E33-36	11.667	15.000	15.000	1	2	3
	6-49-55B	11.600	11.600	11.600	1	0	1
	6-42-40A	11.333	34.000	5.000	4	5	9
	2-E33-38	11.150	12.400	9.900	2	0	2
	2-E17-15	11.100	19.000	7.000	6	4	10
	2-E27-8	11.000	28.000	6.000	6	2	8
	2-E33-37	11.000	12.000	12.000	1	1	2
	2-E24-20	10.500	10.500	10.500	1	0	1
	6-42-41	10.500	11.000	11.000	1	1	2
	6-49-57A	10.500	10.500	10.500	1	0	1
	2-E25-39	10.400	12.000	12.000	1	4	5
	2-E33-35	10.250	10.500	10.500	1	1	2
	2-E35-2	10.200	11.000	11.000	1	4	5
	2-E26-11	10.100	10.500	10.500	1	4	5
	2-E27-12	10.000	10.000	10.000	1	2	3
	6-24-34B	9.858	39.000	5.000	5	7	12
	2-E25-27	9.830	13.000	6.150	5	0	5
	2-E32-5	9.800	9.000	9.000	1	4	5
	2-E33-33	9.667	9.000	9.000	1	2	3
	2-E25-22	9.460	17.000	7.000	6	1	7
	6-43-45	9.333	14.000	12.000	2	4	6
	6-26-33	9.167	25.000	25.000	1	5	6
	6-53-47A	9.000	9.000	9.000	1	0	1
	2-E25-33	8.813	24.000	6.000	8	8	16
	2-E33-32	8.800	9.200	6.000	2	2	4
	6-24-35	8.643	27.000	5.000	8	6	14
	6-52-57	8.600	8.600	8.600	1	0	1
	2-E28-26	8.556	12.000	7.000	4	5	9
	2-E33-30	8.364	12.000	6.000	5	6	11
	2-E24-18	8.167	11.000	5.000	5	1	6
	2-E25-25	8.090	15.800	5.000	12	8	20
	2-E25-23	8.000	8.000	8.000	1	0	1
	2-E25-24	8.000	13.000	6.000	3	1	4
	2-E33-3	8.000	8.000	8.000	1	0	1
	6-43-42J	8.000	10.000	8.000	2	4	6
	2-E32-2	7.900	10.000	6.000	4	6	10
	2-E32-3	7.625	6.000	6.000	1	7	8
	2-E33-29	7.500	8.000	6.000	3	7	10
	6-55-55	7.400	7.400	7.400	1	0	1
	2-E25-32P	7.292	13.000	5.000	13	11	24
	6-24-33	7.065	10.000	5.000	3	5	8

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 163

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Zinc							
	2-E33-5	7.000	9.000	9.000	1	1	2
	2-E17-5	6.800	12.000	5.000	4	6	10
	2-E34-3	6.714	11.000	5.000	3	4	7
	6-44-42	6.714	7.000	7.000	1	6	7
	6-43-43	6.500	7.000	7.000	1	7	8
	6-25-34B	6.200	6.000	6.000	1	4	5
	6-50-53A	6.100	6.100	6.100	1	0	1
	6-52-54	6.100	6.100	6.100	1	0	1
	2-E28-21	6.000	6.000	6.000	1	0	1
	2-E33-10	6.000	7.000	7.000	1	1	2
	2-E33-21	6.000	6.000	6.000	1	0	1
	6-25-34A	6.000	5.000	5.000	1	4	5
	2-E32-1	5.500	6.000	6.000	1	1	2
	2-E17-6	5.429	7.000	6.000	2	5	7
	2-E25-30P	5.400	7.000	7.000	1	4	5
	6-49-55A	4.400	4.400	4.400	1	0	1
	6-47-50	3.600	3.600	3.600	1	0	1
Zinc, filtered							
	6-54-34	358.000	358.000	358.000	1	0	1
	6-33-56	96.000	96.000	96.000	1	0	1
	6-49-57B	86.200	86.200	86.200	1	0	1
	2-E34-5	60.429	354.000	5.000	7	0	7
	6-37-43	58.667	165.000	6.000	2	1	3
	6-43-41F	56.667	89.000	36.000	3	0	3
	2-E33-40	56.500	56.500	56.500	1	0	1
	2-E18-2	37.400	235.000	11.000	5	5	10
	2-E18-1	37.333	145.000	7.000	8	1	9
	6-24-34C	36.083	50.000	12.000	12	0	12
	2-E25-19	27.125	63.000	15.000	8	0	8
	6-60-57	24.000	24.000	24.000	1	0	1
	6-44-43B	22.286	44.000	16.000	6	1	7
	6-45-42	21.400	82.000	5.000	3	2	5
	6-42-42B	20.667	43.000	12.000	6	0	6
	2-E28-18	19.250	30.000	15.000	3	1	4
	2-E24-17	19.000	46.000	6.000	4	2	6
	2-E25-40	19.000	19.000	19.000	1	0	1
	2-E33-39	18.800	18.800	18.800	1	0	1
	2-E25-39	17.667	33.000	33.000	1	2	3
	6-25-34C	15.909	33.000	6.000	9	2	11
	6-49-57A	15.500	15.500	15.500	1	0	1
	2-E17-20	14.833	50.000	7.000	3	3	6
	2-E24-2	14.571	36.000	8.000	6	1	7
	2-E25-26	14.556	53.000	5.000	8	1	9
	2-E17-19	14.400	48.000	9.000	2	3	5
	2-E33-15	14.200	14.200	14.200	1	0	1
	2-E33-24	14.100	20.200	8.000	2	0	2
	6-43-43	13.833	58.000	58.000	1	5	6
	2-E24-8	13.000	13.000	13.000	1	0	1
	6-43-41E	13.000	14.000	12.000	2	0	2
	2-E25-28	12.875	23.000	10.000	7	1	8
	2-E25-43	12.000	12.000	12.000	1	0	1
	6-53-47A	12.000	12.000	12.000	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 164

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Zinc, filtered							
	2-E17-1	11.600	21.000	7.000	5	0	5
	6-24-34A	11.444	20.000	10.000	6	3	9
	6-40-39	11.200	18.000	6.000	4	1	5
	6-23-34	10.818	31.000	5.000	7	4	11
	2-E33-28	10.444	27.000	10.000	3	6	9
	6-35-66	10.250	12.000	8.000	4	0	4
	6-41-40	10.200	12.000	8.000	4	1	5
	2-E25-32P	10.067	73.000	5.000	4	11	15
	2-E34-8	10.000	10.000	10.000	1	0	1
	2-E25-35	9.889	29.000	6.000	3	6	9
	2-E34-2	9.630	25.000	3.300	6	4	10
	2-E25-18	9.556	17.000	7.000	9	0	9
	2-E13-5	9.500	12.000	9.000	3	1	4
	2-E27-13	9.500	9.000	9.000	1	1	2
	6-24-34B	9.182	36.000	6.000	7	4	11
	2-E25-27	9.000	14.000	6.000	5	0	5
	2-E27-11	9.000	9.000	9.000	1	0	1
	2-E18-4	8.875	16.000	6.000	4	4	8
	2-E27-8	8.857	20.000	5.000	3	4	7
	2-E17-12	8.750	11.000	7.000	4	0	4
	2-E25-22	8.625	16.000	7.000	6	2	8
	2-E25-36	8.571	13.000	10.000	3	4	7
	2-E25-38	8.571	13.000	7.000	2	5	7
	2-E33-30	8.530	24.000	6.000	5	5	10
	2-E27-12	8.500	7.000	7.000	1	1	2
	2-E33-32	8.333	10.000	10.000	1	2	3
	2-E25-20	8.300	16.000	6.000	8	2	10
	6-49-55B	8.200	8.200	8.200	1	0	1
	2-E32-3	8.167	19.000	19.000	1	5	6
	6-24-35	8.167	13.000	7.000	9	3	12
	2-E33-18	8.150	11.300	11.300	1	1	2
	2-E17-16	8.143	19.000	6.000	3	4	7
	2-E17-14	8.125	14.000	5.000	5	3	8
	2-E18-3	8.125	23.000	5.000	5	3	8
	2-E24-18	8.000	15.000	6.000	3	2	5
	2-E27-14	8.000	6.000	6.000	1	1	2
	2-E17-9	7.875	14.000	5.000	5	3	8
	2-E25-33	7.813	37.000	5.000	6	10	16
	6-44-42	7.667	16.000	16.000	1	5	6
	6-50-53A	7.667	12.000	6.000	6	0	6
	2-E24-16	7.571	14.000	6.000	3	4	7
	2-E27-9	7.556	11.000	6.000	6	3	9
	2-E33-10	7.500	10.000	10.000	1	1	2
	2-E17-17	7.429	14.000	5.000	5	2	7
	2-E25-37	7.333	8.000	5.000	4	5	9
	2-E28-13	7.250	10.000	6.000	3	1	4
	2-E32-4	7.111	12.000	8.000	3	6	9
	2-E17-13	7.000	11.000	11.000	1	2	3
	2-E17-15	7.000	11.000	5.000	4	5	9
	2-E24-19	7.000	7.000	7.000	1	0	1
	2-E25-21	6.833	12.000	6.000	3	3	6
	2-E25-29P	6.688	14.000	5.000	9	7	16

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 165

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
Zinc, filtered							
	2-E25-34	6.667	15.000	15.000	1	5	6
	6-35-70	6.667	7.000	6.000	3	0	3
	2-E25-25	6.625	9.000	5.000	6	10	16
	6-25-33A	6.600	8.000	8.000	1	4	5
	2-E27-10	6.500	9.000	6.000	3	3	6
	2-E33-21	6.500	8.000	8.000	1	1	2
	6-36-61A	6.500	11.000	11.000	1	3	4
	6-38-65	6.500	7.000	6.000	2	0	2
	6-49-55A	6.375	11.000	5.000	5	3	8
	2-E34-3	6.286	8.000	5.000	3	4	7
	6-24-33	6.250	14.000	6.000	2	6	8
	2-E25-31	6.235	10.000	5.000	8	9	17
	2-E28-27	6.143	11.000	5.000	4	3	7
	2-E32-1	6.000	8.000	5.000	2	1	3
	2-E33-29	6.000	7.000	7.000	1	6	7
	2-E33-8	6.000	7.000	7.000	1	1	2
	6-42-40A	6.000	7.000	7.000	1	6	7
	2-E28-26	5.857	6.000	6.000	1	6	7
	2-E33-5	5.750	8.000	8.000	1	3	4
	6-43-42J	5.750	8.000	8.000	1	3	4
	2-E17-18	5.625	8.000	6.000	3	5	8
	2-E25-24	5.500	9.000	9.000	1	7	8
	2-E25-41	5.500	6.000	5.000	2	0	2
	2-E34-6	5.500	8.000	5.000	2	4	6
	6-54-49	5.500	6.000	6.000	1	1	2
	2-E25-23	5.400	6.000	6.000	2	3	5
	2-E28-21	5.400	7.000	5.000	2	3	5
	6-44-64	5.400	6.000	6.000	2	3	5
	2-E17-5	5.333	8.000	8.000	1	8	9
	2-E17-6	5.222	7.000	7.000	1	8	9
	6-52-54	5.200	5.200	5.200	1	0	1
	2-E32-2	5.000	5.000	5.000	1	5	6
	2-E33-1	5.000	5.000	5.000	1	4	5
	6-39-39	5.000	5.000	5.000	1	1	2
	6-47-46A	5.000	5.000	5.000	1	3	4
	6-55-55	4.100	4.100	4.100	1	0	1
Zinc-65							
	2-E13-14	7.460	7.460	7.460	1	0	1
	2-E24-16	4.570	4.570	4.570	1	0	1
	6-32-43	-2.474	9.270	9.270	1	4	5
	6-24-33	-3.040	13.600	13.600	1	3	4
Zirconium/Nubidium-95							
	6-36-46R	81.400	81.400	81.400	1	0	1
	2-E32-3	4.287	13.700	13.700	1	2	3
o-Nitrophenol							
	6-42-41	28.000	28.000	28.000	1	0	1
	6-40-40B	10.000	10.000	10.000	1	0	1
pH, Field Measurement							
	6-50-48B	9.980	9.980	9.980	1	0	1
	6-50-30	9.600	9.600	9.600	1	0	1
	6-60-60	9.520	9.520	9.520	1	0	1
	2-E33-12	9.200	9.200	9.200	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 166

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
pH, Field Measurement							
	6-55-50A	9.200	9.200	9.200	1	0	1
	6-55-70	9.090	9.090	9.090	1	0	1
	2-E33-37	9.035	10.950	7.980	10	0	10
	2-E28-24	8.950	8.950	8.950	1	0	1
	6-40-33A	8.730	8.730	8.730	1	0	1
	6-42-41	8.710	8.710	8.710	1	0	1
	6-52-57	8.610	8.610	8.610	1	0	1
	2-E34-8	8.579	9.150	7.760	7	0	7
	6-52-46A	8.550	8.550	8.550	1	0	1
	6-43-41G	8.490	8.490	8.490	1	0	1
	6-47-35A	8.460	8.460	8.460	1	0	1
	2-E25-6	8.457	8.730	8.190	3	0	3
	6-52-48	8.420	8.420	8.420	1	0	1
	6-55-40	8.420	8.420	8.420	1	0	1
	2-E25-37	8.378	8.800	8.060	19	0	19
	2-E25-25	8.352	10.200	7.775	39	0	39
	2-E25-30P	8.349	8.800	7.810	8	0	8
	2-E25-3	8.310	8.310	8.310	1	0	1
	2-E26-8	8.310	8.310	8.310	1	0	1
	2-E26-1	8.300	8.300	8.300	1	0	1
	6-51-46	8.300	8.300	8.300	1	0	1
	6-56-53	8.280	8.280	8.280	1	0	1
	6-42-40B	8.275	8.400	8.150	2	0	2
	6-43-41E	8.226	8.670	8.060	14	0	14
	6-42-40A	8.223	8.990	7.900	12	0	12
	2-E25-9	8.220	8.640	7.800	2	0	2
	6-60-57	8.210	8.210	8.210	1	0	1
	6-44-43B	8.209	8.480	7.890	13	0	13
	2-E25-28	8.206	8.800	7.880	24	0	24
	6-39-39	8.200	8.200	8.200	2	0	2
	2-E25-27	8.180	8.500	7.950	9	0	9
	2-E26-12	8.178	8.410	8.050	5	0	5
	2-E25-22	8.177	8.750	7.700	14	0	14
	6-54-48	8.170	8.170	8.170	1	0	1
	6-43-42J	8.169	8.380	7.940	16	0	16
	2-E17-2	8.160	8.160	8.160	1	0	1
	6-43-45	8.158	9.150	7.920	12	0	12
	2-E25-38	8.150	8.500	7.303	20	0	20
	6-31-31	8.140	8.140	8.140	1	0	1
	6-41-40	8.129	8.380	7.750	14	0	14
	2-E28-23	8.123	8.580	7.800	4	0	4
	6-55-50C	8.120	8.800	7.500	4	0	4
	2-E25-26	8.115	8.400	7.220	21	0	21
	2-E25-29P	8.113	8.670	6.700	35	0	35
	2-E17-13	8.103	8.420	7.800	7	0	7
	2-E35-1	8.100	8.100	8.100	1	0	1
	2-E33-43	8.097	8.110	8.080	3	0	3
	2-E33-18	8.095	8.190	8.000	2	0	2
	2-E32-1	8.093	8.400	7.900	4	0	4
	2-E33-15	8.090	8.090	8.090	1	0	1
	6-40-39	8.087	8.530	7.150	16	0	16
	6-43-41F	8.076	8.300	7.790	14	0	14

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 167

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
pH, Field Measurement							
	2-E25-31	8.070	8.900	7.800	38	0	38
	2-E33-42	8.070	8.080	8.060	3	0	3
	6-49-55A	8.066	8.790	7.600	6	1	7
	2-E27-12	8.064	8.210	7.920	9	0	9
	2-E33-40	8.060	8.060	8.060	1	0	1
	2-E28-27	8.057	8.400	7.840	20	0	20
	6-44-42	8.054	8.400	7.600	17	0	17
	2-E27-10	8.052	8.150	7.900	18	0	18
	2-E33-26	8.050	8.050	8.050	1	0	1
	2-E25-40	8.044	9.590	7.770	11	0	11
	2-E26-13	8.043	8.140	7.870	4	0	4
	2-E33-39	8.040	8.040	8.040	1	0	1
	2-E27-13	8.038	8.170	7.820	13	0	13
	2-E18-2	8.035	8.500	7.450	19	0	19
	6-34-41B	8.030	8.030	8.030	1	0	1
	6-59-58	8.030	8.030	8.030	1	0	1
	2-E34-7	8.027	8.490	7.860	10	0	10
	2-E18-3	8.021	8.400	7.390	17	0	17
	2-E25-17	8.015	8.250	7.780	2	0	2
	2-E33-38	8.010	8.010	8.010	1	0	1
	6-31-31P	8.010	8.010	8.010	1	0	1
	6-54-49	8.010	8.010	8.010	1	0	1
	2-E27-14	8.005	8.170	7.910	6	0	6
	2-E33-30	8.003	8.200	7.710	19	0	19
	2-E27-5	8.000	8.000	8.000	1	0	1
	2-E25-41	7.997	8.890	7.640	8	0	8
	2-E33-29	7.997	8.200	7.800	19	0	19
	2-E34-6	7.996	8.748	7.630	21	0	21
	2-E27-16	7.995	8.280	7.660	11	0	11
	2-E26-10	7.993	8.140	7.730	8	0	8
	2-E35-2	7.992	8.400	7.660	13	0	13
	6-52-54	7.990	7.990	7.990	1	0	1
	6-42-42B	7.986	8.410	7.500	13	0	13
	2-E24-4	7.985	7.990	7.980	2	0	2
	2-E17-12	7.984	8.800	7.520	7	0	7
	2-E24-18	7.983	8.500	7.630	16	0	16
	6-45-69A	7.980	8.000	7.960	2	0	2
	6-50-45	7.980	7.980	7.980	1	0	1
	2-E25-42	7.980	8.120	7.840	2	0	2
	6-43-40	7.980	7.980	7.980	1	0	1
	2-E25-18	7.979	8.130	7.400	17	0	17
	2-E25-34	7.978	9.470	6.440	19	0	19
	2-E27-11	7.976	8.290	7.160	9	0	9
	2-E32-2	7.973	8.230	7.820	23	0	23
	2-E33-10	7.967	8.500	7.600	3	0	3
	2-E18-1	7.966	8.600	6.900	22	0	22
	2-E27-7	7.961	8.260	7.130	10	0	10
	6-28-40P	7.960	7.960	7.960	1	0	1
	6-32-43	7.955	8.000	7.910	2	0	2
	6-20-39	7.950	8.100	7.800	2	0	2
	6-55-50D	7.950	8.700	7.200	2	0	2
	2-E18-4	7.946	8.400	7.000	20	0	20

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 168

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
pH, Field Measurement							
	2-E25-21	7.944	8.290	7.200	7	0	7
	6-55-44	7.940	7.940	7.940	1	0	1
	2-E34-2	7.936	8.300	7.640	24	1	25
	2-E25-32P	7.934	8.800	6.380	29	0	29
	2-E27-15	7.933	8.200	7.640	12	0	12
	2-E26-9	7.933	8.160	7.410	9	0	9
	2-E25-36	7.930	8.400	7.630	21	0	21
	2-E33-24	7.930	8.160	7.700	2	0	2
	2-E17-9	7.929	8.300	7.780	19	0	19
	2-E27-9	7.922	8.200	7.000	19	0	19
	6-43-43	7.921	8.410	6.950	16	0	16
	2-E24-2	7.920	8.500	7.620	20	0	20
	2-E33-31	7.916	8.180	7.775	6	0	6
	2-E27-8	7.916	8.300	7.780	19	0	19
	2-E26-4	7.910	7.910	7.910	1	0	1
	2-E24-12	7.905	8.010	7.800	2	0	2
	2-E24-8	7.900	7.900	7.900	1	0	1
	2-E26-5	7.900	7.900	7.900	1	0	1
	2-E33-1	7.900	8.400	7.500	4	0	4
	2-E33-28	7.900	8.200	6.240	20	0	20
	6-57-29A	7.900	7.900	7.900	1	0	1
	2-E33-8	7.897	8.000	7.700	3	0	3
	6-25-33A	7.895	8.400	6.890	19	0	19
	2-E28-13	7.893	8.200	7.700	4	0	4
	2-E25-33	7.892	8.700	7.370	28	0	28
	2-E24-17	7.887	8.130	7.490	18	0	18
	2-E34-5	7.879	8.400	7.300	25	1	26
	2-E34-3	7.871	8.000	7.640	19	0	19
	6-25-34A	7.863	8.400	7.500	17	0	17
	2-E25-39	7.862	8.290	6.830	14	0	14
	2-E17-16	7.859	8.300	7.430	20	0	20
	2-E33-34	7.841	8.130	7.800	7	1	8
	6-47-60	7.838	8.400	7.500	4	1	5
	2-E17-19	7.830	8.000	7.600	10	0	10
	2-E32-4	7.825	8.250	7.250	32	0	32
	2-E33-33	7.821	8.240	6.460	9	0	9
	2-E17-1	7.815	7.970	7.500	16	0	16
	6-26-33	7.808	8.500	7.380	17	0	17
	2-E25-43	7.805	8.070	7.540	2	0	2
	2-E17-5	7.801	8.300	7.370	27	0	27
	2-E13-19	7.800	7.800	7.800	1	0	1
	2-E24-1	7.800	7.800	7.800	1	0	1
	2-E33-21	7.800	7.800	7.800	1	0	1
	6-26-35C	7.798	8.300	7.300	16	0	16
	6-47-50	7.795	8.400	7.880	3	1	4
	2-E25-35	7.792	8.460	7.500	21	0	21
	2-E28-25	7.790	7.790	7.790	1	0	1
	6-26-34	7.790	8.500	6.970	19	0	19
	2-E17-18	7.780	8.300	7.400	25	0	25
	6-46-21B	7.780	7.780	7.780	1	0	1
	2-E28-28	7.779	7.900	7.600	8	0	8
	6-47-46A	7.775	7.900	7.500	4	0	4

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 169

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
pH, Field Measurement							
	6-37-43	7.773	8.000	7.500	4	0	4
	6-54-57	7.770	8.300	8.010	2	1	3
	2-E28-12	7.770	7.780	7.760	2	0	2
	6-36-46S	7.760	7.760	7.760	1	0	1
	2-E17-6	7.751	8.100	7.300	18	0	18
	2-E13-14	7.723	8.100	7.240	6	0	6
	6-50-53A	7.720	8.300	7.500	4	1	5
	2-E16-2	7.718	8.480	7.090	4	0	4
	6-49-55B	7.715	8.430	8.430	1	1	2
	2-E24-20	7.705	7.710	7.700	2	0	2
	2-E25-19	7.702	8.040	7.040	9	0	9
	2-E17-17	7.694	8.400	7.090	24	0	24
	6-45-42	7.694	7.990	7.480	5	0	5
	2-E26-2	7.690	7.690	7.690	1	0	1
	6-40-40B	7.690	7.690	7.690	1	0	1
	2-E24-16	7.679	8.040	7.170	19	0	19
	2-E13-5	7.678	7.890	7.500	5	0	5
	2-E25-23	7.678	7.970	7.000	5	0	5
	6-35-66	7.675	7.900	7.500	4	0	4
	2-E26-11	7.672	8.120	7.050	12	0	12
	2-E25-20	7.671	8.020	7.300	13	0	13
	6-53-55A	7.670	8.340	8.340	1	1	2
	6-44-64	7.668	7.840	7.400	5	0	5
	2-E32-5	7.666	8.020	7.430	14	0	14
	2-E33-3	7.652	8.100	7.400	4	1	5
	2-E24-7	7.650	7.650	7.650	1	0	1
	2-E25-13	7.650	7.650	7.650	1	0	1
	2-E28-18	7.649	8.500	7.010	7	0	7
	2-E28-11	7.640	7.640	7.640	1	0	1
	2-E25-24	7.634	8.000	6.500	13	0	13
	2-E33-41	7.616	8.060	7.490	5	0	5
	2-E25-11	7.607	8.630	6.600	6	0	6
	6-55-55	7.595	8.190	8.190	1	1	2
	2-E32-3	7.587	7.900	7.020	26	0	26
	6-50-53B	7.587	7.880	7.880	2	1	3
	2-E34-1	7.582	7.970	7.440	4	1	5
	2-E33-7	7.580	8.160	8.160	1	1	2
	6-40-62	7.567	7.900	7.400	3	0	3
	2-E24-19	7.562	7.820	7.240	9	0	9
	2-E17-20	7.558	7.800	6.960	17	0	17
	6-35-70	7.558	7.780	7.300	4	0	4
	2-E33-32	7.556	8.210	7.080	13	0	13
	6-48-50	7.550	8.100	8.100	1	1	2
	6-49-57B	7.550	8.100	8.100	1	1	2
	2-E28-26	7.531	7.940	5.630	27	0	27
	2-E17-15	7.530	7.900	6.950	22	0	22
	2-E28-21	7.528	7.840	7.000	5	0	5
	6-53-55B	7.525	8.050	8.050	1	1	2
	2-E33-35	7.524	8.158	6.460	4	1	5
	2-E33-5	7.516	8.080	7.200	4	1	5
	6-36-61B	7.500	7.600	7.400	2	0	2
	6-43-42	7.500	7.500	7.500	1	0	1

Table A-1. Summary of Detections in 200 East Groundwater Aggregate Area (January 1988 - April 1992). Page 170

Constituent	Well	Average of Reported Values (Detections and Nondetections)	Maximum of Detections	Minimum of Detections	Number of Detections in Well	Number of < D.L. in Well	Total Number of Analyses
pH, field Measurement							
	2-E17-14	7.499	8.000	7.080	17	0	17
	2-E33-4	7.470	7.940	7.940	1	1	2
	6-38-65	7.470	7.640	7.300	2	0	2
	6-42-39B	7.470	7.470	7.470	1	0	1
	6-53-55C	7.460	7.920	7.920	1	1	2
	6-36-61A	7.453	7.810	7.300	4	0	4
	6-55-57	7.450	7.900	7.900	1	1	2
	6-40-40A	7.440	7.440	7.440	1	0	1
	6-25-34B	7.436	7.910	5.800	19	0	19
	2-E13-8	7.410	7.410	7.410	1	0	1
	6-54-45A	7.380	7.380	7.380	1	0	1
	6-26-35A	7.376	8.300	5.400	20	0	20
	6-42-39A	7.370	7.370	7.370	1	0	1
	2-E33-36	7.368	8.160	6.270	10	0	10
	6-24-46	7.367	8.000	6.100	3	0	3
	6-24-35	7.302	8.500	6.000	31	0	31
	6-24-33	7.274	7.770	6.680	18	0	18
	6-25-34C	7.258	7.800	6.400	26	0	26
	2-E23-1	7.250	7.250	7.250	1	0	1
	6-53-47A	7.200	7.200	7.200	1	0	1
	2-E28-15	7.120	7.120	7.120	1	0	1
	2-E28-17	7.075	7.700	6.450	2	0	2
	6-24-34C	7.055	7.600	6.500	30	0	30
	2-E28-7	6.980	7.400	6.560	2	0	2
	6-54-34	6.860	6.860	6.860	1	0	1
	6-23-34	6.851	7.400	6.200	31	0	31
	6-24-34B	6.775	7.300	3.500	27	0	27
	6-24-34A	6.694	7.500	3.900	25	0	25
	2-E26-6	6.690	6.690	6.690	1	0	1
	6-56-43	6.620	6.620	6.620	1	0	1
	2-E28-9	6.570	6.570	6.570	1	0	1
	2-E25-2	6.555	6.620	6.490	2	0	2
	6-53-47B	2.530	2.530	2.530	1	0	1

Note: D.L. Detection limit

a Chemical data combined from two chemical constituent data codes or more thane one analytical method. Chemical constituent codes provided from Hanford Site Groundwater Chemical Database by WHC.

Units: All organic and inorganic compounds in micrograms per liter
All radionuclides in picocuries per liter

Table A-2. Maximum Detections
in 200 East Groundwater (October 1951 - April 1991)

Constituent		Well	Maximum of Detections	Date
1,1,1-Trichloroethane	@	6-24-34B	64	15-Nov-87
1,1,2-Trichloroethane		6-24-34C	0.6	26-Dec-91
1,1-Dichloroethane	@	6-23-34	7	19-Apr-90
2,4-Dichlorophenol		2-E17-16	26	19-Dec-91
2,4-Dimethylphenol		2-E17-18	20	19-Dec-91
2,4-Dinitrophenol		6-42-41	120	24-Jan-92
2,4-Dinitrotoluene		2-E33-3	11	25-Mar-91
2-Chlorophenol		2-E33-3	22	25-Mar-91
4-Methyl-2-Pentanone		2-E33-5	11	27-Mar-91
Acetone by VOA		2-E28-7	140	22-Jun-88
Alkalinity		6-23-34	593000	27-Jul-88
Aluminum		6-37-43	255000	13-Aug-85
Aluminum, filtered		2-E34-2	505	27-Nov-89
Americium-241		2-E33-35	0.085	24-Sep-91
Ammonium ion		2-E32-5	1800	05-Jan-90
Antimony		2-E34-5	28.2	28-Feb-91
Antimony, filtered		6-49-57A	42.9	20-Feb-91
Antimony-125		6-40-33A	23.1	08-Aug-90
Arsenic		2-E25-17	56	04-Jan-90
Arsenic, filtered		2-E25-30P	34	18-Oct-88
Barium		6-37-43	1530	13-Aug-85
Barium, filtered		6-40-39	120	08-Jul-91
Beryllium		2-E32-4	10	08-Sep-89
Beryllium, filtered		2-E27-10	7	06-Sep-89
Beryllium-7		6-50-42	222	10-Dec-90
Bicarbonate		6-35-70	220	01-Nov-76
Bis(2-ethylhexyl) phthalate		2-E32-5	56	23-Sep-91
Boron		6-24-34A	213	10-Jan-89
Boron (Colorimetric by curcumin)		6-35-70	0.29	27-Dec-83
Boron, filtered		2-E28-26	182	16-Mar-89
Bromide		2-E25-39	300	20-Jan-92
COD		6-43-41E	178	11-Sep-91
Cadmium		2-E25-17	211	04-Jan-90
Cadmium, filtered		2-E17-14	12	08-Jun-88
Calcium		6-37-43	252000	13-Aug-85
Calcium, filtered		6-50-53A	254000	15-Sep-88
Carbon Tetrachloride by GC	@	6-23-34	7	19-Jan-88
Carbon-14		2-E24-1	58.8	22-Jan-88
Carbonate		6-62-43G	35	13-Jan-77
Cerium/Promethium-144		2-E34-2	34.7	30-Jul-91
Cesium-134		6-40-33A	8.96	08-Aug-90
Cesium-137		2-E33-12	5100000	25-May-59
Chemical calcium by AA		6-50-53A	120	15-Dec-80

Table A-2. Maximum Detections
in 200 East Groundwater (October 1951 - April 1991)

Constituent		Well	Maximum of Detections	Date
Chemical sodium by AA		2-E33-19	1700	23-Jun-58
Chloride		2-E28-24	193000	06-Apr-90
Chloride by chemical analysis		6-50-53A	51	19-Dec-83
Chloroform	@	2-E18-3	25	27-Nov-89
Chromium		2-E34-6	1000	04-Feb-92
Chromium, filtered		2-E25-20	130	16-Jul-91
Cis-1,2-Dichloroethene		6-24-34A	1.7	19-Jan-90
Cobalt		2-E25-17	30	04-Jan-90
Cobalt-60		2-E33-2	13000000	12-Mar-56
Coliform (Membrane Filter)		2-E33-30	8	01-Aug-89
Conductivity, Laboratory		2-E25-13	1490	22-Mar-90
Copper		2-E17-17	798	22-Jan-90
Cyanide		6-50-53A	1690	06-Jun-88
Cyclohexanone		6-50-53B	4	19-Feb-91
DDD		2-E25-33	0.3	13-Jan-92
DDT		2-E34-8	5	02-Jan-92
Dieldrin		2-E34-8	4.8	02-Jan-92
Diethyl ether		2-E34-5	10	28-Feb-91
Dimethoate		2-E25-31	20600	13-Apr-88
Endrin		2-E34-8	4.6	02-Jan-92
Endrin Aldehyde		2-E25-32P	0.6	13-Jan-92
Ethyl cyanide		2-E25-32P	7	26-Sep-91
Europium-154		2-E28-27	12.5	23-Sep-91
Europium-155		2-E28-27	10.2	01-Aug-91
Fluoride	@	2-E28-24	2200	06-Apr-90
Gamma-BHC		2-E34-8	1.9	02-Jan-92
Gross alpha	@	2-E28-24	1250	06-Apr-90
Gross beta		2-E33-4	980000000	23-Apr-56
Hardness		6-49-55A	220	01-Nov-77
Heptachlor		2-E34-8	1.8	02-Jan-92
Hydrazine	@	2-E25-17	38	04-Jan-90
Iodine-129	@	6-35-70	87.8	18-Apr-88
Iron		2-E25-17	592000	04-Jan-90
Iron, filtered		6-54-34	3370	26-Apr-90
Lead		6-37-43	621	13-Aug-85
Lead (graphite furnace)		2-E25-29P	68	30-Aug-89
Lead, filtered		2-E33-28	16	15-Jan-92
Lead-212		2-E33-35	12.6	24-Sep-91
Lithium		2-E16-2	19	14-Dec-89
Lithium, filtered		6-40-33A	16	21-Feb-90
Magnesium		6-50-53A	89900	20-Feb-91
Magnesium by chemical analysis		6-45-69A	22	12-Dec-83
Magnesium, filtered		6-50-53A	71100	15-Sep-88

Table A-2. Maximum Detections
in 200 East Groundwater (October 1951 - April 1991)

Constituent		Well	Maximum of Detections	Date
Manganese		2-E25-17	6240	04-Jan-90
Manganese, filtered		6-52-57	295	25-Feb-91
Mercury		2-E27-15	0.92	26-Feb-90
Mercury, filtered		2-E27-15	0.23	26-Feb-90
Methyl ethyl ketone		2-E13-5	50	22-May-87
Methylene Chloride	@	6-38-65	33500	27-Aug-87
Nickel		6-50-53A	590	20-Feb-91
Nickel, filtered		2-E25-39	71	16-Sep-91
Nitrate	@	6-50-53A	625000	17-Jan-89
Nitrate-Ion		6-50-53A	270	02-Jun-86
Nitrite		6-26-35C	1400	25-Apr-88
P-chloro-m-cresol		2-E33-3	21	25-Mar-91
Phorate		6-43-42J	11	31-Jan-92
Phosphate		2-E25-30P	24500	12-Apr-88
Plutonium-238		2-E28-23	2.13	18-Dec-90
Plutonium-239/40		2-E28-23	449	18-Dec-90
Potassium		6-37-43	42000	13-Aug-85
Potassium, filtered		6-50-53A	15400	06-Mar-88
Potassium-40		2-E33-35	469	24-Sep-91
Pyrene		2-E33-3	13	25-Mar-91
Radium		6-37-43	5.27	13-Aug-85
Ruthenium-106		2-E26-7	140000	13-Jan-72
Selenium		2-E18-3	48.6	16-Aug-88
Selenium, filtered		6-50-53A	27	06-Jun-88
Silicon		2-E25-17	73600	04-Jan-90
Silicon, filtered		2-E25-24	32400	20-Dec-89
Silver		2-E33-10	15	22-Jun-88
Silver, filtered		6-24-34A	27	19-May-89
Sodium		2-E25-30P	107000	12-Apr-88
Sodium, filtered		2-E27-5	306000	05-Aug-87
Specific conductance		6-50-53A	3000	27-Dec-82
Strontium		6-37-43	936	13-Aug-85
Strontium, filtered		6-50-53A	1150	15-Sep-88
Strontium-90		2-E33-7	28000000	22-Apr-57
Styrene		2-E25-23	14	26-Jan-88
Sulfate		6-50-53A	474000	07-Dec-87
Sulphate		6-50-53A	390	11-Dec-78
Technetium-99		6-50-53A	32700	31-Oct-88
Tetrachloroethylene	@	6-23-34	12	19-Apr-90
Thallium		6-49-57A	50	20-Feb-91
Thallium, filtered		6-49-57A	50	20-Feb-91
Titanium		2-E16-2	1120	14-Dec-89
Total Organic Halogen, Low Det. Level		2-E25-31	45300	13-Apr-88

Table A-2. Maximum Detections
in 200 East Groundwater (October 1951 - April 1991)

Constituent		Well	Maximum of Detections	Date
Total carbon		6-24-34B	91000	27-Aug-91
Total dissolved solids		2-E25-25	14900	19-Dec-85
Total dissolved solids		6-23-34	668000	27-Jul-88
Total organic carbon		6-25-34A	22900	25-Jul-88
Total organic halogen		6-25-34B	270	26-May-87
Total potassium		6-50-53A	33	15-Dec-80
Trans-1,2 Dichloroethylene		6-24-34A	2	19-May-89
Trichloroethylene	@	6-31-31P	12	14-May-90
Trichloromonofluoromethane		2-E17-17	13	12-May-89
Triethylene glycol		2-E33-35	10	05-Mar-91
Tritium		6-41-23	150000000	03-Apr-62
Unknown		2-E25-31	4100	13-Apr-88
Unknown Aliphatic Hydrocarbon		2-E32-4	6	28-Dec-88
Unknown Halogenated Hydrocarbon		2-E25-32P	14	04-Apr-90
Uranium		2-E28-18	292	01-Apr-85
Uranium, chemical		2-E28-18	319	05-Sep-85
Uranium-234		2-E28-18	96.1	11-Oct-85
Uranium-235		2-E28-18	5.77	11-Oct-85
Uranium-238		2-E28-18	99.8	11-Oct-85
Vanadium		6-37-43	672	13-Aug-85
Vanadium, filtered		2-E25-23	145	18-Apr-88
Zinc		6-40-40B	1000	24-Jan-92
Zinc, filtered		6-54-34	358	26-Apr-90
Zinc-65		6-24-33	13.6	17-Oct-90
Zirconium/Nubidium-95		6-36-46R	81.4	19-Oct-90
o-Nitrophenol		6-42-41	28	24-Jan-92
pH, Field Measurement		2-E33-37	10.95	06-Mar-92
pH, Laboratory Measurement		2-E33-12	9.4	14-May-90
trans-1,2 Dichloroethylene	@	6-24-34A	2	19-May-89

Notes: The following constituents were also listed in the Hanford Site Groudwater Chemical Database but are not included in Table A-2:

1,2-Dichloroethane
2,3,4,6-Tetrachlorophenol
2-Propanol
Aldrin
Coliform bacteria
Copper, filtered
Fluoride
Nitrate, Phenodisulfonic Acid Method
Pentachlorophenol
Phenol
Plutonium
Temperature, field
Toluene
Turbidity

For a given constituent in this list, the same maximum detected concentration was reported for multiple wells, or multiple sampling events in a specific well. For this reason, these values are suspected to be analytical detection limit concentrations, although they were not specifically identified as such in the Hanford Site Groundwater Database.

Organic, inorganic, and conventional constituent concentrations in micrograms per liter. Radionuclide concentrations in picocuries per liter.

@ Chemical data combined from two chemical constituent data codes or from more than one analytical method. Chemical constituent data codes from Hanford Site Groudwater Database provided by WHC.

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9 3 1 2 9 7 1 8 2 5

Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total number of analys
1,1,1,2-tetrachlorethane	*	5.000	10.000	243	243
1,1,1-trichloroethane	@	.500	23.000	585	671
1,1,2,2-tetrachlorethane	*	5.000	10.000	264	264
1,1,2-trichloroethane	@	.200	5.000	664	665
1,1-dichloroethane	@	1.000	10.000	601	638
1,1-dichloroethylene	*	.500	10.000	318	318
1,1-dimethylhydrazine	*	10.000	10.000	55	55
1,2,3,4-tetrachlorobenzene	*	10.000	10.000	216	216
1,2,3,5-tetrachlorobenzene	*	10.000	10.000	216	216
1,2,3-trichlorobenzene	*	10.000	10.000	216	216
1,2,3-trichloropropane	*	5.000	10.000	243	243
1,2,4,5-tetrachlorobenzene	*	10.000	10.000	218	218
1,2,4-trichlorobenzene	*	4.000	10.000	243	243
1,2-dibromo-3-chloropropane	*	5.000	10.000	242	242
1,2-dibromoethane	*	5.000	10.000	243	243
1,2-dichlorobenzene	*	10.000	10.000	242	242
1,2-dichloroethane	@	.500	10.000	620	621
1,2-dichloropropane	*	5.000	10.000	267	267
1,2-dimethylhydrazine	*	10.000	10.000	55	55
1,2-diphenylhydrazine	*	10.000	10.000	118	118
1,3,5-trichlorobenzene	*	10.000	10.000	216	216
1,3-dichlorobenzene	*	3.000	10.000	241	241
1,3-dichloropropene	*	5.000	10.000	267	267
1,4-dichloro-2-butene	*	5.000	10.000	241	241
1,4-naphthoquinone	*	10.000	10.000	120	120
1-(o-chlorophenyl) thiourea	*	200.000	200.000	100	100
1-Butanol	*	1.000	10000.000	169	169
1-Butynol	*	10000.000	10000.000	93	93
1-Propanol	*	10000.000	10000.000	93	93
1-acetyl-2-thiourea	*	200.000	200.000	100	100
1-chloro-2,3-epoxypropane	*	10.000	10.000	118	118
1-naphthyl-2-thiourea	*	200.000	200.000	100	100
1-naphthylamine	*	10.000	10.000	120	120
2,3,4,6-tetrachlorophenol		10.000	10.000	208	209
2,3,7,8 TCDD	*	.005	.010	63	63
2,4,5-T	*	2.000	20.000	611	611
2,4,5-TP silvex	*	2.000	20.000	680	680
2,4,5-Trichlorophenol	*	5.000	50.000	232	232
2,4,6-trichlorophenol	*	5.000	10.000	246	246
2,4-D	*	2.000	20.000	680	680
2,4-dichlorophenol		5.000	10.000	244	245
2,4-dimethylphenol		5.000	10.000	185	187
2,4-dinitrophenol		10.000	150.000	244	246
2,4-dinitrotoluene		5.000	10.000	144	145
2,6-dichlorophenol	*	5.000	10.000	222	222
2,6-dinitrotoluene	*	10.000	10.000	142	142
2-Hexanone	*	10.000	50.000	94	94
2-Methylnaphthalene	*	10.000	10.000	84	84
2-Methylphenol	*	10.000	10.000	116	116
2-Propanol	*	5000.000	5000.000	20	20
2-acetylaminofluorene	*	10.000	10.000	120	120
2-chloroethyl vinyl ether	*	5.000	10.000	228	228
2-chloronaphthalene	*	10.000	10.000	143	143

Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total number of analyses
2-chlorophenol		2.000	10.000	244	247
2-cyclohexyl-4,6-dinitrophenol	*	10.000	10.000	118	118
2-methyl-2-(methylthio) propionaldehyde-	*	10.000	10.000	118	118
2-methylaziridine	*	10.000	10.000	118	118
2-methyllactonitrile	*	10.000	10.000	118	118
2-naphthylamine	*	10.000	10.000	120	120
2-picoline	*	5.000	10.000	121	121
2-propyn-1-ol	*	8000.000	10000.000	138	138
2-sec-butyl-4,6-dinitrophenol	*	1.000	10.000	362	362
3,3'-Dichlorobenzidine	*	10.000	20.000	143	143
3,3'-dimethoxybenzidine	*	10.000	10.000	118	118
3,3'-dimethylbenzidine	*	10.000	10.000	120	120
3-chloropropionitrile	*	4000.000	10000.000	137	137
3-methylcholanthrene	*	10.000	10.000	120	120
4,4'-methylenebis(2-chloroaniline)	*	10.000	10.000	118	118
4,6-Dinitro-2-methylphenol	*	50.000	200.000	128	128
4,6-dinitro-o-cresol and salts	*	10.000	10.000	118	118
4-Chlorophenylphenyl Ether	*	10.000	10.000	26	26
4-Methyl-2-Pentanone		1.000	50.000	153	155
4-Methylphenol	*	10.000	10.000	117	117
4-Nitroquinoline 1-oxide	*	10.000	10.000	60	60
4-aminobyphenyl	*	10.000	10.000	120	120
4-bromophenyl phenyl ether	*	10.000	10.000	141	141
5-(aminomethyl)-3-isoxazolol	*	10.000	10.000	118	118
5-nitro-o-toluidine	*	10.000	10.000	120	120
7,12-dimethylbenz[a]anthracene	*	10.000	10.000	120	120
7H-dibenzo[c,g]carbazole	*	10.000	10.000	118	118
Acenaphthalene	*	10.000	10.000	82	82
Acenaphthene	*	5.000	10.000	83	83
Acetone - by ABN	*	10.000	10.000	58	58
Acetone by VOA		1.000	100.000	432	457
Acetonitrile	*	10.000	3000.000	240	240
Acetophenone	*	10.000	10.000	120	120
Acrolein	*	5.000	10.000	243	243
Acrylamide	*	10000.000	10000.000	137	137
Acrylonitrile	*	5.000	200.000	243	243
Aldrin		.050	.100	306	312
Allyl Chloride	*	100.000	100.000	70	70
Allyl alcohol	*	2500.000	10000.000	137	137
Alpha,alpha-dimethylphenethylamine	*	10.000	10.000	120	120
Alpha-BHC	*	.050	.100	652	652
Aluminum		150.000	150.000	475	551
Aluminum, filtered		150.000	150.000	631	659
Americium-241		-.007	.014	43	55
Amitrole	*	10.000	10.000	118	118
Ammonium ion		50.000	100.000	599	664
Aniline	*	10.000	10.000	120	120
Anthracene	*	10.000	10.000	81	81
Antimony		100.000	200.000	768	789
Antimony, filtered		100.000	200.000	724	745
Antimony-125		-48.100	14.400	136	153
Aramite	*	10.000	10.000	120	120
Arochlor 1016	*	1.000	1.000	115	115

9 3 1 2 9 7 1 8 2 7

Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total number of analyses
Arochlor 1221	*	1.000	1.000	115	115
Arochlor 1232	*	1.000	1.000	115	115
Arochlor 1242	*	1.000	1.000	115	115
Arochlor 1248	*	1.000	1.000	115	115
Arochlor 1254	*	1.000	1.000	115	115
Arochlor 1260	*	1.000	1.000	115	115
Arsenic		2.000	11.000	236	856
Arsenic, filtered		2.000	8.000	241	772
Auramine	*	10.000	10.000	118	118
Barium		6.000	20.000	65	932
Barium, filtered		6.000	20.000	33	841
Benz[a]anthracene	*	10.000	10.000	142	142
Benz[c]acridine	*	10.000	10.000	118	118
Benzene	*	2.000	5.000	602	602
Benzene, dichloromethyl	*	10.000	10.000	118	118
Benzenethoil	*	10.000	10.000	118	118
Benzidine	*	10.000	10.000	118	118
Benzo(ghi)perylene	*	10.000	10.000	83	83
Benzo(k)fluoranthene	*	10.000	10.000	82	82
Benzo[a]pyrene	*	10.000	10.000	143	143
Benzo[b]fluoranthene	*	10.000	10.000	143	143
Benzo[j]fluoranthene	*	10.000	10.000	118	118
Benzoic Acid	*	1.000	50.000	24	24
Benzyl Alcohol	*	10.000	20.000	83	83
Benzyl chloride	*	10.000	10.000	118	118
Beryllium		1.000	5.000	785	790
Beryllium, filtered		1.000	5.000	738	746
Beryllium-7		-242.000	617.000	80	85
Beta-BHC	*	.050	.100	652	652
Bis(2-chloro-1-methylethyl)ether	*	10.000	10.000	58	58
Bis(2-chloroethoxy) methane	*	10.000	10.000	144	144
Bis(2-chloroethyl) ether	*	10.000	10.000	143	143
Bis(2-chloroisopropyl)ether	*	10.000	10.000	142	142
Bis(2-ethylhexyl) phthalate		1.000	10.000	138	151
Bis(chloromethyl) ether	*	5.000	10.000	228	228
Boron		10.000	10.000	23	424
Boron, filtered		10.000	10.000	25	456
Bromide		500.000	20000.000	823	827
Bromoacetone	*	5.000	10.000	228	228
Bromodichloromethane	*	3.000	5.000	93	93
Bromoform	*	5.000	10.000	266	266
Butyl benzyl phthalate	*	1.000	10.000	142	142
COD				0	3
Cadmium		2.000	10.000	785	811
Cadmium, filtered		2.000	10.000	735	754
Carbon Tetrachloride by GC	@	1.000	5.000	660	667
Carbon disulfide	*	1.000	10.000	266	266
Carbon-14		-2.520	4.050	12	33
Carbophenothion	*	2.000	2.000	97	97
Cerium/Promethium-144		-39.100	39.700	85	87
Cesium-134		-7.420	3.390	83	87
Cesium-137		-9.940	30.000	982	1047
Chlordane	*	.100	1.000	311	311

Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total number of analyses
Chlornaphazine	*	10.000	10.000	118	118
Chloroacetaldehyde	*	16000.000	16000.000	45	45
Chloroalkyl ethers	*	10.000	10.000	118	118
Chlorobenzene	@ *	5.000	10.000	394	394
Chlorobenzilate	*	10.000	300.000	103	103
Chloroethane	*	10.000	10.000	92	92
Chloroform	@	.500	5.000	655	670
Chloromethyl methyl ether	*	10.000	10.000	228	228
Chloroprene	*	5.000	5.000	15	15
Chromium		3.000	20.000	347	986
Chromium, filtered		3.000	20.000	689	771
Chrysene	*	10.000	10.000	144	144
Cis-1,2-Dichloroethene		1.000	1.000	18	20
Citrus red	*	1000.000	1000.000	100	100
Cobalt		4.000	20.000	624	628
Cobalt, filtered	*	4.000	20.000	483	483
Cobalt-60		-13.700	37.500	846	1046
Coliform (Membrane Filter)		1.000	1.000	150	154
Coliform bacteria		1.000	2.200	491	505
Copper		7.000	20.000	708	837
Copper, filtered		7.000	20.000	713	759
Cresols	*	10.000	10.000	215	215
Crotonaldehyde	*	10.000	10.000	228	228
Cyanide		5.000	20.000	456	497
DDD		.100	.100	307	312
DDE	*	.050	.100	311	311
DDT		.100	.100	306	313
Decane	*	10.000	10.000	91	91
Delta-BHC	*	.100	.100	652	652
Di-n-butyl phthalate	*	1.000	10.000	145	145
Di-n-octyl phthalate	*	10.000	10.000	143	143
Di-n-propylnitrosamine	*	4.000	10.000	143	143
Diallate	*	10.000	10.000	60	60
Dibenz[a,h]acridine	*	10.000	10.000	118	118
Dibenz[a,h]anthracene	*	10.000	10.000	143	143
Dibenz[a,j]acridine	*	10.000	10.000	118	118
Dibenzo[a,e]pyrene	*	10.000	10.000	118	118
Dibenzo[a,h]pyrene	*	10.000	10.000	118	118
Dibenzo[a,i]pyrene	*	10.000	10.000	118	118
Dibenzofuran	*	10.000	10.000	84	84
Dibromomethane	*	5.000	10.000	243	243
Dibutyl Phosphate	*	5000.000	10000.000	113	113
Dichlorodifluoromethane	*	5.000	10.000	243	243
Dieldrin		.050	.100	306	312
Diethyl phthalate	*	10.000	10.000	142	142
Diethylarsine	*	10.000	10.000	173	173
Diethylstilbesterol	*	200.000	200.000	100	100
Dihydrosafrole	*	10.000	10.000	118	118
Dimethoate		.480	20.000	94	99
Dimethyl phthalate	*	10.000	10.000	142	142
Dinitrobenzene	*	10.000	10.000	120	120
Dinoseb	*	10.000	10.000	58	58
Dioxane	*	200.000	1000.000	243	243

9 3 1 2 7 1 8 2 9

Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total number of analys
Dioxin	*	.100	.100	37	37
Diphenylamine	*	10.000	10.000	120	120
Disulfoton	*	2.000	100.000	99	99
Dodecane	*	10.000	10.000	91	91
Endosulfan I	*	.100	.100	311	311
Endosulfan II	*	.050	.100	311	311
Endosulfan Sulfate	*	.500	.500	274	274
Endrin		.100	.100	647	654
Endrin Aldehyde		.200	2.000	206	211
Ethanol	*	5000.000	10000.000	113	113
Ethyl benzene	*	2.000	5.000	113	113
Ethyl carbamate	*	5000.000	10000.000	137	137
Ethyl cyanide		5.000	10000.000	151	152
Ethyl methacrylate	*	5.000	50.000	242	242
Ethyl methanesulfonate	*	10.000	10.000	120	120
Ethylene glycol	@ *	10000.000	10000.000	120	120
Ethylene oxide	*	10.000	3000.000	228	228
Ethyleneimine	*	10.000	10.000	118	118
Ethylenethiourea	*	200.000	200.000	100	100
Europium-154		-38.100	8.850	76	87
Europium-155		-13.400	7.560	93	97
Famphur	*	10.000	10.000	2	2
Fluoranthene	*	.800	10.000	143	143
Fluorene	*	10.000	10.000	83	83
Fluoride	@	100.000	1000.000	438	1174
Formalin	*	500.000	500.000	228	228
Gamma-BHC		.050	.100	647	653
Gross alpha	@	-.774	20.000	371	1648
Gross beta		-2.650	4.000	31	1945
Heptachlor		.050	.100	306	312
Heptchlor epoxide	*	.100	1.000	311	311
Hexachlorobenzene	*	10.000	10.000	241	241
Hexachlorobutadiene	*	10.000	10.000	143	143
Hexachlorocyclopentadiene	*	10.000	10.000	143	143
Hexachloroethane	*	10.000	10.000	144	144
Hexachlorophene	*	10.000	10.000	218	218
Hexachloropropene	*	10.000	10.000	120	120
Hydrazine	@	30.000	3000.000	247	249
Hydrogen sulfide	*	10.000	10.000	173	173
Indeno(1,2,3-cd)pyrene	*	10.000	10.000	143	143
Iodine-129	@	-.409	1.780	82	298
Iodomethane	*	5.000	10.000	243	243
Iron		20.000	30.000	60	1016
Iron, filtered		20.000	30.000	442	816
Isobutyl alcohol	*	200.000	10000.000	152	152
Isodrin	*	10.000	10.000	60	60
Isophorone	*	10.000	10.000	83	83
Isosafrole	*	10.000	10.000	120	120
Kepone	*	1.000	10.000	66	66
Kerosene	*	10000.000	10000.000	218	218
Lead (graphite furnace)		2.000	5.000	665	761
Lead, filtered		2.000	5.000	702	724
Lithium		10.000	10.000	324	341

Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total number of analyses
Lithium, filtered		10.000	10.000	357	372
Maleic hydrizide	*	500.000	500.000	124	124
Malononitrile	*	10.000	10.000	118	118
Manganese		2.000	10.000	430	918
Manganese, filtered		2.000	10.000	603	768
Manganese-54	*	-1.810	-1.630	2	2
Melphalan	*	10.000	10.000	118	118
Mercury		.100	.200	734	736
Mercury, filtered		.100	.200	699	702
Methacrylonitrile	*	5.000	10.000	243	243
Methanethiol	*	10.000	10.000	228	228
Methapyrilene	*	10.000	10.000	120	120
Metholonyl	*	10.000	10.000	118	118
Methoxychlor	*	2.000	3.000	652	652
Methyl Isobutyl Ketone	*	10.000	10.000	457	457
Methyl bromide	*	10.000	10.000	265	265
Methyl chloride	*	2.000	10.000	266	266
Methyl ethyl ketone		5.000	100.000	607	611
Methyl methacrylate	*	5.000	10.000	246	246
Methyl methanesulfonate	*	10.000	10.000	120	120
Methyl parathion	*	.500	2.000	99	99
Methylene Chloride	a	1.000	10.000	620	672
Methylthiouracil	*	10.000	10.000	118	118
Molybdenum	*	40.000	40.000	340	340
Molybdenum, filtered	*	40.000	40.000	371	371
Monobutyl Phosphate	*	5000.000	10000.000	113	113
N,N-diethylhydrazine	*	10.000	10.000	228	228
N-Nitrosodiphenylamine	*	1.000	10.000	82	82
N-nitroso-N-methylurethane	*	10.000	10.000	118	118
N-nitrosodi-n-butylamine	*	10.000	10.000	120	120
N-nitrosodiethanolamine	*	10.000	10.000	118	118
N-nitrosodiethylamine	*	10.000	10.000	120	120
N-nitrosodimethylamine	*	10.000	10.000	120	120
N-nitrosomethylethylamine	*	10.000	10.000	120	120
N-nitrosomethylvinylamine	*	10.000	10.000	118	118
N-nitrosomorpholine	*	10.000	10.000	120	120
N-nitrosonornicotine	*	10.000	10.000	118	118
N-nitrosopiperidine	*	10.000	10.000	120	120
N-phenylthiourea	*	500.000	500.000	100	100
N-propylamine	*	10000.000	10000.000	137	137
Naphthalene	*	10.000	10.000	333	333
Nickel		7.000	30.000	443	953
Nickel, filtered		7.000	30.000	675	769
Nicotinic acid	*	100.000	100.000	124	124
Nitrate	a	200.000	2500.000	274	1887
Nitrite		200.000	1000.000	686	688
Nitrobenzine	*	10.000	10.000	144	144
Nitrosopyrrolidine	*	10.000	10.000	120	120
O,O,O-triethyl phosphorothioate	*	10.000	10.000	120	120
O-toluidine hydrochloride	*	10.000	10.000	118	118
P benzoquinone	*	10.000	10.000	118	118
P-chloro-m-cresol		5.000	20.000	244	247
P-chloroaniline	*	10.000	20.000	144	144

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Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total numb of analyse
P-dimethylaminoazobenzene	*	10.000	10.000	120	120
P-nitroaniline	*	10.000	50.000	142	142
Paraldehyde	*	2000.000	10000.000	137	137
Parathion	*	2.000	10.000	99	99
Pcdd's	*	.010	.010	62	62
Pcdf's	*	.010	.010	62	62
Pentachlorobenzene	*	10.000	10.000	218	218
Pentachloroethane	*	5.000	10.000	231	231
Pentachloronitrobenzene	*	10.000	10.000	120	120
Pentachlorophenol		4.000	100.000	321	322
Perchlorate	*	500.000	1000.000	85	85
Phenacetin	*	10.000	10.000	120	120
Phenanthrene	*	10.000	10.000	82	82
Phenol	@	1.000	20.000	797	802
Phenylenediamine	*	10.000	10.000	120	120
Phorate		2.000	2.000	60	62
Phosphate		400.000	5000.000	976	991
Phthalic acid esters	*	10.000	10.000	118	118
Plutonium-238		-.017	.019	233	254
Plutonium-239/40		-.009	.034	213	255
Potassium-40		4.130	70.000	27	87
Pronamide	*	10.000	10.000	120	120
Propionitrile	*	5.000	5.000	55	55
Pyrene		3.000	10.000	82	83
Pyridine	*	5.000	500.000	231	231
Radium		-.094	.194	413	667
Radium-226	*	2.310	2.310	1	1
Reserpine	*	10.000	10.000	118	118
Resorcinol	*	10.000	10.000	118	118
Ruthenium-103	*	-1.430	2.230	2	2
Ruthenium-106		-96.900	571.000	896	978
Safrol	*	10.000	10.000	120	120
Selenium		1.000	10.000	708	765
Selenium, filtered		1.000	10.000	688	735
Silver		4.000	20.000	804	806
Silver, filtered		4.000	20.000	747	748
Strontium-90		-3.670	3.010	672	845
Strychnine	*	50.000	50.000	124	124
Styrene		4.000	5.000	92	95
Sulfate		500.000	500.000	2	1043
Sulfide	*	1000.000	10000.000	118	118
Sym-trinitrobenzene	*	10.000	10.000	120	120
Technetium-99		-11.200	10.000	218	546
Tetrachloroethylene	@	.500	9.500	595	665
Tetradecane	*	10.000	10.000	73	73
Tetraethylpyrophosphate	*	2.000	10.000	99	99
Tetrahydrofuran	*	10.000	10.000	409	409
Thallium		5.000	5.000	153	154
Thallium, filtered		5.000	5.000	136	137
Thiofanox	*	10.000	10.000	118	118
Thiourea	*	200.000	200.000	100	100
Thiuram	*	10.000	10.000	118	118
Tin	*	30.000	100.000	604	604

Table A-3. Summary of reported results below analytical detection limits.

Constituent		Minimum of reported D.L.	Maximum of reported D.L.	Number of analyses analyses < D.L.	Total number of analyses
Tin 113 Daughter	*	-2.700	3.400	10	10
Tin, filtered	*	30.000	100.000	463	463
Titanium		60.000	60.000	330	340
Titanium, filtered	*	60.000	60.000	371	371
Toluene		2.000	5.000	592	603
Toluenediamine	*	10.000	10.000	118	118
Total Organic Halogen, Low Det. Level		-5.800	20.000	1569	2082
Total organic carbon		133.000	1900.000	1572	1652
Toxaphene	*	1.000	2.000	652	652
Trans-1,2 Dichloroethylene	@	1.000	10.000	635	637
Tributyl Phosphate	*	10.000	10.000	75	75
Tributylphosphoric Acid	*	10.000	10.000	216	216
Trichloroethylene	@	.500	5.000	617	670
Trichloromethanethiol	*	10.000	10.000	228	228
Trichloromonofluoromethane		5.000	10.000	242	244
Trichloropropane	*	10.000	10.000	173	173
Tris(2,3-dibromopropyl) phosphate	*	10.000	10.000	118	118
Tritium		-371.000	457.000	348	1671
Turbidity		.100	.100	20	545
Uranium		.013	.098	6	363
Uranium, chemical		-313.000	.586	4	337
Uranium-235		-.008	.058	12	72
Vanadium		5.000	30.000	226	921
Vanadium, filtered		5.000	30.000	106	837
Vinyl Acetate	*	5.000	10.000	93	93
Vinyl Chloride	*	2.000	2.000	37	37
Vinyl chloride	*	2.000	10.000	602	602
Warfarin	*	10.000	10.000	118	118
Xylene-m	*	5.000	5.000	460	460
Xylene-o,p	*	3.000	5.000	466	466
Xylenes (total)	*	5.000	5.000	161	161
Zinc		3.000	10.000	347	914
Zinc, filtered		3.000	10.000	420	811
Zinc-65		-17.900	7.630	83	87
Zirconium	*	50.000	50.000	340	340
Zirconium, filtered	*	50.000	50.000	371	371
Zirconium/Nubidium-95		-32.000	88.900	85	87
dibromochloromethane	*	5.000	5.000	93	93
m-Cresol	*	10.000	10.000	84	84
m-Nitroaniline	*	10.000	50.000	84	84
o,o-Diethyl-o,2-pyrazinyl phosphorothion	*	10.000	10.000	60	60
o-Nitroaniline	*	10.000	50.000	83	83
o-Nitrophenol		5.000	10.000	184	186
p-Dichlorobenzene	*	5.000	5.000	256	256
p-Dichlorobenzene	@ *	2.000	10.000	424	424
p-Nitrophenol	*	3.000	50.000	247	247
pH, Field Measurement		7.000	7.000	24	2140

9 3 1 2 9 7 1 8 3 3

Table A-3. Summary of reported results below analytical detection limits.

Note: D.L. Detection limit

* Designates constituents with all analyses below detection limit

@ Chemical data combined from two chemical constituent data codes or more than one analytical method. Chemical constituent data codes provided from Hanford Site Groundwater Chemical Database by WHC.

Units: All organic and inorganic compounds in micrograms per liter
All radionuclides in picocuries per liter

9 3 1 2 9 3 7 1 8 0 4

Table A4. Summary of Wells with Detected Compounds

Well Number	Total Number of Analyses	Total Number of Detections
2-E13-14	265	89
2-E13-19	33	15
2-E13-5	196	81
2-E13-8	51	19
2-E16-2	300	116
2-E17-1	535	189
2-E17-12	566	254
2-E17-13	557	248
2-E17-14	733	330
2-E17-15	845	373
2-E17-16	781	319
2-E17-17	747	303
2-E17-18	781	307
2-E17-19	483	206
2-E17-2	125	104
2-E17-20	775	311
2-E17-5	1028	413
2-E17-6	633	231
2-E17-8	44	26
2-E17-9	769	296
2-E18-1	782	305
2-E18-2	751	302
2-E18-3	712	299
2-E18-4	646	273
2-E23-1	34	15
2-E24-1	87	66
2-E24-11	60	39
2-E24-12	132	77
2-E24-13	29	15
2-E24-16	657	258
2-E24-17	580	227
2-E24-18	559	200
2-E24-19	218	95
2-E24-2	639	225
2-E24-20	74	26
2-E24-4	83	35
2-E24-7	37	16
2-E24-8	64	33
2-E25-10	12	6
2-E25-11	299	131
2-E25-13	36	19
2-E25-17	207	103
2-E25-18	818	303

Well Number	Total Number of Analyses	Total Number of Detections
2-E25-19	570	218
2-E25-2	40	16
2-E25-20	758	291
2-E25-21	481	172
2-E25-22	596	221
2-E25-23	332	103
2-E25-24	544	193
2-E25-25	1321	631
2-E25-26	845	273
2-E25-27	332	134
2-E25-28	799	265
2-E25-29P	1188	669
2-E25-3	29	19
2-E25-30P	453	242
2-E25-31	1394	767
2-E25-32P	1420	613
2-E25-33	1180	635
2-E25-34	665	249
2-E25-35	775	340
2-E25-36	781	270
2-E25-37	584	280
2-E25-38	569	271
2-E25-39	267	90
2-E25-40	230	109
2-E25-41	253	107
2-E25-42	99	49
2-E25-43	108	43
2-E25-6	193	85
2-E25-9	190	79
2-E26-1	18	9
2-E26-10	220	86
2-E26-11	260	108
2-E26-12	109	39
2-E26-13	108	37
2-E26-2	36	22
2-E26-3	7	3
2-E26-4	37	24
2-E26-5	57	19
2-E26-6	44	18
2-E26-8	36	9
2-E26-9	245	88
2-E27-1	9	7
2-E27-10	725	244

9 3 1 2 9 7 1 3 3 5

Table A4. Summary of Wells with Detected Compounds

Well Number	Total Number of Analyses	Total Number of Detections
2-E27-11	301	100
2-E27-12	224	79
2-E27-13	224	87
2-E27-14	158	69
2-E27-15	218	81
2-E27-16	179	53
2-E27-5	63	31
2-E27-7	151	54
2-E27-8	741	261
2-E27-9	805	323
2-E28-1	24	10
2-E28-11	4	1
2-E28-12	204	76
2-E28-13	294	97
2-E28-15	4	2
2-E28-16	12	9
2-E28-17	26	23
2-E28-18	481	195
2-E28-19	18	16
2-E28-21	429	184
2-E28-23	238	136
2-E28-24	81	48
2-E28-25	83	66
2-E28-26	893	290
2-E28-27	914	317
2-E28-28	299	81
2-E28-5	2	2
2-E28-7	162	83
2-E28-9	30	26
2-E32-1	211	76
2-E32-2	904	309
2-E32-3	766	246
2-E32-4	1087	376
2-E32-5	439	132
2-E33-1	283	110
2-E33-10	205	70
2-E33-12	39	19
2-E33-13	7	4
2-E33-14	14	7
2-E33-15	47	29
2-E33-18	100	51
2-E33-20	29	29
2-E33-21	133	56

Well Number	Total Number of Analyses	Total Number of Detections
2-E33-24	106	55
2-E33-26	30	12
2-E33-27	2	2
2-E33-28	977	331
2-E33-29	938	312
2-E33-3	212	84
2-E33-30	943	340
2-E33-31	303	119
2-E33-32	302	119
2-E33-33	258	88
2-E33-34	292	71
2-E33-35	260	60
2-E33-36	193	59
2-E33-37	186	54
2-E33-38	79	55
2-E33-39	44	28
2-E33-4	36	6
2-E33-40	51	29
2-E33-41	141	56
2-E33-42	22	1
2-E33-43	24	1
2-E33-5	271	105
2-E33-7	84	37
2-E33-8	128	55
2-E33-9	44	22
2-E34-1	299	105
2-E34-2	901	356
2-E34-3	657	218
2-E34-5	811	297
2-E34-6	645	225
2-E34-7	229	51
2-E34-8	231	96
2-E35-1	93	32
2-E35-2	201	90
6-20-20	39	36
6-20-39	124	39
6-23-34	1031	472
6-24-33	853	367
6-24-34A	885	406
6-24-34B	993	452
6-24-34C	1027	449
6-24-35	1017	403
6-24-46	140	52

Table A4. Summary of Wells with Detected Compounds

Well Number	Total Number of Analyses	Total Number of Detections
6-25-33A	447	142
6-25-34A	427	136
6-25-34B	435	146
6-25-34C	998	394
6-25-55	28	20
6-26-33	461	163
6-26-34	384	118
6-26-35A	466	149
6-26-35C	440	135
6-28-40	26	25
6-28-40P	31	3
6-28-52A	8	3
6-31-31	79	42
6-31-31P	32	6
6-31-53B	6	1
6-32-22	36	36
6-32-43	195	88
6-32-62	22	21
6-33-42	36	33
6-33-56	41	24
6-34-39A	17	8
6-34-41B	29	15
6-34-42	102	57
6-34-51	65	28
6-35-66	204	105
6-35-70	298	135
6-36-46P	12	3
6-36-46Q	24	7
6-36-46R	23	6
6-36-46S	3	1
6-36-61A	237	94
6-36-61B	36	22
6-37-43	155	67
6-38-65	194	86
6-39-39	157	52
6-40-33A	150	49
6-40-39	468	171
6-40-40A	65	29
6-40-40B	68	35
6-40-62	239	96
6-41-23	36	35
6-41-40	487	195
6-42-39A	66	24

Well Number	Total Number of Analyses	Total Number of Detections
6-42-39B	58	29
6-42-40A	714	213
6-42-40B	240	76
6-42-40C	29	18
6-42-41	62	22
6-42-42B	532	207
6-43-40	64	29
6-43-41E	450	168
6-43-41F	388	139
6-43-41G	64	25
6-43-42J	551	212
6-43-43	594	207
6-43-45	484	175
6-44-42	576	192
6-44-43B	552	237
6-44-64	225	108
6-45-42	517	235
6-45-69A	163	70
6-46-21B	59	40
6-47-35A	42	20
6-47-46A	204	80
6-47-50	213	80
6-47-60	212	72
6-48-50	39	5
6-49-28	27	15
6-49-55A	434	255
6-49-55B	105	41
6-49-57A	77	34
6-49-57B	79	31
6-50-30	32	10
6-50-42	56	31
6-50-45	41	17
6-50-48B	36	10
6-50-53A	395	235
6-50-53B	80	33
6-51-46	41	10
6-51-63	27	19
6-52-46A	41	19
6-52-48	42	16
6-52-54	50	31
6-52-57	50	24
6-53-47A	177	73
6-53-47B	69	35

Table A4. Summary of Wells with Detected Compounds

Well Number	Total Number of Analyses	Total Number of Detections
6-53-48A	39	16
6-53-48B	42	16
6-53-50	43	17
6-53-55A	71	16
6-53-55B	32	3
6-53-55C	32	4
6-54-34	52	26
6-54-45A	26	9
6-54-48	69	32
6-54-49	67	44
6-54-57	80	25
6-55-40	9	2
6-55-44	8	
6-55-50A	53	10
6-55-50C	259	80
6-55-50D	40	20
6-55-55	85	32
6-55-57	36	10
6-55-70	23	4
6-56-43	28	7
6-56-53	41	10
6-57-29A	52	35
6-58-24	8	5
6-59-58	65	35
6-60-57	61	32
6-60-60	35	11
6-61-37	21	20
6-61-41	21	14
6-61-62	63	39
6-61-66	54	19
6-62-31	15	10
6-63-25A	40	22
6-63-55	34	31
6-63-58	57	32
6-64-62	57	35
6-65-23	4	2
6-65-50	30	24

Well Number	Total Number of Analyses	Total Number of Detections

Table A-5. Input Parameters for Exposure to Current Onsite Contaminant Levels.

PARAMETER	DESCRIPTION	UNITS	VALUE
WG-CONC	Conc. of contaminant in GW	g/ml	1
WB-DATE	Date of conc. measurement	unitless	1/1/91
EG-TWATER	Water distribution time from pump to use	days	0.5
EG-PRODLV	Leafy vegetable production rate	kg/yr	15
EG-PRODOV	Other vegetable production rate	kg/yr	140
EG-PRODMT	Meat production rate	kg/yr	70
EG-PRODMK	Milk production rate	kg/yr	230
EG-IRRATE	Irrigation rate	l/m2/month	100
* Values are contaminant-specific.			

Table A-6. Input Parameters for Exposure to Future Offsite Contaminant Levels.

PARAMETER	DESCRIPTION	UNITS	VALUE
WS-DEPTH	Depth of release unit in saturated zone	ft	16
WS-DATE	Starting date of release unit	unitless	1/1/91
WS-LENGTH	Length of site in direction of GW flow	ft	*
WS-WIDTH	Width of site perpendicular to GW flow	ft	*
WS-LEACHV	Waste liquid infiltration rate	ft/day	0.018
WS-TLIFE	# of yrs contaminant was discharged to release unit	yrs	1
WS-NUM	# of flux rates for contaminant	unitless	1
WS-CDATE	Date contaminant was first discharged to release unit	unitless	1/1/91
WS-FLUX	Flux rate for contaminant	g/yr or Ci/yr	*
WS-TIME	# of yrs contaminant was discharged to release unit at flux rate	yrs	1
WZ-CLASS	Soil class in the saturated zone	unitless	Gravel
WZ-SAND	% sand in the saturated zone	%	81
WZ-SILT	% silt in the saturated zone	%	15
WZ-CLAY	% clay in the saturated zone	%	4
WZ-OMC	% organic matter content in the saturated zone	%	0.0004
WZ-IRON	% iron and aluminum in the saturated zone	%	2.7
WZ-PH	ph of the pore water in the saturated zone	unitless	7.91
WZ-TOTPOR	Total porosity of the saturated zone	%	0.3
WZ-EFFPOR	Effective porosiy of the saturated zone	%	0.25
WZ-PVELOC	Pore water velocity of the saturated zone	ft/day	1.65
WZ-THICK	Thickness of the saturated zone	ft	300
WZ-BULKD	Bulk density of the saturated zone	g/cm3	0.9
WZ-DIST	Travel distance in saturated zone from source to receptor	ft	40000
WZ-LDISP	Longitudinal dispersivity	ft	4000
WZ-TDISP	Transverse dispersivity	ft	800
WZ-VDISP	Vertical dispersivity	ft	4.64
WW-VELOC	River flow velocity	ft/sec	5
WW-DEPTH	River depth	ft	15
WW-WIDTH	River width	ft	2000
WW-DIST	Distance to closest receptor	ft	1000

Table A-6. Input Parameters for Exposure to Future Offsite Contaminant Levels.

PARAMETER	DESCRIPTION	UNITS	VALUE
WW-DISCHG	Average annual discharge at receptor location	ft3/sec	180000
WA-SUBKD	Subsurface absorption coefficient for contaminant in the saturated zone	ml/g	*
EW-TWATER	Water distribution time from pump to use	days	0.5
EG-PRODLV	Leafy vegetable production rate	kg/yr	15
EG-PRODOV	Other vegetable production rate	kg/yr	140
EG-PRODMT	Meat production rate	kg/yr	70
EG-PRODMK	Milk production rate	kg/yr	230
EG-IRRATE	Irrigation rate	l/m2/month	100
EW-PRODFF	Finfish production rate	kg/yr	6.9
EW-PRODSF	Shellfish production rate	kg/yr	0
EW-FDELAY	Finfish consumption delay	days	1
EW-SDELAY	Shellfish consumption delay	days	0
* Values are contaminant-specific.			

Table A-7. Chemical Specific Exposure Input Parameters.

Contaminant	WS-LENGTH (ft)	WS-WIDTH (ft)	WS-FLUX (g/yr or Ci/yr)	WA-SUBKD (ml/g)
Inorganics:				
Arsenic	1,800.	5,900.	2.47E+04	0
Chromium	850.	1,900.	1.77E+04	0
Cyanide	3,000.	3,100.	9.86E+05	0.1
Nitrate	2,500.	8,500.	4.91E+05	0
Radionuclides:				
H-3	4,000.	10,200.	4.60E+03	0
Co-60	3,600.	3,000.	6.30E-01	2,000
Sr-90	2,200.	6,700.	2.00E+00	20
Tc-99	2,500.	4,800.	1.28E+01	0
I-129	10,600.	10,000.	1.01E-01	0
Cs-137	590.	590.	4.10E-02	500
Pu-239/240	390.	590.	1.80E-03	100

Table A-8. Transmissivity and Hydraulic Conductivity Values for the Uppermost Unconfined Portion of the Uppermost Aquifer (Connelly et al. 1992a).

Well Number	Transmissivity		Equivalent Hydraulic Conductivity	
	m^2/s	ft^2/day	m/s	ft/day
200-E18-1	$7.5x10^{-4}$	700	$1.7x10^{-4}$	50
200-E18-2	$2.2x10^{-3}$	2000	$5.3x10^{-4}$	150
200-E18-3	$3.2x10^{-3}$	3000	$7.4x10^{-4}$	210
200-E25-22	$1.6x10^{-1}$	150000	$2.2x10^{-2}$	6200
200-E25-34	$>2.7x10^{-1}$	>250000	$6.7x10^{-2}$	19000
200-E25-35	$>8.6x10^{-2}$	>80000	$2.3x10^{-2}$	6500
200-E27-8	$>7.3x10^{-2}$	>68000	$2.4x10^{-2}$	6800
200-E27-9	$3.8x10^{-2}$	35000	$1.2x10^{-2}$	3500
200-E27-10	$3.8x10^{-2}$	35000	$1.2x10^{-2}$	3500
200-E28-27	$>5.2x10^{-2}$	>48000	$1.7x10^{-2}$	4800
200-E32-4	$>1.0x10^{-2}$	>9500	$3.4x10^{-3}$	950
200-E33-28	$>5.7x10^{-2}$	>53000	$1.9x10^{-2}$	5300
200-E33-29	$>5.5x10^{-2}$	>51000	$1.8x10^{-2}$	5100
200-E33-30	$>6.0x10^{-2}$	>56000	$2.0x10^{-2}$	5600
200-E34-2	$1.2x10^{-1}$	114000	$4.0x10^{-2}$	11400
200-E34-3	$1.5x10^{-2}$	14000	$4.9x10^{-3}$	1400
600-31-53A	$1.6x10^{-2}$	14900	$4.4x10^{-4}$	125
600-31-53B	$1.5x10^{-2}$	14200	$4.3x10^{-4}$	120
600-33-56	$2.3x10^{-2}$	21000	$6.0x10^{-4}$	170
600-36-61B	$4.5x10^{-3}$	4200	$9.3x10^{-5}$	25
600-43-43	$4.0x10^{-2}$	37000	$7.2x10^{-3}$	2050
600-44-42	$8.2x10^{-2}$	76000	$1.4x10^{-2}$	4000
600-52-54	$2.2x10^{-3}$	2000	$1.4x10^{-3}$	400
600-52-57	$1.3x10^{-4}$	120	$1.0x10^{-4}$	30
600-53-55C	$8.6x10^{-2}$	80000	$1.2x10^{-2}$	3300
600-55-50C	$6.5x10^{-1}$	600000	$8.8x10^{-2}$	25000
600-55-50D	$4.3x10^{-1}$	400000	$3.0x10^{-2}$	8500
600-55-60A	$6.9x10^{-2}$	64000	$5.6x10^{-3}$	1600
600-55-60B	$4.3x10^{-1}$	400000	$2.6x10^{-2}$	7300

9 3 1 2 9 7 1 3 1 3

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
299-E18-1	329	315-329	308-329	317	08/03/88	Constant Discharge	700-800	--	--
299-E18-1	329	315-329	308-329	317	08/03/88	Recovery	700	--	--
299-E18-2	329	316-329	308-329	318	11/04/88	Constant Discharge	2000	--	No Recovery Data
299-E18-2	329	316-329	308-329	318	08/12/88	Constant Discharge	8000	0.01	299-E18-3 is Pumping Well; Poor Data
299-E18-3	330	316-330	309-330	319	08/12/88	Constant Discharge	8000	--	299-E18-2 and 299-E18-4 are Observation Wells
299-E18-3	330	316-330	309-330	319	08/12/88	Recovery	3000	--	299-E18-2 and 299-E18-4 are Observation Wells
299-E24-19	301	286-301	280-301	290	10/02/89	Slug Withdrawal	1600-1800	--	2 Withdrawal Tests Conducted
299-E24-20	300	282-300	280-300	282	04/22/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E25-22	295	268-295	265-295	271	08/31/87	Constant Discharge	--	--	Data Not Analyzed
299-E25-22	295	268-295	265-295	271	08/31/87-09/01/87	Recovery	100,000-200,000	--	--
299-E25-32	329	265-305	319-329	268	12/87	Constant Discharge	--	--	Data Not Analyzed
299-E25-33	282	285-319	262-282	248	02/88	Constant Discharge	--	--	Data Not Analyzed
299-E25-34	272	255-272	252-272	259	08/08/88	Step Drawdown	--	--	Data Not Analyzed for Transmissivity
299-E25-34	272	255-272	252-272	259	08/08/88	Constant Discharge and Recovery	>250,000	--	Well Not Stressed Sufficiently: 299-E25-28 is Observation Well

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
299-E25-35	281	264-283	260-281	271	06/17/88	Constant Discharge and Recovery	>80,000	--	Well Not Stressed Sufficiently
299-E25-39	278	262-278	258-276	262	10/30/90	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E25-40	273	257-273	252-273	262	09/29/89	Slug Withdrawal	1000-1200	--	2 Withdrawal Tests Conducted
299-E25-41	276	262-276	255-276	266	09/29/89	Slug Withdrawal	290-330	--	2 Withdrawal Tests Conducted
299-E25-41	276	262-276	255-276	266	09/29/89	Slug Injection	1100-2500	--	2 Injection Tests Conducted
299-E25-42	290	277-290	270-290	277	10/04/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E25-43	260	243-260	239-260	243	10/10/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E26-8	246	228-246[b]	326-396	186	03/23/82	Constant Discharge	6.5	--	--
299-E26-9	201	195-201	190-201	199	08/13/90	Slug Withdrawal	2500	--	Data in Doremus and Pearson (1990)
299-E26-11	206	200-208	200-208	194	08/28/90	Slug Withdrawal	120	--	Data in Doremus and Pearson (1990)
299-E26-12	239	223-239	218-239	223	10/11/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E26-13	213	197-213	192-213	197	10/15/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E27-8	248	247-257[b]	226-246	235	08/19/87	Constant Discharge	>68,000	--	Well Not Stressed Sufficiently
299-E27-9	239	234-244[b]	219-239	226	08/15/87	Recovery	35,000	--	--

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
299-E27-10	233	230-240[b]	213-233	221	08/11/87	Recovery	35,000	--	--
299-E27-13	276	261-275	254-275	286	10/20/89	Slug Withdrawal	2500-5700	--	2 Withdrawal Tests Conducted
299-E27-14	267	250-267	246-267	255	10/20/89	Slug Withdrawal	2400-2900	--	3 Withdrawal Tests Conducted
299-E27-15	261	245-261	241-261	250	10/19/89	Slug Withdrawal	5600	--	2 Withdrawal Tests Conducted
299-E27-17	245	228-245	223-245	228	11/18/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E28-15	?	?	?	298	03/19/68	Step Drawdown	135,000	--	Two Adjacent Observation Wells
299-E28-27	290	291-301[b]	270-290	277	09/29/87	Constant Discharge	>48,000	--	Well Not Stressed Sufficiently
299-E32-4	298	298-308[b]	276-298	263	09/21/87	Constant Discharge	>9500	--	Well Not Stressed Sufficiently
299-E32-5	292	275-292	271-292	279	11/06/89	Slug Withdrawal	10,000	--	3 Withdrawal Tests Conducted
299-E32-6	277	261-277	255-277	261	10/03/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E32-9	253	238-263	231-263	238	10/01/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E33-12	414	232-290? (OH)	305-385	219	05/11/82	Constant Discharge	130	--	--
299-E33-28	276	268-278[b]	256-276	261	10/21/87	Constant Discharge	>53,000	--	Well Not Stressed Sufficiently
299-E33-29	283	280-290[b]	263-283	271	09/17/87	Constant Discharge	>51,000	--	Well Not Stressed Sufficiently

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
299-E33-30	275	267-277[b]	255-275	260	09/24/87	Constant Discharge	>56,000	--	Well Not Stressed Sufficiently
299-E33-33	248	232-248	227-248	237	09/27/89	Slug Withdrawal	5400	--	--
299-E33-42	260	247-260	239-260	247	11/14/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E33-43	271	256-271	250-271	256	11/13/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E34-2	240	230-240[b]	220-240	227	08/07/87	Constant Discharge	85,000	--	Well Not Stressed Sufficiently
299-E34-2	240	230-240[b]	220-240	227	08/07/87	Recovery	114,000	--	Well Not Stressed Sufficiently
299-E34-3	213	204-214[b]	193-213	208	08/05/87	Constant Discharge	14,000	--	Well Not Stressed Sufficiently
299-E34-3	213	204-214[b]	193-213	208	08/05/87	Recovery	14,000	--	Well Not Stressed Sufficiently
299-E34-7	204	195-204	194-204	201	10/05/89	Slug Withdrawal	700-750	--	2 Withdrawal Tests Conducted
299-E34-9	234	225-234	213-234	225	11/15/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E34-10	247	237-247	225-247	237	11/16/91	Slug Injection and Withdrawal	--	--	Analyses Pending
299-E35-2	201	194-201	191-201	198	08/13/90	Slug Withdrawal	130	--	Data in Doremus and Pearson (1990)
699-28-40[j] (OH)	--	340-350	--	--	04/20/70	Recovery	5		Sand Fill in Well; 699-28-40P is Pumping Well

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[m] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
699-31-53A	340	303-423	301-423	302	04/22-23/59	Constant Discharge	11,200	0.08	Graham (1981) Reported an Average Transmissivity of 14,000 ft^2/d
699-31-53A	340	303-423	301-423	302	04/22-23/59	Constant Discharge	14,900	0.38[g]	Data Reanalyzed
699-31-53B	394	303-423*	307-430	303	04/23/59	Step Drawdown	--	--	2 Tests Conducted; Data Not Analyzed
699-31-53B	394	303-423*	307-430	303	04/22-23/59	Recovery	21,000	--	Graham (1981) Reported an Average Transmissivity of 14,000 ft^2/d
699-31-53B	394	303-423*	307-430	303	04/22-23/59	Recovery	14,200	--	Data Reanalyzed
699-33-58	440	317-440*	315-409	313	11/25/58	Recovery	21,000	--	--
699-33-58	440	317-440*	315-409	313	11/25/58	Recovery	22,000	--	--
699-36-61A	363	358-389*	330-369	340	07/22/69	Step Drawdown and Recovery	2800	--	Average Transmissivity
699-36-61A	363	358-389*	330-369	340	07/22/69	Step Drawdown	970	--	--
699-36-61A	363	358-389*	330-369	340	07/22/69	Step Drawdown	730	--	Data Reanalyzed
699-36-61A	363	358-389*	330-369	340	07/22/69	Step Test Recovery	40,000	--	--
699-36-61A	363	358-389*	330-369	340	07/22/69	Step Test Recovery	4300	--	Data Reanalyzed
699-36-61B	363	339-505?	330-505	340	07/22/69	Step Drawdown	400	0.05	Pumping Well is 699-36-61A

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
699-36-61B	363	339-505?	330-505	340	07/22/69	Step Drawdown	5000	--	Data Reanalyzed
699-36-61B	363	339-505?	330-505	340	07/22/69	Step Test Recovery	53,000	--	Pumping Well is 699-36-61A
699-36-61B	363	339-505?	330-505	340	07/22/69	Step Test Recovery	4200	--	Data Reanalyzed
699-40-39	212	202-212	202-212	128	08/04/89	Slug Injection	4.5	--	--
699-40-40A	226	215-226	215-226	130	11/22/91	Slug Injection and Withdrawal	--	--	Analyses Pending
699-41-40	174	147-158 (OH)	164-174	130	05/28/89	Slug Test Equivalent[e]	0.01	--	Confined Aquifer Conditions
699-41-40	174	164-174	164-174	130	08/07/89	Slug Injection	2.0-3.4	--	Confined Aquifer Conditions
699-42-39A (BP-91-2)	180	169-180	169-180	135	10/22/91	Slug Injection and Withdrawal	--	--	Analyses Pending
699-42-40A	173	139-171	139-171	123	01/18/82	Constant Discharge	310	0.017	Pumping Well is 699-42-40C
699-42-40B	150	130-150	130-150	124	01/18/82	Constant Discharge	360	0.0093	Pumping Well is 699-42-40C
699-42-41	155	143-155	134-155	143	10/16/91	Slug Injection and Withdrawal	--	--	Analyses Pending
699-42-42B	203	193-203	193-203	166	10/19/88	Constant Discharge	140	--	Poor Test Data from Observation Well 699-43-42J; Poor Recover Test (No Check Valve)
699-43-40	135	120-134	113-134	120	11/26/91	Slug Injection and Withdrawal	--	--	Analyses Pending

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
699-43-41E	146	138-148	138-148	129	08/29-30/89	Slug Injection	15-18	--	Confined Aquifer Conditions
699-43-41F	176	166-176	166-176	128	05/30/89	Slug Injection	34-45	--	Confined Aquifer Conditions
699-43-43	177	162-180*	157-177	154	09/09/88	Constant Discharge	37,000	--	Poor Recovery Test (No Check Valve)
699-44-42	172	155-174*	151-172	156	09/22/88	Constant Discharge	76,000	--	Poor Recovery Test (No Check Valve)
699-44-43B	176	173-178 (OH)	156-178	164	05/19/88	Slug Injection	1.2-3.3	--	--
699-44-43B	176	173-178 (OH)	156-178	164	05/19/88	Slug Withdrawal	0.9-4.3	--	--
699-44-43B	176	161-178	156-178	164	07/05/89	Slug Injection	5.8-7.1	--	--
699-47-35A	88	63-99*	75-87	62	08/14-18/79	Constant Discharge	T(early)=530 T(late)=560	0.002 0.15[g]	Pumping Well is 699-47-35C
699-47-35B	106	75-95	77-97	63	06/14-16/79	Constant Discharge	?	--	Pumping Well is 699-47-35C
699-47-35C	100	65-98	65-98	63	06/13/79	Step Drawdown	--	--	Data Not Analyzed for Transmissivity
699-47-35C	100	65-98	65-98	63	6/14-16/79	Constant Discharge	?	--	699-47-35A and 699-47-35B are Observation Wells
699-47-35C	100	65-98	65-98	63	6/14-16/79	Recovery	?	--	--

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
699-47-60	278	250-277*	235-277	247	09/03/69	Constant Discharge	2700	--	Deju (1974) Reported an Average Transmissivity of 3300 ft^2/d
699-47-60	278	250-277*	235-277	247	09/03/69	Recovery	1000-3400	--	Deju (1974) Reported an Average Transmissivity of 3300 ft^2/d
699-52-54	167	162-167	157-167	162	01/21/91	Slug Test	1150[h]	--	--
699-52-54	167	162-167	157-167	162	08/31/91	Constant Discharge	2000	--	--
699-52-57	161	155-159	139-159	155	01/21/91	Slug Test	40[h]	--	--
699-52-57	161	155-159	139-159	155	08/01/91	Constant Discharge	120	--	--
699-53-55C	221	172-221	197-221	172	01/09/92	Constant Discharge	70,000-90,000	0.4[g]	--
699-55-50A	50	45-100, 101-106[c]*	40-100	42	09/27/56	Constant Discharge and Recovery	--	--	Data Not Analyzed; 699-55-50D is Pumping Well
699-55-50A	50	45-100, 101-106[c]*	40-100	42	02/27/57	Step Drawdown	--	--	Data Not Analyzed for Transmissivity
699-55-50A	50	45-100, 101-106[c]*	40-100	42	03/06/57	Recovery	640,000	--	699-55-50B, 699-55-50C, and 699-55-50D are Observation Wells
699-55-50A	50	45-100, 101-106[c]*	40-100	42	10/01/56	Recovery	400,000	0.19[g]	699-55-50B is Pumping Well
699-55-50A	50	45-100, 101-106[c]*	40-100	42	10/01/56	Constant Discharge and Recovery	594,000[f]	--	699-55-50B is Pumping Well

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[c] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
699-55-50B	--	48-85	--	--	10/01/56	Constant Discharge and Recovery	594,000[f]	--	699-55-50A and 699-55-50C are Observation Wells
699-55-50B	--	48-85	--	--	03/06/57	Recovery	--	--	Data Plotted, But Not Analyzed; 699-55-50A is Pumping Well
699-55-50B	--	48-85	--	--	09/28/56	Step Drawdown	--	--	Data Not Analyzed for Transmissivity
699-55-50B	--	48-85	--	--	09/27/56	Constant Discharge and Recovery	--	--	Data Not Analyzed; 699-55-50A and 699-55-50D are Observation Wells
699-55-50C	56	37-60	35-59	42	10/01/56	Recovery	400,000	0.21[g]	699-50-55B is Pumping Well
699-55-50C	56	37-60	35-59	42	10/01/56	Constant Discharge and Recovery	694,000[f]	--	699-55-50B is Pumping Well
699-55-50C	56	37-60	35-59	42	03/06/57	Recovery	670,000	--	699-55-50A is Pumping Well
699-55-50D	92	43-90	33-90	36	09/27/56	Constant Discharge and Recovery	--	--	699-55-50B is Pumping Well
699-55-50D	92	43-90	33-90	36	10/01/56	Recovery	400,000	0.21[g]	699-55-50B is Pumping Well
699-55-50D	92	43-90	33-90	36	08/06/57	Recovery	--	--	Data Plotted, But Not Analyzed; 699-55-50A is Pumping Well
699-55-60A	236	190-230	190-230	170	12/30/43	Constant Discharge	64,000	--	Specific Capacity Data

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
699-55-60B	288	230-285	230-285	171	08/16/44	Constant Discharge	320,000	--	Specific Capacity Data
699-55-60B	288	230-285	230-285	171	08/16/44	Constant Discharge	400,000	--	Specific Capacity Data
699-56-53	270	85-100*	190-270	31	01/11/82	Constant Discharge	240	--	--
699-60-57	154	142-155*	55-142/ 142-155	61	08/16/78	Constant Discharge	9800	--	Test Interval Open to Basalt
699-60-57	154	142-155*	55-142/ 142-155	61	08/16/78	Constant Discharge	10,600-18,400	--	Test Interval Open to Basalt
299-E17-20	324	324-344*	303-324	316	09/20/88	Step Drawdown	--	--	Poor Test
299-E17-20	324	324-344*	303-324	316	09/20/88	Constant Discharge and Recovery	--	--	Well Not Stressed Sufficiently; Transmissivity Probably >100,000 ft^2/d
299-E18-4	328	312-328	308-328	318	08/12/88	Constant Discharge	--	--	Little Drawdown Observed; 299-E18-3 is Pumping Well
299-E18-4	328	312-328	308-328	318	11/02/88	Constant Discharge	--	--	Well Not Stressed Sufficiently
299-E24-18	329	313-329	308-329	316	08/10/86	Step Drawdown	--	--	Poor Test
299-E24-18	329	313-329	308-329	316	08/10/86	Constant Discharge and Recovery	--	--	Well Not Stressed Sufficiently
299-E24-19	301	285-301	280-301	290	10/02/89	Slug Injection	--	--	Data Not Analyzable; 2 Slug Injection Tests Conducted

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[b] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
299-E25-22	295	268-295	265-295	271	08/28/87	Step Drawdown	--	--	Well Not Stressed Sufficiently
299-E25-28	335	320-340	320-340	252	03/87	Constant Discharge	--	--	Well Not Stressed Sufficiently
299-E25-40	273	257-273	252-273	262	09/29/89	Slug Injection	--	--	2 Injection Tests Conducted; Data Not Analyzable
299-E26-6	282	250-290	250-290	241	11/11/80	Step Drawdown	--	--	3-Hr Test; No Data Found
299-E26-6	282	250-290	250-290	241	11/14/80	Constant Discharge	--	--	8-Hr Test at 200 gpm; No Data Found
299-E26-10	206	193-206	190-206	197	08/29/90	Slug Withdrawal	--	--	2 Tests Conducted; Rapid Recovery
299-E27-11	251	236-251	230-251	240	09/27/89	Slug Injection	--	--	Data Not Analyzable
299-E27-11	251	236-251	230-251	240	09/27/89	Slug Withdrawal	--	--	Data Not Analyzable
299-E27-12	271	253-271	251-271	258	10/19/89	Slug Injection	--	--	Data Not Analyzable; 2 Tests Conducted
299-E27-12	271	253-271	251-271	258	10/19-20/89	Slug Withdrawal	--	--	Data Not Analyzable; 3 Tests Conducted
299-E27-15	261	245-261	241-261	250	10/19/69	Slug Injection	--	--	Data Not Analyzable; 2 Tests Conducted
299-E28-11	347	?	?	297	07/16/62	Step Drawdown	--	--	Lack of Drawdown

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[a] (ft)	Current Depth to Water[d]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
299-E28-11	347	?	?	297	7/20-21/62	Constant Discharge and Recovery	--	--	Lack of Drawdown; Insufficient Data
299-E32-2	278	279-289[b]	256-278	267	09/04/87	Step Drawdown	--	--	Well Not Stressed Sufficiently
299-E32-2	278	279-289[b]	256-278	267	09/08/87	Constant Discharge	--	--	Well Not Stressed Sufficiently
299-E32-3	266	291-301[b]	266-286	273	09/01/87	Step Drawdown	--	--	Well Not Stressed Sufficiently
299-E32-3	266	291-301[b]	266-286	273	09/02/87	Constant Discharge	--	--	Well Not Stressed Sufficiently
299-E33-33	248	232-248	227-248	237	09/27/89	Slug Injection	--	--	Data Not Analyzable; 2 Tests Conducted
299-E33-29	203	260-290[b]	268-283	271	09/17/87	Step Drawdown	--	--	Well Not Stressed Sufficiently
299-E33-30	275	267-277[b]	255-275	260	09/23/87	Step Drawdown	--	--	Well Not Stressed Sufficiently
299-E34-2	240	230-240[b]	220-240	227	08/07/87	Step Drawdown	--	--	Well Not Stressed Sufficiently
299-E34-5	191	181-191[b]	171-191	187	07/20/87	Step Drawdown	--	--	Well Not Stressed Sufficiently
299-E34-5	191	181-191[b]	171-191	187	07/21/87	Constant Discharge	--	--	Well Not Stressed Sufficiently
699-33-56	440	317-440[*]	315-409	313	11/24/58	Step Drawdown	--	--	Poor Test Data
699-33-56	440	317-440[*]	315-409	313	11/25/58	Constant Discharge	--	--	Poor Test Data

Table A-9. Uppermost Aquifer Hydrologic Test Data for the 200 East Area.

Hanford Well Designation	Current Depth[a/] (ft)	Depth of Test Interval (ft)	Current Screen/ Perforation Interval[c/] (ft)	Current Depth to Water[d/]	Date of Test	Type of Hydrologic Test	Transmissivity (ft^2/day)	Storage Coefficient	Comments
699-36-46 (OH)	452	440-450	440-450	301	04/21/70	Constant Discharge	--	--	Poor Test; 699-36-46P is Pumping Well
699-39-39	160	129-200*	110-184	124	07/16/74	Constant Discharge	--	--	Well Went Dry During Test
699-40-39	212	197-199 (OH)	202-212	128	05/02/89	Slug Injection	--	--	Confined Aquifer Conditions; Insufficient Data
699-40-62	384	359-374*	335-374	342	12/11/89	Constant Discharge and Recovery	--	--	Poor Test Data
699-53-55 (OH)	221	172-221	197-221	172	--	Slug Test	--	--	Poor Test Data
699-50-57	154	142-155*	55-142/ 142-155	61	08/16/78	Recovery	--	--	Poor Test Data

Source: Newcomer et al. 1992a
* Well Recompleted Since Test Was Conducted.
a/ Taken From Hanford Ground Water Data Base.
b/ Temporary Screen Installed Prior to Final Well Completion.
c/ Interval Completed in Basalt.
d/ Measured or Estimated as of June, 1991.
e/ Water Level Monitored After Confining Unit Encountered During Drilling.
f/ Average Transmissivity.
g/ Specific Yield.
h/ Calculated by multiplying hydraulic conductivity by the last interval.
i/ Hydraulic intercommunication between aquifers in well.
OH Open Hole.

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 1 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
299-E13-5			X	
299-E13-6	X			
299-E13-8	X			
299-E13-14	X		X	
299-E13-19			X	
299-E16-2	X		X	
299-E17-1	X		X	
299-E17-2	X		X	
299-E17-5	X		X	X
299-E17-6	X		X	
299-E17-8	X		X	
299-E17-9				X
299-E17-12	X		X	
299-E17-13	X		X	
299-E17-14			X	
299-E17-15				X
299-E17-16				X
299-E17-17				X
299-E17-18				X
299-E17-19				X
299-E17-20				X
299-E18-1			X	X
299-E18-2			X	X
299-E18-3			X	X
299-E18-4			X	X
299-E24-1	X		X	
299-E24-2	X		X	

9 3 1 2 9 7 1 3 1 7

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 2 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
299-E24-4	X		X	
299-E24-7			X	
299-E24-8	X		X	
299-E24-11	X		X	
299-E24-12	X		X	
299-E24-13	X		X	
299-E24-16			X	
299-E24-17			X	
299-E24-18			X	
299-E24-19			X	
299-E24-20			X	
299-E25-2			X	
299-E25-3	X		X	
299-E25-6	X		X	
299-E25-8	X			
299-E25-9			X	
299-E25-11	X		X	X
299-E25-13	X		X	
299-E25-17	X		X	
299-E25-18	X		X	X
299-E25-19	X		X	X
299-E25-20	X		X	X
299-E25-21	X		X	X
299-E25-22	X		X	
299-E25-23	X		X	
299-E25-24	X		X	
299-E25-25			X	X

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 3 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
299-E25-26			X	X
299-E25-27			X	
299-E25-28			X	X
299-E25-29P				X
299-E25-30P			X	
299-E25-31			X	X
299-E25-32P			X	X
299-E25-33				X
299-E25-34			X	X
299-E25-35			X	X
299-E25-36			X	X
299-E25-37				X
299-E25-38				X
299-E25-39				X
299-E25-40				X
299-E25-41				X
299-E25-42				X
299-E25-43				X
299-E26-1			X	
299-E26-2	X		X	
299-E26-4	X		X	
299-E26-6	X		X	
299-E26-8	X		X	
299-E26-9				X
299-E26-10				X
299-E26-11				X
299-E26-12				X

9 3 1 2 9 7 1 3 1 9

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 4 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
299-E26-13				X
299-E27-5	X		X	
299-E27-7	X		X	X
299E27-8			X	X
299-E27-9			X	X
299-E27-10			X	X
299-E27-11				X
299-E27-12				X
299-E27-13				X
299-E27-14				X
299-E27-15				X
299-E27-16				X
299-E27-17				X
299-E28-7			X	
299-E28-8	X			
299-E28-9			X	
299-E28-12	X		X	
299-E28-13	X		X	
299-E28-16	X		X	
299-E28-17	X			
299-E28-18	X		X	
299-E28-19	X			
299-E28-21	X		X	
299-E28-23	X		X	
299-E28-24	X		X	
299-E28-25	X		X	
299-E28-26		X		X

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 5 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
299-E28-27		X		X
299-E28-28		X		X
299-E32-1			X	
299-E32-2	X	X	X	X
299-E32-3			X	X
299-E32-4				X
299-E32-5		X		
299-E32-6				X
299-E32-7				X
299-E32-8				X
299-E32-9				X
299-E33-1	X	X	X	
299-E33-3	X	X	X	
299-E33-4		X		
299-E33-5		X	X	
299-E33-6	X			
299-E33-7	X	X	X	
299-E33-8	X		X	
299-E33-9	X		X	
299-E33-10	X		X	
299-E33-12	X	X	X	
299-E33-13		X		
299-E33-14		X		
299-E33-15		X		
299-E33-18	X	X	X	
299-E33-20			X	
299-E33-21	X		X	

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 6 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
299-E33-24	X	X	X	
299-E33-25			X	
299-E33-26		X		
299-E33-28	X	X	X	X
299-E33-29		X		X
299-E33-30		X		X
299-E33-31		X		X
299-E33-32		X		X
299-E33-33		X		X
299-E33-34		X		X
299-E33-35		X		X
299-E33-36				X
299-E33-37				X
299-E33-38		X		X
299-E33-39				X
299-E33-40		X		X
299-E33-41				X
299-E33-42				X
299-E33-43				X
299-E34-1			X	
299-E34-2			X	
299-E34-3			X	X
299-E34-4				X
299-E34-5				X
299-E34-6				X
299-E34-7				X
299-E34-8				X

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 7 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
299-E34-9				X
299-E34-10				X
299-E35-1				X
299-E35-2				X
699-23-34				X
699-24-33				X
699-24-34A				X
699-24-34B				X
699-24-34C				X
699-24-35				X
699-25-33A				X
699-25-34A				X
699-25-34C				X
699-25-35A				X
699-26-33				X
699-26-34				X
699-26-35A				X
699-26-35C				X
699-40-39				X
699-40-40A				X
699-40-40B				X
699-41-40				X
699-42-39A				X
699-42-40A	X			X
699-42-40B	X			
699-42-40C	X			
699-42-41				X

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 8 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
699-42-42B				X
699-43-40				X
699-43-41E				X
699-43-41F				X
699-43-41G				X
699-43-41J				X
699-43-43				X
699-43-45				X
699-44-42				X
699-44-43B				X
699-45-42	X			
699-47-50	X	X		
699-47-60		X		
699-48-50		X		
699-49-55A		X		
699-49-55B		X		
699-49-57A		X		
699-49-57B		X		
699-50-42	X			
699-50-45	X			
699-50-48B	X			
699-50-53A		X		
699-50-53B		X		
699-51-46	X			
699-52-46A	X			
699-52-48	X			
699-52-54		X		

Table A-10. Summary of Groundwater Monitoring Wells and their Associated Networks for the 200 East Area. Page 9 of 9

Well No.	OGWMN	CERCLA	PNL	RCRA
699-52-57				
699-53-47A	X			
699-53-47B	X			
699-53-48A	X			
699-53-48B	X			
699-53-50	X			
699-53-55A		X		
699-53-55B		X		
699-53-55C		X		
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APPENDIX B

HEALTH AND SAFETY PLAN

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ACRONYMS AND ABBREVIATIONS

AAMS	aggregate area management study
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EII	Environmental Investigations Instructions
HEHF	Hanford Environmental Health Foundation
HSP	health and safety plan
HWOP	Hazardous Waste Operations Permit
JSA	Job Safety Analysis
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
RCRA	Resource Conservation Recovery Act
RWP	Radiation Work Permit
SCBA	self-contained breathing apparatus
Westinghouse Hanford	Westinghouse Hanford Company
WISHA	Washington Industrial Safety and Health Act

1.0 GENERAL CONSIDERATIONS AND REQUIREMENTS

1.1 INTRODUCTION

The purpose of this Health and Safety Plan (HSP) is to outline standard health and safety procedures for Westinghouse Hanford Company (Westinghouse Hanford) employees and contractors engaged in investigation activities in the 200 East Groundwater Aggregate Area Management Study (AAMS). These activities will include surface investigation, drilling and sampling boreholes, and environmental sampling in areas of known chemical and radiological contamination. Appropriate site-specific safety documents (e.g., Hazardous Waste Operations Permit [HWOP] or Job Safety Analysis [JSA]) will be written for each task or group of tasks. A more complete discussion of Westinghouse Hanford environmental safety procedures is presented in the Westinghouse Hanford manual *Health and Safety for Hazardous Waste Field Operations*, WHC-CM-4-3 vol. 4 (WHC 1992).

All employees of Westinghouse Hanford or any other contractors who are participating in onsite activities in the 200 East Groundwater AAMS shall read the site-specific safety document and attend a pre-job safety or tailgate meeting to review and discuss the task.

1.2 DESIGNATED SAFETY PERSONNEL

The field team leader and site safety officer are responsible for site safety and health. Specific individuals will be assigned on a task-by-task basis by project management, and their names will be properly recorded before the task is initiated.

All activities onsite must be cleared through the field team leader. The field team leader has responsibility for the following:

- Allocating and administering resources to successfully comply with all technical and health and safety requirements
- Verifying that all permits, supporting documentation, and clearances are in place (e.g., electrical outage requests, welding permits, excavation permits, HWOP or JSA, sampling plan, radiation work permits [RWP], and onsite/offsite radiation shipping records)
- Providing technical advice during routine operations and emergencies
- Informing the appropriate site management and safety personnel of the activities to be performed each day

- Coordinating resolution of any conflicts that may arise between RWPs and the implementation of the HWOP or JSA with health physics
- Handling emergency response situations as may be required
- Conducting pre-job and daily tailgate safety meetings
- Interacting with adjacent building occupants and/or inquisitive public.

The site safety officer is responsible for implementing the HWOP at the site. The site safety officer shall do the following.

- Monitor chemical, physical, and (in conjunction with the health physics technician) radiation hazards to assess the degree of hazard present; monitoring shall specifically include organic vapor detection, radiation screening, and confined space evaluation where appropriate.
- Determine protection levels, clothing, and equipment needed to ensure the safety of personnel in conjunction with the health physics department.
- Monitor the performance of all personnel to ensure that the required safety procedures are followed.
- Halt operations immediately, if necessary, due to safety or health concerns.
- Conduct safety briefings as necessary.
- Assist the field team leader in conducting safety briefings as necessary.

The health physics technician is responsible for ensuring that all radiological monitoring and protection procedures are being followed as specified in the Radiation Protection Manual and in the appropriate RWP. Westinghouse Hanford Industrial Safety and Fire Protection personnel will provide safety overview during drilling operations consistent with Westinghouse Hanford policy and, as requested, will provide technical advice. Also, downwind sampling for hazardous materials and radiological contaminants and other analyses may be requested from appropriate contractor personnel as required.

The ultimate responsibility and authority for employee's health and safety lies with the employee and the employee's colleagues. Each employee is responsible for exercising the utmost care and good judgment in protecting his or her personal health and safety and that of fellow employees. Should any employee observe a potentially unsafe condition or situation, it is the responsibility of that employee to immediately bring the observed condition to the

attention of the appropriate health and safety personnel, as designated previously. In the event of an immediately dangerous or life-threatening situation, the employee automatically has temporary "stop work" authority and the responsibility to immediately notify the field team leader or site safety officer. When work is temporarily halted because of a safety or health concern, personnel will exit the exclusion zone and meet at a predetermined place in the support zone. The field team leader, site safety officer, and health physics technician will determine the next course of action.

1.3 MEDICAL SURVEILLANCE

All field team members engaged in operable unit activities at sites governed by an HWOP must have baseline physical examinations and be participants in Westinghouse Hanford (or an equivalent) hazardous waste worker medical surveillance program.

Medical examinations will be designed to identify any pre-existing conditions that may place an employee at high risk, and will verify that each worker is physically able to perform the work required by this plan without undue risk to personal health. The physician shall determine the existence of conditions that may reduce the effectiveness or prevent the employee's use of respiratory protection. The physician shall also determine the presence of conditions that may pose undue risk to the employee while performing the physical tasks of this work plan using level B personal protection equipment. This would include any condition that increases the employee's susceptibility to heat stress.

The examining physician's report will not include any nonoccupational diagnoses unless directly applicable to the employee's fitness for the work required.

1.4 TRAINING

Before engaging in any onsite activities, each team member is required to have received 40 hours of health and safety training related to hazardous waste site operations and at least 8 hours of refresher training each year thereafter as specified in 29 Code of Federal Regulations (CFR) 1910.120. In addition, each inexperienced employee (never having performed site characterization) will be directly supervised by a trained/experienced person for a minimum of 24 hours of field experience.

The field team leader and the site safety officer shall receive an additional 8 hours of training (in addition to the refresher training previously discussed).

1.5 TRAINING FOR VISITORS

For the purposes of this plan, a visitor is defined as any person visiting the Hanford Site, who is not a Westinghouse Hanford employee or a Westinghouse Hanford contractor directly involved in the Resource Conservation and Recovery Act (RCRA)/Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) facility investigation activities, including but not limited to those engaged in surveillance, inspection, or observation activities.

Visitors who must, for whatever reason, enter a controlled (either contamination reduction or exclusion) zone, shall be subject to all of the applicable training, respirator fit testing, and medical surveillance requirements discussed in Westinghouse Hanford Environmental Investigations Instructions (EII) 1.1 and Appendix B to EII 1.1 (WHC 1991).

All visitors shall be informed of potential hazards and emergency procedures by their escorts and shall conform to EII 1.1 (WHC 1991).

1.6 RADIATION DOSIMETRY

All personnel engaged in onsite activities shall be assigned dosimeters according to the requirements of the RWP applicable to that activity. All visitors shall be assigned basic dosimeters, as a minimum, that will be exchanged annually.

1.7 REQUIREMENTS FOR THE USE OF RESPIRATORY PROTECTION

All employees of Westinghouse Hanford and subcontractors who may be required to use air-purifying or air-supplied respirators must be included in the medical surveillance program and be approved for the use of respiratory protection by the Hanford Environmental Health Foundation (HEHF) or other licensed physician. Each team member must be trained in the selection, limitations, and proper use and maintenance of respiratory protection (existing respiratory protection training may be applicable towards the 40-hour training requirement).

Before using a negative pressure respirator, each employee must have been fit-tested (within the previous year) for the specific make, model, and size according to Westinghouse Hanford fit-testing procedures. Beards (including a few days' growth), large sideburns, or moustaches that may interfere with a proper respirator seal are not permitted.

Subcontractors must provide evidence to Westinghouse Hanford that personnel are participants in a medical surveillance and respiratory protection program that complies with 29 CFR 1910.120 and 29 CFR 1910.134, respectively.

2.0 GENERAL PROCEDURES

The following personal hygiene and work practice guidelines are intended to prevent injuries and adverse health effects. A hazardous waste site poses a multitude of health and safety concerns because of the variety and number of hazardous substances present. These guidelines represent the minimum standard procedures for reducing potential risks associated with this project and are to be followed by all job-site employees at all times.

2.1 GENERAL WORK SAFETY PRACTICES

2.1.1 Work Practices

The following work practices must be observed.

- Eating, drinking, smoking, taking certain medications, chewing gum, and similar actions are prohibited within the exclusion zone. All sanitation facilities shall be located outside the exclusion zone; decontamination is required before using such facilities.

- Personnel shall avoid direct contact with contaminated materials unless necessary for sample collecting or required observation. Remote handling of such things as casings and auger flights will be practiced whenever practical.

- While operating in the controlled zone, personnel shall use the "buddy system" where appropriate, or be in visual contact with someone outside of the controlled zone.

- The buddy system will be used where appropriate for manual lifting.

- Requirements of Westinghouse Hanford radiation protection and RWP manuals shall be followed for all work involving radioactive materials or conducted within a radiologically controlled area.

- Onsite work operations shall only be carried out during daylight hours, unless the entire control zone is adequately illuminated with artificial lighting. A new tour (shift) will operate the drilling rig after completion of each shift.

- Do not handle soil, waste samples, or any other potentially contaminated items unless wearing the protective equipment specified in the HWOP or JSA.

- Whenever possible, stand upwind of excavations, boreholes, well casings, drilling spoils, and the like, as indicated by an onsite windsock.

- Stand clear of trenches during excavation. Always approach an excavation from upwind.

- Be alert to potentially changing exposure conditions as evidenced by such indications as perceptible odors, unusual appearance of excavated soils, or oily sheen on water.

- Do not enter any test pit or trench deeper than 1.2 m (4 ft) unless in accordance with procedures specified in the HWOP.

- Do not <u>under any circumstances</u> enter or ride in or on any backhoe bucket, materials hoist, or any other similar device not specifically designed for carrying passengers.

- All drilling team members must make a conscientious effort to remain aware of their own and others' positions in regards to rotating equipment, cat heads, or u-joints. Drilling operations members must be extremely careful when assembling, lifting, and carrying flights or pipe to avoid pinch-point injuries and collisions.

- Tools and equipment will be kept off the ground whenever possible to avoid tripping hazards and the spread of contamination.

- Personnel not involved in operation of the drill rig or monitoring activities shall remain a safe distance from the rig as indicated by the field team leader.

- Follow all provisions of each site-specific hazardous work permit as addressed in the HWOP, including cutting and welding, confined space entry, and excavation.

- Catalytic converters on the underside of vehicles are sufficiently hot to ignite dry prairie grass. Team members should not drive over dry grass that is higher than the ground clearance of the vehicle and should be aware of the potential fire hazard posed by catalytic converters at all times. Never allow a running or hot vehicle to sit in a stationary location over dry grass or other combustible materials.

- Follow all provisions of each site-specific RWP.

- Team members will attempt to minimize truck tire disturbance of all stabilized sites.

2.1.2 Personal Protective Equipment

- Personal protective equipment will be selected specifically for the hazards identified in the HWOP. The site safety officer in conjunction with Westinghouse Hanford Health Physics and Industrial Hygiene and Safety is responsible for choosing the appropriate type and level of protection required for different activities at the job site.

- Levels of protection shall be appropriate to the hazard to avoid either excessive exposure or additional hazards imposed by excessive levels of protection. The HWOP will contain provisions for adjusting the level of protection as necessary. These personal protective equipment specifications must be followed at all times, as directed by the field team leader, health physics technician, and site safety officer.

- Each employee must have a hard hat, safety glasses, and substantial protective footwear available to wear as specified in the HWOP or JSA.

- The exclusion zone around drilling or other noisy operations will be posted "Hearing Protection Required" and team members will have had noise control training.

- Personnel should maintain a high level of awareness of the limitations in mobility, dexterity, and visual impairment inherent in the use of level B and level C personal protective equipment.

- Personnel should be alert to the symptoms of fatigue, heat stress, and cold stress and their effects on the normal caution and judgment of personnel.

- Rescue equipment as required by Occupational Safety and Health Administration (OSHA), Washington Industrial Safety and Health Act (WISHA), or standards for working over water will be available and used.

2.1.3 Personal Decontamination

- The HWOP will describe in detail methods of personnel decontamination, including the use of contamination control corridors and step-off pads when appropriate.

- Thoroughly wash hands and face before eating or putting anything in the mouth to avoid hand-to-mouth contamination.

- At the end of each work day or each job, disposable clothing shall be removed and placed in (chemical contamination) drums, plastic-lined boxes or other containers as appropriate. Clothing that can be cleaned may be sent to the Hanford Site laundry.

- Individuals are expected to thoroughly shower before leaving the work site or Hanford Site if directed to do so by the health physics technician, site safety officer, or field team leader.

2.1.4 Emergency Preparation

- A multipurpose dry chemical fire extinguisher, a fire shovel, a complete field first-aid kit, and a portable pressurized spray wash unit shall be available at every site where there is potential for personnel contamination.

- Prearranged hand signals or other means of emergency communication will be established when respiratory protection equipment is to be worn, because this equipment seriously impairs speech.

- The Hanford Fire Department shall be initially notified before the start of the site investigation project. This notification shall include the location and nature of the various types of field work activities as described in the work plan. A site location map shall be included in this notification.

2.2 CONFINED SPACE/TEST PIT ENTRY PROCEDURES

The following procedures apply to the entry of any confined space, which for the purpose of this document shall be defined as any space having limited egress (access to an exit) and the potential for the presence or accumulation of a toxic or explosive atmosphere. This includes manholes, certain trenches (particularly those through waste disposal areas), and all test pits greater than 1 m (4 ft) deep. If confined spaces are to be entered as part of the work operations, a hazardous work permit (filled out for confined space entry) must be obtained from Industrial Safety and Fire Protection.

The identified remedial investigation activities on the 200 East Groundwater AAMS should not require confined space entry. Nevertheless, the hazards associated with confined spaces are of such severity that all employees should be familiar with the safe work discussed in the following paragraphs.

No employee shall enter any test pit or trench deeper than 1 m (4 ft) unless the sides are shored or laid back to a stable slope as specified in OSHA 29 CFR 1926.652 or equivalent state occupational health and safety regulations.

When an employee is required to enter a pit or trench 1 m (4 ft) deep or more, an adequate means of access and egress, such as a slope of at least 2:1 to the bottom of the pit or a secure ladder or steps shall be provided.

Before entering any confined space, including any test pit, the atmosphere will be tested for flammable gases, oxygen deficiency, and organic vapors. If other specific contamination, such as radioactive materials or other gases and vapors may be present, additional testing for those substances shall be conducted. Depending on the situation, the space may require ventilation and retesting before entry.

An employee entering a confined or partially confined space must be equipped with an appropriate level of respiratory protection in keeping with the monitoring procedures discussed previously and the action levels for airborne contaminants (see "Warnings and Action Levels" in HWOP).

No employee shall enter any test pit requiring the use of level B protection, unless a backup person also equipped with a pressure-demand self-contained breathing apparatus (SCBA) is present. No backup person shall attempt any emergency rescue unless a second backup person equipped with an SCBA is present, or the appropriate emergency response authorities have been notified and additional help is on the way.

3.0 SITE BACKGROUND

Specific details on the 200 East Groundwater AAMS background and known and suspected contamination are described in Chapters 2.0 through 10.0 of the plan. The 200 East Groundwater Aggregate Area encompasses the 200 East Area and associated perimeter of the U.S. Department of Energy's (DOE) Hanford Site, in the south-central portion of the state of Washington. The 200 East Area is located in Benton County in the central portion of the Hanford Site. It is adjacent to the 200 East Area, located roughly 5 km to the west.

The 200 East Groundwater Aggregate Area at the Hanford Site was used by the U.S. Government as a chemical separations area in the process to produce plutonium for nuclear weapons. These operations resulted in the release of chemical and radioactive wastes into the soil, air, and water of the area. Each waste site in the aggregate area is described separately in this document. Close relationships between waste units, such as overflow from one to another, are also discussed.

4.0 SCOPE OF WORK AND POTENTIAL HAZARDS

While the information presented in Chapters 2.0 through 10.0 of the plan are believed to be representative of the constituents and quantities of wastes at the time of discharge, the present chemical nature, location, extent, and ultimate fate of these wastes in and around the liquid disposal facilities are largely unknown. The emphasis of the investigation in the 200 East Groundwater AAMS will be to characterize the nature and extent of contamination in the groundwater (saturated soil and rock) zone.

4.1 WORK TASKS

Work tasks are described in Chapter 5.0 of the plan.

4.2 POTENTIAL HAZARDS

Onsite tasks will involve noninvasive surface sampling procedures and invasive soil sampling either directly in or immediately adjacent to areas known or suspected to contain potentially hazardous chemical substances, toxic metals, and radioactive materials.

Surface radiological contamination and fugitive dust will be the potential hazards of primary concern during noninvasive mapping and sampling activities.

Existing data indicate that hazardous substances may be encountered during invasive sampling; these include radionuclides, heavy metals, and corrosives. In addition, volatile organics may also be associated with certain facilities such as the solvent storage buildings or underground storage tanks.

Potential hazards include the following:

- External radiation (gamma and to a lesser extract, beta) from radioactive materials in the soil
- Internal radiation resulting from radionuclides present in contaminated soil entering the body by ingestion or through open cuts and scratches
- Internal radiation resulting from inhalation of particulate (dust) contaminated with radioactive materials
- Inhalation of toxic vapors or gases such as volatile organics or ammonia
- Inhalation or ingestion of particulate (dust) contaminated with inorganic or organic chemicals, and toxic metals
- Dermal exposure to soil or groundwater contaminated with radionuclides
- Dermal exposure to soil or groundwater contaminated with inorganic or organic chemicals, and toxic metals
- Physical hazards such as noise, heat stress, and cold stress
- Slips, trips, falls, bumps, cuts, pinch points, falling objects, other overhead hazards, crushing injuries, and other hazards typical of a construction-related job site
- Unknown or unexpected underground utilities
- Biological hazards; snakes, spiders, etc.

4.3 ASSESSMENT AND MITIGATION OF POTENTIAL HAZARDS

The likelihood of significant exposure (100 mR/h or greater) to external radiation is remote and can be readily monitored and controlled by limiting exposure time, increasing distance, and employing shielding as required.

Internal radiation by inhalation or inadvertent ingestion of contaminated dust is a realistic concern and must be continuously evaluated by the health physics technician. Appropriate respiratory protection, protective clothing, and decontamination procedures will be implemented as necessary to reduce potential inhalation, ingestion, and dermal exposure to acceptable levels.

Dermal exposure to toxic chemical substances is not expected to pose a significant problem for the identified tasks given the use of the designated protective clothing. The appropriate level of personal protective clothing and respiratory protection will vary from work site to work site.

5.0 ENVIRONMENTAL AND PERSONAL MONITORING

The site safety officer or authorized delegate shall be present at all times during work activities which require an HWOP, and shall be in charge of all environmental/personal monitoring equipment. Industrial Hygiene and Safety shall review all activities involving or potentially involving radiological exposure or contamination control and shall prescribe the appropriate level of technical support and/or monitoring requirements. Other equipment deemed necessary by the site safety officer or Industrial Hygiene and Safety shall be obtained at their direction; work will be initiated or continued until such equipment is in place. These instruments are to be used only by persons who are trained in their usage and who understand their limitations. No work shall be done unless instrumentation is available and in proper working order.

Air sampling may be required downwind of the referenced waste sites to monitor particulates and vapors before job startup. Siting of such sampling devices will be determined by Health Physics, the site safety officer, and HEHF, if appropriate. Any time personnel exposure monitoring, other than radiological, is required to determine exposure levels, it must be done by HEHF. Discrete sampling of ambient air within the work zone and breathing zones will be conducted using a direct-reading instrument, as specified in the site-specific safety document, and other methods as deemed appropriate (e.g., pumps with tubes, O_2 meters). The following standards will be used in determining critical levels:

- "Radionuclide Concentrations in Air," in Chapter XI, DOE Order 5480.1B (DOE 1986)
- "Air Contaminants - Permissible Exposure Limits," in 29 CFR 1910.1000
- *Threshold Limit Values and Biological Exposure Indices for 1990-1991* (ACGIH 1991)
- *Occupational Safety and Health Standards*, 29 CFR 1910.1000
- *Pocket Guide to Chemical Hazards* (NIOSH 1991), which provides National Institute for Occupational Safety and Health (NIOSH)-recommended exposure limits for substances that do not have either a threshold limit value or a permissible exposure limit.

5.1 AIRBORNE RADIOACTIVE AND RADIATION MONITORING

An onsite health physics technician will monitor airborne radioactive contamination levels and external radiation levels. Action levels will be consistent with derived air concentrations and applicable guidelines as specified in the radiation protection manual WHC-CM-4-10 (WHC 1988).

Appropriate respiratory protection shall be required when conditions are such that the airborne contamination levels may exceed an 8-hour derived air concentration (e.g., the presence of high levels of uncontained, loose contamination on exposed surfaces or operations that may raise excessive levels of dust contaminated with airborne radioactive materials, such as excavation or drilling under extremely dry conditions).

Specific conditions requiring the use of respiratory protection because of radioactive materials in air will be incorporated into the RWP. If, in the judgement of the health physics technician, any of these conditions arise, work shall cease until appropriate respiratory protection is provided.

6.0 PERSONAL PROTECTIVE EQUIPMENT

The level of personal protective equipment required initially at a site will be specified in the site-specific safety document for each task or group of tasks. Personal protective clothing and respiratory protection shall be selected to limit exposure to anticipated chemical

and radiological hazards. Work practices and engineering controls may be used to control exposure.

7.0 SITE CONTROL

The field team leader, site safety officer, and health physics technician are designated to coordinate access control and security on the site. Special site control measures will be necessary to restrict public access. The zones will be clearly marked with rope and/or appropriate signs. The size and shape of the control zone will be dictated by the types of hazards expected, the climatic conditions, and specific operations required.

Control zone boundaries may be increased or decreased based on results of field monitoring, environmental changes, or work technique changes. The site RWP and the contractor's standard operating procedures for radiation protection may also dictate the boundary size and shape. All team members must be surveyed for radioactive contamination when leaving the controlled zone if in a radiation zone.

The onsite command post and staging area will be established near the upwind side of the control zone as determined by an onsite windsock. Exact location for the command post is to be determined just before start of work. Vehicle access, availability of utilities (power and telephone), wind direction, and proximity to sample locations should be considered in establishing a command post location.

8.0 DECONTAMINATION PROCEDURES

Remedial investigation activities will require entry into areas of known chemical and radiological contamination. Consequently, it is possible that personnel and equipment could be contaminated with hazardous chemical and radiological substances.

During site activities, potential sources of contamination may include airborne vapors, gases, dust, mists, and aerosols; splashes and spills; walking through contaminated areas; and handling contaminated equipment. Personnel who enter the exclusion zone will be required to go through the appropriate decontamination procedures on leaving the zone. Decontamination procedures shall be consistent with EII 5.4, "Field Decontamination of Drilling, Well Development, and Sampling Equipment," and EII 5.5, "Decontamination of

Equipment for RCRA/CERCLA Sampling" (WHC 1991), or other approved decontamination procedures.

9.0 CONTINGENCY AND EMERGENCY RESPONSE PLANS

As a general rule, in the event of an unanticipated, potentially hazardous situation indicated by instrument readings, visible contamination, unusual or excessive odors, or other indications, team members shall temporarily cease operations and move upwind to a predesignated safe area as specified in the site-specific safety documentation.

10.0 REFERENCES

ACGIH, 1991, *Threshold Limit Values and Biological Exposure Indices for 1990-1991*, American Conference of Governmental Industrial Hygienists, Cincinnati, Ohio.

DOE, 1986, *Environment, Safety & Health Program for DOE Operations*, DOE Order 5480.1B, U.S. Department of Energy, Washington, D.C.

NIOSH, 1991, *Pocket Guide to Chemical Hazards, National Institute for Occupational Safety and Health*, U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, Washington, D.C.

WHC, 1988, *Radiation Protection*, WHC-CM-4-10, Westinghouse Hanford Company, Richland, Washington.

WHC, 1991, *Environmental Investigations and Site Characterization Manual*, WHC-CM-7-7, Westinghouse Hanford Company, Richland, Washington.

WHC, 1992, *Health and Safety for Hazardous Waste Field Operations*, WHC-CM-4-3 Vol. 4, Westinghouse Hanford Company, Richland, Washington.

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APPENDIX C

PROJECT MANAGEMENT PLAN

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ACRONYMS AND ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
FS	feasibility study
MCS	Management Control System
PMP	Project Management Plan
PNL	Pacific Northwest Laboratory
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
Tri-Party Agreement	Hanford Federal Facility Agreement and Consent Order

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1.0 INTRODUCTION

This Project Management Plan (PMP) defines the administrative and institutional tasks necessary to support the 200 East Groundwater Aggregate Area investigations at the Hanford Site. Also, this PMP defines the responsibilities of the various participants, the organizational structure, and the project tracking and reporting procedures. This PMP is in accordance with the provisions of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) dated August 1990 (Ecology et al. 1990). Any revisions to the Tri-Party Agreement that would result in changes to the project management requirements would supersede the provisions of this chapter.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

2.1 INTERFACE OF REGULATORY AUTHORITIES AND THE U.S. DEPARTMENT OF ENERGY

The 200 East Groundwater Aggregate Area consists of active and inactive waste management units to be remedied under either the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The U.S. Department of Ecology (Ecology) has been designated as the lead regulatory agency, as defined in the Tri-Party Agreement. Accordingly, Ecology is responsible for overseeing remedial action activity at this aggregate area and ensuring that the applicable authorities of both the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) are applied. The specific responsibilities of EPA, Ecology, and DOE are detailed in the Tri-Party Agreement.

2.2 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization for implementing remedial activities at the 200 East Groundwater Aggregate Area is shown in Figure C-1. The following sections describe the responsibilities of the individuals shown in Figure C-1.

2.2.1 Project Managers

The EPA, DOE, and Ecology have each designated one individual as project manager for remedial activities at the Hanford Site. These project managers will serve as the primary point of contact for all activities to be carried out under the Tri-Party Agreement. The responsibilities of the project managers are given in Section 4.1 of the Tri-Party Agreement.

2.2.2 Unit Managers

As shown in Figure C-1, EPA, DOE, and Ecology will each designate an individual as a unit manager for the 200 East Groundwater Aggregate Area.

The unit manager from Ecology will serve as the lead unit manager. The Ecology unit manager will be responsible for regulatory oversight of all activities required for the 200 East Groundwater Aggregate Area.

The unit manager from EPA will be responsible for making decisions related to issues for which the supporting regulatory agency maintains authority. All such decisions will be made in consideration of recommendations made by the Ecology unit manager.

The unit manager from DOE will be responsible for maintaining and controlling the schedule and budget and keeping the EPA and Ecology unit managers informed as to the status of the activities at the 200 East Groundwater Aggregate Area, particularly the status of agreements and commitments.

2.2.3 Quality Assurance Lead

The quality assurance lead will be a designated person within the Westinghouse Hanford Quality Assurance Organization. This designated person will be responsible for monitoring overall environmental restoration activities for this project. The designated personnel shall have the necessary organizational independence and authority to identify conditions adverse to quality and to systematically seek corrective action.

This individual is responsible for the preplanned survellance and audit activities for this project. A quality assurance report shall be provided to the technical lead, annually as a minimum, for inclusion in the project final report generated by the technical organization. The quality assurance report shall summarize the surveillance and audit activities as well as associated corrective actions that may have been taken during the interval.

2.2.4 Health and Safety Officer (Environmental Division/Environmental Field Services)

The health and safety officer is responsible for monitoring all potential health and safety hazards, including those associated with radioactive, volatile, and/or toxic compounds during sample handling and sampling decontamination activities. The health and safety officer has the responsibility and authority to halt field activities resulting from unacceptable health and safety hazards.

2.2.5 Technical Lead

The technical lead will be a designated person within the Westinghouse Hanford Environmental Engineering Group. The responsibilities of the technical lead will be to plan, authorize, and control work so that it can be completed on schedule and within budget, and to ensure that all planning and work performance activities are technically sound.

2.2.6 Remedial Investigation/Feasibility Study Coordinators

The remedial investigation (RI) and feasibility study (FS) coordinators will be responsible for coordinating all activities related to the RI and FS, respectively, including data collection, analysis, and reporting. The RI and FS coordinators will be responsible for keeping the technical lead informed as to the RI and FS work status and any problems that may arise.

2.2.7 Resource Conservation and Recovery Act Facility Investigation/Corrective Measures Study Contractor

Figure C-1 shows the organizational relationship of an offsite contractor. Assuming a contractor is used to perform the RI/FS for the 200 East Groundwater Aggregate Area, the contractor would assume responsibilities of the RI and FS coordinators, as described above. In this instance, the contractor will be directly responsible for planning data collection activities and for analyzing and reporting the results of the data-gathering in the RI and FS reports. However, the Westinghouse Hanford coordinator would retain the responsibility for securing and managing the field sampling efforts of the Hanford Site technical resource teams, described below. Figure C-2 shows a sample organizational structure for an RI/FS contractor team.

2.2.8 Hanford Site Technical Resources

The various technical resources available on the Hanford Site for performing the field studies are shown in Table C-1. These resources will be responsible for performing data collection activities and analyses, and for reporting the results of specific technical activities. Figures C-3 through C-6 show the detailed organizational structure of specific technical teams. Internal and external work orders and subcontractor task orders will be written by the Westinghouse Hanford technical lead to use these technical resources, which are under the control of the technical lead. Statements of work will be provided to the technical teams and will include a discussion of authority and responsibility, a schedule with clearly defined milestones, and a task description including specific requirements. Each technical team will keep the coordinator informed of the work status performed by that group and any problems that may arise.

3.0 DOCUMENTATION AND RECORDS

All plans and reports will be categorized as either primary or secondary documents as described by Section 9.1 of the Tri-Party Agreement. The process for document review and comment will be as described in Section 9.2 of the Tri-Party Agreement. Revisions, should they become necessary after finalization of any document, will be in accordance with Section 9.3 of the Tri-Party Agreement. Changes in the work schedule, as well as minor field changes, can be made without having to process a formal revision. The process for making these changes will be as stated in Section 12.0 of the Tri-Party Agreement. Administrative records, which must be maintained to support the Hanford Site activities, will be in accordance with Section 9.4 of the Tri-Party Agreement.

4.0 FINANCIAL AND PROJECT TRACKING REQUIREMENTS

4.1 MANAGEMENT CONTROL

Westinghouse Hanford will have the overall responsibility for planning and controlling the investigation activities, and providing effective technical, cost, and schedule baseline management. If a contractor is used, the contractor will assume the direct day-to-day responsibilities for these management functions. The management control system used for this project must meet the requirements of DOE Order 4700.1, Project Management System

and DOE Order 2250.1C, Cost and Schedule Control Systems Criteria. The Westinghouse Hanford Management Control System (MCS) meets these requirements. The primary goals of the Westinghouse Hanford MCS are to provide methods for planning, authorizing, and controlling work so that it can be completed on schedule and within budget, and to ensure that all planning and work performance activities are technically sound and in conformance with management and quality requirements.

The schedule developed for the 200 East Groundwater Aggregate Area will be updated at least annually, to expand the new current fiscal year and the follow-on year. In addition, any approved schedule changes (see Section 12.0 of the Tri-Party Agreement for the formal change control system) would be incorporated at this time, if not previously incorporated. This update will be performed in the fourth quarter of the previous fiscal year (e.g., July to September) for the upcoming current fiscal year. The work schedule can be revised at any time during the year if the need arises, but the changes would be restricted to major changes that would not be suitable for the change control process.

4.2 MEETINGS AND PROGRESS REPORTS

Both project and unit managers must meet periodically to discuss progress, review plans, and address any issues that have arisen. The project managers' meeting will take place at least quarterly, and is discussed in Section 8.1 of the Tri-Party Agreement.

Unit managers shall meet monthly to discuss progress, address issues, and review near-term plans pertaining to their respective operable units and/or treatment, storage, and disposal groups/units. The meetings shall be technical in nature, with emphasis on technical issues and work progress. The assigned DOE unit manager for the 200 East Groundwater Aggregate Area will be responsible for preparing revisions to the aggregate area schedule prior to the meeting. The schedule shall address all ongoing activities associated with the 200 East Groundwater Aggregate Area, including actions on specific source units (e.g., sampling). This schedule will be provided to all parties and reviewed at the meeting. Any agreements and commitments (within the unit manager's level of authority) resulting from the meeting will be prepared and signed by all parties as soon as possible after the meeting. Meeting minutes will be issued by the DOE unit manager and will summarize the discussion at the meeting, with information copies given to the project managers. The minutes will be issued within five working days following the meeting. The minutes will include, at a minimum, the following information:

- Status of previous agreements and commitments
- Any new agreements and commitments

- Schedules (with current status noted)
- Any approved changes signed off at the meeting in accordance with Section 12.1 of the Tri-Party Agreement.

Project coordinators for each operable unit also will meet on a monthly basis to share information and to discuss progress and problems.

The DOE shall issue a quarterly progress report for the Hanford Site within 45 days following the end of each quarter. Quarters end on March 31, June 30, September 30, and December 31. The quarterly progress reports will be placed in the public information repositories as discussed in Section 10.2 of the Tri-Party Agreement. The report shall include the following:

- Highlights of significant progress and problems.
- Technical progress with supporting information, as appropriate.
- Problem areas with recommended solutions. This will include any anticipated delays in meeting schedules, the reason(s) for the potential delay, and actions to prevent or minimize the delay.
- Significant activities planned for the next quarter.
- Work schedules (with current status noted).

5.0 REFERENCES

Ecology, EPA, and DOE, 1990, *Hanford Federal Facility Agreement and Consent Order*, (First Amendment), 89-10, Rev.1, Olympia, Washington.

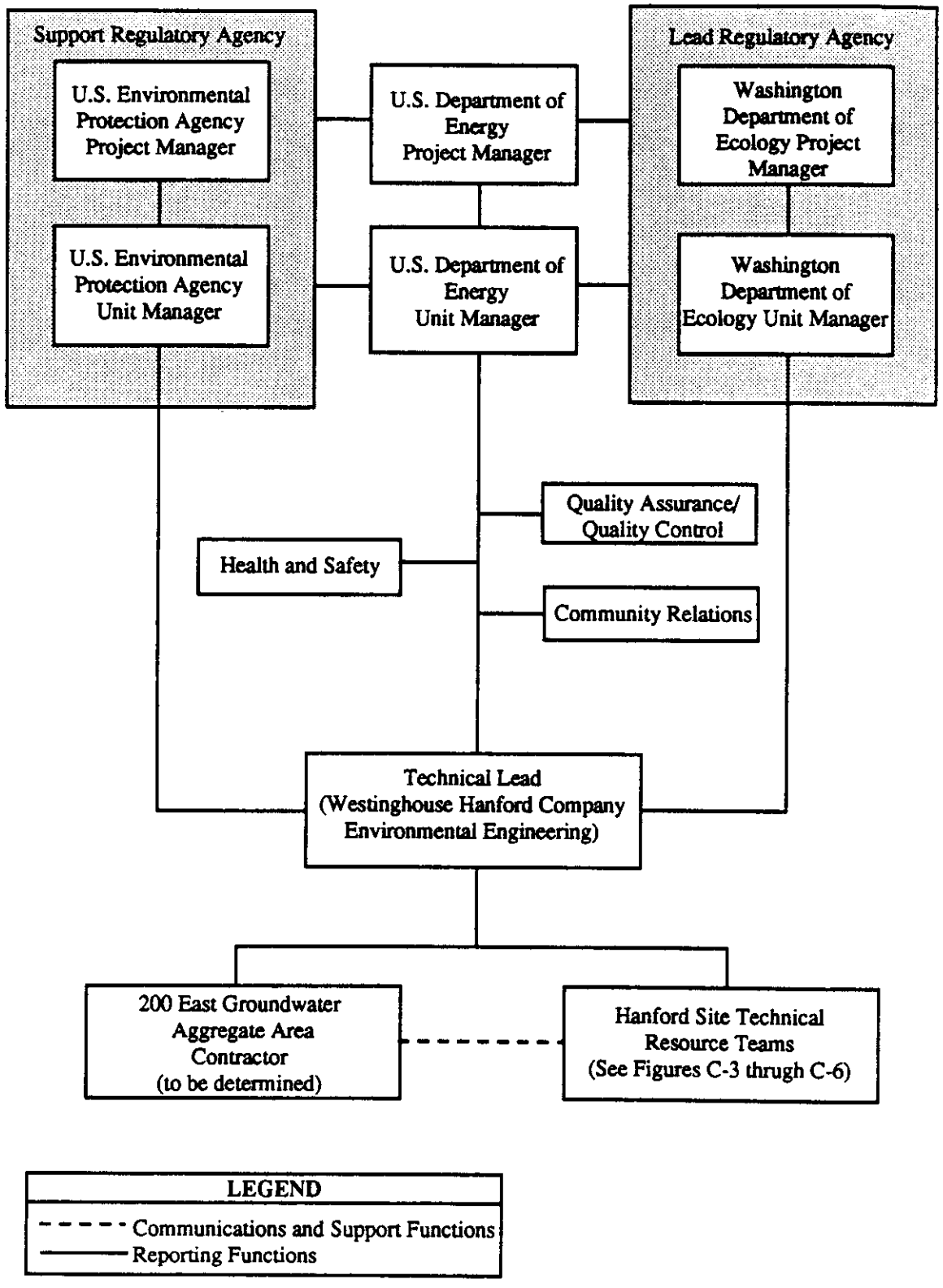

Figure C-1. Project Organization for the 200 East Groundwater Aggregate Area Project.

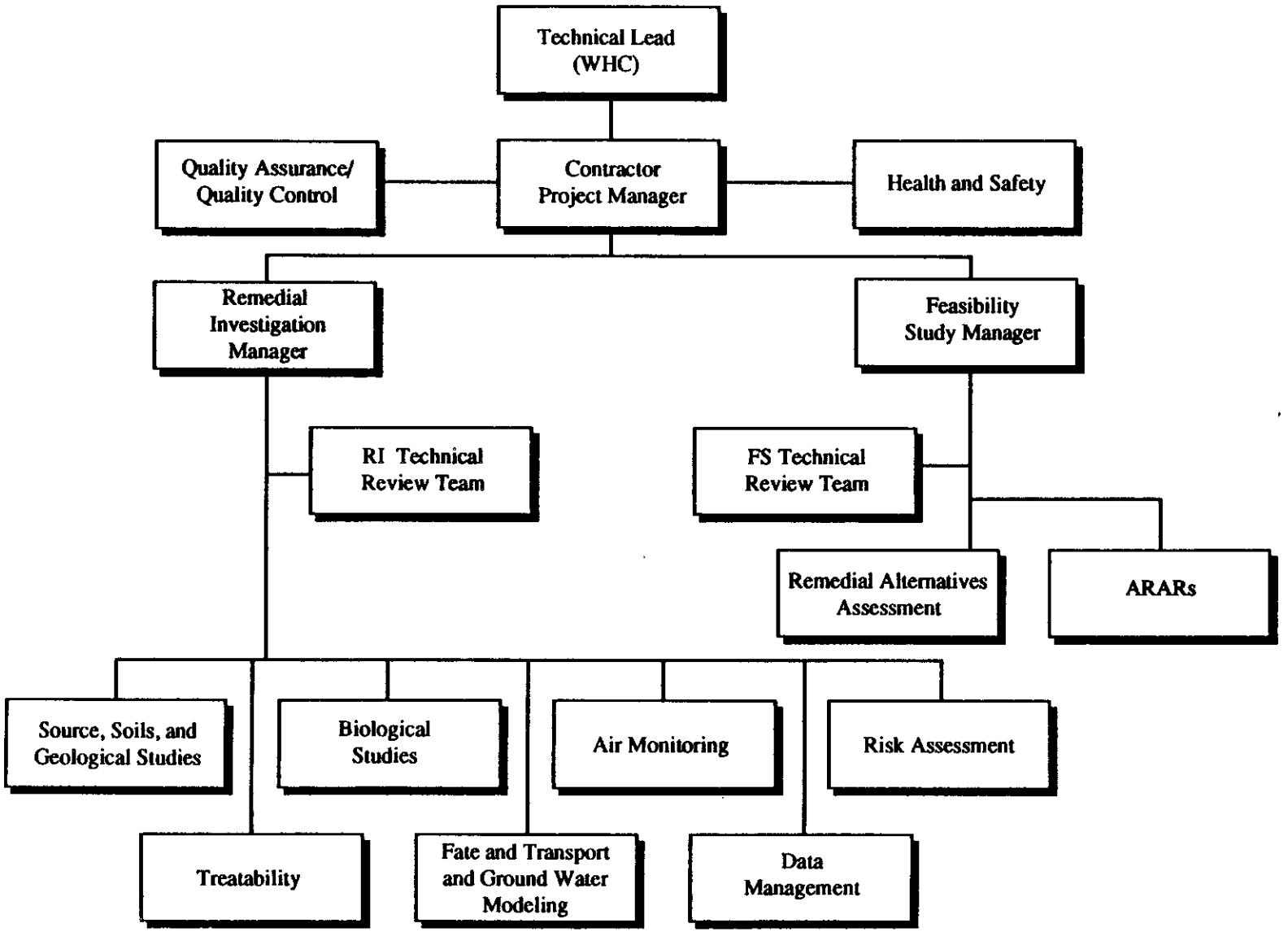

Figure C-2. Example Project Organization for the 200 East Groundwater Aggregate Area

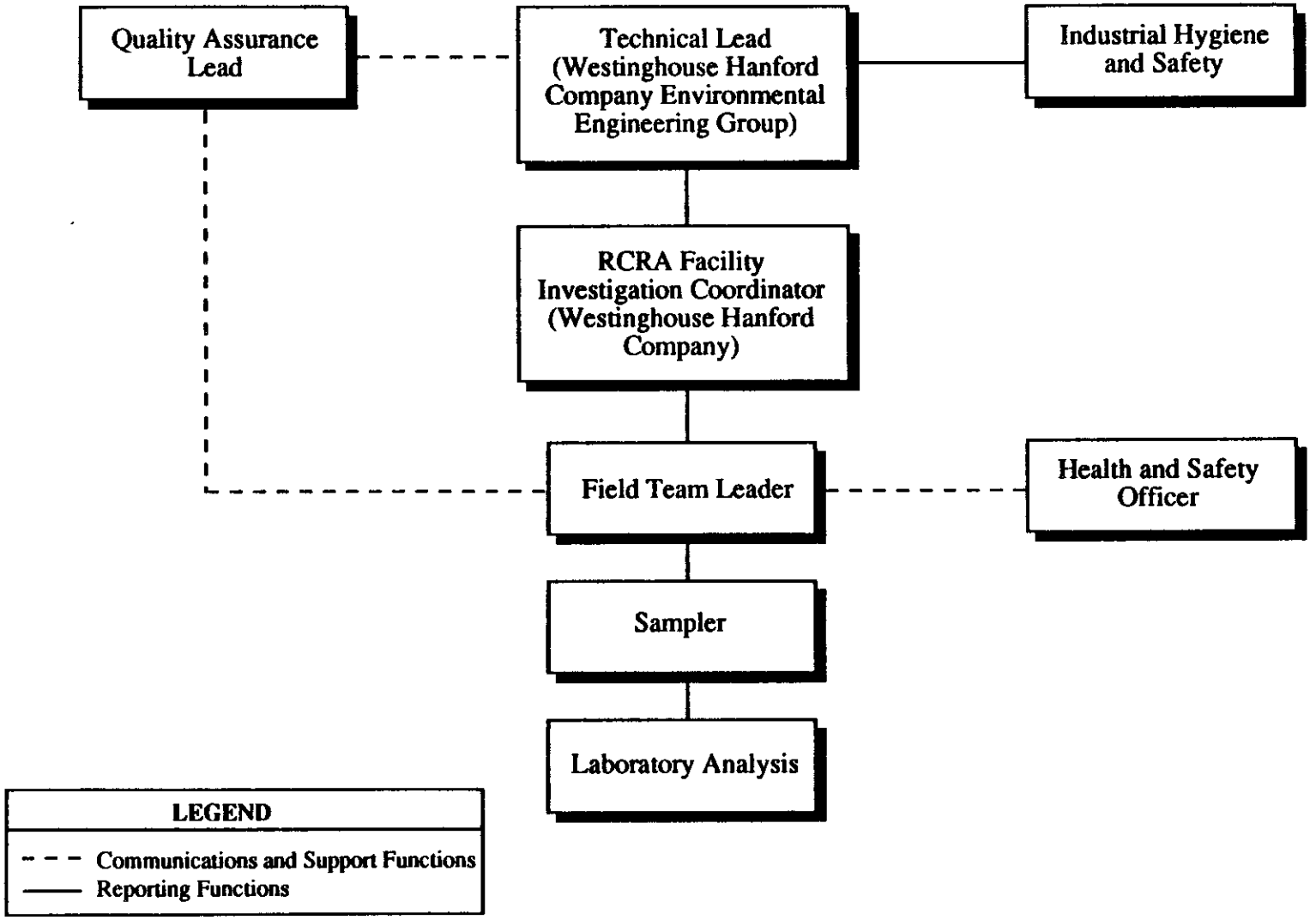

Figure C-3. The Hanford Site Soil Sampling Team.

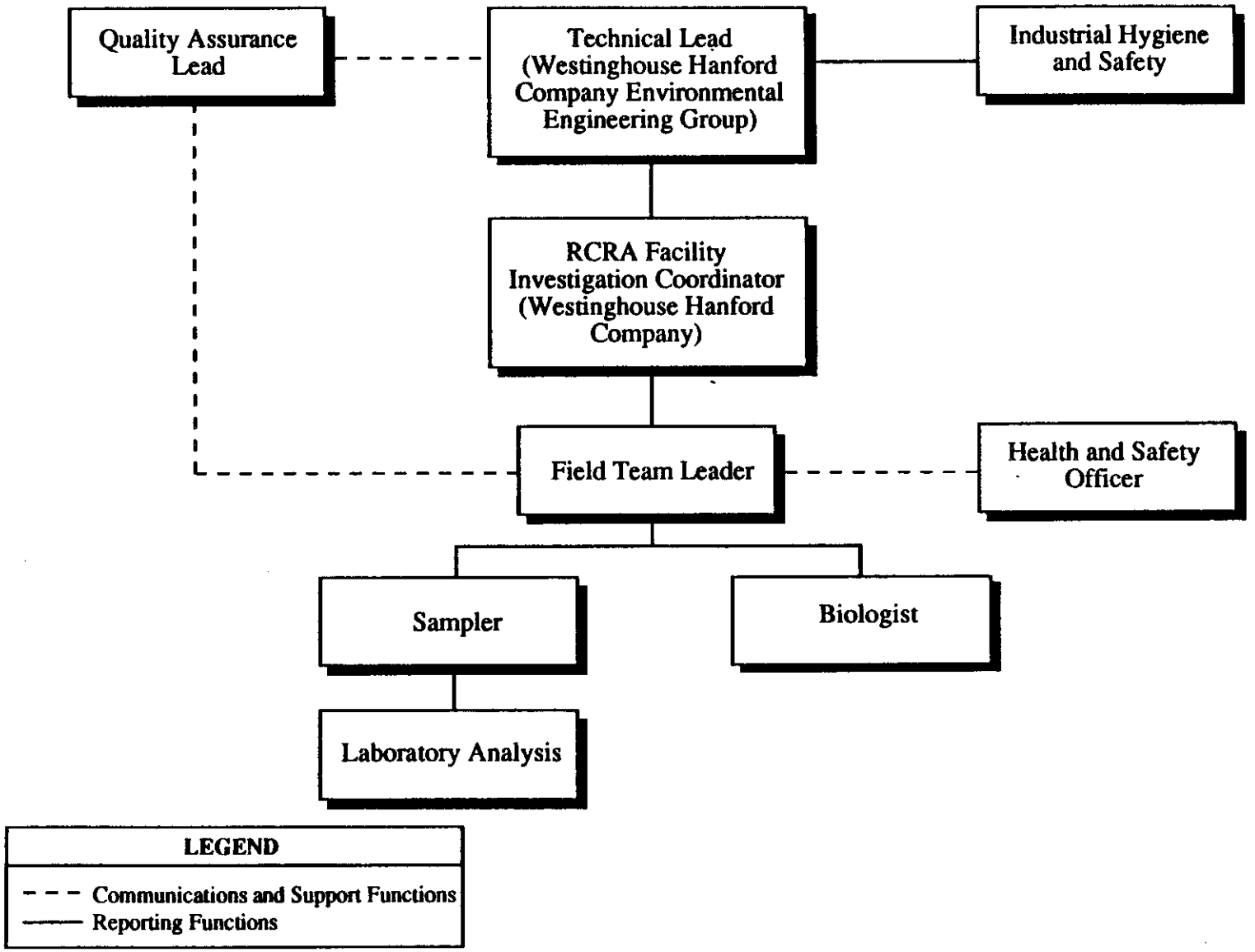

Figure C-4. The Hanford Site Biological Sampling Team.

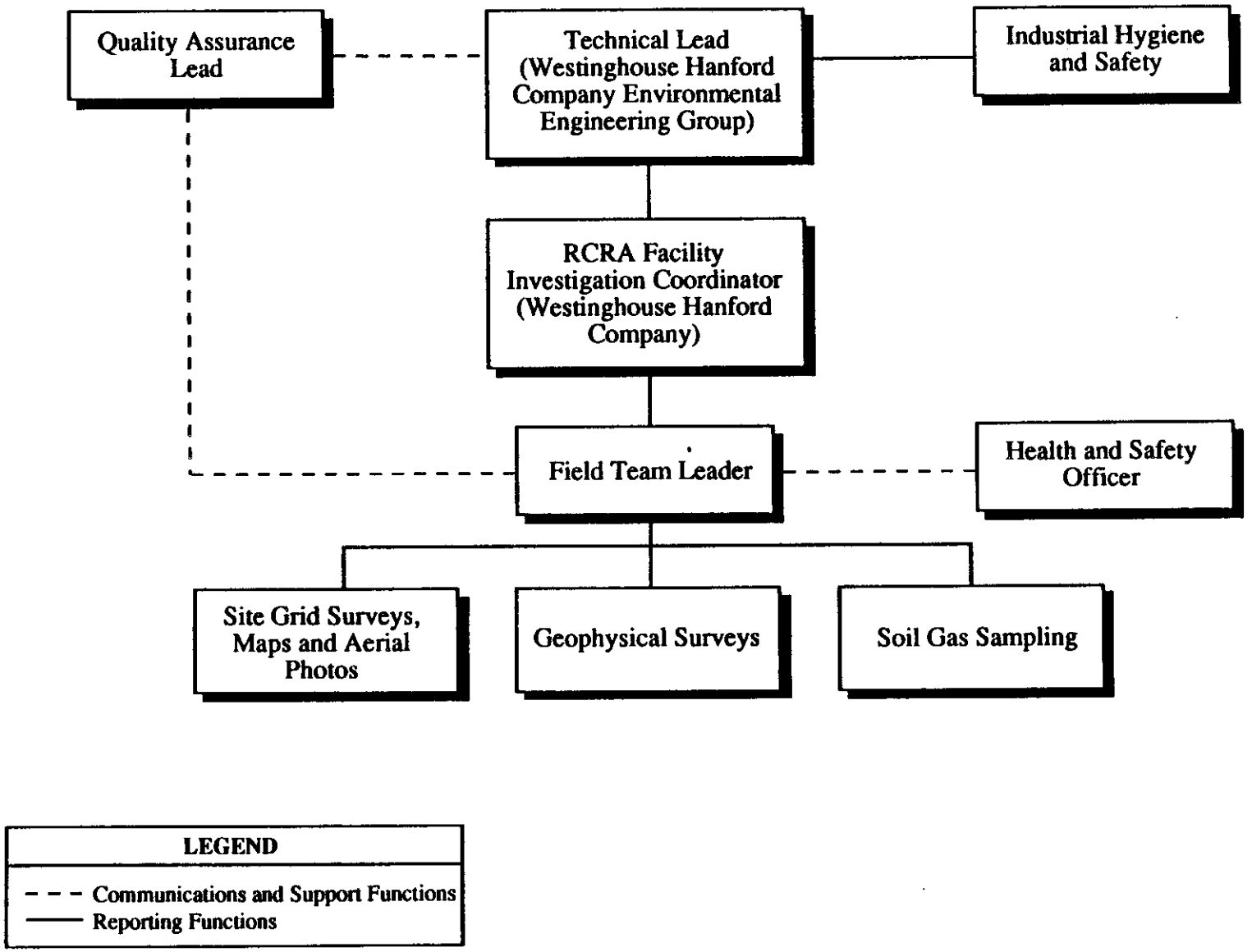

Figure C-5. The Hanford Site Physical and Geophysical Survey Team.

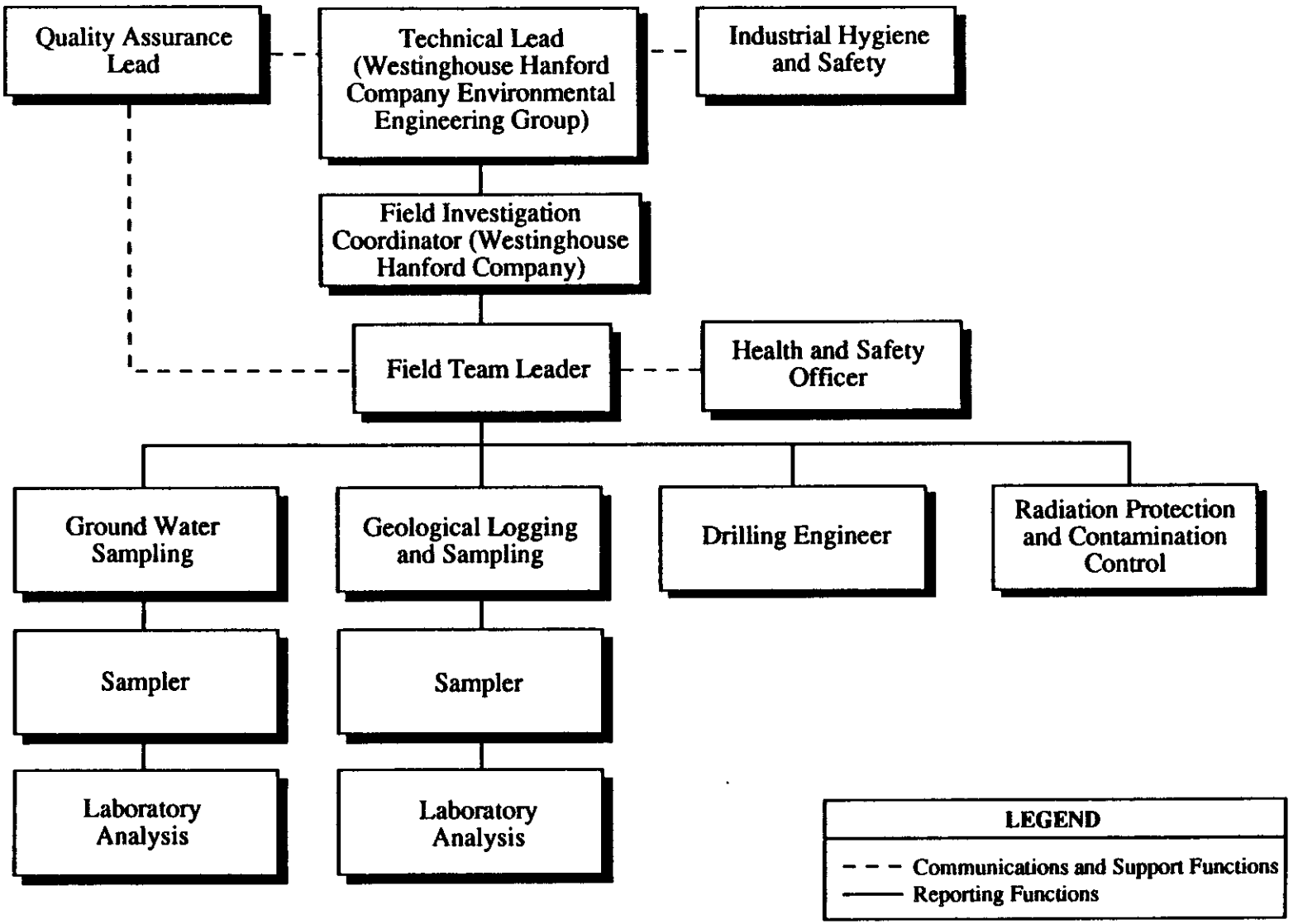

Figure C-6. Drilling, Sampling, and Well-Development Team.

Table C-1. Hanford Site RI/FS Technical Resources. Page 1 of 2

Subject/Activity	Technical Resources	
	RI	FS
Hydrology and geology	Westinghouse Hanford/Geosciences PNL/Earth and Environmental Sciences Center	Westinghouse Hanford/Geosciences
Toxicology and risk/endangerment assessment	Westinghouse Hanford/Environmental Technology PNL/Earth and Environmental Sciences Center PNL/Life Sciences Center	Westinghouse Hanford/ Environmental Technology
Environmental chemistry	Westinghouse Hanford/Geosciences PNL/Earth and Environmental Sciences Center	Westinghouse Hanford/Geosciences
Geotechnical and civil engineering	Westinghouse Hanford/Geosciences (Planning) Environmental Field Services	NA
Geotechnical and civil engineering	NA	Westinghouse Hanford/ Environmental Engineering PNL/Waste Technology Center
Groundwater treatment engineering	NA	Westinghouse Hanford/ Environmental Engineering PNL/Waste Technology Center
Waste stabilization and treatment	NA	Westinghouse Hanford/ Environmental Engineering PNL/Waste Technology Center
Surveying	Kaiser Engineers Hanford	NA

Table C-1. Hanford Site RI/FS Technical Resources.

	Technical Resources	
Subject/Activity	RI	FS
Soil and water sampling and analysis	Westinghouse Hanford/Environmental Engineering Westinghouse Office of Sampling Management PNL/Earth and Environmental Sciences Center PNL/Materials and Chemical Sciences Center	NA
Drilling and well installation	Westinghouse Hanford/Geosciences Environmental Field Services Kaiser Engineers	NA
Radiation monitoring	Westinghouse Hanford/Operational Health Physics	NA

NA = Not applicable.

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APPENDIX D

INFORMATION MANAGEMENT OVERVIEW

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ACRONYMS AND ABBREVIATIONS

AR	administrative record
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CMS	Corrective Measures Study
DOE	U.S. Department of Energy
DOE/RL	U.S. Department of Energy, Richland Operations Office
Ecology	Washington Department of Ecology
EDMC	Environmental Data Management Center
EHPSS	Environmental Health and Pesticide Services Section
EII	Environmental Investigations Instructions
EIMP	Environmental Information Management Plan
EPA	U.S. Environmental Protection Agency
ER	environmental restoration
ERRA	Environmental Restoration Remedial Action
FOMP	Field Office Management Plan
FS	feasibility study
GIS	geographic information system
HEHF	Hanford Environmental Health Foundation
HEIS	Hanford Environmental Information System
HLAN	Hanford Local Area Network
HMS	Hanford Meteorological Station
IMO	Information Management Overview
KEH	Kaiser Engineers Hanford
OSM	Office of Sample Management
PNL	Pacific Northwest Laboratory
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RFI	RCRA Facility Investigation
RI	remedial investigation
ROD	record of decision
TR	training records
Tri-Party Agreement	Hanford Federal Facility Agreement and Consent Order
TSD	treatment, storage, and disposal
Westinghouse Hanford	Westinghouse Hanford Company

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DEFINITIONS OF TERMS

Action Plan. Action plan for implementation of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1990). A negotiation between the U.S. Environmental Protection (EPA), the U.S. Department of Energy (DOE), and the State of Washington Department of Ecology (Ecology). The Action Plan defines the methods and processes by which hazardous waste permits will be obtained, and by which closure and post-closure actions under the Resource Conservation and Recovery Act of 1976 (RCRA) and by which remedial actions under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) will be conducted on the Hanford Site.

Administrative Record (AR). In CERCLA, the official file that contains all information that was considered or relied on by the regulatory agency in arriving at a final remedial action decision, as well as all documentation of public participation throughout the process. In RCRA, the official file that contains all documents to support a final RCRA permit determination.

Administrative Record File. The assemblage of documents compiled and maintained by an agency pertaining to a proposed project of administrative action and designated as AR or that are candidates for inclusion in the AR once a record of decision (ROD) is attained.

Data Management. The planning and control of activities affecting data.

Data Quality. The totality of features and characteristics of data that bears on its ability to satisfy a given purpose. The characteristics of major importance are accuracy, precision, completeness, representativeness, and comparability.

Data Validation. The process whereby data are accepted or rejected based on a set of criteria. This aspect of quality assurance involves establishing specified criteria for data validation. The quality assurance project plan (QAPP) must indicate the specified criteria that will be used for data validation.

ENCORE. The name given to the combination of hardware, software, and administrative subsystems that serve to integrate the management of the Hanford Site environmental data.

Environmental Data Management Center (EDMC). The central facility and services that provide a files management system for processing environmental information.

Environmental Information. Data related to the protection or improvement of the Hanford Site environment, including data required to satisfy environmental statutes, applicable DOE orders, or the Tri-Party Agreement.

Field File Custodian. An individual who is responsible for receipt, validation, storage, maintenance, control, and disposition of information or other records generated in support of Environmental Division activities.

Hanford Environmental Information System (HEIS). A computer-based information system under development as a resource for the storage, analysis, and display of investigative data collected for use in site characterization and remediation activities. Subject areas currently being developed include geophysics/soil gas, vadose zone soil (geologic), atmospherics, and biota.

Information System. Collection of components relate to the management of data and reporting of information. Information systems typically include computer hardware, computer software, operating systems, utilities, procedures, and data.

Lead Agency. The regulatory agency (EPA or Ecology) that is assigned the primary administrative and technical responsibility with respect to actions at a particular operable unit.

Nonrecord Material. Copies of material that are maintained for information, reference, and operating convenience and for which another office has primary responsibility.

Operable Unit. An operable unit at the Hanford Site is a group of land disposal and groundwater sites placed together for the purposes of doing a remedial investigation/ feasibility study. The primary criteria for placement of a site into an operable unit are geographic proximity, similarity of waste characteristics and site types, and the possibility for economies of scale.

Primary Document. A document that contains information on which key decisions are made with respect to the remedial action or permitting process. Primary documents are subject to dispute resolution and are part of the administrative record file.

Project Manager. The individual responsible for implementing the terms and conditions of the Action Plan on behalf of his respective party. The EPA, DOE, and Ecology will each designate one project manager.

Quality Affecting Record. Information contained on any media, including but not limited to, hard copy, sample material, photo copy, and electronic systems, that is complete in

terms of appropriate content and that furnishes evidence of the quality of items and/or activities affecting quality.

Quality Assurance. The systematic actions necessary to provide adequate confidence that a material, component, system, process, or facility performs satisfactorily or as planned in service.

Quality Assured Data. Data developed under an integrated program for assurance of the reliability of data.

Raw Data. Unprocessed or unanalyzed information.

Record Validation. A review to determine that records are complete, legible, and meet records requirements. Documents are considered valid records only after the validation process has been completed.

Retention Period. The length of time records must be held before they can be disposed of. The time is usually expressed in years from the date of the record, but may also be expressed as contingent on the occurrence of an event.

Secondary Document. A document providing information that does not, in itself, reflect or support key decisions. A secondary document is subject to review by the regulatory agencies and may be part of the administrative record field. It is not subject to dispute resolution.

Validated Data. Data that meet criteria contained in an approved company procedure.

Verified Data. Data that have been checked for accuracy and consistency following a transfer action (e.g., from manual log to computer, or from distributed database to centralized data repository).

1.0 INTRODUCTION AND OBJECTIVES

1.1 INTRODUCTION

An extensive amount of data will be generated over the next several years in connection with the activities planned for the 200 East Groundwater Aggregate Area. The quality of these data are extremely important to the full remediation of the aggregate area as agreed on by the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA) the Washington Department of Ecology (Ecology), and interested parties.

The Information Management Overview (IMO) provides an overview of the data management activities at the operable unit level. It identifies the type and quantity of data to be collected and references the procedures which control the collection and handling of data. It provides guidance for the data collector, aggregate area investigator, project manager, and reviewer to fulfill their respective roles.

This IMO addresses handling of data generated from activities associated with the aggregate area activities. All data collected will be in accordance with the Environmental Investigations Instructions (EII) contained in the Westinghouse Hanford Company's (Westinghouse Hanford) *Environmental Investigations and Site Characterization Manual* (WHC 1991a).

Development of a comprehensive plan for the management of all environmental data generated at the Hanford Site is under way. The *Environmental Information Management Plan* (EIMP) (Steward et al. 1989), released in March 1989, described activities in the Environmental Data Management Center (EDMC) and long-range goals for management of scientific and technical data. The scientific and technical data part of the EIMP was reviewed, revised, and expanded in fiscal year 1990 (Michael et al. 1990). An *Environmental Restoration Remedial Action Program Records Management Plan* (WHC 1991b) issued in July 1991, enables the program office to identify, control, and maintain the quality assurance (QA), decisional, or regulatory prescribed records generated and used in support of the Environmental Restoration Remedial Action (ERRA) Program.

1.2 OBJECTIVES

This IMO describes the process for the collection and control procedures for validated data, records, documents, correspondence, and other information associated with this aggregate area. This IMO addresses the following:

- Types of data to be collected

- Plans for managing data
- Organizations controlling data
- Databases used to store the data
- EIMP
- Hanford Environmental Information System (HEIS).

2.0 TYPES OF DATA

2.1 TYPES OF DATA

The general types of technical data to be collected and the associated controlling procedures are as follows:

Type of data	Procedure
Historical reports	EII 1.6
Aerial photos	EII 1.6
Chart recordings	EII 1.6
Technical memos	EII 1.6
Validated samples analyses	EII 1.6
Reports	EII 1.6
Logbooks	EII 1.5
Chain-of-custody forms	EII 5.1
Sample quality assurance/ quality control (QA/QC)	Office of Sample Management (OSM)

All such data are submitted to the EDMC for entry into the administrative record (AR).

General types of related administrative data is shown in Table D-1, which is organized in terms of general types of personnel and compliance/regulatory data. Table D-1 references the appropriate procedures and the record custodians. Data associated with aggregate area investigations will be submitted to the EDMC for entry into the AR, as appropriate.

2.2 DATA COLLECTION

Data will be collected according to the aggregate area sampling and analysis plans and the Quality Assurance Project Plan (QAPP). Section 2.1 listed the controlling procedures for data collection and handling before turnover to the organization responsible for data storage.

All procedures for data collection shall be approved in compliance with the Westinghouse Hanford *Environmental Investigations and Site Characterization Manual* (WHC 1991a).

2.3 DATA STORAGE AND ACCESS

Data will be handled and stored according to procedures approved in compliance with applicable Westinghouse Hanford procedures (WHC 1988). The EDMC is the central files manager and process facility. All data entering the EDMC will be indexed, recorded, and placed into safe and secure storage. Data designated for placement into the AR will be copied, placed into the Hanford Site AR file, and distributed by the EDMC to the user community. The hard copy files are the primary sources of information; the various electronic data bases are secondary sources.

Normal access to data is through EDMC which is responsible for the AR. The Administrative Record Public Access Room is located in the 345 Hills Street Facility in Richland, Washington. This facility includes AR file documents (including identified guidance documents and technical literature).

Project participants may access data that are not in the AR by requesting it at the monthly unit managers' meeting for the operable unit of concern. As the project moves to completion, it is expected that all of the relevant data will be contained in the AR and the need to access data will be minimal.

The following types of data will be accessed from and reside in locations other than the EDMC:

Data Type	Data location
• QA/QC laboratory data	OSM (Westinghouse Hanford)
• Sample status	OSM (Westinghouse Hanford)
• Archived samples	Laboratory performing analyses
• Training records	Technical Training Support Section (Westinghouse Hanford)
• Meteorological data	Hanford Meteorological Station (HMS) (Pacific Northwest Laboratory [PNL])

• Health and safety records	Hanford Environmental Health Foundation (HEHF)
• Personal protective fitting	Environmental Health and Pesticide Services Section (Westinghouse Hanford)
• Radiological exposure	Pacific Northwest Laboratory.

2.4 DATA QUANTITY

Data quantities for the investigative activities will be estimated based on the sampling and analysis plans developed for investigation of sites within the aggregate area.

3.0 DATA MANAGEMENT

3.1 OBJECTIVE

A considerable amount of data will be generated through the implementation of the aggregate area sampling and analysis plans. The QAPP will provide the specific procedural direction and control for obtaining and analyzing samples in conformance with requirements to ensure quality data results. The sampling and analysis plans will provide the basis for selecting the location, depth, frequency of collection, etc., of media to be sampled and methods to be employed to obtain samples of selected media for cataloging, shipment, and analysis. Figure D-1 displays the general data management model for data generated through work plan activities.

3.2 ORGANIZATIONS CONTROLLING DATA

This section addresses the organizations that will receive data generated from aggregate area activities.

3.2.1 Environmental Engineering Group

The Westinghouse Hanford Environmental Engineering Group provides the operable unit technical coordinator. The technical coordinator is responsible for maintaining and transmitting data to the designated storage facility.

3.2.2 Office of Sample Management

The Westinghouse Hanford OSM will validate all analytical data packages received from the laboratory. Validated summary data (sample results and copies of chain-of-custody forms) will be forwarded to the technical coordinator. Nonvalidated data will be forwarded to the technical coordinator on request. Preliminary data will be clearly labeled as such. The OSM will maintain raw sample data, QA/QC laboratory data, and the archived sample index.

3.2.3 Environmental Data Management Center

The EDMC is the Westinghouse Hanford Environmental Division's central facility and service that provides a file management system for processing environmental information. The EDMC manages and controls the AR and Administrative Record Public Access Room at the Hanford Site. Part 1 of the EIMP (Michael et al. 1990) describes the central file system and services provided by the EDMC. The following procedures address data transmittal to the EDMC:

- EII 1.6, Records Management (WHC 1991a)
- EII 1.11, Technical Data Management (WHC 1991a)
- TPA-MP-02, Information Transmittals and Receipt Controls (DOE/RL 1990)
- TPA-MP-07, Administrative Record Collection and Management (DOE/RL 1990)

3.2.4 Information Resource Management

Information Resource Management is the designated records custodian (permanent storage) for Westinghouse Hanford. The procedural link from the EDMC to the Information Resource Management is currently under development.

3.2.5 Hanford Environmental Health Foundation

The HEHF performs the analyses on the nonradiological health and exposure data (Section 3.3.2) and forwards summary reports to the Fire and Protection Group and the Environmental Health and Pesticide Services Section within the Westinghouse Hanford Environmental Division. Nonradiological and health exposure data are maintained also for other Hanford Site contractors (PNL and Kaiser Engineers Hanford [KEH]) associated with aggregate area activities. The HEHF provides summary data to the appropriate site contractor. EII 2.1, Preparation of Hazardous Waste Operations Permits, and EII 2.2,

Occupational Health Monitoring (WHC 1991a) address the preparation of health and safety plans and occupational health monitoring, respectively.

3.2.6 Environmental Health and Pesticide Services Section

The Westinghouse Hanford Environmental Health and Pesticide Services Section maintains personal protective equipment fitting records and maintains nonradiological health field exposure and exposure summary reports provided by HEHF for Westinghouse Hanford Environmental Division and subcontractor personnel.

3.2.7 Technical Training Records and Scheduling Section

The Westinghouse Hanford Technical Training Records and Scheduling Section provides training and maintains training records (Section 3.3.4).

3.2.8 Pacific Northwest Laboratory

The PNL operates the HMS and collects and maintains meteorological data (Section 3.3.1). Data management is discussed in Andrews (1988).

The PNL collects and maintains radiation exposure data (Section 3.3.3).

3.3 DATABASES

This section addresses databases that will receive data generated from the aggregate area activities. These and other databases are described in the EIMP (Michael et al. 1990). All of these databases exist independently of this aggregate area and serve other site functions. Data pertinent to the operable unit, housed in these databases, will be submitted to the AR.

3.3.1 Meteorological Data

The HMS collects and maintains meteorological data. Their database contains meteorological data from 1943 to the present, and Andrews (1988) is the document containing meteorological data management information.

3.3.2 Nonradiological Exposure and Medical Records

The HEHF collects and maintains data for all nonradiological exposure records and medical records.

3.3.3 Radiological Exposure Records

The PNL collects and maintains data on occupational radiation exposure. This database contains respiratory personal protective equipment fitting records, work restrictions, and radiation exposure information.

3.3.4 Training Records

Training records for Westinghouse Hanford and subcontractor personnel are managed by the Westinghouse Hanford Technical Training Support Section. Other Hanford Site contractors (PNL and KEH) maintain their own personnel training records. Training records for non-Westinghouse personnel are entered into the Westinghouse (soft reporting) database to document compliance.

Training records include:

- Initial 40-h hazardous waste worker training
- Annual 8-h hazardous waste worker training update
- Hazardous waste generator training
- Hazardous waste site specific training
- Radiation safety training
- Cardiopulmonary resuscitation
- Scott air pack
- Fire extinguisher
- Noise control
- Mask fit.

3.3.5 Environmental Information/Administrative Record

Environmental information and the AR are managed by Westinghouse Hanford EDMC personnel. They provide an index and key information on all data transmitted to the EDMC. This database is used to assist in data retrieval and to produce index lists as required.

3.3.6 Sample Status Tracking

The OSM maintains the sample status tracking database. This database contains information about each sample. Information maintained includes sample number, ship date, receipt date, and laboratory identification.

4.0 ENVIRONMENTAL INFORMATION AND RECORDS MANAGEMENT PLAN

This section briefly discusses the EIMP (Michael et al. 1990) that was developed to provide an overview of an integrated approach to managing Hanford Site environmental data, and the *Environmental Restoration Remedial Action Program Records Management Plan* (WHC 1991b).

4.1 ENVIRONMENTAL INFORMATION MANAGEMENT PLAN

The EIMP provides an overview of how information is managed throughout the lifetime of Hanford Site environmental programs.

The Environmental Division of Westinghouse Hanford is responsible for the protection and improvement of the Hanford Site environment. To fulfill responsibility, the Environmental Division has assumed a management role with respect to Hanford Site environmental information. This management role includes (1) establishing standards for how data are validated and controlled, (2) developing and maintaining a supporting computer-based environment, and (3) sustaining a centralized file management system.

Hanford Site environmental information is defined as data related to the protection or improvement of the Hanford Site environment, including data required to satisfy environmental statutes, applicable DOE orders, or the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1990), (Tri-Party Agreement).

Environmental information falls into several overlapping categories, such as administrative versus technical and electronic versus manual or hard copy. A considerable amount of data are recorded in documents, which are governed by company-wide document and records control practices. Other data are collected or generated by computer and, therefore, exist in electronic form. The name ENCORE has been given to the combination of administrative, hardware, and software systems that serve to integrate the management of this electronic data.

Administrative information (e.g., budgets and schedules) is subject to accounting and other standard business practices. Scientific and technical data are subject to a different set of legal, classification, release, and engineering requirements.

Superimposed over these categories is the files management system for environmental information. This management system, has been developed to meet a number of Environmental Division needs, including requirements for compilation of AR files. The AR files are compilations of all material related to environmental restoration and remedial action records of decision (ROD) for each operable unit and treatment, storage, and disposal (TSD) group described in the Tri-Party Agreement.

Data in electronic form flows from information systems in the ENCORE realm to both scientific/technical and administrative documents. Environmental documents distributed within the Hanford Site and from regulatory agencies are received by the EDMC for storage and future processing.

Part I of the EIMP describes the overall Westinghouse Hanford systems that are generally applied to documents and records. Part I also describes, in greater detail, the files management system developed to manage the AR file information. The EDMC compiles the AR files and provides controlled distribution of specified information to the AR files held by DOE, Ecology, and the EPA. The EDMC also provides controlled distribution of specified community relations information to regional information repositories.

Part II addresses computer-based information, with an emphasis on scientific and technical data. The long-term nature of environmental programs and the complex interrelationships of environmental data require that the data be preserved, retrievable, traceable, and sufficient for future use. To ensure data availability for response to regulatory and agency requirements, the plan is directed toward optimizing the use of automated techniques for managing data. The current processing environment and the proposed ENCORE realm are described, and the plans for implementation of ENCORE are addressed.

4.2 ENVIRONMENTAL RESTORATION REMEDIAL ACTION PROGRAM RECORDS MANAGEMENT PLAN

The ERRA Program records management plan was developed to fulfill the requirements of the U.S. Department of Energy, Richland Operations Office (DOE/RL) *Environmental Restoration Field Office Management Plan* (FOMP) (DOE/RL 1989). The FOMP describes the plans, organization, and control systems to be used for management of the Hanford Site ERRA Program. The Westinghouse Hanford ERRA Program Office has developed this ERRA Program records management plan to fulfill the requirements of the FOMP. This records management plan will enable the program office to identify, control,

and maintain the quality assurance, decisional, or regulatory prescribed records generated and used in support of the ERRA Program.

The ERRA Program records management plan describes how the applicable records management requirements will be implemented for the ERRA Program. The plan also develops the criteria for identifying the appropriate requirements for each individual piece of information related to ERRA work activities.

This records management plan applies to all ERRA Program records and documents generated, used, or maintained in support of ERRA-funded work activities on the Hanford Site. The terms, information, documents, nonrecord material, records, record material, and QA records used throughout the ERRA records management plan are interpreted as ERRA information, ERRA documents, ERRA nonrecord material, ERRA records, ERRA record material, and ERRA QA records.

5.0 HANFORD ENVIRONMENTAL INFORMATION SYSTEM

5.1 OBJECTIVE

The Hanford Environmental Information System (HEIS) has been developed by PNL for Westinghouse Hanford as a primary resource for computerized storage, retrieval, and analysis of quality-assured technical data associated with Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) remedial investigation/ feasibility study (RI/FS) activities and RCRA Facility Investigation/Corrective Measures Study (RFI/CMS) activities being undertaken at the Hanford Site. The HEIS will provide a means of interactive access to data sets extracted from other databases relevant to implementation of the Tri-Party Agreement (Ecology et al. 1990). The HEIS will support graphics analysis, including a geographic information system. Implementation of HEIS will serve to ensure that data consistency, quality, traceability, and security are achieved through incorporation of all environmental data within a single controlled database.

The following is a list of data subjects proposed to be entered into HEIS:

- Geologic
- Geophysics
- Atmospheric
- Biotic
- Site characterization
- Soil gas

- Waste site information
- Surface monitoring
- Groundwater.

5.2 STATUS OF THE HANFORD ENVIRONMENTAL INFORMATION SYSTEM

The HEIS, a computerized database containing technical data and information used to support the Hanford environmental restoration (ER) activities, is operational. The data for the Hanford groundwater wells and groundwater samples is currently accessible via the Hanford Local Area Network (HLAN) to local users and to offsite users via a modem link to the HEIS database computer. Additional data, including geologic, biota, and other pertinent environmental sample results, are being entered into the HEIS database.

The *Hanford Environmental Information System (HEIS) User's Manual* (WHC 1990) was issued in October 1990. An operator manual is being prepared and is expected to be issued in 1992.

The HEIS geographic information system (GIS) will display detailed maps for the Hanford restoration sites including data from the HEIS database. Such spatially related data will be used to support analysis of waste site technical issues and restoration options. The combination of the HEIS for data and the GIS spatial displays offers some powerful tools for many users to analyze and collectively evaluate the environmental data from the ER and site-wide monitoring programs.

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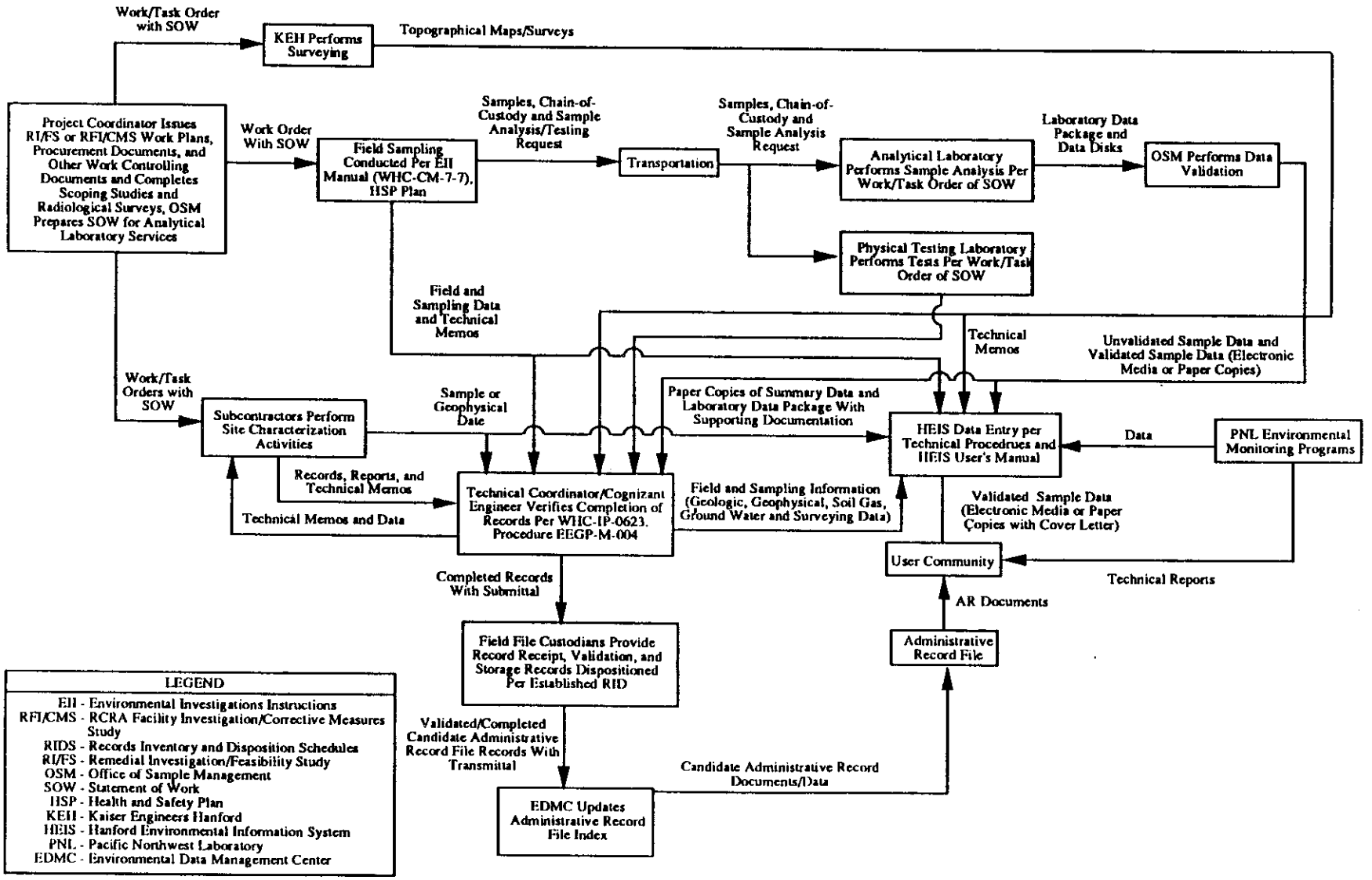

Figure D-1. Environmental Engineering, Technology and Permitting Data Management Model.

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Table D-1. Types of Related Administrative Data.

Type of Data	Controlling document/procedure	Record Custodians				
		TR	HEHF	PNL	EDMC	EHPSS
Personnel						
Personnel training and qualifications	EII 1.7[a/]	X				
Occupational exposure records (nonradiological)	EII 2.2[a/]		X			X
Radiological exposure records				X		
Respiratory protection fitting						X
Personnel health and safety records	EII 2.1[a/]		X			X
Compliance/regulatory						
Action-specific requirements/screening levels	EII 1.6[a/]				X	
Guidance document tracking	EII 1.6[a/]				X	
Compliance issues	EII 1.6[a/]				X	
Problem resolution	EII 1.6[a/]				X	
Administrative record	TPA-MP-11[b/]				X	

a/ WHC 1991a, *Environmental Investigations and Site Characterization Manual.*
b/ DOE/RL 1990, *Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Handbook.*
EDMC = Environmental Data Management Center (Westinghouse Hanford Company).
EHPSS = Environmental Health and Pesticide Services Section (Westinghouse Hanford Company).
EII = Environmental Investigations Instructions.
HEHF = Hanford Environmental Health Foundation.
TR = training records (Westinghouse Hanford Company, Pacific Northwest Laboratory [PNL], Kaiser Engineers Hanford [KEH]).

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