From: Xiaosong Yin
To: Keith Lockie
Date: 06/15/2006 8:29:02 AM
Subject: Additional information request

Keith,

Attached is a list of request NRC generated to follow up our 6/1/06 public meeting. In order to better complete our TER on INL TFF waste determination, your response is greatly appreciated. For your convenience, I have also attached the questions and the slides we presented in the meeting. If you have any questions, feel free to let me know.

Thanks,
Xiaosong

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Subject: Additional information request
Creation Date 06/15/2006 8:29:02 AM
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Return Notification:	None
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Security:	Standard

Follow-up Items from 6/1/06 Meeting with DOE on INL TFF Waste Determination

As committed by NRC staff at the conclusion of the 6/1/06 meeting, we are providing a list of follow-up items that require a response from DOE. Information requested is based on the questions provided to DOE for this meeting (see attached) as well as NRC's Request for Additional Information (RAI). The issue number from the list of attached questions is listed in blue after each information request along with the number of the slide that NRC presented in the meeting (if applicable).

1. Based on information provided in clarifying RAI #3 and as a follow-up to RAI #6, NRC requests the following information.

--DOE-ID should provide specifications or standards that will be imposed on the slag to ensure its suitability for cement blending and to ensure that it will release its content of reducing agents. Issue 3

--DOE-ID should provide additional justification regarding why the effect of stresses imposed by the large mass of grout and concrete to be emplaced in the tank and vault on the physical degradation of the concrete base mat can be neglected.

2. Based on information provided in response to RAIs #1 and #4, the following information is needed to determine if the uncertainty in the Np-237 inventory in the sand pad will have a significant impact on the modeling results and to help explain inconsistent modeling results for Sr-90 in response to RAI #4.

--DOE-ID should provide the Kds used for Np-237 in the screening analysis, since DOE did not perform additional modeling of release and transport of Np-237, although the uncertainty in the inventory of Np-237 was much greater than it was for other modeled constituents in response to RAI #4. Issue 4

--DOE-ID should explain the inconsistent and unexpected high sand pad inventory values for most of the low pH Kd sensitivity runs for Sr-90 contained within response to RAI #4. Issue 4

3. Based on new characterization data (ICP/EXT-04-00244) that show inconsistencies with DOE-IDs hydrogeologic conceptual model (HCM), NRC needs additional information to determine the implications of this new information on DOE-ID's modeling results. As a follow-up to information provided in response to RAIs 10, 11, 12, and 13, that addressed controlling hydrogeologic features and model support, NRC is requesting the following information:

--DOE-ID should provide the reference that contains a new west/east geologic cross-section B-B' that is illustrated in Figure 3-4 of "Evaluation of Tc-99 in Groundwater at INTEC: Summary of Phase I Results" (ICP/EXT-04-00244). The reference from ICP/EXT-04-00244 that contains this cross-section is "Phase 1 Monitoring Well and Tracer Study Report for Operable Unit 3-13, Group 4, Perched Water," DOE/ID-10967, Revision 1, 2003. DOE-ID did not provide the most recent geologic cross-sections for the study area in response to NRC RAI 12. Slide 7 and Issue 2

--DOE-ID should provide any additional reports documenting recent characterization activities related to the elevated Tc-99 monitoring well data that may provide additional information regarding the updated HCM for vadose zone flow at TFF. Slides 4, 7, and 8, and Issue 2

--DOE-ID should provide the approximate thickness and extent of perched zones in the final calibrated model in plan view along the cross-section, final calibrated heads at nearby monitoring well locations, and the hydrostratigraphic location of the top of the perched zones. Based on new information that shows the HCM for vadose zone flow at TFF has evolved based on collection of additional characterization data (ICP/EXT-04-0244), NRC needs additional information to determine the goodness of fit of the modeled versus observed heads, to determine the amount of dilution in the perched zones, and to estimate the magnitude of attenuation during lateral transport along the perched zone. Issue 2

--DOE-ID should provide center-line plume concentrations (as depicted in Figure 4-2 of the PA) as a function of time for modeled radionuclides at key locations in table format and a figure showing these locations. Locations should include the following grid cells: 1.) directly underneath the TFF in the perched water, 2.) near the "spillway" in the perched water, and 3.) in the saturated zone. DOE-ID revised the time of peak release for Tc-99 in Table 4-1 of the PA in response to RAI #13. The source of the error described in the RAI response is not clear. Furthermore, the travel time to saturated groundwater is difficult to determine with the use of scientific notation which truncates the year of maximum concentration in groundwater for Tc-99 (DOE-ID should provide the travel time in years). The information requested above is also needed to clarify to what extent Sr-90 concentrations are reduced due to attenuation in the 600 meters of lateral transport in the unsaturated zone, which cannot be determined easily from the currently available information. Slide 10 and Issue 2

--DOE-ID should provide a new figure that shows an accurate depiction of the locations of sedimentary interbeds as shown in Figure 4-2 in the PA (the location of the sedimentary interbeds depicted on this figure is not consistent with Figure 2-12 in the PA). Slide 13

--DOE-ID should try to provide a better explanation regarding the large lateral extent (0.5-1 mile) of the contaminant plume near-surface and as it enters the saturated zone. For example, is the large lateral extent near-surface indicative of perched water in the alluvium? DOE-ID should also explain why the contaminant plume is depicted at the surface of the model domain in Figure 4-2 of the PA when the tanks are located at approximately 45 feet below grade. Slide 11

Summary List of Major Issues for 6/1/2006 Telecon with DOE-ID
Draft 3116 Waste Determination

1. NRC has several questions regarding the nature and extent of current contamination in the subsurface at the TFF including the following:

    - the current level of Sr-90 and Tc-99 contamination in perched water and saturated groundwater from TFF sources
    - the potential impact of existing contamination on future contaminant transport due to competitive sorption and changes in geochemistry
    - the results of additional hydrogeologic characterization performed recently for the elevated Tc-99 in the saturated zone
    - the impact of current contamination on monitoring and the ability to detect future releases from the TFF
    - the use of recent characterization data to calibrate the PA model used for the waste determination

2. NRC has several questions regarding construction of the PORFLOW model including the following:

    - boundary conditions for the Big Lost River used in the final calibrated PA model
    - selection of the cross-section used in the modeling, i.e., vadose zone flow is expected to be in a more southeasterly direction from the Big Lost River
    - consideration of volcanic vents and dikes (Anderson and Liszewski)
    - consideration of the head gradient of perched water and mounding of water in perched zones
    - extent of perched zone (inconsistencies with the head targets in PORFLOW model vs. Rodriquez reference)
    - consideration of transient flow conditions
    - consideration of disturbed alluvium and historic Big Lost River channel deposits in the PORFLOW model
    - treatment of basaltic rubble zones in the PORFLOW model
    - the affect of grid discretization and treatment of fractures as porous material on unsaturated and saturated zone dispersion/dilution
    - head data for perched water in the final calibrated model (information on thickness of perched zone and layers where perched water exists is needed)
    - lateral transport to spillway in the absence of perched water
    - saturated zone thickness difference near TFF
    - NRC needs a higher resolution map of potentiometric surface near TFF
    - NRC would also like to get a copy of ICP/EXT-04-00244 and any other recent characterization data for the TFF (this report should have a west/east cross-section which wasn't provided in the RAI responses)

- NRC would like to get a copy of center-line plume concentration over time for all modeled constituents at key locations (perched water close to the TFF, at the spillway, and as it enters the saturated zone)

3. NRC has additional questions regarding grouting operations and slag specifications (see additional information on attached page).

4. NRC will have questions regarding the Kd selection and saturation levels for the sand pad inventory/release modeling and results of the analysis.

5. NRC will have questions regarding the flooding scenario.

6. NRC would like for DOE-ID to explicitly list all key radionuclides important to worker dose.

Additional Information for Issue #3

In the DOE response to the NRC Clarifying Request 3 (CH2M-WG Idaho, 2006; page CR-3-1), it was stated that slag will be added to the engineered grout placements and encapsulation grout pours and the first pour in the WM-185 and WM-187 vaults to ensure the establishment of a reduced environment and mitigate the release of electroactive radionuclides, such as Tc-99. The revised basic mix design also was listed.

Are there specific standards or specifications that will be imposed on the slag to ensure its suitability for cement blending and to ensure it is reactive and will release its content of reducing agents? Such specifications would include glass content, usually in excess of 80%, and also granulometry, particle size, or surface area. In addition, the sulfide sulfur content should be determined. Normally, blast furnace slag contains 0.7-1.1 wt% sulfur. If the sulfide sulfur falls below the lower limit, it might be necessary to conduct tests to ascertain reducing conditions would occur. Also, steps are needed to ensure the slag that is used in the mixture is fresh. Slag is perishable and, once ground, looses reactivity rapidly, within a few months, in storage. The mixture formulation provided in the DOE response suggests that the grout formulator intends to make the grout at the site. (The alternative is to intergrind the slag and cement at the cement plant and supply a preblend). If the grout formulator uses a silo for slag storage at the site, steps must be taken to ensure the slag used for mixing is still fresh and reactive.

Although there is uncertainty in the available literature data regarding the minimum slag content required to achieve reducing conditions, it seems the mixture formulation given in the DOE RAI response has just enough slag to achieve reducing conditions, but not enough for a good safety margin. It would be useful if results of laboratory tests are provided to demonstrate the mixture design given in the RAI response would result in reducing conditions.

NRC Meeting with DOE-ID on RAI responses for

Draft Section 3116 Waste Determination

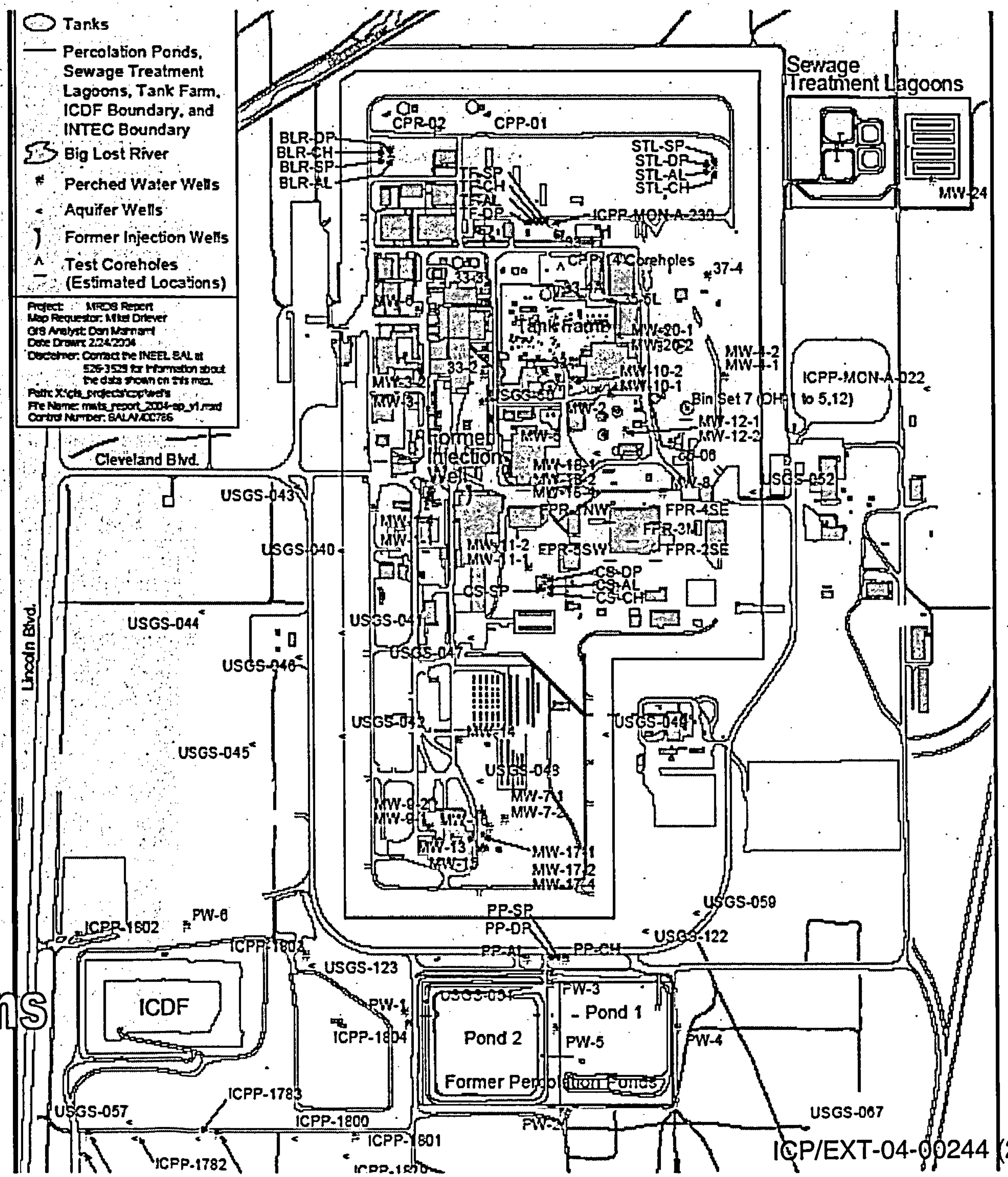
June 1, 2006

Hydrology

Existing Contamination and Additional Characterization

Related to Model Support, Future Flow and Transport, and Monitoring

Well Locations



ICP/EXT-04-00244 (2004)

Sr-90– Perched

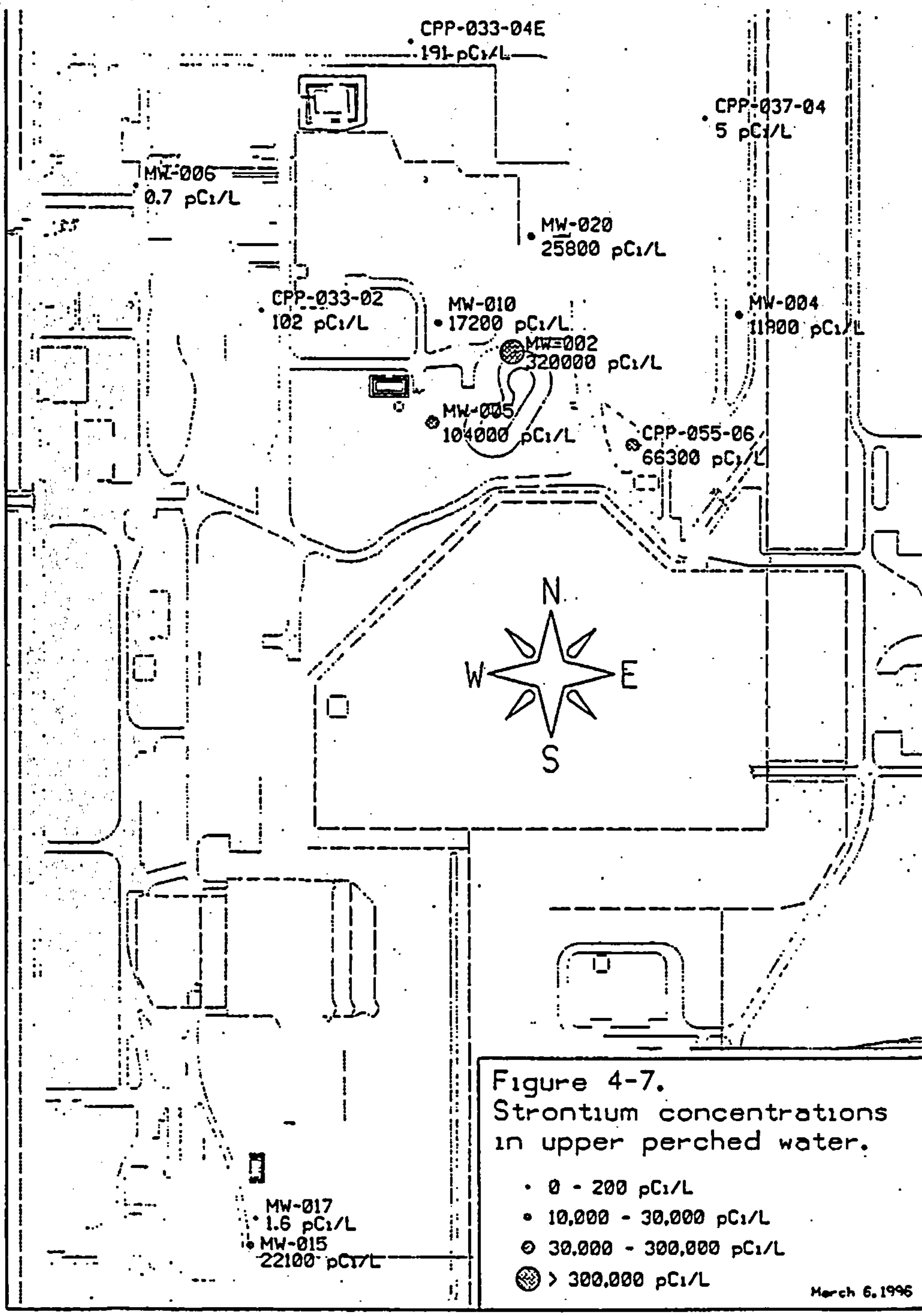


Figure 4-7. Sr-90 concentrations in the upper perched groundwater (May–June 1995).

Rodriguez et al, 1997

Tc-99 Perched

Rodriguez et al, 1997

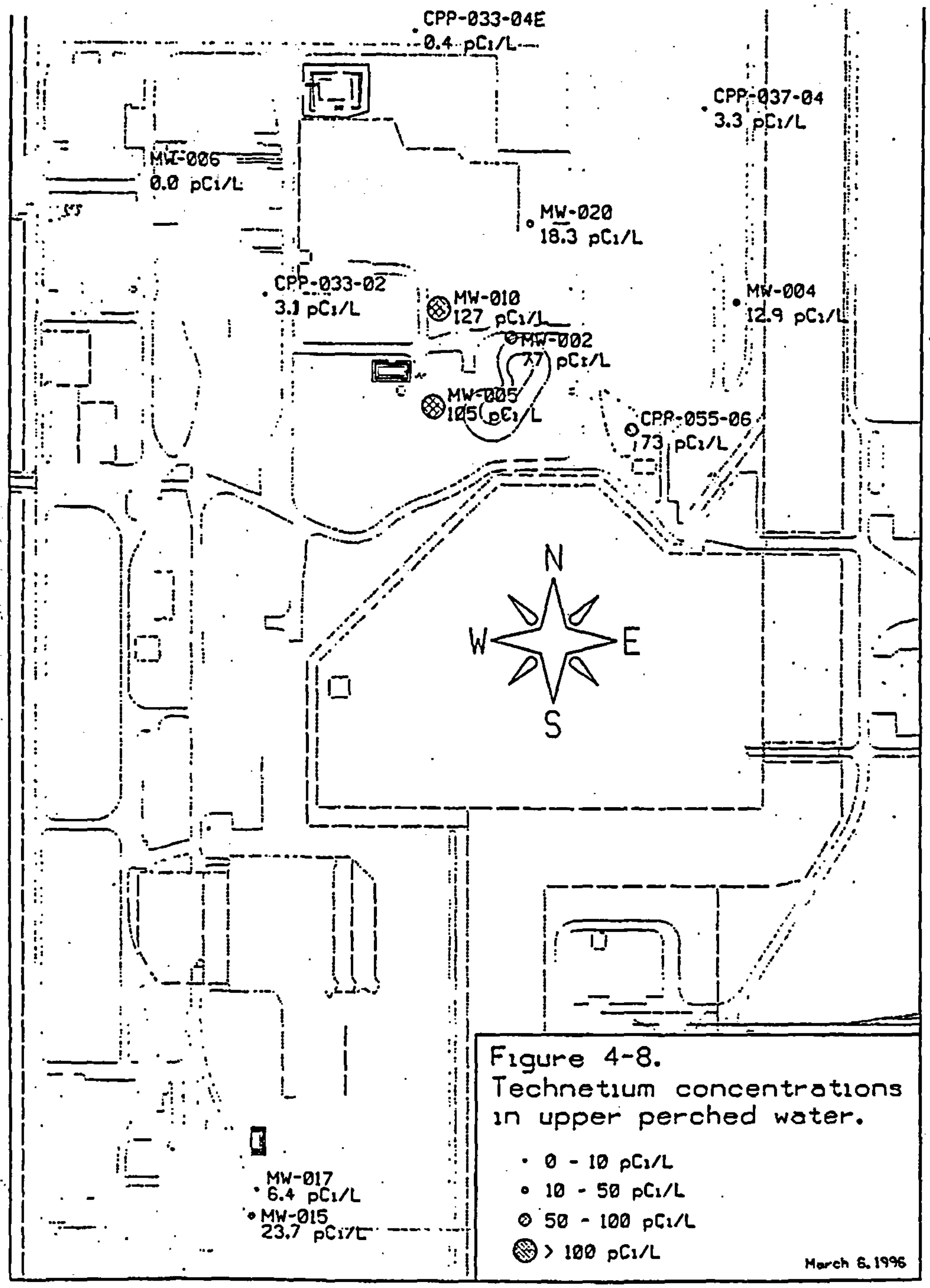


Figure 4-8. Tc-99 concentrations in the upper perched groundwater (May–June 1995).

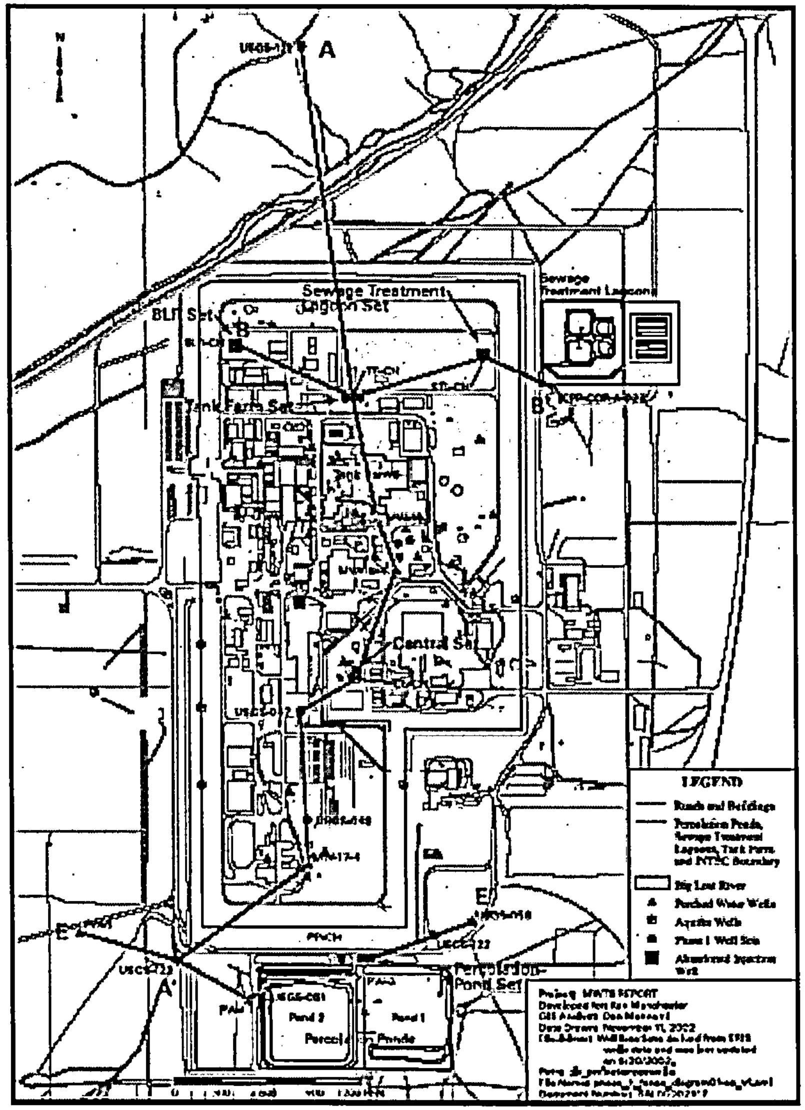
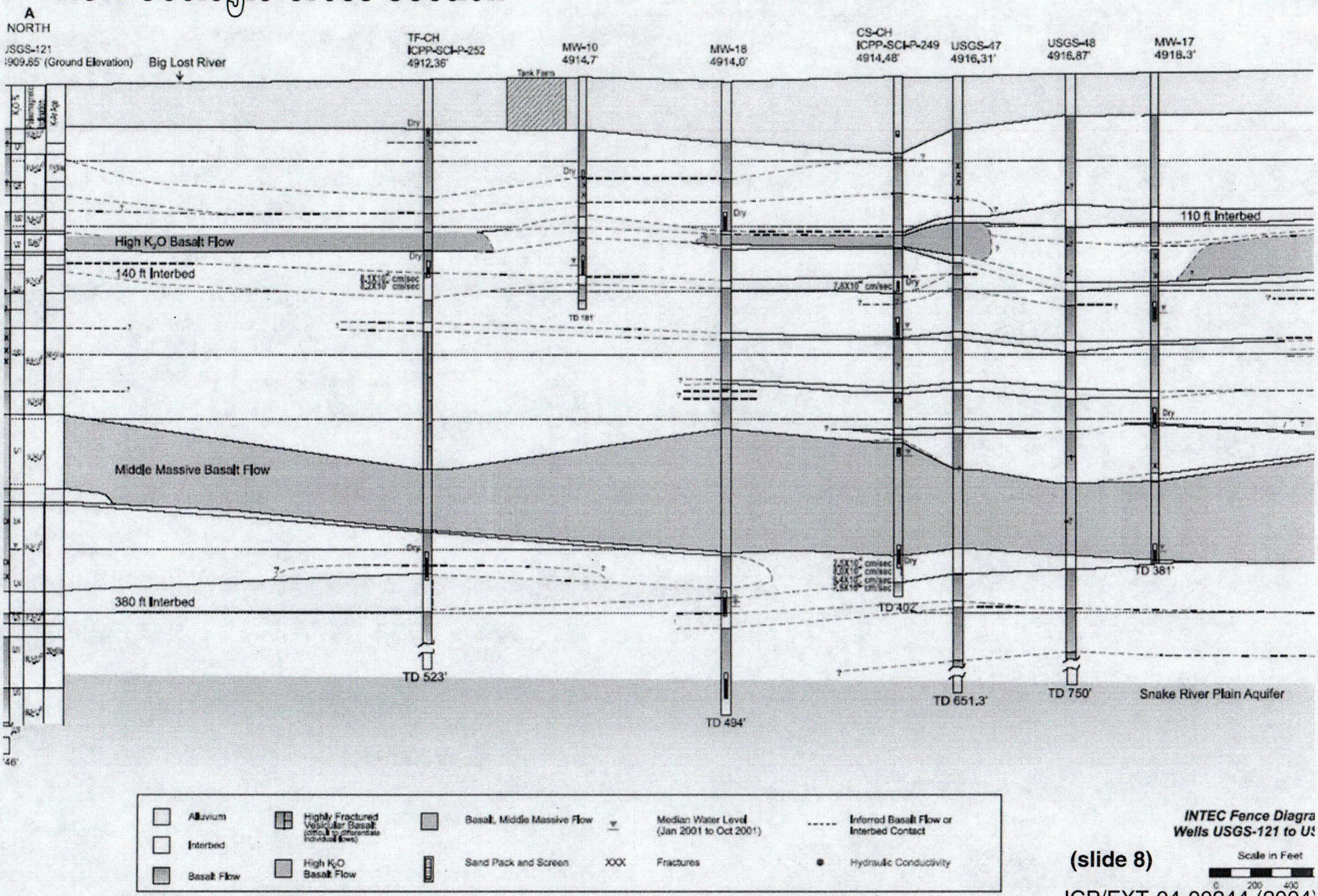


Figure 3-4. Cross section location map.

Recent Geologic Investigation

ICP/EXT-04-00244 (2004)

New Geologic Cross-Section



(slide 8)

ICP/EXT-04-00244 (2004)

Geologic cross section through Tank Farm Well Set and tank farm area.

PA Model and Calibration

How are contaminants transported in the model?

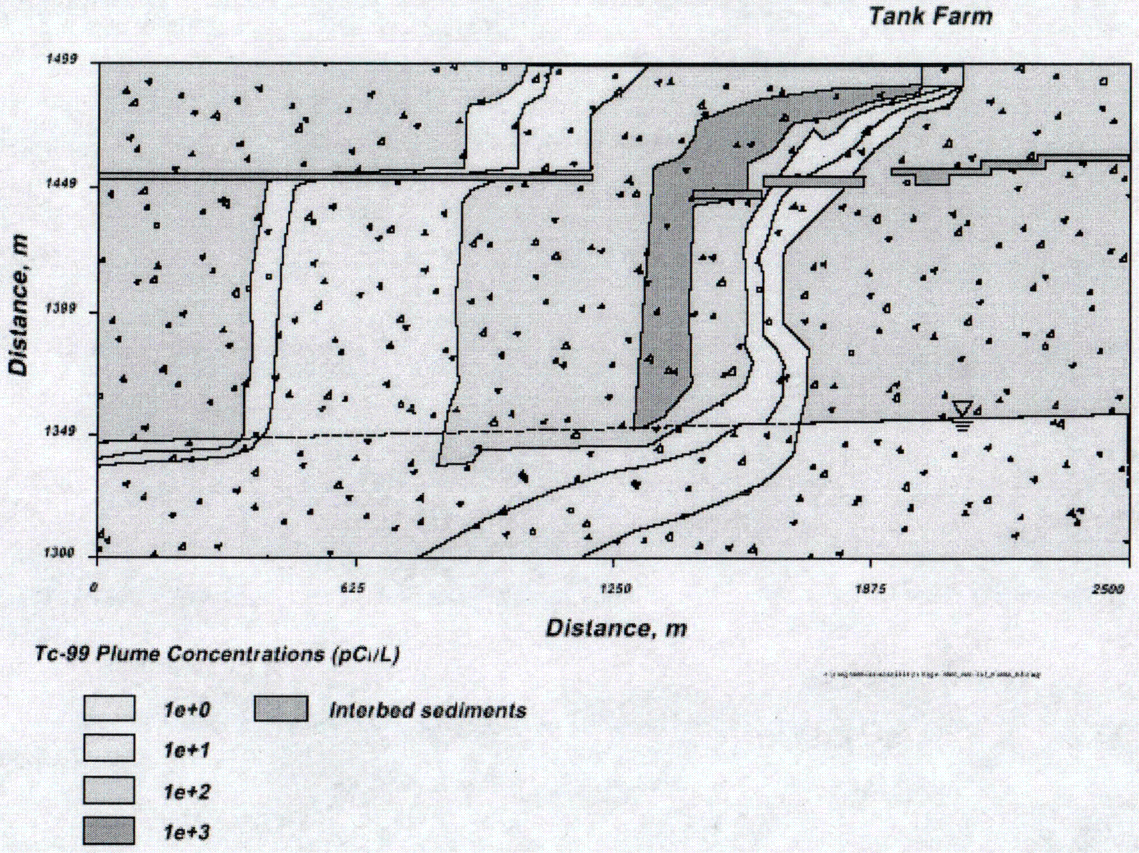


Figure 4-2. Groundwater modeling domain showing ^{99}Tc concentrations and location of maximum concentrations (all concentrations based on a unit source inventory).[ee]

PA Tc-99 Plume

DOE-ID-10966, Rev 1 (2003 PA)

Contaminant Flow and Transport

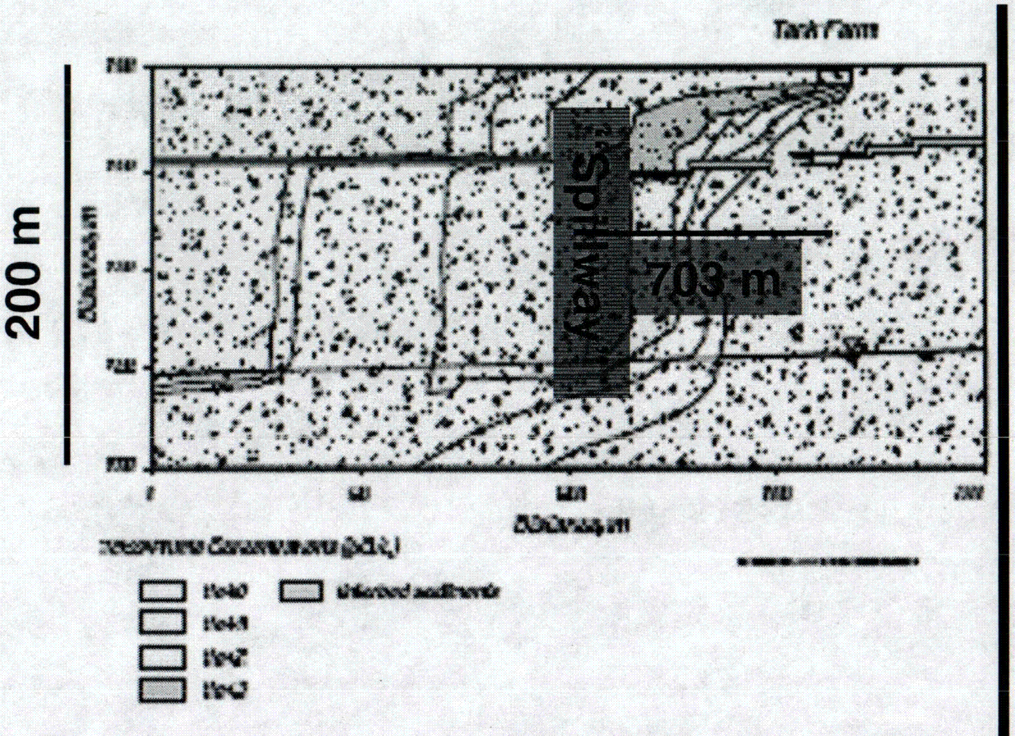
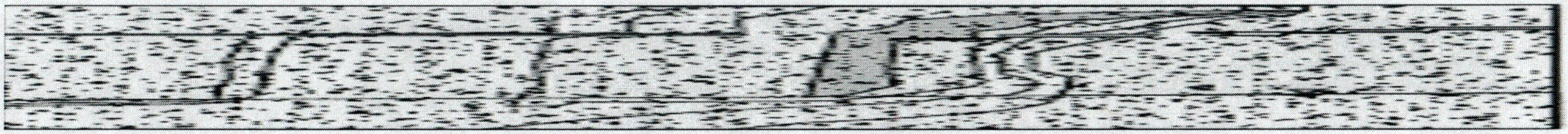


Figure 4-2. Groundwater modeling domain showing ^{99}Tc concentrations and location of maximum concentrations (all concentrations based on a unit source inventory).

TFF PA model showing geometry of Tc-99 plume with no vertical exaggeration



← 703 meters →

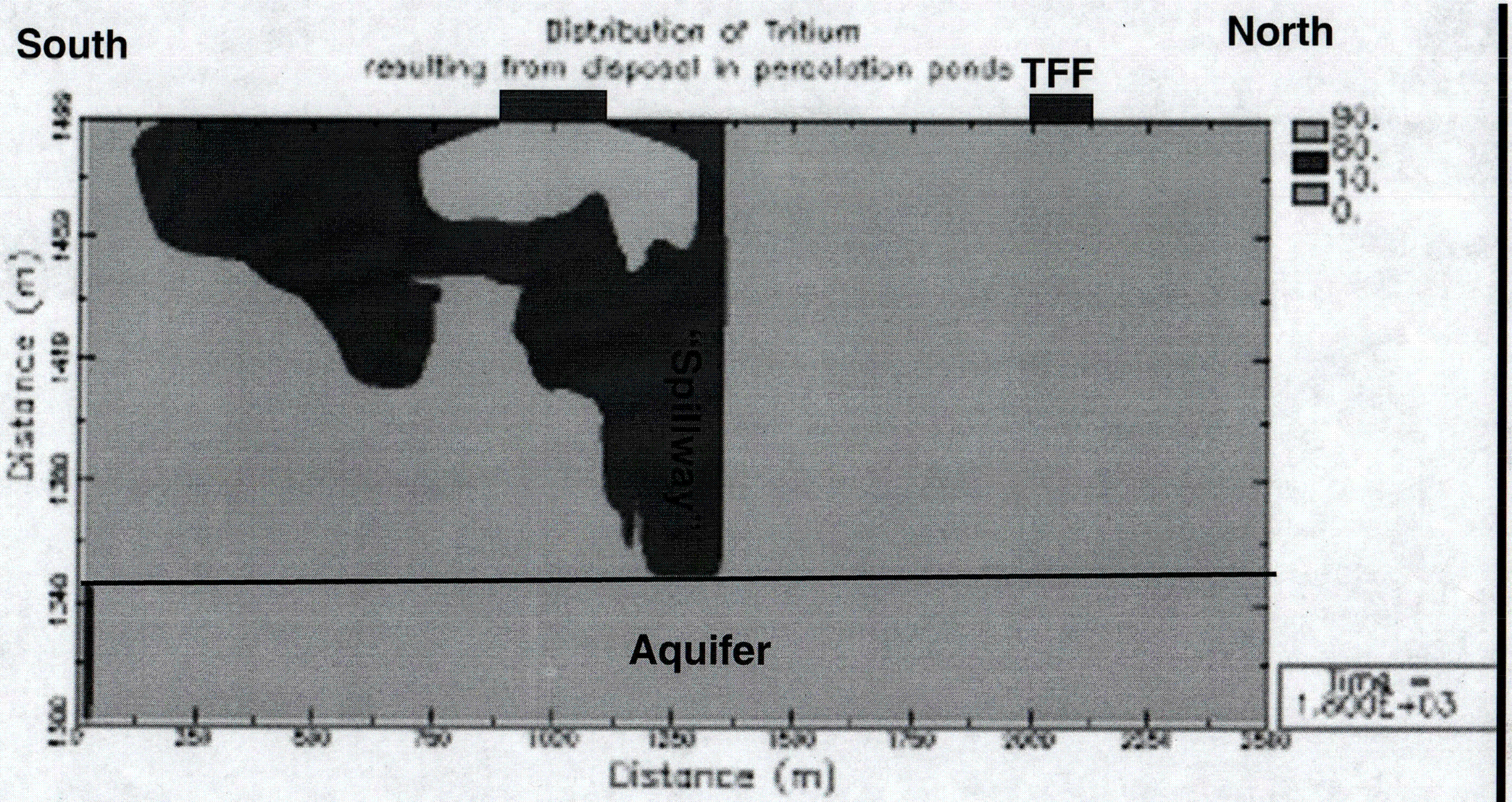
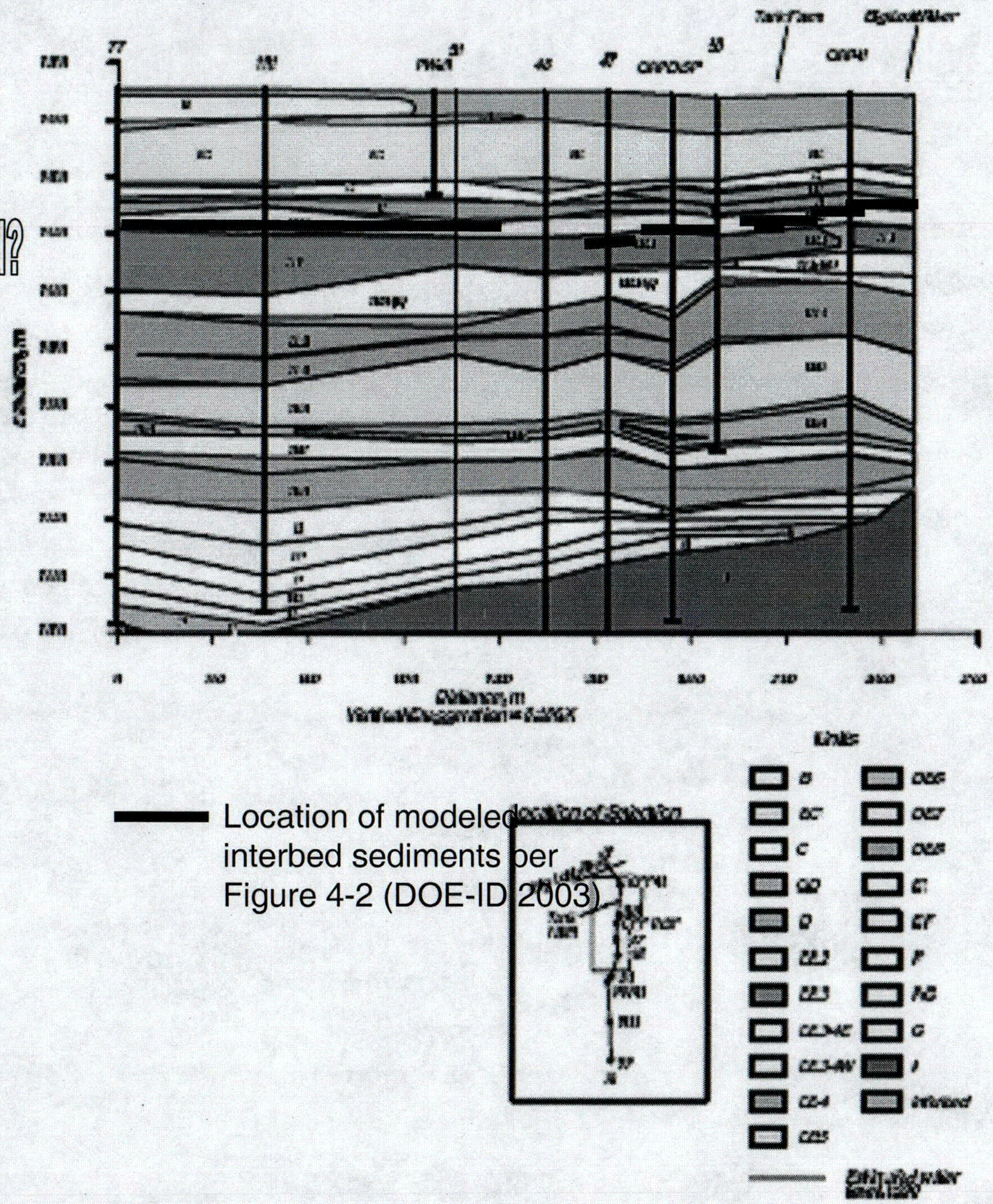


Figure 3-20. Distribution of tritium resulting from discharge into percolation ponds (units in pCi/mL).[ll]

Model Calibration

Location of Sedimentary Interbed?



Location of modeled interbed sediments per Figure 4-2 (DOE-ID 2003)

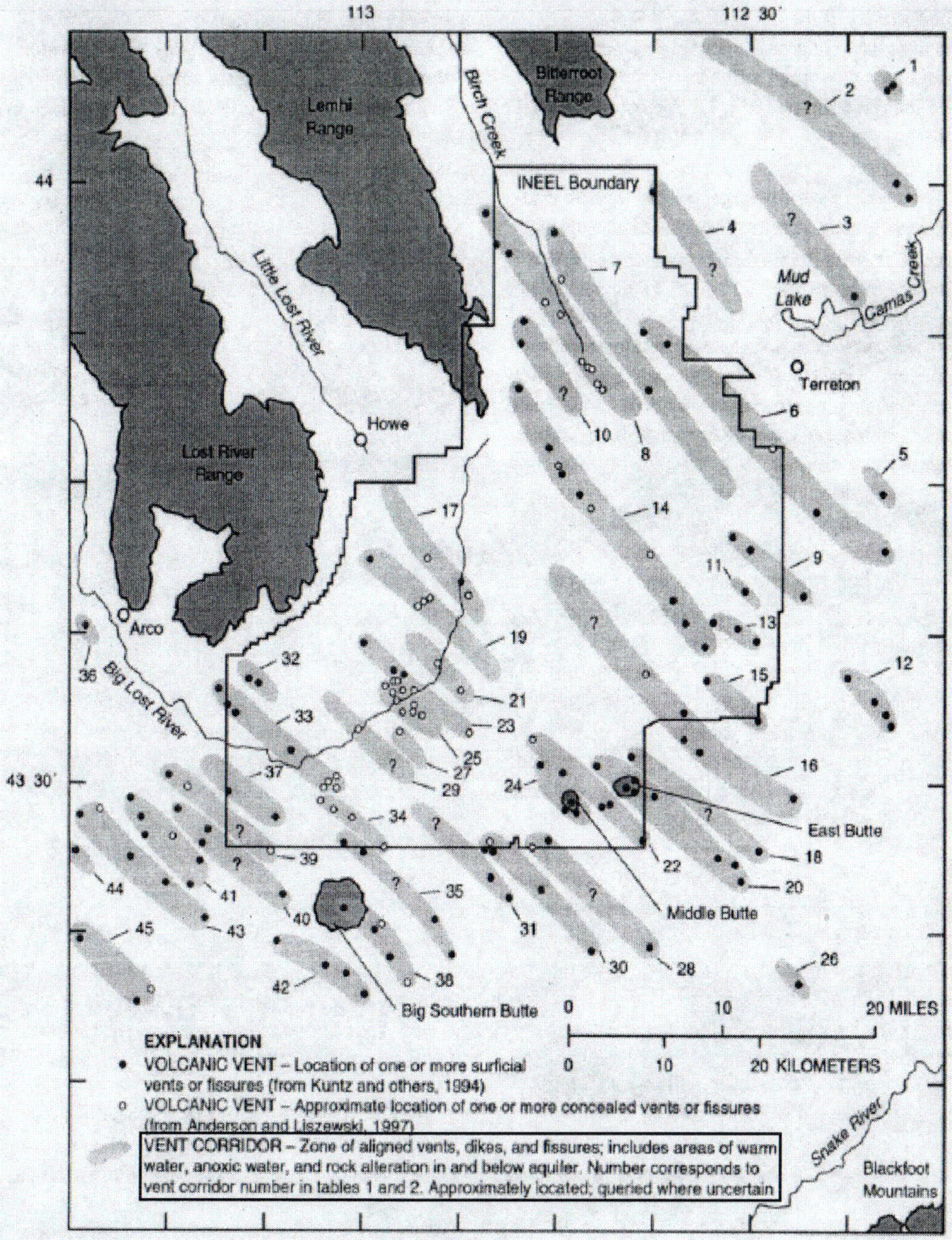
Figure 2-12. North-south geological cross-section.[bb]

Anderson, S.R. and M.J. Liszewski. Stratigraphy of the Unsaturated Zone and the Snake River Plain Aquifer At and Near the Idaho National Engineering Laboratory, Idaho. USGS WRIR 97-4183 (1997) http://www.osti.gov/bridge/

Geologic Features Affecting Hydraulic Properties

How do volcanic vents, dikes, and fissures affect contaminant flow and transport?

Volcanic Vent Corridors 23 and 25



Anderson et al. (1999)

Figure 7. Locations of volcanic vents and vent corridors at and near the Idaho National Engineering and Environmental Laboratory.

Volcanic Vents

Volcanic Vent Corridors 23 and 25

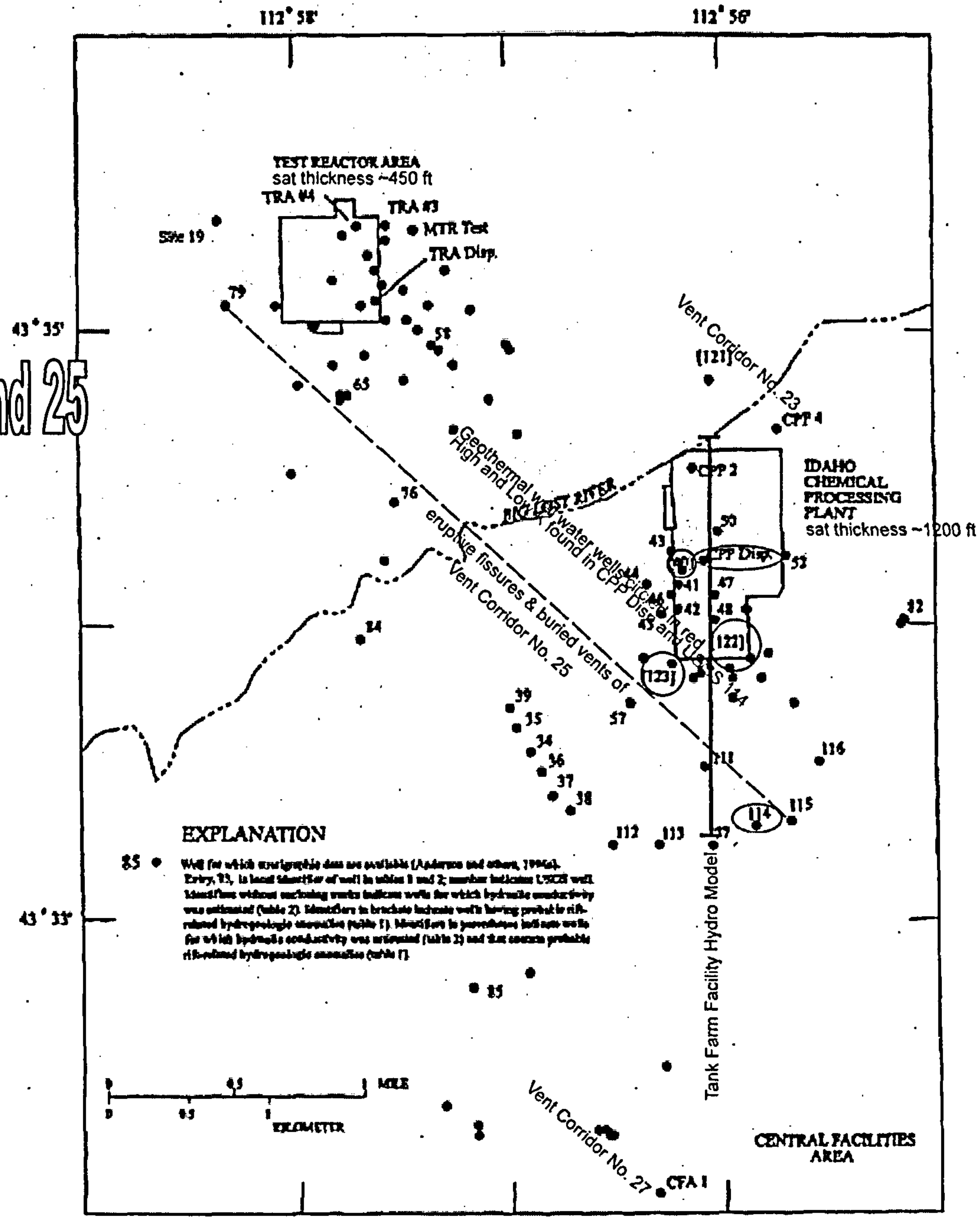


Figure 3. Locations of wells at and near the Idaho Chemical Processing Plant, Test Reactor Area, and Central Facilities Area for which stratigraphic data and estimates of hydraulic conductivity are available.

Anderson et al. (1999)

Volcanic Vent Corridors 23 and 25

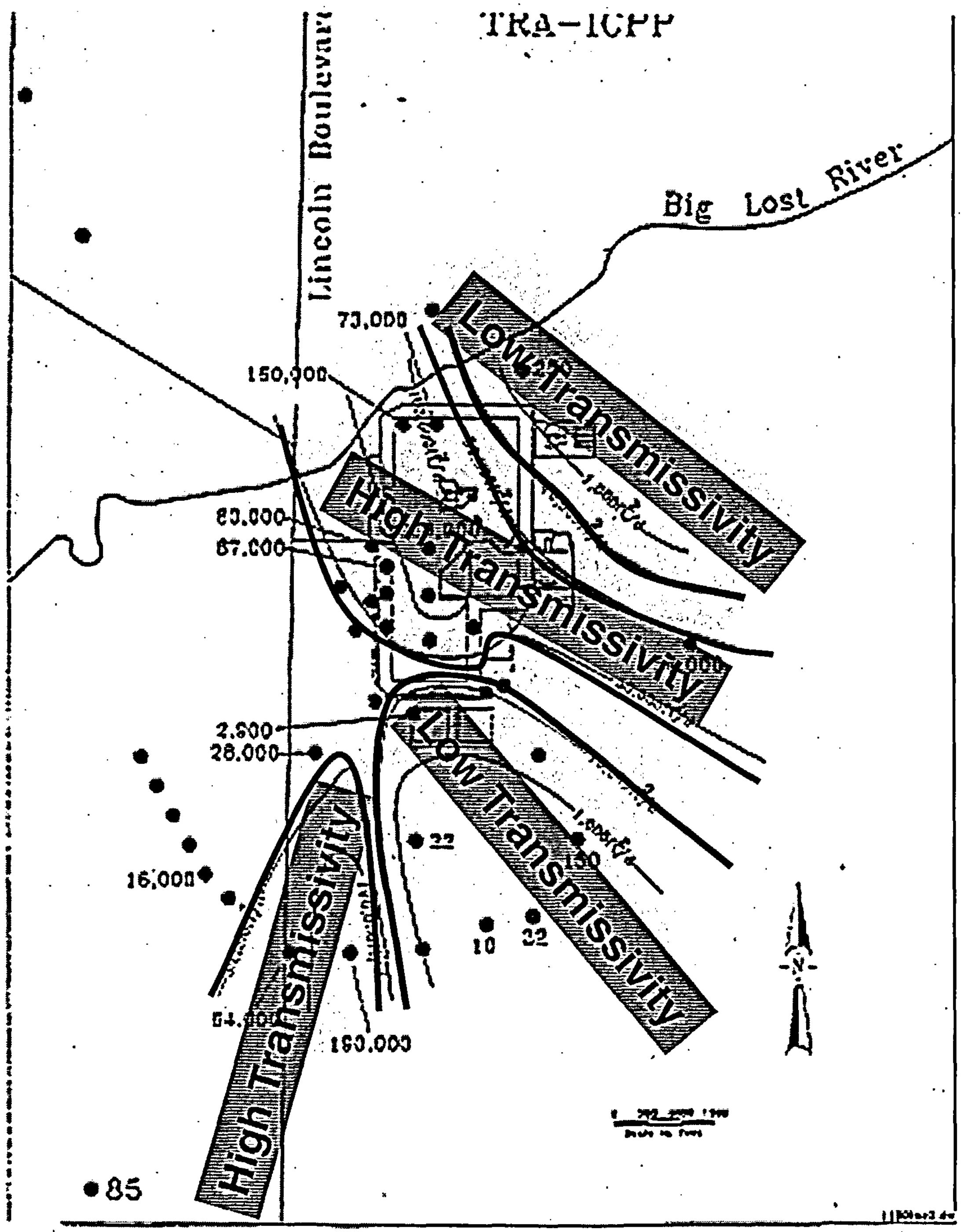


Figure 2-38. Plot of transmissivities in the SRPA near the ICPP.

Rodriguez et al, 1997 (with annotation)

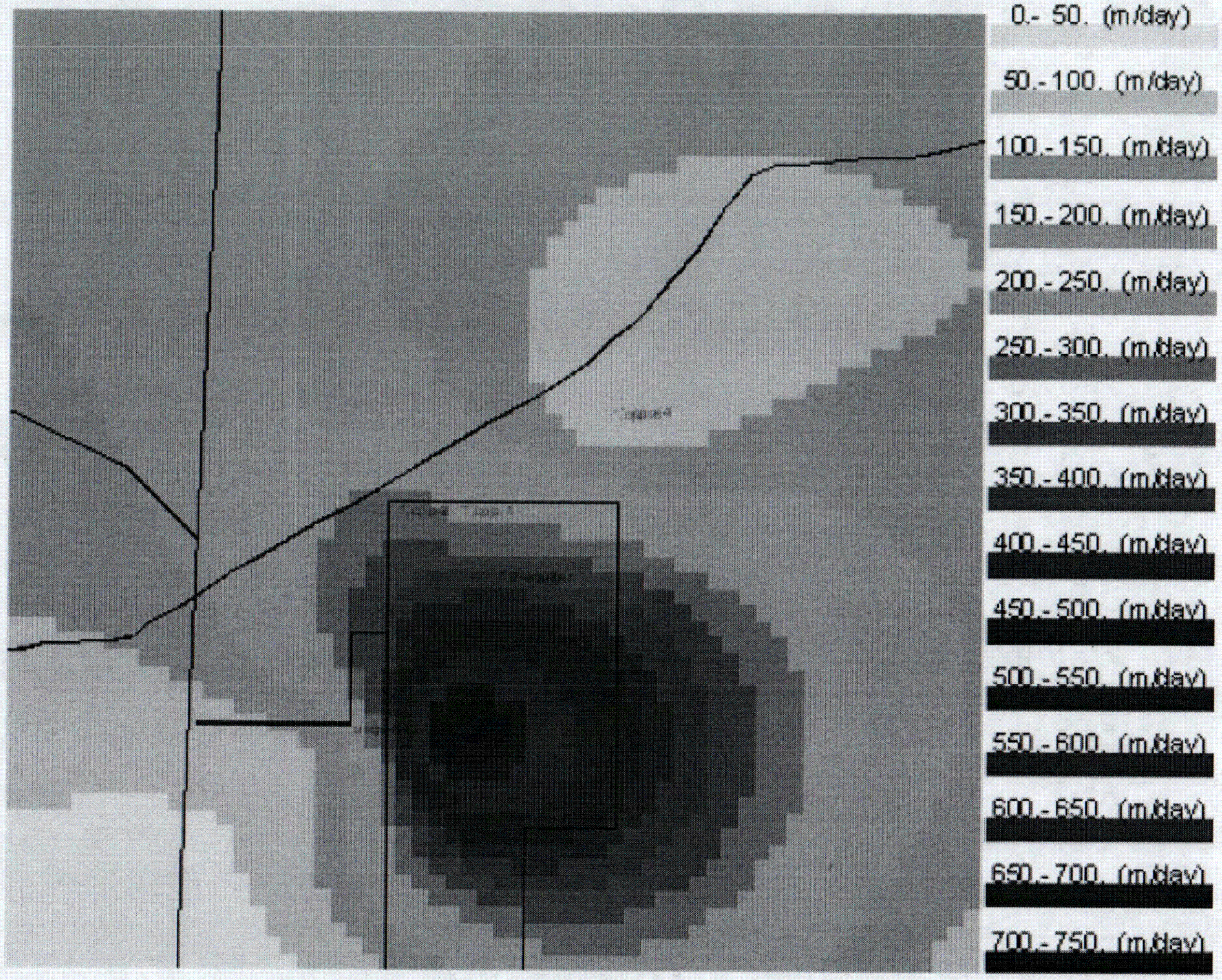


Figure F-4. Upper basalt hydraulic conductivity field.

Hydraulic Conductivity Field

Volcanic Vents 95, 111, and 112 (77?)

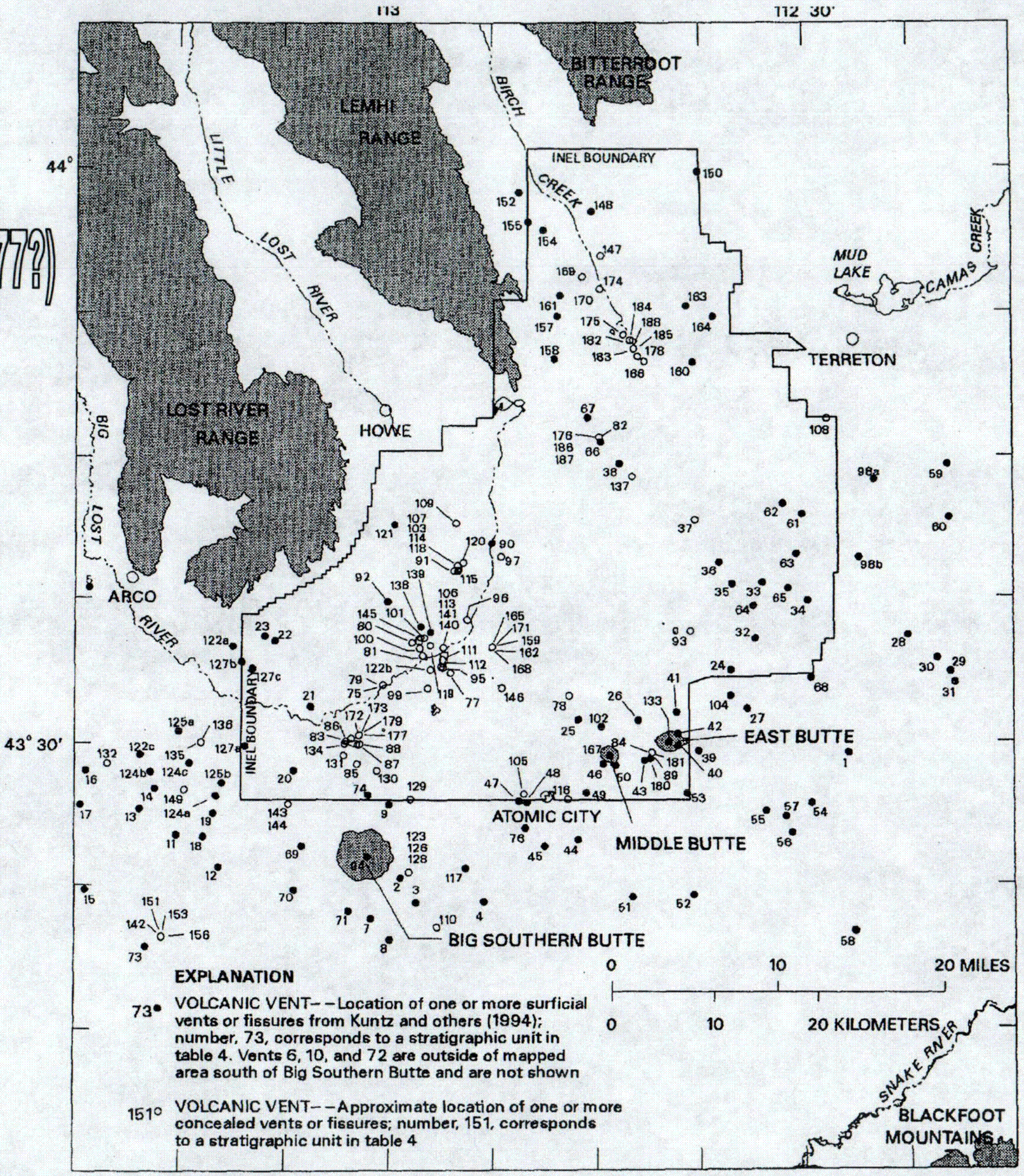


Figure 7. Locations of selected volcanic vents at and near the Idaho National Engineering Laboratory.

Anderson, S.R. and M.J. Liszewski. Stratigraphy of the Unsaturated Zone and the Snake River Plain Aquifer At and Near the Idaho National Engineering Laboratory, Idaho. USGS WRIR 97-4183 (1997)
http://www.osti.gov/bridge/

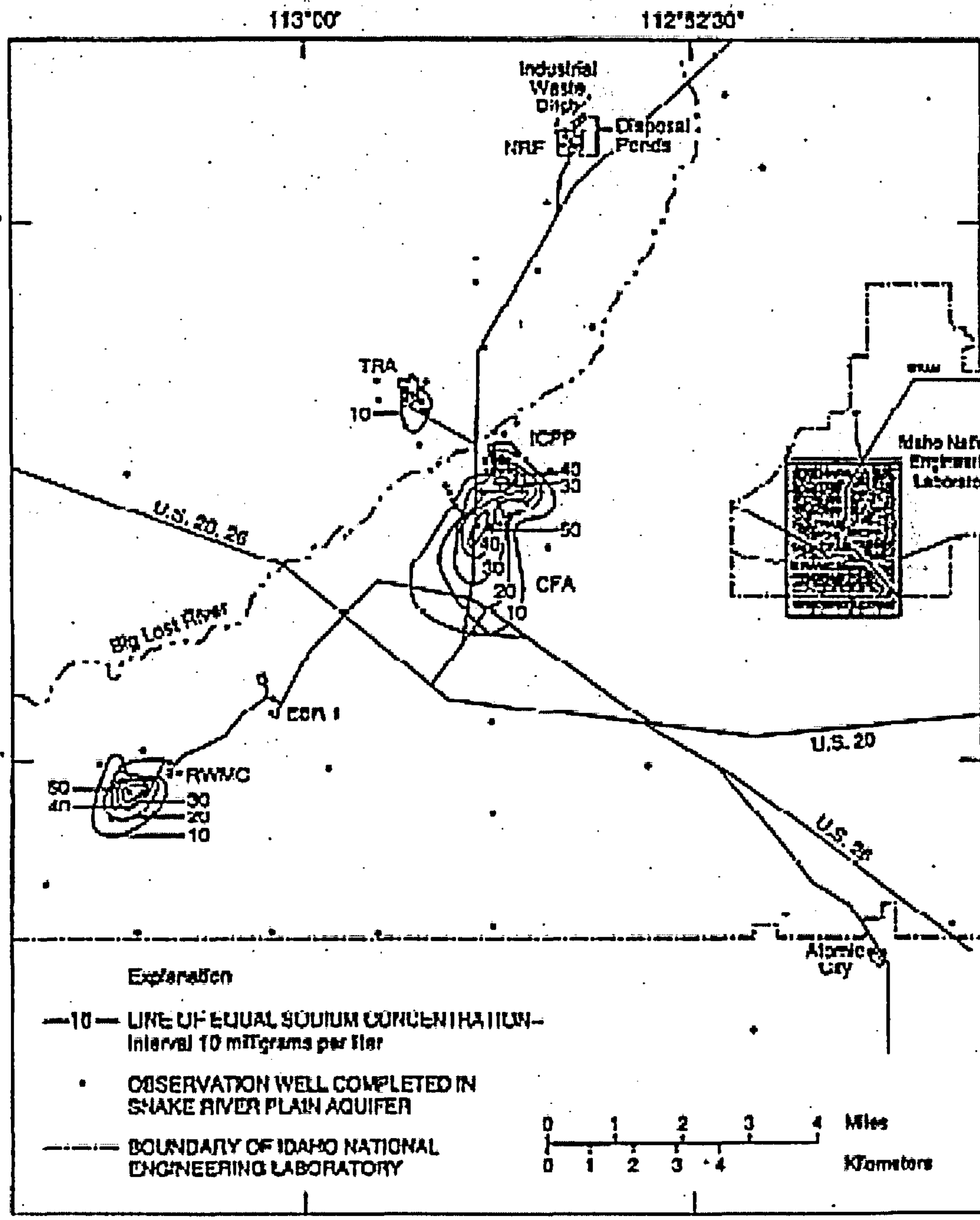


Figure 14.--Distribution of sodium in water from the Snake River Plain aquifer at the Idaho National Engineering Laboratory, October 1988.

Orr, B.R. and L.D. Cecil. Hydrologic Conditions and Distribution of Selected Chemical Constituents in Water, Snake River Plain Aquifer, INEL, Idaho. USGS WRIR 91-4047.

Orr, B.R. and L.D. Cecil. Hydrologic Conditions and Distribution of Selected Chemical Constituents in Water, Snake River Plain Aquifer, INEL, Idaho. USGS WRIR 91-4047.

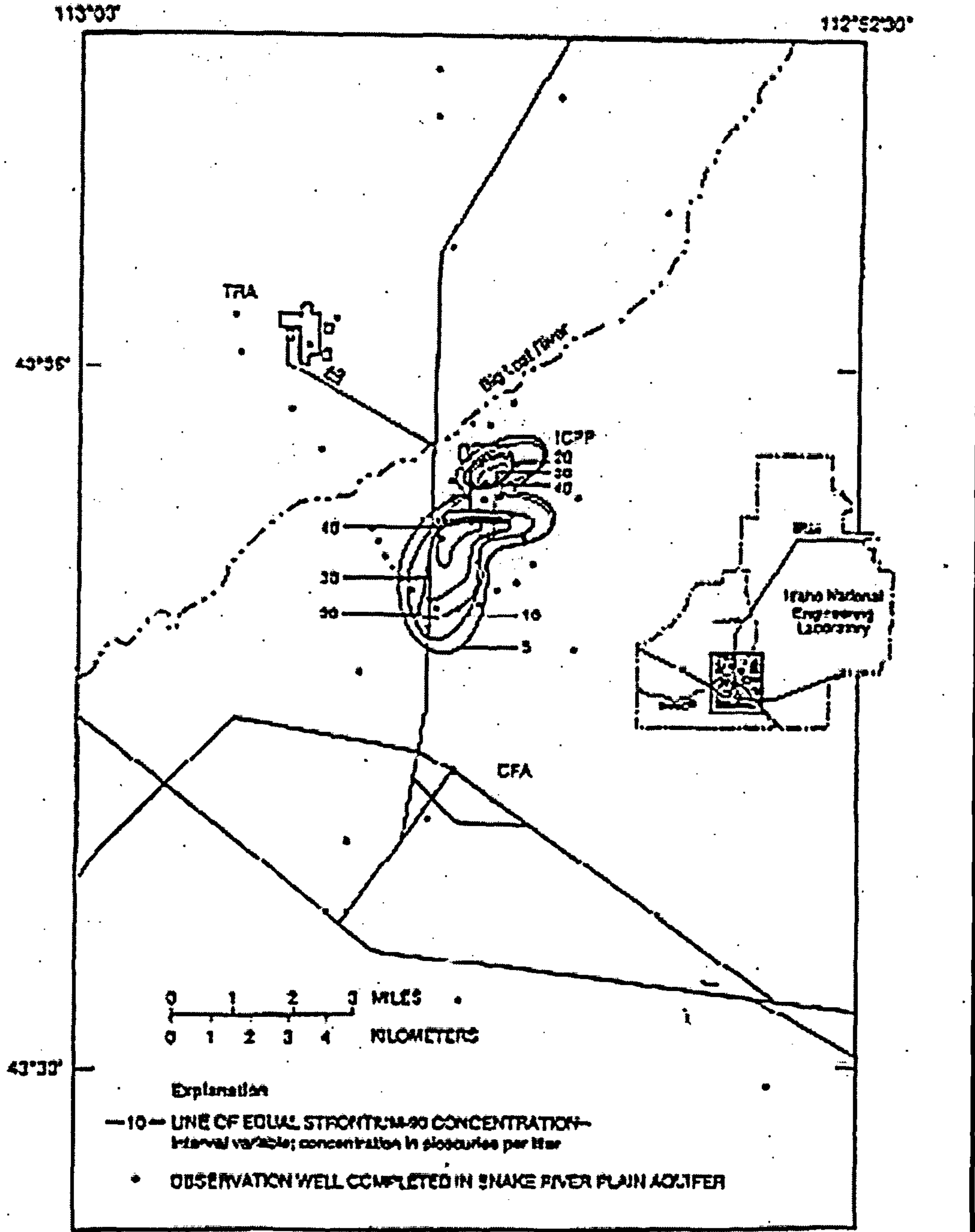


Figure 13.--Distribution of strontium-90 in water from the Snake River Plain aquifer at the Idaho National Engineering Laboratory, October 1988.

Boundary Conditions & Perched Water

How does the Big Lost River control flow and transport in the unsaturated zone?

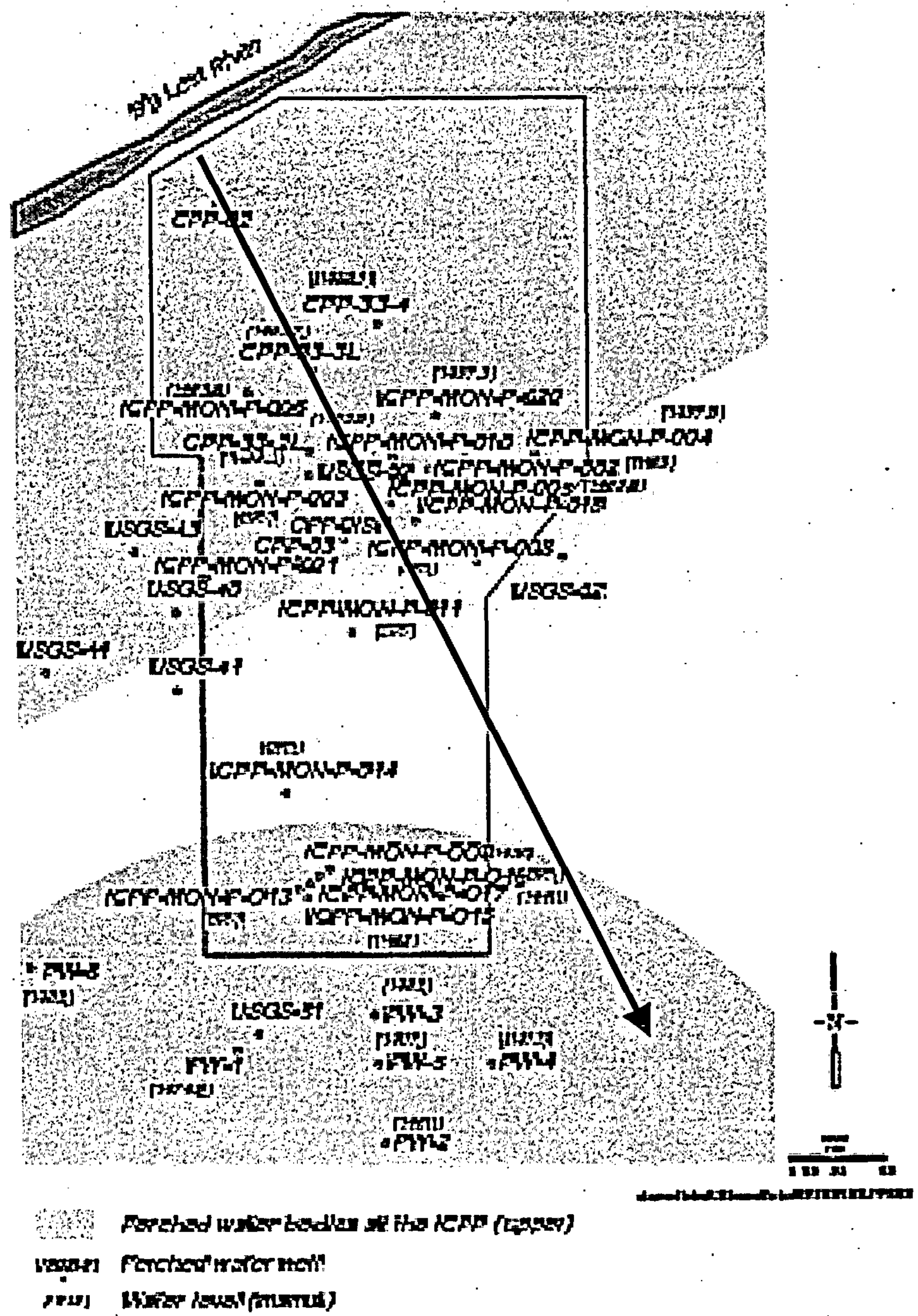


Figure 3-19. The extent of upper perched water at the INTEC facility based on perched water well data in Table 3-7.[m]

Rodriguez et al. 1997, INTEC CERCLA report

Extent of Upper Perched Zone

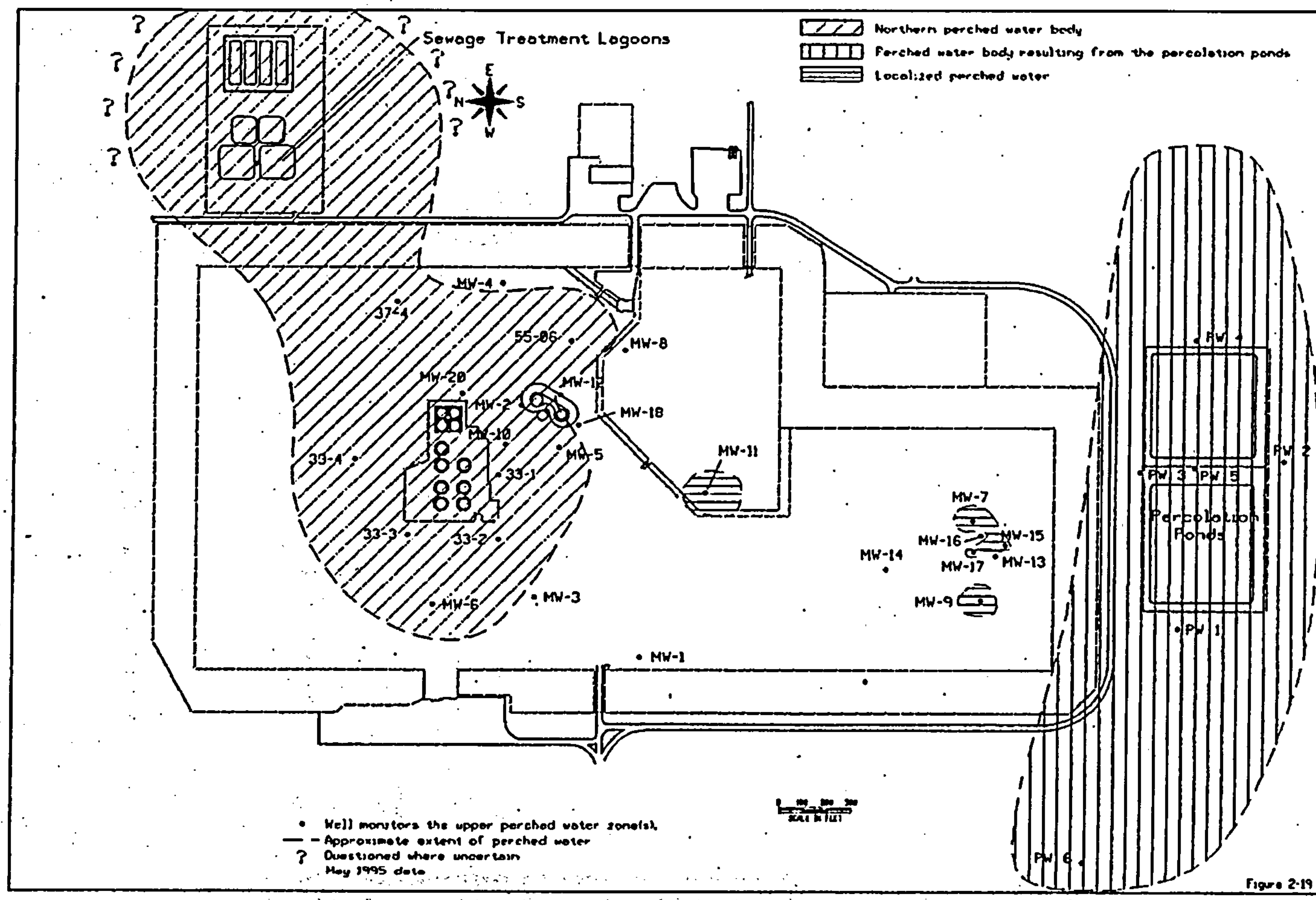


Figure 2-19. Approximate extent of the upper basalt perched water bodies at the ICPP.

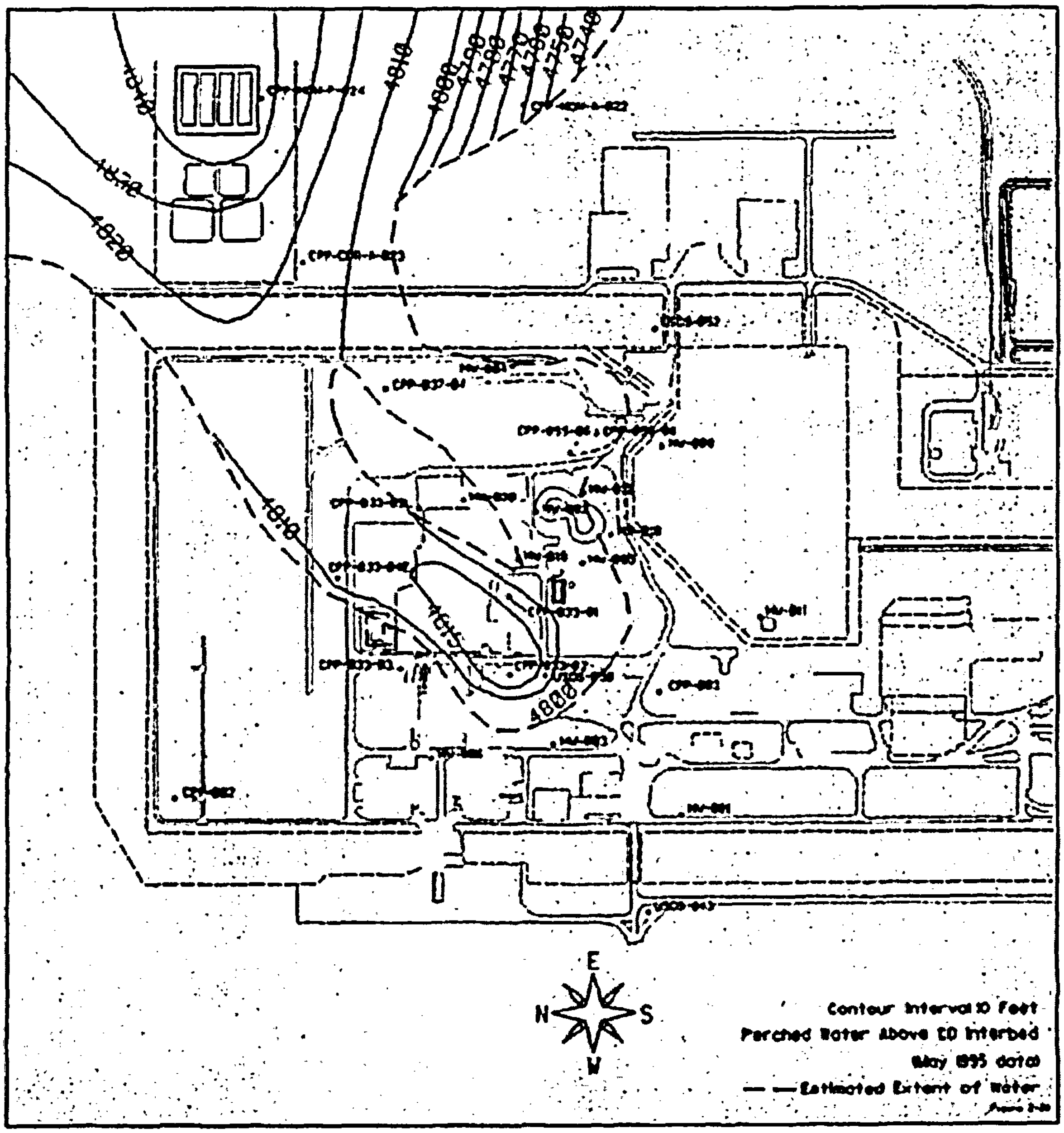


Figure 2-20. Elevation of water above the "CD" interbed in the northern ICPP.

Rodriguez et al, 1997

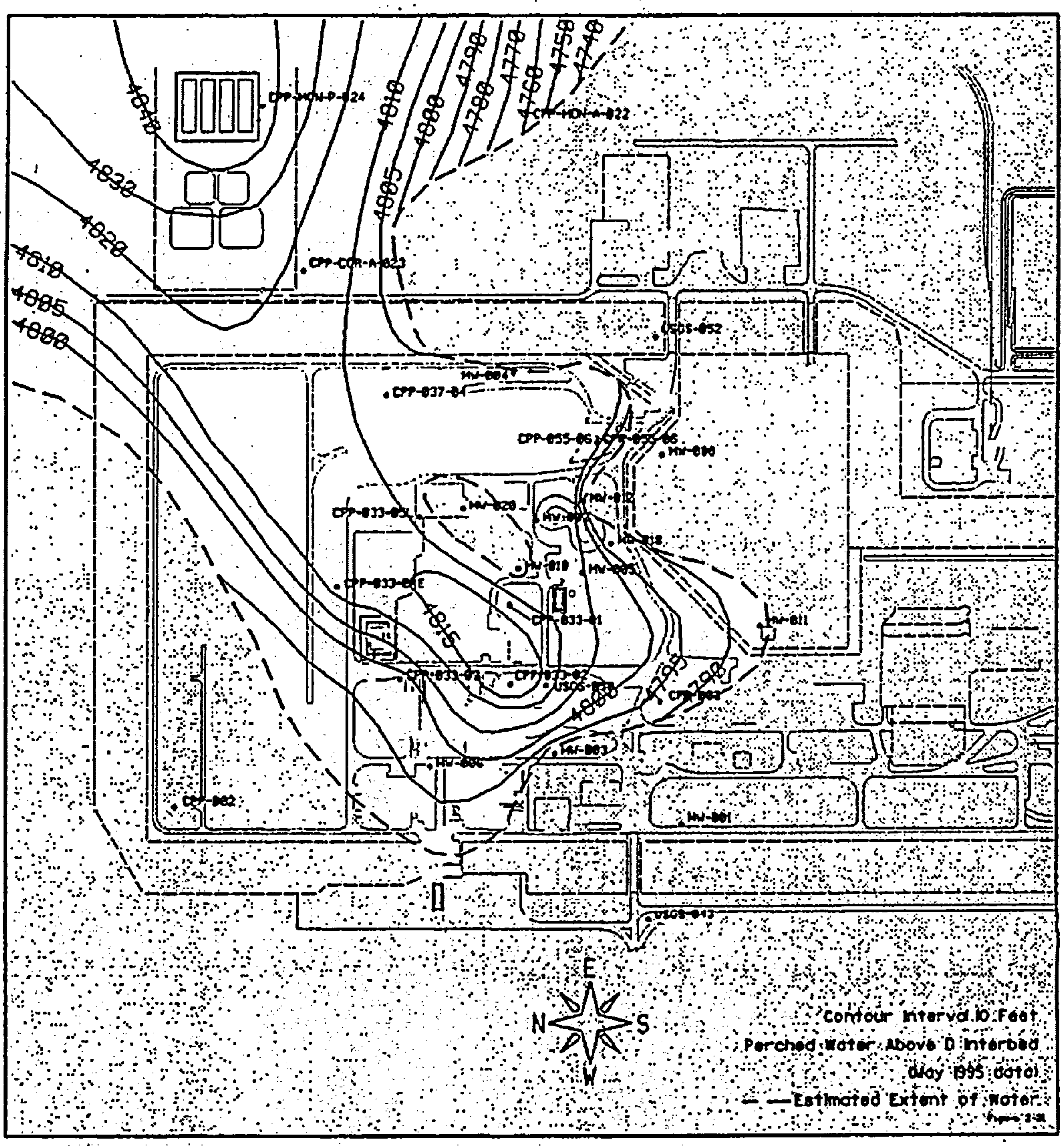


Figure 2-21. Elevation of water above the "D" interbed in the northern ICPP.

Water-levels

Lower Perched Zone Extent

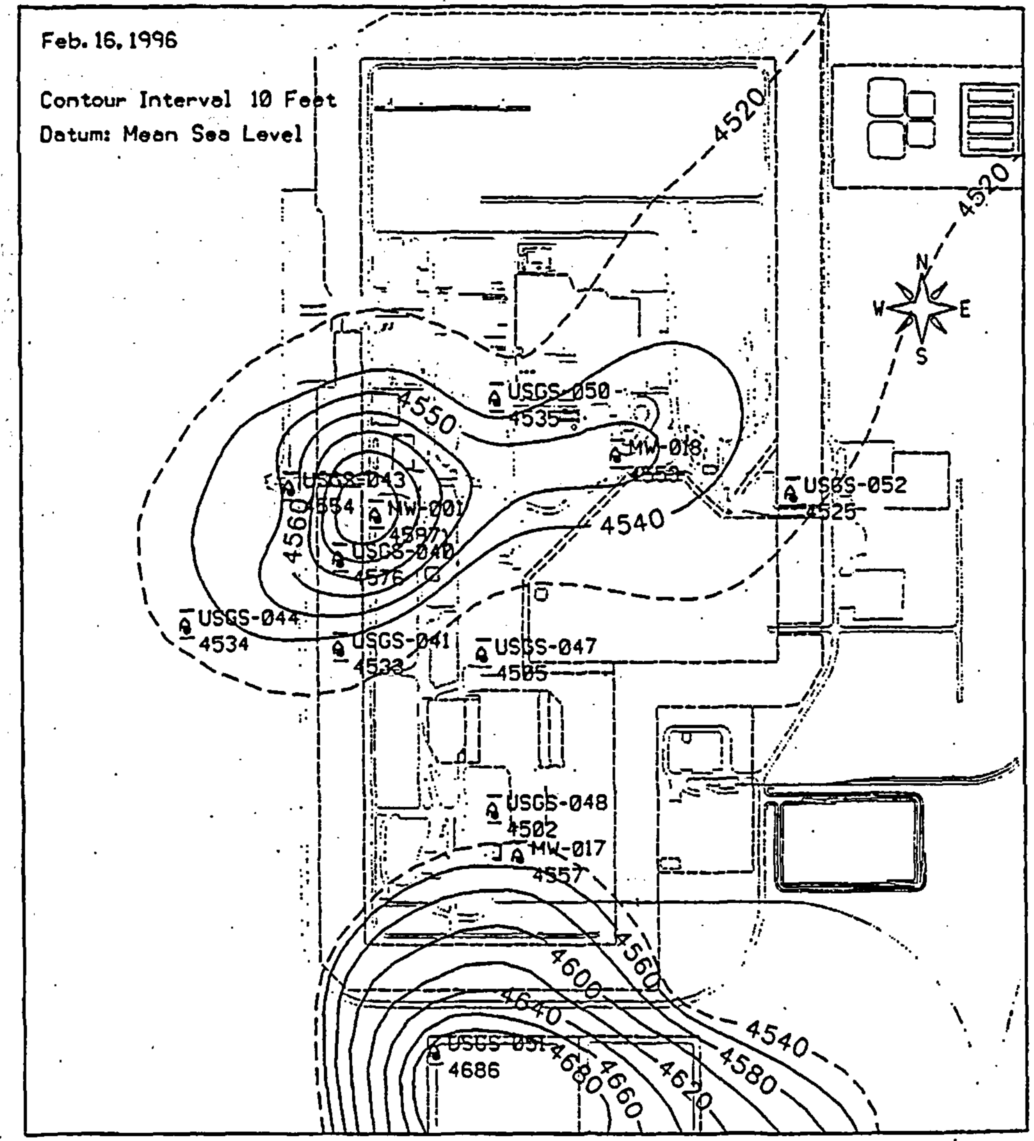


Figure 2-25. Approximate extent of the lower perched groundwater zone.

Rodriguez et al, 1997

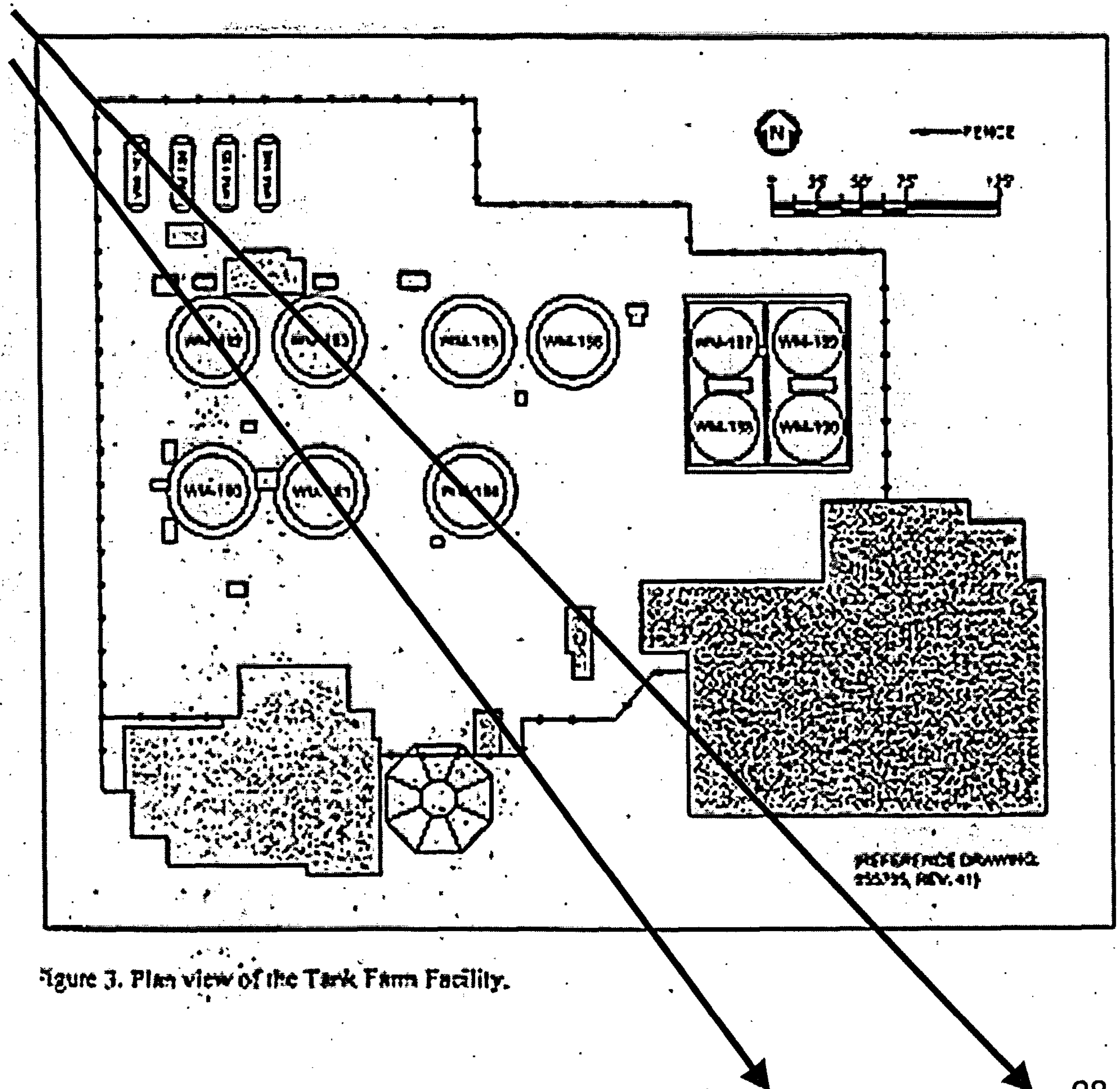


Figure 3. Plan view of the Tank Farm Facility.