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Updated Drainable Interstitial Liquid Volume Estimates for 119 Single-Shell Tanks Declared Stabilized

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Updated Drainable Interstitial Liquid Volume Estimates for 119 Single-Shell Tanks Declared Stabilized

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DIL	drainable interstitial liquid
DOE	U.S. Department of Energy
DST	double-shell tank
ft	feet
gal	gallons
gal/hr	gallons per hour
gal/in.	gallons per inch
gal/min	gallons per minute
ILL	interstitial liquid level
in.	inches
kgal	kilogallon
LOW	liquid observation well
N/A	not applicable
PLR	pumpable liquid remaining
SST	single-shell tank
vol	volume
%	percent

1.0 INTRODUCTION

1.1 SUMMARY

This document assesses the volume of drainable interstitial liquid (DIL) and pumpable liquid remaining in 119 single-shell tanks (SSTs) that were previously stabilized. Based on the methodology and assumptions presented, the DIL exceeded the stabilization criterion of less than 50,000 gal in two of the 119 SSTs. Tank 241-C-102 had an estimated DIL of 62,000 gal, and the estimated DIL for tank 241-BY-103 was 58,000 gal. In addition, tanks 241-BX-103, 241-T-102, and 241-T-112 appear to exceed the stabilization criterion of 5,000 gal supernatant. An assessment of the source of the supernatant in these tanks is beyond the scope of this document.

The actual DIL and pumpable liquid remaining volumes for each tank may vary significantly from estimated volumes as a result of specific tank waste characteristics that are not currently measured or defined. Further refinement to the pumpable liquid and DIL volume estimates may be needed as additional tank waste information is obtained.

1.2 BACKGROUND

Part of the legacy of the Hanford Site is the storage of radioactive waste in SSTs. Large volumes of radioactive waste were stored in 149 underground SSTs, constructed from 1943 to 1964; and 28 underground double-shell tanks (DSTs), constructed from 1968 to 1980. To limit the number of new DSTs that had to be constructed to store liquid radioactive waste, the U.S. Department of Energy (DOE) authorized the concentration of waste liquids until the soluble salts were precipitated. These precipitated salts were allowed to settle in the SSTs. Free supernatants were pumped from most of the SSTs by 1980 and were concentrated and stored in DSTs. No new waste additions were made to the SSTs after 1980, but the tanks have exceeded their design life and leakage from 67 SSTs is assumed or has been confirmed (Vladimiroff et al. 1999).

To reduce the potential of further SST leakage, liquid was removed from the SSTs, and the tanks were interim stabilized. As of November 1, 1999, of the 149 SSTs at the Hanford Site, 119 SSTs have been declared interim stabilized, and 30 tanks remain to be interim stabilized. Tank 241-C-106 is expected to be declared interim stabilized as a result of sluicing. A Consent Decree between the DOE and Washington State establishes the requirements for stabilizing the remaining 29 tanks. The Consent Decree requires that all tanks be interim stabilized by September 30, 2004. The criteria to stabilize a tank are that the tank must contain less than 50,000 gal of DIL, less than 5,000 gal of supernatant, and the pump flow must be at 0.05 gal/min or less before pumping can be discontinued (Vladimiroff et al. 1999). If a tank was supernatant pumped or if a jet pump fails before the pump flow rate decreases to less than 0.05 gal/min, the tank can be declared stabilized if less than 50,000 gal of DIL and less than 5,000 gal of supernatant remain.

1.3 SCOPE

To maintain consistency in the methodology used to determine a tank meets the interim stabilization criteria, and to ensure all SSTs are adequately interim stabilized, the methodology presented by Field and Vladimiroff (1999) was applied to the 119 SSTs previously stabilized and the DIL and "pumpable liquid remaining" volumes were recalculated. This document presents the basis for revised DIL and pumpable liquid remaining estimates and calculation results for the 119 tanks previously stabilized to assess whether the liquid volume in any of the tanks exceeds 50,000 gal of DIL. Additional detail regarding calculations and methodology is included in Field and Vladimiroff (1999).

1.4 CATASTROPHIC LEAKERS

Seven of the 119 SSTs have had known catastrophic leaks (Nelson and Ohl 1999), but do not have a liquid observation well (LOW) installed. These tanks are: 241-A-105, 241-BX-102, 241-SX-110, 241-SX-113, 241-SX-115, 241-T-106, and 241-U-104. Nelson and Ohl (1999) define a catastrophic failure as a leak of 50,000 gal or more or leak rates greater than 10 gal/hr. Two other tanks, 241-SX-108 and 241-SX-109, have also been shown to have significant leakage based on increased radioactivity in tank laterals.

An assessment of tank 241-SX-109 (Thompson 1999) concluded that, "although the tank definitely leaked in the past, it is improbable that there is liquid which could leak from the tank at this time." The report further states, "assuming a realistic percentage of liquid in the tank below the level sampled, a leak at 10% of the estimated rate of leaks from typical tank leaks would have emptied any accessible drainable liquid in the 58 inches below the sampled depth before 1990."

Applying the criteria of Thompson (1999), it was assumed that any drainable liquid previously contained in tanks designated as catastrophic leakers, and in tanks 241-SX-108 and 241-SX-109, has leaked from the tank. Therefore, the interstitial liquid level for these nine tanks was assumed to be negligible, and the DIL was assumed to be "0."

2.0 INTERIM STABILIZATION METHODS

In the past, SSTs were interim stabilized by one of three methods: jet pumping, supernatant pumping, or administrative stabilization. Each of these methods is discussed in the following sections.

2.1 JET PUMPING

Jet pumping has been used to stabilize 40 of the 119 SSTs, and is the method that has been selected to stabilize the remaining 29 SSTs.

A central screened well is installed in the center of the tank, and a specially designed jet pump is installed in the well. The pump removes liquid from the central well at the fastest rate possible, which is the same rate that it drains to the well. After enough liquid is removed, the excess potential is reduced to the point where inflow into the well is reduced to less than 0.05 gal/min. The pump rate decreases to 0.05 gal/min after the majority of the drainable liquid has been removed. At this point, saltwell pumping is declared complete, and an assessment is conducted to verify the DIL is less than 50,000 gal. After the tank is declared interim stabilized, it is isolated by intrusion prevention to ensure that in-tank-leakage does not occur until the tank is prepared for retrieval.

At the completion of jet pumping, the solids remaining in the tank still contain interstitial liquid on the surface of the particles and in the capillary region (this liquid is defined as non-drainable interstitial liquid). Drainable liquids will generally remain in the unpumpable region (bottom 18 inches of a tank).

2.2 SUPERNATANT PUMPING

As the name implies, this method was used to remove only the free-liquid or supernatant layer from the tank. Twenty-four of the SSTs were stabilized by supernatant pumping. The supernatant pump generally operates at a higher flow rate than a jet pump and is not capable of the slow pump rates achievable with a jet pump. Tanks were declared stabilized after supernatant pumping as long as the calculated DIL was below 50,000 gal.

If a tank did not contain a LOW, it was assumed that the solids remaining in the tank remain saturated after pumping. If a tank had a LOW, it was assumed that any interstitial liquids contained in solids above the interstitial liquid level (ILL) are non-drainable. Solids below the ILL were assumed to be saturated. Liquids held in the capillary region were assumed to be non-drainable.

2.3 ADMINISTRATIVE STABILIZATION

In the past, 55 of the SSTs were determined to contain less than 50 kgal of DIL and less than 5 kgal of supernatant prior to pumping. These tanks were declared stabilized without pumping or "administratively stabilized." Administrative stabilization has been discontinued.

An in-tank video was taken to assess the tank contents. If a tank did not contain a LOW or if core sample data were not available, it was assumed that the solids in the tank were saturated. If a tank had an observation well, it was assumed that any interstitial liquids contained in solids above the ILL were non-drainable. Solids below the ILL were assumed to be saturated. Core sample data was also used as a basis for estimating the fraction of drainable liquid in a tank. Liquids contained within the capillary region were assumed to be non-drainable.

3.0 METHODOLOGY

The following sections discuss inputs and calculations performed to estimate pumping volumes and DIL volumes.

3.1 INPUT VALUES

The primary inputs needed to estimate DIL and pumpable liquid volumes include: tank waste volume estimates, measured liquid levels, drainable porosity estimates for each waste type, capillary height, and unpumpable region. Figure 3-1 is a schematic of the saltwell pump and pumping regions. Input values for each of the tanks are shown in Table 5-1.

3.1.1 Waste Volume Estimates

The best-basis volumes for supernatant, saltcake, and sludge were used as input values to determine the amount of pumpable liquid in each tank. Current best-basis volumes for SSTs are presented in monthly updates of the Waste Tank Summary Report (Hanlon 1999)

3.1.2 Measured Liquid Levels

Interstitial liquid level measurements were obtained for 43 of the 119 tanks as a measure of the saturated liquid level. The liquid level and waste surface level were assumed to be the same, and the solids were assumed to be saturated if there was no LOW or diptube measurement. Liquid observation wells are placed in many of the tanks and record the distance to a saturated surface in the tank. Diptubes are used with jet pumping to measure the depth of liquid in the saltwell. Drainable porosity measurements and liquid level estimates based on diptubes are made after the liquid level in the diptubes equilibrates. This may take as little as a few weeks for a coarse waste with high permeability or months for waste with fine particles and low permeability.

If the waste is not entirely saturated, the LOW or diptube measurements indicate how much of the solids are saturated.

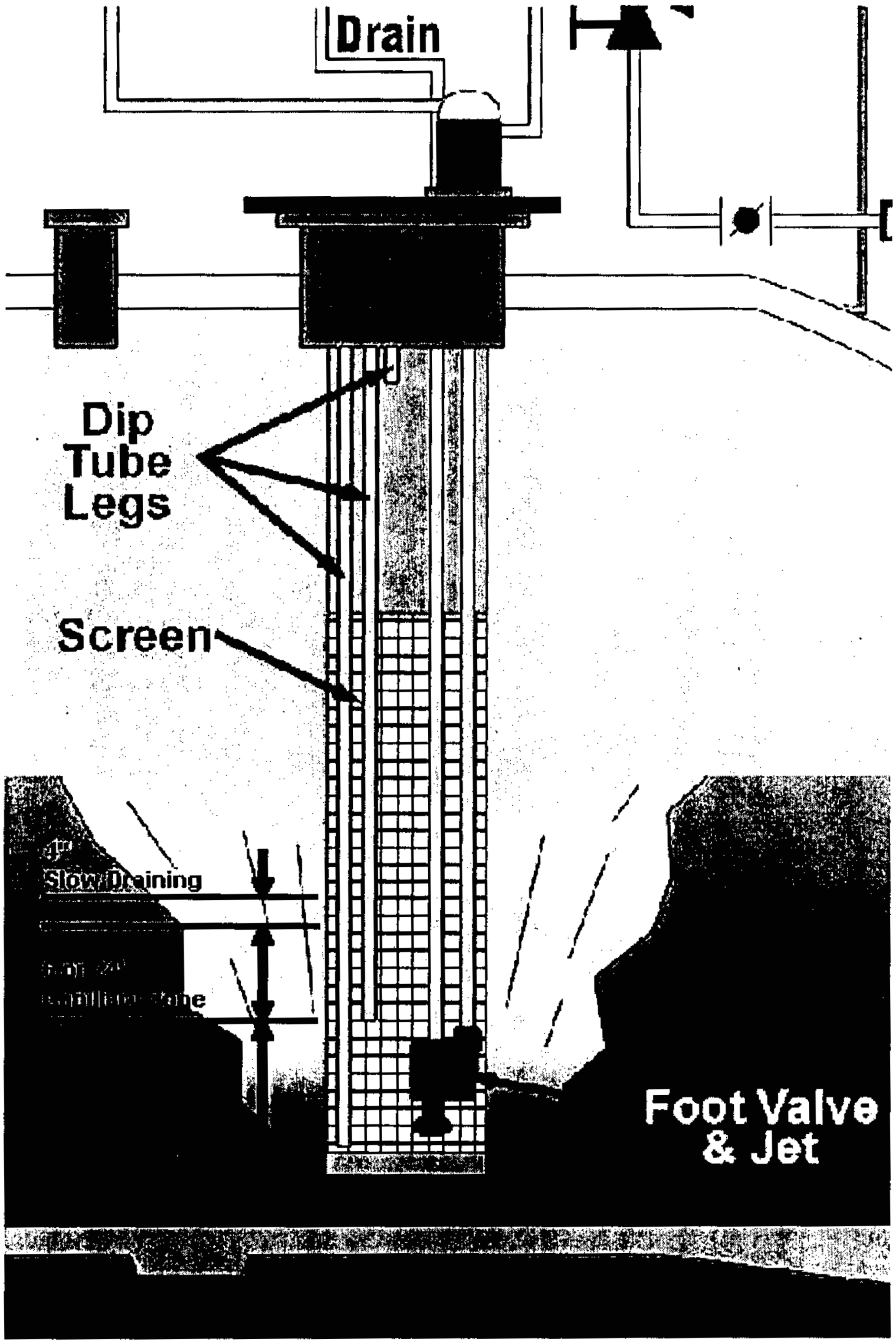
3.1.3 Drainable Porosity Estimates

Drainable porosity was calculated for many of the jet pumped tanks (Boettger 1997) by dividing the volume of liquid pumped over a given time period by the liquid level drawdown volume (change in liquid level height times the tank height to volume conversion factor gal/in.).

When drainable porosity measurements were not available, drainable porosity estimates used as inputs for DIL calculations were 25% for saltcake and 15% for sludge. These values are based on average drainable porosity estimates for 33 tanks previously jet pumped (Field and Vladimiroff 1999). No statistically significant difference could be determined in the drainable porosity values for different types of saltcake or in drainable porosity values for different types of sludge. The drainable porosity value and capillary height for saltcake or sludge actually varies more as a function of particle size than of waste type (some waste designated as saltcake may have very fine particles and behave more like a sludge [i.e., low drainable porosity and long capillary height]). However, currently, little particle size information is available for any of the tank waste.

Except as shown in Appendix A, drainable porosity values for jet pumped tanks are from Boettger (1997).

Figure 3-1. Representation of Saltwell Pump with Associated Dimensions of Unpumpable and Capillary Liquid Regions



3.1.4 Capillary Height

Porous media typically exhibit a capillary height above a saturated layer which will sustain a liquid column. The capillary height is defined as the height where internal hydrostatic forces equal external hydrostatic forces within the waste material (Kirk 1980). Because of these forces, liquid in the capillary region will not drain from the waste. The capillary height for saltcake has been shown to range from 6 in. to over 24 in. As noted in the previous section, capillary height is largely a function of particle size, and some saltcakes may have very fine particles and a capillary height characteristic of sludge. Except as noted in Table 5-1, a capillary height of 6 in. was assumed for saltcake for these calculations (Field and Vladimiroff 1999). This assumption will tend to overestimate the amount of DIL in the saltcake.

Sludge is typically a finer, less permeable material than saltcake and generally holds more liquid. However, sludge is more hydroscopic, and the drainable porosity is lower than for saltcake. Although some sludge tanks may not drain and capillary heights may be as high as 20 ft, except as noted in Table 5-1, a sludge capillary height of 24 in. was assumed for DIL calculations (Field and Vladimiroff 1999). This assumption will tend to overestimate the amount of DIL in the sludge.

3.1.5 Unpumpable Region

The bottom 18 in. of a tank is unpumpable because of the operation and design of the saltwell screen (see Figure 3-1). The target minimum depth of the screen in relation to the tank bottom is approximately 2 in. above the lowest point of the tank bottom. The set point offset is 12 in., and there is an estimated 4-in. height above the capillary region that cannot support a minimum pumping rate of 0.05 gal/min.

Sections 3.2.4 and 3.2.5 discuss how capillary height and the unpumpable liquid height is used to determine the amount of DIL and pumpable liquid in a tank.

3.2 CALCULATIONS

This section describes the calculations which were performed to estimate pumpable liquid remaining and DIL volumes. Calculations for each tank are presented in Appendix B.

3.2.1 Establishing a Common Reference Point

One hundred nine of the SSTs have dished bottoms. Only the tanks in A-Farm and AX-Farm have flat bottoms. For tanks with dished bottoms, the volume and type of waste in the dished bottom was calculated separately. The volume of waste above the dish was calculated by multiplying the height of the layer by a conversion factor of 2,754 gal/in. for 100 series tanks and 196 gal/in. for 200 series tanks (i.e., B-200s, T-200s, etc.).

3.2.2 Using Liquid Observation Well Readings

As explained in Section 3.1.2, liquid level measurements were used to adjust the height of the solids layer for 43 of the 119 tanks. If the LOW/diptube reading indicated the ILL was in the sludge layer, the height of drainable sludge was revised. If the ILL was in the saltcake layer, the drainable sludge height was unaffected, and the saltcake height was reduced to account for only the saturated saltcake region.

There is one important difference between the LOW and diptude measurements. The diptude measures the liquid level in the saltwell and does not include the capillary region in the waste (i.e., the capillary height was not subtracted from sludge or saltcake if the ILL was determined from diptube measurements). In contrast, the LOW measures the saturated liquid level in the waste. Therefore, the LOW reading contains an unquantified portion of the capillary region.

The capillary region for highly permeable waste such as a typical saltcake is probably small compared to the total waste volume, and part of the capillary region may be only partially saturated (data is not available to quantify the saturated and unsaturated portions). Therefore, these calculations assume that the LOW measurement does not include the assumed 6-in. capillary region for waste designated as saltcake (i.e., capillary height is not subtracted from the LOW for saltcake). This assumption for saltcake may result in high calculations for DIL and pumpable liquid remaining (PLR) in saltcake.

The sludge capillary height is generally much greater than the capillary height for saltcake and often represents a greater portion of the waste matrix. Also, because sludge is less permeable with smaller pores, most of the sludge capillary region is likely "saturated." Therefore, it was assumed that the LOW measurement includes all of the capillary region for sludge (i.e., capillary height is subtracted from the LOW for sludge).

Table 5-1 shows which tanks have an ILL measurement and whether the measurement is from diptude or LOW readings.

3.2.3 Drainable Interstitial Liquid

The drainable interstitial liquid volume is the sum of DIL in each waste layer, less the capillary height (see Section 2.1.4). This volume includes drainable liquid in the unpumpable region. It does not include supernatant or interstitial liquid in the capillary region. The following equation was used to calculate the DIL values, rounded to the nearest 1,000 gal shown in Table 5-1:

DIL = (Sludge vol. below ILL – Capillary vol. sludge)(Sludge Drainable Porosity) + (Saltcake vol. below ILL – Capillary vol. saltcake)(Saltcake Drainable Porosity)

- Capillary volume is assumed to be in only the sludge if the sludge depth is greater than 18 in. (unpumpable region) + sludge capillary height from the bottom of the tank.
- The capillary height is proportioned between the sludge and saltcake if the total sludge height is less than the unpumpable region plus the capillary height.

Example Calculations:

1. Tank 241-B-107 (Saltcake and Sludge in a dish bottom tank, no LOW)

   Sludge: Volume = 93,000 gal, Capillary height = 24 in., Drainable Porosity =25%

   Saltcake: Volume = 71,000 gal, Capillary height = 6 in., Drainable Porosity =15%

   Assume all waste is saturated.

   Unpumpable volume = 18 in., this includes the dish volume (12,500 gal) and 6 in. above the dish which is equivalent to 16,524 gal (6 in. * 2,754 gal/in.)
   Unpumpable volume = 29,024 gal

Sludge accounts for most, but not all of the capillary volume, because the tank has less than 24 in. (66,096 gal) of sludge above the 18-in. unpumpable region.

Volume of sludge above the unpumpable region =
93,000 gal (sludge volume) – 29,024 (unpumpable volume) = 63,976 gal.

Relative portion of sludge capillary height = 63,976 gal / 66,096 gal = 0.968

The capillary height of saltcake = the assumed capillary height for saltcake (6 in.) times the relative portion of saltcake capillary height (1 - 0.968).

Capillary height of saltcake = 6 in. (1 - 0.968) = 0.19 in.

The DIL includes drainable liquid in the unpumpable region and the drainable liquid above the capillary height. All sludge above the unpumpable region is in the sludge capillary region and is not DIL. All of the saltcake except the capillary height 0.19 in. (523 gal) is included in the DIL.

DIL = (29,024 gal) (0.15) + (71,000 gal. – 0.19 in. *2,754 gal/in.) (0.25)
= 4,354 gal + 17,619 gal
= <u>21,973</u> gal

2. Tank 241-TX-110 (Saltcake and Sludge in a dish bottom tank with diptube readings)

   Sludge: Volume = 37,000 gal, Drainable Porosity =15%

   Saltcake Volume = 425,000 gal, Drainable Porosity =26%

   ILL = 33.0 in. (from diptube, ignore capillary height)

Drainable porosity above the unpumpable region was based on jet pump drawdown measurements (Boettger 1997). Because sludge liquids were not pumped, an average drainable porosity for sludge was assumed.

Because the ILL is based on diptude readings, the capillary height is assumed to be above the ILL and is not subtracted.

Converting the ILL height to an equivalent volume:

ILL volume = dish volume (bottom 12 in.) + volume above dish
= 12,500 gal + (33-12) in. (2,754 gal/in.) = 70,334 gal

The sludge volume above the unpumpable height = 37,000 – 29, 024 = 7,976 gal.

The saltcake volume below the ILL = 70,334 – 37,000 = 33,334 gal.

DIL = unpumpable volume *sludge drainable porosity + saltcake volume below ILL * saltcake drainable porosity

= 29,024 gal * 0.15 + 33,334 * 0.26 = <u>13,020</u> gal

Calculations for all tanks and calculation verifications are included in Appendix B

3.2.4 Pumpable Liquid

The pumpable liquid volume is the sum of DIL plus the supernatant minus the unpumpable liquid volume. The unpumpable liquid height is the bottom 18-in. for all tanks based on operational limitations (see Section 3.1.5). The following equation was used to calculate the DIL values shown in Table 5-1:

PLR = DIL – (unpumpable region) (drainable porosity) + supernatant

Example Calculations:

1. Tank 241-B-107

   unpumpable volume = 12,500 gal + 6 in. (2,754 gal/in.) = 29,024 gal

   PLR = 21,973 gal – 29,024 gal (0.15) + 1,000 gal
   = <u>18,619</u> gal

2. Tank 241-TX-110

   unpumpable volume = 12,500 gal + 6 in. (2,754 gal/in.) = 29,024 gal

   PLR = 13,020 gal – (29,024 gal) 0.15 + 0
   = <u>8,666</u> gal

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4.0 ASSUMPTIONS AND TANK-SPECIFIC NOTES

The following assumptions were used to calculate DIL and pumpable liquid volumes:

- Best-basis tank volume and waste type estimates were used (Hanlon 1999).
- The saltwell pumping system is located in the center of the tank, and all calculations are referenced to the tank bottom center line.
- The ILL readings (LOW or diptube) were referenced to the tank bottom centerline. The following assumptions were made regarding the capillary region with respect to the ILL (see Section 3.2.2):

  If the ILL was from LOW readings:

  - The sludge capillary height was assumed to be below the ILL and the capillary region was subtracted from the measured liquid level to calculate DIL and PLR.
  - The saltcake capillary height was assumed to be above the ILL and was not subtracted from the measured liquid level to calculate DIL and PLR.

  If the ILL was from diptude readings:

  - The saltcake and sludge capillary heights were assumed to be above the ILL and were not subtracted from the measured liquid level to calculate DIL and PLR.
- The DIL was assumed to be "0" for the seven tanks with known catastrophic leaks (Nelson and Ohl 1999) and for tanks 241-SX-108 and 241-SX-109 (Thompson 1999).
- The waste is layered from top to bottom in the following order: supernatant, saltcake, and sludge. All layers are flat and cover the entire diameter of the tank.
- Average porosities for sludge and saltcake are assumed except where drainable porosity measurements are available for jet pumped tanks.
- Except for tanks with LOW readings or diptube measurements, it is assumed the solids in the tank are saturated with drainable liquid.
- There is only one capillary region in the tank. A 6-in. capillary region is used for saltcake, and a 24-in. region is used for sludge. If less than 18 in. of sludge is in a tank, the capillary height is prorated proportionally between the sludge and saltcake capillary heights.

- The 18-in. unpumpable region is comprised of the following dimensions: 2 in. below the saltwell, 12 in. from the bottom of the saltwell to the process control set point, and 4 in. of slow draining region (Figure 3-1).

5.0 CONCLUSION

Table 5-1 lists the supernatant, saltcake, and sludge volume estimates used to estimate DIL and pumpable liquid volumes remaining for each tank. If a LOW reading was available to measure the liquid level in the solids, this was also included in the table. As noted in Section 1.0, the revised DIL and pumpable liquid estimates are based on the methodology presented in Field and Vladimiroff (1999) and updated best-basis tank waste volume estimates.

Two of the tanks exceeded the 50,000 gal DIL criteria for stabilization: 241-C-102 and 241-BY-103. Liquid volume estimates for these tanks should be further assessed. Both tanks have an ILL measurement.

The ILL for tank 241-C-102 was based on diptube measurements, and jet pumping was stopped before reaching a 0.05 gal/min pump rate due to pump failure.

Tank 241-BY-103 was also jet pumped, and pumping was stopped due to pump failure. This tank was declared stabilized previously based on an estimated porosity of 13% and a DIL of 38.3 kgal (Saueressig 1997). Since then, the LOW reading has gradually increased from 99.1 in. to 116.1 in., and liquid intrusion is suspected (Hanlon 1999). Based on the 99.1 in. LOW measurements, and the assumptions presented in this document, the drainable porosity was re-calculated to be about 20% with a current DIL of 58 kgal. Because the waste is classified as a saltcake, it was assumed that the 6-in. capillary height is above the saltcake (see Section 3.2.2). The slow backflow into the saltwell and neutron probe scans indicate that although the waste is classified as saltcake, it is highly impermeable and behaves more like sludge. In this case, the capillary height would be 24 in. rather than 6 in. and would be subtracted from the ILL. The DIL falls below 50,000 gal if capillary height is subtracted from the ILL.

With the data currently available, there is still a large amount of uncertainty in estimating the DIL and pumpable liquid volume remaining in a tank. Actual liquid volume estimates will vary depending on the actual permeability of saltcake and sludge, and supernatant volumes.

Table 5-1. Estimated Drainable Interstitial Liquid and Pumpable Liquid Remaining Volumes for 119 Single-Shell Tanks (3 pages)

Stab. Method	Tank No.	Supernate volume (gal)	Saltcake Volume (gal)	Sludge volume (gal)	ILL[2] (in.)	Porosity (saltcake)	Porosity (sludge)	PLR (gal)	DIL (gal)
SN	A-102	4,000	22,000	15,000	-	0.25	0.15	4,000	8,000
AR	A-103	5,000	0	366,000	138.9	N/A	0.15	43,000	45,000
AR	A-104	0	0	28,000	-	N/A	0.15	0	4,000
AR	A-105[3]	0	0	51,000	-	N/A	-	0	0
AR	A-106	0	0	125,000	-	N/A	0.15	1,000	9,000
SN	AX-102	0	23,000	7,000	-	0.25	0.15	0	7,000
AR	AX-103	0	104,000	8,000	-	0.25	0.15	11,000	23,000
AR	AX-104	0	0	8,000	-	N/A	0.15	0	1,000
SN	B-101	0	113,000	0	-	0.25	N/A	17,000	24,000
SN	B-102	4,000	28,000	0	-	0.25	N/A	4,000	7,000
SN	B-103	0	59,000	0	-	0.25	N/A	3,000	11,000
SN	B-104	1,000	61,000	309,000	132.0	0.25	0.15	42,000	45,000
AR	B-105	0	130,000	28,000	46.8	0.25	0.15	16,000	20,000
SN	B-106	1,000	116,000	0	-	0.25	N/A	19,000	25,000
SN	B-107	1,000	71,000	93,000	-	0.25	0.15	19,000	22,000
SN	B-108	0	41,000	53,000	-	0.25	0.15	11,000	15,000
SN	B-109	0	64,000	63,000	-	0.25	0.15	17,000	21,000
AR	B-110	1,000	0	245,000	95.8	N/A	0.15	23,000	27,000
SN	B-111	1,000	0	236,000	87.3	N/A	0.15	20,000	23,000
SN	B-112	3,000	0	30,000	-	N/A	0.15	3,000	4,000
AR	B-201	1,000	0	28,000	-	N/A	0.15	1,000	4,000
AR	B-202	0	0	27,000	-	N/A	0.15	0	4,000
AR	B-203	1,000	0	50,000	-	N/A	0.15	1,000	5,000
AR	B-204	1,000	0	49,000	-	N/A	0.15	1,000	5,000
AR	BX-101	1,000	0	42,000	-	N/A	0.15	1,000	4,000
AR	BX-102[3]	0	0	96,000	-	N/A	-	0	0
AR	BX-103	9,000	0	62,000	-	N/A	0.15	9,000	4,000
SN	BX-104	3,000	0	90,000	-	N/A	0.15	3,000	4,000
SN	BX-105	5,000	0	46,000	-	N/A	0.15	5,000	4,000
SN	BX-106	0	0	38,000	-	N/A	0.15	0	4,000
JET	BX-107	1,000	0	344,000	-	N/A	0.13	33,000	36,000
SN	BX-108	0	0	26,000	-	N/A	0.15	0	4,000
JET	BX-109	0	0	193,000	-	N/A	0.20	20,000	25,000
SN	BX-110	3,000	71,000	133,000	-	0.25	0.15	26,000	28,000
JET	BX-111	1,000	136,000	25,000	21.3[2]	0.12	0.15	2,000	5,000
JET	BX-112	1,000	0	164,000	-	N/A	0.09	7,000	9,000
JET	BY-101	0	278,000	109,000	89.4	0.10	0.15	24,000	28,000
JET	BY-102	0	277,000	0	63.4	0.26	N/A	33,000	40,000
JET	BY-103	0	391,000	9,000	116.1	0.20	0.15	53,000	58,000
JET	BY-104	0	176,000	150,000	87.7	0.25	0.15	36,000	40,000
JET	BY-107	0	226,000	40,000	70.2	0.25	0.15	35,000	39,000
JET	BY-108	0	74,000	154,000	57.1[2]	0.24	0.24	26,000	33,000
JET	BY-109	0	233,000	57,000	52.4[2]	0.33	0.15	26,000	31,000
JET	BY-110	0	295,000	103,000	60.0[2]	0.13	0.15	17,000	21,000
JET	BY-111	0	459,000	0	27.4[2]	0.25	N/A	6,000	14,000
JET	BY-112	0	291,000	0	28.2	0.42	N/A	12,000	24,000
AR	C-101	0	0	88,000	-	N/A	0.15	0	4,000
JET	C-102	0	0	316,000	94.3[2]	N/A	0.26	55,000	62,000

Table 5-1. Estimated Drainable Interstitial Liquid and Pumpable Liquid Remaining Volumes for 119 Single-Shell Tanks (3 pages)

Stab. Method	Tank No.	Supernate volume (gal)	Saltcake Volume (gal)	Sludge volume (gal)	ILL[2] (in.)	Porosity (saltcake)	Porosity (sludge)	PLR (gal)	DIL (gal)
SN	C-104	0	0	295,000	-	N/A	0.15	30,000	34,000
AR	C-105	2,000	0	132,000	-	N/A	0.15	8,000	10,000
JET	C-107	0	0	257,000	67.7[2]	N/A	0.18	25,000	30,000
AR	C-108	0	0	66,000	-	N/A	0.15	0	4,000
AR	C-109	4,000	0	62,000	-	N/A	0.15	4,000	4,000
JET	C-110	1,000	0	177,000	56.7[2]	N/A	0.27	30,000	37,000
SN	C-111	0	0	57,000	-	N/A	0.15	0	4,000
AR	C-112	0	0	104,000	-	N/A	0.15	1,000	6,000
AR	C-201	0	0	2,000	-	N/A	0.15	0	0
AR	C-202	0	0	1,000	-	N/A	0.15	0	0
AR	C-203	0	0	5,000	-	N/A	0.15	0	1,000
AR	C-204	0	0	3,000	-	N/A	0.15	0	0
AR	S-104	1,000	0	293,000	111.2	N/A	0.15	31,000	34,000
JET	S-105	0	454,000	2,000	53.8	0.33	0.15	33,000	42,000
JET	S-108	0	445,000	5,000	16.7[2]	0.17	0.15	0	4,000
JET	S-110	0	259,000	131,000	92.1[2]	0.13	0.13	27,000	30,000
AR	SX-107	0	0	104,000	-	N/A	0.15	0	6,000
AR	SX-108[3]	0	0	87,000	-	N/A	-	0	0
AR	SX-109[3]	0	175,000	75,000	-	-	-	0	0
AR	SX-110[3]	0	0	62,000	-	N/A	-	0	0
SN	SX-111	0	0	122,000	-	N/A	0.15	3,000	8,000
AR	SX-112	0	0	108,000	-	N/A	0.15	1,000	6,000
AR	SX-113[3]	0	0	31,000	-	N/A	-	0	0
AR	SX-114	0	34,000	147,000	-	0.25	0.15	15,000	21,000
AR	SX-115[3]	0	0	12,000	-	N/A	-	0	0
SN	T-101	1,000	64,000	37,000	-	0.25	0.15	16,000	20,000
AR	T-102	13,000	0	19,000	-	N/A	0.15	11,000	3,000
AR	T-103	4,000	0	23,000	-	N/A	0.15	3,000	3,000
AR	T-105	0	0	98,000	-	N/A	0.15	0	5,000
AR	T-106[3]	2,000	0	19,000	-	N/A	-	2,000	0
JET	T-107	0	0	173,000	65.6[2]	N/A	0.21	20,000	34,000
AR	T-108	0	23,000	21,000	-	0.25	0.15	0	5,000
AR	T-109	0	58,000	0	-	0.25	N/A	3,000	10,000
JET	T-111	0	0	446,000	146.0[2]	N/A	0.10	35,000	38,000
AR	T-112	7,000	0	60,000	-	N/A	0.15	7,000	4,000
AR	T-201	1,000	0	28,000	-	N/A	0.15	1,000	4,000
AR	T-202	0	0	21,000	-	N/A	0.15	0	3,000
AR	T-203	0	0	35,000	-	N/A	0.15	0	5,000
AR	T-204	0	0	38,000	-	N/A	0.15	0	5,000
AR	TX-101	3,000	10,000	74,000	-	0.25	0.15	7,000	8,000
JET	TX-102	0	217,000	0	34.5[2]	0.36	N/A	16,000	27,000
JET	TX-103	0	157,000	0	34.0	0.25	N/A	11,000	18,000
SN	TX-104	5,000	37,000	23,000	-	0.25	0.15	9,000	9,000
JET	TX-105	0	609,000	0	31.3	0.38	N/A	14,000	25,000
JET	TX-106[1]	0	341,000	0	64.0[2]	0.24	N/A	30,000	37,000
AR	TX-107	1,000	27,000	8,000	-	0.25	0.15	1,000	6,000
JET	TX-108	0	128,000	6,000	19.6[2]	0.25	0.15	1,000	8,000
JET	TX-109[1]	0	0	384,000	125.8	N/A	0.15	2,000	6,000

Table 5-1. Estimated Drainable Interstitial Liquid and Pumpable Liquid Remaining Volumes for 119 Single-Shell Tanks (3 pages)

Stab. Method	Tank No.	Supernate volume (gal)	Saltcake Volume (gal)	Sludge volume (gal)	ILL[2] (in.)	Porosity (saltcake)	Porosity (sludge)	PLR (gal)	DIL (gal)
JET	TX-110	0	425,000	37,000	33.0[2]	0.26	0.15	10,000	14,000
JET	TX-111	0	327,000	43,000	30.0[2]	0.18	0.15	6,000	10,000
JET	TX-112	0	649,000	0	62.5[2]	0.17	N/A	21,000	26,000
JET	TX-113	0	424,000	183,000	46.9[2]	0.17	0.17	14,000	18,000
JET	TX-114	0	531,000	4,000	36.7[2]	0.21	0.15	11,000	17,000
JET	TX-115	0	568,000	0	35.4[2]	0.32	N/A	15,000	25,000
JET	TX-116	0	563,000	68,000	52.0[2]	0.20	0.15	17,000	21,000
JET	TX-117	0	597,000	29,000	30.0[2]	0.16	0.15	5,000	10,000
JET	TX-118	0	266,000	34,000	39.7[2]	0.35	0.15	20,000	24,000
JET	TY-101	0	46,000	72,000	17.0[2]	0.08	0.08	0	2,000
AR	TY-102	0	64,000	0	-	0.25	N/A	5,000	12,000
JET	TY-103	0	0	162,000	56.0[2]	N/A	0.15	16,000	20,000
AR	TY-104	0	0	43,000	-	N/A	0.15	0	4,000
JET	TY-105	0	0	231,000	70.0[2]	N/A	0.07	10,000	12,000
AR	TY-106	0	0	21,000	-	N/A	0.15	0	3,000
AR	U-101	3,000	0	22,000	-	N/A	0.15	2,000	3,000
AR	U-104[3]	0	43,000	79,000	-	-	-	0	0
AR	U-110	0	0	186,000	-	N/A	0.15	14,000	18,000
AR	U-112	4,000	0	45,000	-	N/A	0.15	4,000	4,000
AR	U-201	1,000	0	4,000	-	N/A	0.15	1,000	1,000
SN	U-202	1,000	0	4,000	-	N/A	0.15	1,000	1,000
AR	U-203	1,000	0	2,000	-	N/A	0.15	1,000	0
SN	U-204	1,000	0	2,000	-	N/A	0.15	1,000	0
TOTAL		104,000	11,280,000	9,228,000				1,259,000	1,695,000

N/A = not applicable: designation given to porosity values if there was "0" saltcake or sludge, respectively.

[1] Capillary height was measured for this tank (Boettger 1997)
[2] Where footnoted, the ILL measurement was a diptube measurement, all other ILLs are LOW measurements.
[3] Tank Leak Failure, DIL, and PLR calculated to be "0" by setting drainable porosity values to "0".

6.0 REFERENCES

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APPENDIX A

POROSITY CALCULATIONS AND BASIS FOR DRAINABLE INTERSTITIAL LIQUID ESTIMATES DIFFERING FROM BOETTGER (1997)

Most of the tank DIL calculations differ somewhat from those presented in TI-178 based on updated tank volume estimates, calculations based on new average porosity values, and/or different assumptions regarding the position and height of the capillary region. Volumes, porosities, and capillary height values used for calculations in this document for the 119 SSTs are shown in Table 5-1.

Only tanks designated "catastrophic leakers", those with negligible DIL, or tanks for which jet pump porosity values were recalculated and differ from the TI-178 document (Boettger 1997) are discussed further in this section.

A1.0 Catastrophic Leakers

241-A-105, 241-BX-102, 241-SX-108, 241-SX-110, 241-SX-113, 241-SX-115, 241-T-106, and 241-U-104 were designated Catastrophic Leakers (Nelson and Ohl 1999); DIL was assumed to be "0" (see Section 1.0).

A2.0 Leakers with Negligible Drainable Interstitial Liquid Remaining

SX-108 - Tank Leak, applying the same criteria used for tank 241-SX-109 (Thompson 1999), tank determined to have little or no remaining DIL.

SX-109 - Tank Leak, tank determined to have little or no remaining DIL (Thompson 1999)

A3.0 Jet Pump Porosity Differences from Boettger (1997)

BY-108 - An average value of 12.5% drainable porosity was assumed previously (Boettger 1997). However, sufficient information is available to calculate a tank specific drainable porosity of 24%. The calculation is as follows:

> The starting liquid level was 99.5 in. The liquid level dropped to 57.1 in. in the diptube after pumping was completed, and the liquid level in the diptube came to equilibrium. This equates to a 116 kgal drawdown. The estimated volume of liquid pumped was 27.3 kgal.
>
> *Drainable Porosity = 27.3 kgal / 116 kgal = 24%*

Using the 24% drainable porosity value increases the estimated DIL from 8.8 kgal (Boettger 1997) to 33.0 kgal.

TX-106 – Used average drainable porosity values of 25% for saltcake and 15% for sludge (HNF-2978). The Boettger (1997) calculated drainable porosity of 2% is possible, but seems low because all other TX Farm drainable porosity calculations range from 16% to 38%.

The capillary height was measured by lancing to be 58 in. for tank TX-106 (Boettger 1997). Although classified as saltcake, this waste had low permeability, as evidenced by the capillary height and length of time required for the liquid level to reach equilibrium after pumping). Therefore, capillary height was subtracted from the LOW for this tank.

The DIL value for TX-106 increased from 10.9 kgal (Boettger 1997) to 37.0 kgal.

C-102 – The drainable porosity value shown in Boettger (1997) was used. The total waste volume below the ILL was 238,825 gal. Because the ILL is based on diptube measurements, capillary height is assumed to be above the ILL and should not be subtracted out. Also, the dish volume should be included in the DIL calculation and not subtracted out. The recalculated DIL volume is 62,000 gal, compared to the Boettger (1997) value of 30.2 kgal. The new DIL estimate exceeds the 50,000 gal stabilization criteria.

BY-103 – The drainable porosity and DIL calculation for this tank were not included in Boettger (1997). The tank was declared stabilized based on an estimated porosity of 13% and a DIL of 38.3 kgal (Saueressig 1997). However, based on LOW measurements, and the assumptions presented in this document, the drainable porosity was re-calculated to be 19.5% with a DIL of 58 kgal. The LOW level at the start of pumping was 131.5 in. After pumping 17.4 kgal (net production), the LOW dropped to 99.1 in. for about a year.

$$Porosity = 17{,}400\ gal\ /\ (131.5-99.1)\ in.\ *\ 2{,}754\ gal/in.\ = 19.5\%$$

Currently, the LOW level is 116.1 in. Intrusion is expected as the cause for the rising LOW level (Hanlon 1999). The current DIL calculation is:

$$DIL = ((116.1-12)\ in.\ *\ 2{,}754\ gal/in.\ + 12{,}500\ gal)\ *\ 0.195 = 58{,}000\ gal.$$

Because the waste is classified as a saltcake, it was assumed that the 6-in. capillary height is above the saltcake. The slow backflow into the saltwell and neutron probe scans indicates that although the waste is classified as saltcake, it is highly impermeable and acts more like sludge. In this case, the capillary height would be subtracted from the ILL. The DIL falls below 50,000 gal if capillary height is subtracted from the ILL.

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APPENDIX B

SPREADSHEET CALCULATIONS AND VERIFICATION

	A	B	C	D	E	F	G	H	I	J	K
1			Table B-1. Estimated Liquid Volume in 119 SSTs								
2	Stab. Method	Tank No.	Supernate Volume (gal)	Saltcake Volume (gal)	Sludge Volume (gal)	Total Solids (gal)	LOW Volume (gal)	Liquid Level Height	Level Meas.	Difference between Total and Low (gal)	PLR (gal)
3	SN	A-102	4,000	22,000	15,000	37,000	0	-			4,000
4	AR	A-103	5,000	0	366,000	366,000	382,663	138.9	LOW	-16,663	42,550
5	AR	A-104	0	0	28,000	28,000	0	-			0
6	AR	A-105	0	0	51,000	51,000	0	-			0
7	AR	A-106	0	0	125,000	125,000	0	-			1,400
8	SN	AX-102	0	23,000	7,000	30,000	0	-			0
9	AR	AX-103	0	104,000	8,000	112,000	0	-			11,476
10	AR	AX-104	0	0	8,000	8,000	0	-			0
11	SN	B-101	0	113,000	0	113,000	0	-			16,863
12	SN	B-102	4,000	28,000	0	28,000	0	-			4,000
13	SN	B-103	0	59,000	0	59,000	0	-			3,363
14	SN	B-104	1,000	61,000	309,000	370,000	342,980	132.0	LOW	27,020	41,577
15	AR	B-105	0	130,000	28,000	158,000	108,471	46.8	LOW	49,529	15,731
16	SN	B-106	1,000	116,000	0	116,000	0	-			18,613
17	SN	B-107	1,000	71,000	93,000	164,000	0	-			18,618
18	SN	B-108	0	41,000	53,000	94,000	0	-			10,520
19	SN	B-109	0	64,000	63,000	127,000	0	-			16,895
20	AR	B-110	1,000	0	245,000	245,000	243,175	95.8	LOW	1,825	23,208
21	SN	B-111	1,000	0	236,000	236,000	219,744	87.3	LOW	16,256	19,694
22	SN	B-112	3,000	0	30,000	30,000	0	-			3,000
23	AR	B-201	1,000	0	28,000	28,000	0	-			1,000
24	AR	B-202	0	0	27,000	27,000	0	-			0
25	AR	B-203	1,000	0	50,000	50,000	0	-			1,000
26	AR	B-204	1,000	0	49,000	49,000	0	-			1,000
27	AR	BX-101	1,000	0	42,000	42,000	0	-			1,000
28	AR	BX-102	0	0	96,000	96,000	0	-			0
29	AR	BX-103	9,000	0	62,000	62,000	0	-			9,000
30	SN	BX-104	3,000	0	90,000	90,000	0	-			3,000
31	SN	BX-105	5,000	0	46,000	46,000	0	-			5,000
32	SN	BX-106	0	0	38,000	38,000	0	-			0

	A	B	C	D	E	F	G	H	I	J	K
1			**Table B-1. Estimated Liquid Volume in 119 SSTs**								
2	Stab. Method	Tank No.	Supernate Volume (gal)	Saltcake Volume (gal)	Sludge Volume (gal)	Total Solids (gal)	LOW Volume (gal)	Liquid Level Height	Level Meas.	Difference between Total and Low (gal)	PLR (gal)
33	JET	BX-107	1,000	0	344,000	344,000	0	-			33,354
34	SN	BX-108	0	0	26,000	26,000	0	-			-454
35	JET	BX-109	0	0	193,000	193,000	0	-			19,576
36	SN	BX-110	3,000	71,000	133,000	204,000	0	-			26,432
37	JET	BX-111	1,000	136,000	25,000	161,000	38,112	21.3	DIP	122,888	1,767
38	JET	BX-112	1,000	0	164,000	164,000	0	-			7,199
39	JET	BY-101	0	278,000	109,000	387,000	225,693	89.4	LOW	161,307	23,666
40	JET	BY-102	0	277,000	0	277,000	154,111	63.4	LOW	122,889	32,523
41	JET	BY-103	0	391,000	9,000	400,000	299,291	116.1	LOW	100,709	52,702
42	JET	BY-104	0	176,000	150,000	326,000	220,978	87.7	LOW	105,022	35,891
43	JET	BY-107	0	226,000	40,000	266,000	172,684	70.2	LOW	93,316	34,817
44	JET	BY-108	0	74,000	154,000	228,000	136,705	57.1	DIP	91,295	25,844
45	JET	BY-109	0	233,000	57,000	290,000	123,762	52.4	DIP	166,238	26,228
46	JET	BY-110	0	295,000	103,000	398,000	144,692	60.0	DIP	253,308	16,516
47	JET	BY-111	0	459,000	0	459,000	54,912	27.4	DIP	404,088	6,472
48	JET	BY-112	0	291,000	0	291,000	57,181	28.2	LOW	233,819	11,826
49	AR	C-101	0	0	88,000	88,000	0	-			0
50	JET	C-102	0	0	316,000	316,000	239,154	94.3	DIP	76,846	54,634
51	SN	C-104	0	0	295,000	295,000	0	-			29,982
52	AR	C-105	2,000	0	132,000	132,000	0	-			7,532
53	JET	C-107	0	0	257,000	257,000	165,898	67.7	DIP	91,102	24,637
54	AR	C-108	0	0	66,000	66,000	0	-			0
55	AR	C-109	4,000	0	62,000	62,000	0	-			4,000
56	JET	C-110	1,000	0	177,000	177,000	135,604	56.7	DIP	41,396	29,777
57	SN	C-111	0	0	57,000	57,000	0	-			0
58	AR	C-112	0	0	104,000	104,000	0	-			1,332
59	AR	C-201	0	0	2,000	2,000	0	-			0
60	AR	C-202	0	0	1,000	1,000	0	-			0
61	AR	C-203	0	0	5,000	5,000	0	-			0
62	AR	C-204	0	0	3,000	3,000	0	-			0

	A	B	C	D	E	F	G	H	I	J	K
1			**Table B-1. Estimated Liquid Volume in 119 SSTs**								
2	**Stab. Method**	**Tank No.**	**Supernate Volume (gal)**	**Saltcake Volume (gal)**	**Sludge Volume (gal)**	**Total Solids (gal)**	**LOW Volume (gal)**	**Liquid Level Height**	**Level Meas.**	**Difference between Total and Low (gal)**	**PLR (gal)**
63	AR	S-104	1,000	0	293,000	293,000	285,741	111.2	LOW	7,259	30,682
64	JET	S-105	0	454,000	2,000	456,000	127,639	53.8	LOW	328,361	32,543
65	JET	S-108	0	445,000	5,000	450,000	25,444	16.7	DIP	424,556	0
66	JET	S-110	0	259,000	131,000	390,000	233,095	92.1	DIP	156,905	26,529
67	AR	SX-107	0	0	104,000	104,000	0	-			432
68	AR	SX-108	0	0	87,000	87,000	0	-			0
69	AR	SX-109	0	175,000	75,000	250,000	-14,548	-		264,548	0
70	AR	SX-110	0	0	62,000	62,000	0	-			0
71	SN	SX-111	0	0	122,000	122,000	0	-			3,132
72	AR	SX-112	0	0	108,000	108,000	0	-			1,032
73	AR	SX-113	0	0	31,000	31,000	0	-			0
74	AR	SX-114	0	34,000	147,000	181,000	0	-			15,382
75	AR	SX-115	0	0	12,000	12,000	0	-			0
76	SN	T-101	1,000	64,000	37,000	101,000	0	-			16,270
77	AR	T-102	13,000	0	19,000	19,000	0	-			11,496
78	AR	T-103	4,000	0	23,000	23,000	0	-			3,096
79	AR	T-105	0	0	98,000	98,000	0	-			432
80	AR	T-106	2,000	0	19,000	19,000	0	-			2,000
81	JET	T-107	0	0	173,000	173,000	160,114	65.6	DIP	12,886	27,529
82	AR	T-108	0	23,000	21,000	44,000	0	-			0
83	AR	T-109	0	58,000	0	58,000	0	-			3,113
84	JET	T-111	0	0	446,000	446,000	381,536	146.0	DIP	64,464	35,251
85	AR	T-112	7,000	0	60,000	60,000	0	-			7,000
86	AR	T-201	1,000	0	28,000	28,000	0	-			1,000
87	AR	T-202	0	0	21,000	21,000	0	-			0
88	AR	T-203	0	0	35,000	35,000	0	-			0
89	AR	T-204	0	0	38,000	38,000	0	-			0
90	AR	TX-101	3,000	10,000	74,000	84,000	0	-			7,082
91	JET	TX-102	0	217,000	0	217,000	74,465	34.5	DIP	142,535	16,359
92	JET	TX-103	0	157,000	0	157,000	73,088	34.0	LOW	83,912	11,016

	A	B	C	D	E	F	G	H	I	J	K
1			Table B-1. Estimated Liquid Volume in 119 SSTs								
2	Stab. Method	Tank No.	Supernate Volume (gal)	Saltcake Volume (gal)	Sludge Volume (gal)	Total Solids (gal)	LOW Volume (gal)	Liquid Level Height	Level Meas.	Difference between Total and Low (gal)	PLR (gal)
93	SN	TX-104	5,000	37,000	23,000	60,000	0	-			8,613
94	JET	TX-105	0	609,000	0	609,000	65,652	31.3	LOW	543,348	13,919
95	JET	TX-106*	0	341,000	0	341,000	155,708	64.0	DIP	185,292	30,404
96	AR	TX-107	1,000	27,000	8,000	35,000	0	-			1,000
97	JET	TX-108	0	128,000	6,000	134,000	33,430	19.6	DIP	100,570	1,102
98	JET	TX-109*	0	0	384,000	384,000	325,905	125.8	LOW	58,095	1,570
99	JET	TX-110	0	425,000	37,000	462,000	70,334	33.0	DIP	391,666	9,863
100	JET	TX-111	0	327,000	43,000	370,000	62,072	30.0	DIP	307,928	5,529
101	JET	TX-112	0	649,000	0	649,000	151,577	62.5	DIP	497,423	20,834
102	JET	TX-113	0	424,000	183,000	607,000	108,615	46.9	DIP	498,385	13,530
103	JET	TX-114	0	531,000	4,000	535,000	80,524	36.7	DIP	454,476	10,815
104	JET	TX-115	0	568,000	0	568,000	76,944	35.4	DIP	491,056	15,334
105	JET	TX-116	0	563,000	68,000	631,000	122,660	52.0	DIP	508,340	16,778
106	JET	TX-117	0	597,000	29,000	626,000	62,072	30.0	DIP	563,928	5,288
107	JET	TX-118	0	266,000	34,000	300,000	88,786	39.7	DIP	211,214	19,921
108	JET	TY-101	0	46,000	72,000	118,000	26,270	17.0	DIP	91,730	0
109	AR	TY-102	0	64,000	0	64,000	0	-			4,613
110	JET	TY-103	0	0	162,000	162,000	133,676	56.0	DIP	28,324	15,698
111	AR	TY-104	0	0	43,000	43,000	0	-			0
112	JET	TY-105	0	0	231,000	231,000	172,232	70.0	DIP	58,768	10,025
113	AR	TY-106	0	0	21,000	21,000	0	-			0
114	AR	U-101	3,000	0	22,000	22,000	0	-			1,946
115	AR	U-104	0	43,000	79,000	122,000	0	-			0
116	AR	U-110	0	0	186,000	186,000	0	-			13,632
117	AR	U-112	4,000	0	45,000	45,000	0	-			4,000
118	AR	U-201	1,000	0	4,000	4,000	0	-			1,000
119	SN	U-202	1,000	0	4,000	4,000	0	-			1,000
120	AR	U-203	1,000	0	2,000	2,000	0	-			1,000
121	SN	U-204	1,000	0	2,000	2,000	0	-			1,000
122											

	A	B	C	D	E	F	G	H	I	J	K
1			Table B-1. Estimated Liquid Volume in 119 SSTs								
2	Stab. Method	Tank No.	Supernate Volume (gal)	Saltcake Volume (gal)	Sludge Volume (gal)	Total Solids (gal)	LOW Volume (gal)	Liquid Level Height	Level Meas.	Difference between Total and Low (gal)	PLR (gal)
123		TOTALS	104,000	11,280,000	9,228,000	20,508,000					1,258,552
124											
125			* Measured capillary height used in liquid volume estimates (Boettger 1997)								
126			DIP = Diptube measurement, LOW = liquid observation well measurement								
127			PLR = Pumpable Liquid remaining, DIL = Drainable Interstitial Liquid								
128											

	B	L	M	N	O	P	Q	R	S	T
1				Table B-1. Estimated Liquid Volume in 119 SSTs						
2	Tank No.	DIL (gal)	PLR Rounded (gal)	DIL Rounded (gal)	Tank Farm	Porosity (saltcake)	Porosity (sludge)	Capillary Height (saltcake, in.)	Capillary Height (sludge, in.)	Unpumpable Volume (gal)
3	A-102	7,750	4,000	8,000	A	0.25	0.15	6	24	49,572
4	A-103	44,986	43,000	45,000	A	0.25	0.15	6	24	49,572
5	A-104	4,200	0	4,000	A	0.25	0.15	6	24	49,572
6	A-105	0	0	0	A	-	-	6	24	49,572
7	A-106	8,836	1,000	9,000	A	0.25	0.15	6	24	49,572
8	AX-102	6,800	0	7,000	AX	0.25	0.15	6	24	49,572
9	AX-103	23,069	11,000	23,000	AX	0.25	0.15	6	24	49,572
10	AX-104	1,200	0	1,000	AX	0.25	0.15	6	24	49,572
11	B-101	24,119	17,000	24,000	B	0.25	0.15	6	24	29,024
12	B-102	7,000	4,000	7,000	B	0.25	0.15	6	24	29,024
13	B-103	10,619	3,000	11,000	B	0.25	0.15	6	24	29,024
14	B-104	44,931	42,000	45,000	B	0.25	0.15	6	24	29,024
15	B-105	20,187	16,000	20,000	B	0.25	0.15	6	24	29,024
16	B-106	24,869	19,000	25,000	B	0.25	0.15	6	24	29,024
17	B-107	21,971	19,000	22,000	B	0.25	0.15	6	24	29,024
18	B-108	14,874	11,000	15,000	B	0.25	0.15	6	24	29,024
19	B-109	21,249	17,000	21,000	B	0.25	0.15	6	24	29,024
20	B-110	26,562	23,000	27,000	B	0.25	0.15	6	24	29,024
21	B-111	23,047	20,000	23,000	B	0.25	0.15	6	24	29,024
22	B-112	4,354	3,000	4,000	B	0.25	0.15	6	24	29,024
23	B-201	4,200	1,000	4,000	B2	0.25	0.15	6	24	33,638
24	B-202	4,050	0	4,000	B2	0.25	0.15	6	24	33,638
25	B-203	5,046	1,000	5,000	B2	0.25	0.15	6	24	33,638
26	B-204	5,046	1,000	5,000	B2	0.25	0.15	6	24	33,638
27	BX-101	4,354	1,000	4,000	BX	0.25	0.15	6	24	29,024
28	BX-102	0	0	0	BX	-	-	6	24	29,024
29	BX-103	4,354	9,000	4,000	BX	0.25	0.15	6	24	29,024
30	BX-104	4,354	3,000	4,000	BX	0.25	0.15	6	24	29,024
31	BX-105	4,354	5,000	4,000	BX	0.25	0.15	6	24	29,024
32	BX-106	4,354	0	4,000	BX	0.25	0.15	6	24	29,024

Table B-1. Estimated Liquid Volume in 119 SSTs

	B	L	M	N	O	P	Q	R	S	T
1										
2	Tank No.	DIL (gal)	PLR Rounded (gal)	DIL Rounded (gal)	Tank Farm	Porosity (saltcake)	Porosity (sludge)	Capillary Height (saltcake, in.)	Capillary Height (sludge, in.)	Unpumpable Volume (gal)
33	BX-107	36,128	33,000	36,000	BX	0.13	0.13	6	24	29,024
34	BX-108	3,900	0	4,000	BX	0.25	0.15	6	24	29,024
35	BX-109	25,381	20,000	25,000	BX	0.20	0.20	6	24	29,024
36	BX-110	27,786	26,000	28,000	BX	0.25	0.15	6	24	29,024
37	BX-111	5,323	2,000	5,000	BX	0.12	0.15	6	24	29,024
38	BX-112	8,811	7,000	9,000	BX	0.09	0.09	6	24	29,024
39	BY-101	28,019	24,000	28,000	BY	0.10	0.15	6	24	29,024
40	BY-102	40,069	33,000	40,000	BY	0.26	0.26	6	24	29,024
41	BY-103	57,957	53,000	58,000	BY	0.20	0.15	6	24	29,024
42	BY-104	40,244	36,000	40,000	BY	0.25	0.15	6	24	29,024
43	BY-107	39,171	35,000	39,000	BY	0.25	0.15	6	24	29,024
44	BY-108	32,809	26,000	33,000	BY	0.24	0.24	6	24	29,024
45	BY-109	30,581	26,000	31,000	BY	0.33	0.15	6	24	29,024
46	BY-110	20,870	17,000	21,000	BY	0.13	0.15	6	24	29,024
47	BY-111	13,728	6,000	14,000	BY	0.25	0.15	6	24	29,024
48	BY-112	24,016	12,000	24,000	BY	0.42	0.42	6	24	29,024
49	C-101	4,354	0	4,000	C	0.25	0.15	6	24	29,024
50	C-102	62,180	55,000	62,000	C	0.26	0.26	6	24	29,024
51	C-104	34,336	30,000	34,000	C	0.25	0.15	6	24	29,024
52	C-105	9,886	8,000	10,000	C	0.25	0.15	6	24	29,024
53	C-107	29,862	25,000	30,000	C	0.18	0.18	6	24	29,024
54	C-108	4,354	0	4,000	C	0.25	0.15	6	24	29,024
55	C-109	4,354	4,000	4,000	C	0.25	0.15	6	24	29,024
56	C-110	36,613	30,000	37,000	C	0.27	0.27	6	24	29,024
57	C-111	4,354	0	4,000	C	0.25	0.15	6	24	29,024
58	C-112	5,686	1,000	6,000	C	0.25	0.15	6	24	29,024
59	C-201	300	0	0	C2	0.25	0.15	6	24	33,638
60	C-202	150	0	0	C2	0.25	0.15	6	24	33,638
61	C-203	750	0	1,000	C2	0.25	0.15	6	24	33,638
62	C-204	450	0	0	C2	0.25	0.15	6	24	33,638

Table B-1. Estimated Liquid Volume in 119 SSTs

	B	L	M	N	O	P	Q	R	S	T
2	Tank No.	DIL (gal)	PLR Rounded (gal)	DIL Rounded (gal)	Tank Farm	Porosity (saltcake)	Porosity (sludge)	Capillary Height (saltcake, in.)	Capillary Height (sludge, in.)	Unpumpable Volume (gal)
63	S-104	34,036	31,000	34,000	S	0.25	0.15	6	24	29,024
64	S-105	41,761	33,000	42,000	S	0.33	0.15	6	24	29,024
65	S-108	4,225	0	4,000	S	0.17	0.15	6	24	29,024
66	S-110	30,302	27,000	30,000	S	0.13	0.13	6	24	29,024
67	SX-107	5,686	0	6,000	SX	0.25	0.15	6	24	35,024
68	SX-108	0	0	0	SX	-	-	6	24	35,024
69	SX-109	0	0	0	SX	-	-	6	24	35,024
70	SX-110	0	0	0	SX	-	-	6	24	35,024
71	SX-111	8,386	3,000	8,000	SX	0.25	0.15	6	24	35,024
72	SX-112	6,286	1,000	6,000	SX	0.25	0.15	6	24	35,024
73	SX-113	0	0	0	SX	-	-	6	24	35,024
74	SX-114	20,636	15,000	21,000	SX	0.25	0.15	6	24	35,024
75	SX-115	0	0	0	SX	-	-	6	24	35,024
76	T-101	19,624	16,000	20,000	T	0.25	0.15	6	24	29,024
77	T-102	2,850	11,000	3,000	T	0.25	0.15	6	24	29,024
78	T-103	3,450	3,000	3,000	T	0.25	0.15	6	24	29,024
79	T-105	4,786	0	5,000	T	0.25	0.15	6	24	29,024
80	T-106	0	2,000	0	T	-	-	6	24	29,024
81	T-107	33,624	28,000	34,000	T	0.21	0.21	6	24	29,024
82	T-108	5,156	0	5,000	T	0.25	0.15	6	24	29,024
83	T-109	10,369	3,000	10,000	T	0.25	0.15	6	24	29,024
84	T-111	38,154	35,000	38,000	T	0.10	0.10	6	24	29,024
85	T-112	4,354	7,000	4,000	T	0.25	0.15	6	24	29,024
86	T-201	4,200	1,000	4,000	T2	0.25	0.15	6	24	33,638
87	T-202	3,150	0	3,000	T2	0.25	0.15	6	24	33,638
88	T-203	5,046	0	5,000	T2	0.25	0.15	6	24	33,638
89	T-204	5,046	0	5,000	T2	0.25	0.15	6	24	33,638
90	TX-101	8,436	7,000	8,000	TX	0.25	0.15	6	24	29,024
91	TX-102	26,807	16,000	27,000	TX	0.36	0.36	6	24	29,024
92	TX-103	18,272	11,000	18,000	TX	0.25	0.25	6	24	29,024

	B	L	M	N	O	P	Q	R	S	T
1				**Table B-1. Estimated Liquid Volume in 119 SSTs**						
2	Tank No.	DIL (gal)	PLR Rounded (gal)	DIL Rounded (gal)	Tank Farm	Porosity (saltcake)	Porosity (sludge)	Capillary Height (saltcake, in.)	Capillary Height (sludge, in.)	Unpumpable Volume (gal)
93	TX-104	8,569	9,000	9,000	TX	0.25	0.15	6	24	29,024
94	TX-105	24,948	14,000	25,000	TX	0.38	0.38	6	24	29,024
95	TX-106*	37,370	30,000	37,000	TX	0.24	0.24	58	24	29,024
96	TX-107	6,456	1,000	6,000	TX	0.25	0.15	6	24	29,024
97	TX-108	7,758	1,000	8,000	TX	0.25	0.15	6	24	29,024
98	TX-109*	5,923	2,000	6,000	TX	0.25	0.15	6	104	29,024
99	TX-110	14,217	10,000	14,000	TX	0.26	0.15	6	24	29,024
100	TX-111	9,883	6,000	10,000	TX	0.18	0.15	6	24	29,024
101	TX-112	25,768	21,000	26,000	TX	0.17	0.17	6	24	29,024
102	TX-113	18,464	14,000	18,000	TX	0.17	0.17	6	24	29,024
103	TX-114	16,670	11,000	17,000	TX	0.21	0.15	6	24	29,024
104	TX-115	24,622	15,000	25,000	TX	0.32	0.32	6	24	29,024
105	TX-116	21,132	17,000	21,000	TX	0.20	0.15	6	24	29,024
106	TX-117	9,642	5,000	10,000	TX	0.16	0.15	6	24	29,024
107	TX-118	24,275	20,000	24,000	TX	0.35	0.15	6	24	29,024
108	TY-101	2,102	0	2,000	TY	0.08	0.08	6	24	29,024
109	TY-102	11,869	5,000	12,000	TY	0.25	0.15	6	24	29,024
110	TY-103	20,051	16,000	20,000	TY	0.25	0.15	6	24	29,024
111	TY-104	4,354	0	4,000	TY	0.25	0.15	6	24	29,024
112	TY-105	12,056	10,000	12,000	TY	0.07	0.07	6	24	29,024
113	TY-106	3,150	0	3,000	TY	0.25	0.15	6	24	29,024
114	U-101	3,300	2,000	3,000	U	0.25	0.15	6	24	29,024
115	U-104	0	0	0	U	-	-	6	24	29,024
116	U-110	17,986	14,000	18,000	U	0.25	0.15	6	24	29,024
117	U-112	4,354	4,000	4,000	U	0.25	0.15	6	24	29,024
118	U-201	600	1,000	1,000	U2	0.25	0.15	6	24	33,638
119	U-202	600	1,000	1,000	U2	0.25	0.15	6	24	33,638
120	U-203	300	1,000	0	U2	0.25	0.15	6	24	33,638
121	U-204	300	1,000	0	U2	0.25	0.15	6	24	33,638
122										

	B	L	M	N	O	P	Q	R	S	T
1				Table B-1. Estimated Liquid Volume in 119 SSTs						
2	Tank No.	DIL (gal)	PLR Rounded (gal)	DIL Rounded (gal)	Tank Farm	Porosity (saltcake)	Porosity (sludge)	Capillary Height (saltcake, in.)	Capillary Height (sludge, in.)	Unpumpable Volume (gal)
123	TOTALS	1,694,506	1,259,000	1,695,000						
124										
125										
126										
127										
128										

Table B-2. Formulas for Estimating PLR and DIL for 119 SSTs

Stab. Method	Tank No.	PLR Formula (gal)	DIL Formula (gal)*
SN	A-102	=L3-E3*Q3-D3*P3+C3	=D3*P3+E3*Q3
AR	A-103	=L4-T4*Q4+C4	=(E4-2754*24)*Q4+D4*P4
AR	A-104	=C5	=IF(E5>T5, T5*Q5,E5*Q5)
AR	A-105	=L6-T6*Q6+C6	=IF(E6>T6, T6*Q6,E6*Q6)
AR	A-106	=L7-T7*Q7+C7	=(E7-2754*24)*Q7+D7*P7
SN	AX-102	=L8-E8*Q8-D8*P8+C8	=D8*P8+E8*Q8
AR	AX-103	=L9-E9*Q9-(T9-E9)*P9+C9	=E9*Q9+(D9-2754*6)*P9
AR	AX-104	=C10	=IF(E10>T10, T10*Q10,E10*Q10)
SN	B-101	=L11-T11*P11+C11	=(D11-2754*6)*P11
SN	B-102	=L12-D12*P12+C12	=D12*P12
SN	B-103	=L13-T13*P13+C13	=(D13-2754*6)*P13
SN	B-104	=L14-T14*Q14+C14	=(E14-2754*24)*Q14+((H14-12)*2754-E14+12500)*P14
AR	B-105	=L15-E15*Q15-(T15-E15)*P15+C15	=E15*Q15+(G15-E15-6*2754)*P15
SN	B-106	=L16-T16*P16+C16	=(D16-2754*6)*P16
SN	B-107	=L17-T17*Q17+C17	=T17*Q17+(D17-(6*(95120-E17)/66096)*2754)*P17
SN	B-108	=L18-T18*Q18+C18	=T18*P18+(D18-(1-(E18-T18)/(2754*24))*6*2754)*P18
SN	B-109	=L19-T19*Q19+C19	=T19*P19+(D19-(1-(E19-T19)/(2754*24))*6*2754)*P19
AR	B-110	=L20-T20*Q20+C20	=(G20-24*2754)*Q20+D20*P20
SN	B-111	=L21-T21*Q21+C21	=(G21-24*2754)*Q21+D21*P21
SN	B-112	=L22-T22*Q22+C22	=IF(E22>T22, T22*Q22,E22*Q22)
AR	B-201	=C23	=IF(E23>T23, T23*Q23,E23*Q23)
AR	B-202	=C24	=IF(E24>T24, T24*Q24,E24*Q24)
AR	B-203	=L25-T25*Q25+C25	=IF(E25>T25, T25*Q25,E25*Q25)
AR	B-204	=L26-T26*Q26+C26	=IF(E26>T26, T26*Q26,E26*Q26)
AR	BX-101	=L27-T27*Q27+C27	=IF(E27>T27, T27*Q27,E27*Q27)
AR	BX-102	=L28-T28*Q28+C28	=(E28-2754*24)*Q28+D28*P28
AR	BX-103	=L29-T29*Q29+C29	=IF(E29>T29, T29*Q29,E29*Q29)
SN	BX-104	=L30-T30*Q30+C30	=IF(E30>T30, T30*Q30,E30*Q30)
SN	BX-105	=L31-T31*Q31+C31	=IF(E31>T31, T31*Q31,E31*Q31)
SN	BX-106	=L32-T32*Q32+C32	=IF(E32>T32, T32*Q32,E32*Q32)
JET	BX-107	=L33-T33*Q33+C33	=(E33-2754*24)*Q33+D33*P33
SN	BX-108	=C34	=IF(E34>T34, T34*Q34,E34*Q34)
JET	BX-109	=L35-T35*Q35+C35	=(E35-2754*24)*Q35+D35*P35

Table B-2. Formulas for Estimating PLR and DIL for 119 SSTs

Stab. Method	Tank No.	PLR Formula (gal)	DIL Formula (gal)*
SN	BX-110	=L36-T36*Q36+C36	=(E36-2754*24)*Q36+D36*P36
JET	BX-111	=N37-E37*Q37-(T37-E37)*P37+C37	=IF(G37>E37,E37*Q37+(G37-E37)*P37,G37*Q37)
JET	BX-112	=L38-T38*Q38+C38	=(E38-2754*24)*Q38+D38*P38
JET	BY-101	=L39-T39*Q39+C39	=IF(G39>E39,E39*Q39+(G39-E39)*P39,G39*Q39)
JET	BY-102	=L40-T40*P40+C40	=IF(G40>E40,E40*Q40+(G40-E40)*P40,G40*Q40)
JET	BY-103	=L41-E41*Q41-(T41-E41)*P41+C41	=IF(G41>E41,E41*Q41+(G41-E41)*P41,G41*Q41)
JET	BY-104	=L42-T42*Q42+C42	=IF(G42>E42,E42*Q42+(G42-E42)*P42,G42*Q42)
JET	BY-107	=L43-T43*Q43+C43	=IF(G43>E43,E43*Q43+(G43-E43)*P43,G43*Q43)
JET	BY-108	=L44-T44*Q44+C44	=IF(G44>E44,E44*Q44+(G44-E44)*P44,G44*Q44)
JET	BY-109	=L45-T45*Q45+C45	=IF(G45>E45,E45*Q45+(G45-E45)*P45,G45*Q45)
JET	BY-110	=L46-T46*Q46+C46	=IF(G46>E46,E46*Q46+(G46-E46)*P46,G46*Q46)
JET	BY-111	=L47-T47*P47+C47	=IF(G47>E47,E47*Q47+(G47-E47)*P47,G47*Q47)
JET	BY-112	=L48-T48*P48+C48	=IF(G48>E48,E48*Q48+(G48-E48)*P48,G48*Q48)
AR	C-101	=L49-T49*Q49+C49	=IF(E49>T49, T49*Q49,E49*Q49)
JET	C-102	=L50-T50*Q50+C50	=IF(G50>E50,E50*Q50+(G50-E50)*P50,G50*Q50)
SN	C-104	=L51-T51*Q51+C51	=(E51-2754*24)*Q51+D51*P51
AR	C-105	=L52-T52*Q52+C52	=(E52-2754*24)*Q52+D52*P52
JET	C-107	=L53-T53*Q53+C53	=IF(G53>E53,E53*Q53+(G53-E53)*P53,G53*Q53)
AR	C-108	=L54-T54*Q54+C54	=IF(E54>T54, T54*Q54,E54*Q54)
AR	C-109	=L55-T55*Q55+C55	=IF(E55>T55, T55*Q55,E55*Q55)
JET	C-110	=L56-T56*Q56+C56	=IF(G56>E56,E56*Q56+(G56-E56)*P56,G56*Q56)
SN	C-111	=L57-T57*Q57+C57	=IF(E57>T57, T57*Q57,E57*Q57)
AR	C-112	=L58-T58*Q58+C58	=(E58-2754*24)*Q58+D58*P58
AR	C-201	=C59	=IF(E59>T59, T59*Q59,E59*Q59)
AR	C-202	=C60	=IF(E60>T60, T60*Q60,E60*Q60)
AR	C-203	=C61	=IF(E61>T61, T61*Q61,E61*Q61)
AR	C-204	=C62	=IF(E62>T62, T62*Q62,E62*Q62)
AR	S-104	=L63-T63*Q63+C63	=(E63-2754*24)*Q63+D63*P63
JET	S-105	=L64-E64*Q64-(T64-E64)*P64+C64	=IF(G64>E64,E64*Q64+(G64-E64)*P64,G64*Q64)
JET	S-108	0	=IF(G65>E65,E65*Q65+(G65-E65)*P65,G65*Q65)
JET	S-110	=L66-T66*Q66+C66	=IF(G66>E66,E66*Q66+(G66-E66)*P66,G66*Q66)
AR	SX-107	=L67-T67*Q67+C67	=(E67-2754*24)*Q67+D67*P67
AR	SX-108	=L68-T68*Q68+C68	=IF(E68>T68, T68*Q68,E68*Q68)

Table B-2. Formulas for Estimating PLR and DIL for 119 SSTs

Stab. Method	Tank No.	PLR Formula (gal)	DIL Formula (gal)*
AR	SX-109	=L69-T69*Q69+C69	=IF(G69>E69,E69*Q69+(G69-E69)*P69,G69*Q69)
AR	SX-110	=L70-T70*Q70+C70	=IF(E70>T70, T70*Q70,E70*Q70)
SN	SX-111	=L71-T71*Q71+C71	=(E71-2754*24)*Q71+D71*P71
AR	SX-112	=L72-T72*Q72+C72	=(E72-2754*24)*Q72+D72*P72
AR	SX-113	0	=IF(E73>T73, T73*Q73,E73*Q73)
AR	SX-114	=L74-T74*Q74+C74	=(E74-2754*24)*Q74+D74*P74
AR	SX-115	=C75	=IF(E75>T75, T75*Q75,E75*Q75)
SN	T-101	=L76-T76*Q76+C76	=T76*P76+(D76-(1-(E76-T76)/(2754*24))*6*2754)*P76
AR	T-102	=C77	=IF(E77>T77, T77*Q77,E77*Q77)
AR	T-103	=C78	=IF(E78>T78, T78*Q78,E78*Q78)
AR	T-105	=L79-T79*Q79+C79	=(E79-2754*24)*Q79+D79*P79
AR	T-106	=C80	=IF(E80>T80, T80*Q80,E80*Q80)
JET	T-107	=L81-T81*Q81+C81	=IF(G81>E81,E81*Q81+(G81-E81)*P81,G81*Q81)
AR	T-108	=L82-E82*Q82-(T82-E82)*P82+C82	=E82*Q82+(T82-E82)*P82
AR	T-109	=L83-T83*P83+C83	=(D83-2754*6)*P83
JET	T-111	=L84-T84*Q84+C84	=IF(G84>E84,E84*Q84+(G84-E84)*P84,G84*Q84)
AR	T-112	=L85-T85*Q85+C85	=IF(E85>T85, T85*Q85,E85*Q85)
AR	T-201	=C86	=IF(E86>T86, T86*Q86,E86*Q86)
AR	T-202	=C87	=IF(E87>T87, T87*Q87,E87*Q87)
AR	T-203	=L88-T88*Q88+C88	=IF(E88>T88, T88*Q88,E88*Q88)
AR	T-204	=L89-T89*Q89+C89	=IF(E89>T89, T89*Q89,E89*Q89)
AR	TX-101	=L90-T90*Q90+C90	=T90*P90+(D90-(1-(E90-T90)/(2754*24))*6*2754)*P90
JET	TX-102	=L91-T91*P91+C91	=IF(G91>E91,E91*Q91+(G91-E91)*P91,G91*P91)
JET	TX-103	=L92-T92*P92+C92	=IF(G92>E92,E92*Q92+(G92-E92)*P92,G92*P92)
SN	TX-104	=L93-E93*Q93-(T93-E93)*P93+C93	=E93*Q93+(D93-6*2754)*P93
JET	TX-105	=L94-T94*P94+C94	=IF(G94>E94,E94*Q94+(G94-E94)*P94,G94*P94)
JET	TX-106*	=L95-T95*P95+C95	=IF(G95>E95,E95*Q95+(G95-E95)*P95,(G95-R95)*Q95)
AR	TX-107	=L96-E96*Q96-(T96-E96)*P96+C96	=E96*Q96+(T96-E96)*P96
JET	TX-108	=L97-E97*Q97-(T97-E97)*P97+C97	=IF(G97>E97,E97*Q97+(G97-E97)*P97,G97*Q97)
JET	TX-109*	=L98-T98*Q98+C98	=(G98-2754*S98)*Q98+D98*P98
JET	TX-110	=L99-T99*Q99+C99	=IF(G99>E99,E99*Q99+(G99-E99)*P99,G99*Q99)
JET	TX-111	=L100-T100*Q100+C100	=IF(G100>E100,E100*Q100+(G100-E100)*P100,G100*Q100)
JET	TX-112	=L101-T101*P101+C101	=IF(G101>E101,E101*Q101+(G101-E101)*P101,G101*Q101)

Table B-2. Formulas for Estimating PLR and DIL for 119 SSTs

Stab. Method	Tank No.	PLR Formula (gal)	DIL Formula (gal)*
JET	TX-113	=L102-T102*Q102+C102	=IF(G102>E102,E102*Q102+(G102-E102)*P102,G102*Q102)
JET	TX-114	=L103-E103*Q103-(T103-E103)*P103+C103	=IF(G103>E103,E103*Q103+(G103-E103)*P103,G103*Q103)
JET	TX-115	=L104-T104*P104+C104	=IF(G104>E104,E104*Q104+(G104-E104)*P104,G104*Q104)
JET	TX-116	=L105-T105*Q105+C105	=IF(G105>E105,E105*Q105+(G105-E105)*P105,G105*Q105)
JET	TX-117	=L106-T106*Q106+C106	=IF(G106>E106,E106*Q106+(G106-E106)*P106,G106*Q106)
JET	TX-118	=L107-T107*Q107+C107	=IF(G107>E107,E107*Q107+(G107-E107)*P107,G107*Q107)
JET	TY-101	=L108-T108*Q108+C108	=IF(G108>E108,E108*Q108+(G108-E108)*P108,G108*Q108)
AR	TY-102	=L109-T109*P109+C109	=(D109-2754*6)*P109
JET	TY-103	=L110-T110*Q110+C110	=IF(G110>E110,E110*Q110+(G110-E110)*P110,G110*Q110)
AR	TY-104	=L111-T111*Q111+C111	=IF(E111>T111, T111*Q111,E111*Q111)
JET	TY-105	=L112-T112*Q112+C112	=IF(G112>E112,E112*Q112+(G112-E112)*P112,G112*Q112)
AR	TY-106	=C113	=IF(E113>T113, T113*Q113,E113*Q113)
AR	U-101	=C114	=IF(E114>T114, T114*Q114,E114*Q114)
AR	U-104	=L115-T115*Q115+C115	=T115*P115+(D115-(1-(E115-T115)/(2754*24))*6*2754)*P115
AR	U-110	=L116-T116*Q116+C116	=(E116-2754*24)*Q116+D116*P116
AR	U-112	=L117-T117*Q117+C117	=IF(E117>T117, T117*Q117,E117*Q117)
AR	U-201	=C118	=IF(E118>T118, T118*Q118,E118*Q118)
SN	U-202	=C119	=IF(E119>T119, T119*Q119,E119*Q119)
AR	U-203	=C120	=IF(E120>T120, T120*Q120,E120*Q120)
SN	U-204	=C121	=IF(E121>T121, T121*Q121,E121*Q121)
		*See Table B-1 for calculation row and column	

CHECKLIST FOR PEER REVIEW

Document Reviewed: RPP-5556, Rev. 0

Scope of Review:

<u>Yes No N/A</u>

[ ] [ ] [x] Previous reviews complete and cover analysis, up to scope of this review, with no gaps.

[x] [ ] [ ] Problem completely, defined.

[ ] [ ] [x] Accident scenarios developed in a clear and logical manner.

[x] [ ] [ ] Necessary assumptions explicitly stated and supported.

[x] [ ] [ ] Computer codes and data files documented.

[x] [ ] [ ] Data used in calculations explicitly stated in document.

[x] [ ] [ ] Data checked for consistency with original source information as applicable.

[x] [ ] [ ] Mathematical derivations checked including dimensional consistency of results.

[x] [ ] [ ] Models appropriate and used within range of validity or use outside range of established validity justified.

[x] [ ] [ ] Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.

[x] [ ] [ ] Software input correct and consistent with document reviewed.

[x] [ ] [ ] Software output consistent with input and with results reported in document reviewed.

[x] [ ] [ ] Limits/criteria/guidelines applied to analysis results are appropriate and referenced.

[ ] [ ] [x] Safety margins consistent with good engineering practices.

[ ] [ ] [x] Conclusions consistent with analytical results and applicable limits.

[x] [ ] [ ] Results and conclusions address all points required in the problem statement.

[ ] [ ] [x] Format consistent with appropriate NRC Regulatory Guide or other standards.

[x] [ ] [ ] Review calculation, comments, and/or notes are attached.

[x] [ ] [ ] Document approved

T. Albert Hu **1-20-2000**

Reviewer

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