

*****RMIS Viewprint Document Cover Sheet*****

This document was retrieved from the Records Management Information System (RMIS). It is intended for information only and may not be the most recent or updated version.

Accession #: **D3287373**

Document #: **Not Available**

Title/Desc:

**DOCUMENTED SAFETY ANALYSIS FOR THE 242A EVAPORATOR
[SEC 2 OF 2] [APPENDIX 2B THRU CHAPTER 17.0 PAGE
17-2]**

Pages: **271**

**This document was too large to scan
as a single document. It has
been divided into smaller sections.**

Section 2 of 2

Document Information			
Document #	HNF-14755	Revision	0
Title	DOCUMENTED SAFETY ANALYSIS FOR THE 242A EVAPORATOR [TEXT THRU SEC 2Bi- 17-2]		
Date	11/14/2003		
Originator	CAMPBELL TA	Originator Co.	CH2M
Recipient		Recipient Co.	
References			
Keywords			
Projects			
Other Information			

HNF-14755 REV 0

1

2
3
4
5

APPENDIX 2B

**242-A EVAPORATOR
PROCESS FLOW DATA**

HNF-14755 REV 0

1

This page intentionally left blank.

HNF-14755 REV 0

1 **CONTENTS**
2
3
4 2B.0 PROCESS FLOW DATA..... 2B-1
5 2B.1 DESCRIPTION OF FLOW SHEETS 2B-1
6 2B.2 REFERENCES 2B-9
7
8
9 **LIST OF TABLES**
10
11
12 Table 2B-1. Process Flow Sheet for 242-A Evaporator T2B-1

HNF-14755 REV 0

1

This page intentionally left blank.

2

1 **2B.0 PROCESS FLOW DATA**

2
3
4
5 The process flow sheet allows people to model the 242-A Evaporator plant by entering different
6 values in place of the values used in this flow sheet. A majority of the assumed flow conditions,
7 which are variable or subject to change, are located in one area of the flow sheet. Changing any
8 of these flows or values results in an immediate adjustment in the flow sheet and a recalculation
9 of new values. The partition coefficients and the activity coefficients, located in two columns of
10 the spreadsheet, can be changed easily when data support new values for these constants. Also,
11 the equations in the spreadsheet can be changed, if desired, to accommodate changes in the
12 242-A Evaporator plant or new assumption about the stream flow relationships.

13
14 The ability to change the flow sheet increases the opportunity for many groups to use the flow
15 sheet for their own purposes. For example, process engineering can use the flow sheet to
16 estimate concentration of radionuclides in the effluent streams. Advanced engineering can use
17 the flow sheet to predict the effect of changing the partition and activity coefficients. Using feed,
18 product, and effluent data, the activity and partition coefficients can be adjusted to match
19 operating conditions. Health Physics personnel can use the flow sheet to estimate effluent
20 concentrations when plant conditions change. The decontamination coefficients provide a
21 measure of the efficiency of the process in containing radioactivity and preventing releases to the
22 environs.

23
24 **2B.1 DESCRIPTION OF FLOW SHEETS**

25
26
27 The following are specifics on the flow sheets presented in Tables 2B-1 through 2B-4 of this
28 appendix. The assumptions evolved during development of the flow sheet. References are made
29 to the design calculation sheets, which provide examples of the equations and formulas used in
30 calculating the values on the flow sheet.

31
32 Each column is identified separately, giving a brief description of the flow and the methodology
33 and assumptions used in calculating the values. Reference to an example calculation is noted to
34 clarify how the values were derived.

35
36 The first two columns describe the radionuclide, inorganic or organic chemicals and the units.
37 Two values are used for each chemical to simplify construction of the Symphony spreadsheet.
38 The space allowed for the equation for each cell is limited in size, which limits the number of
39 mathematical operations that can be performed for each cell. Also, two cells allow for a quick
40 scan of the values to determine if the input and output from a vessel is balanced. The other cell
41 has values in units that can be compared to environmental release limits.

42
43 **Table 2B-1, Sheet 1**

44
45 Column 3, Stream 1, Feed: The feed stream enters the C-A-1 vessel recirculating loop from feed
46 tank TK-241-AW-102. A flow rate of 340 L/min (90 gal/min) was selected as an average flow
47 rate. The temperature value comes from the previous flow sheet FDM-T-600-00001
48 (H-2-69320). Feed density (Sp. Gr.) is calculated using the primary inorganic chemical

1 composition values and the PREDICT computer equations (note slurry sp. gr calculation
2 example on page 8 of the design calculation sheets). Pump pressure for the feed was assumed to
3 be 340 kpa- (50 lbf/in²-) gauge.
4
5 The individual values for the chemicals (mg/L and FCi/mL) are an average of samples from
6 three double-shell tanks, 241-AW-101, 241-AW-103, and 241-AW-106 (not the appropriate
7 columns in Table 2B-2. These three tanks contain a near double-shell slurry feed (DSSF)
8 product. The values for each tank were averaged (labeled TI-355 Values). A standard deviation
9 for the sample values is also shown. The next column is entitled "Adjusted Feed to C-A-1." The
10 "Average TI-355 Values" values were multiplied by 70% and entered in the "Adjusted Feed to
11 C-A-1" column as the "best guess" of the feed concentration. The values were then adjusted
12 upward so that the slurry values of the Stream 2 column matched the average of the sample date.
13 The "Adjusted Feed to C-A-1" values are identical to the "Stream 1" values and the column
14 labeled "Typical Feed to C-A-1" in Table 2B-3. The feed values required adjustment based on
15 the partition coefficient values and the activity coefficient values. For example, the "³H"
16 (tritium) concentration value from the tanks sampled was 1.0 E-02 FCi/mL. The value for the
17 feed input is higher (1.8 E-02 FCi/mL) to account for the low ³H partition coefficient (6.6 E+03).
18 The low partition coefficient means that a larger fraction of the tritium is evaporated overhead
19 with the condensate stream, the expected path for tritium because tritium is part of the water
20 molecule.
21
22 The column next to "Average TI-355 Values" in Table 2B-2 is labeled "Std. Dev. +/-." The
23 "values" in this column is the calculated standard deviation for the values used to calculate the
24 average values. The standard deviation is a little misleading because each tank result is an
25 average of four samples for the tank. Therefore, the standard deviation values, in most cases, are
26 nearly equal to the average value. This suggests that the variation in values is wider than if the
27 values were selected from the same statistical population of values. The wide variation in values
28 is expected for double-shell tank sample analysis because each tank contains a mixture of waste
29 from a variety of sources. The sample analysis values from these tanks, when compared to other
30 typical feed for the 242-A Evaporator, are higher. This comparison shows that the waste in the
31 three tanks is concentrated waste.
32
33 Stream 2, Slurry: Slurry flow for this flow sheet is based on a 30% waste volume reduction
34 factor. The inorganic and radionuclide concentrations are calculated using the partition factor.
35 The partition factor is a measure of the equilibrium concentrations of a substance in the gas and
36 liquid phase when steady state can be assumed. For example, the partition coefficient for "³H" is
37 6.6 x 10³ (Table 2B-3, Column entitled "C-A-1 Vapor Space Part. Coeff.") The partition
38 coefficient means FCi/mL ³H in the liquid phase divided by FCi/mL ³H in the aqueous phase,
39 assuming equilibrium conditions. An example of the calculation equations is shown on pages 2
40 through 4 of the design calculation sheets.
41
42 Organic concentrations are calculated using the pure vapor pressure of the compound and the
43 activity coefficient for that compound. These values are used instead of partition coefficients
44 because the vapor concentrations of organics are temperature dependent. As the temperature
45 increases, the organic concentrations in the vapor phase also increase. For an ideal organic
46 vapor, the activity coefficient would be 1.0, meaning that the vapor phase mole fraction equals
47 the liquid phase mole fraction. The activity coefficient, therefore, is a measure of how close the
48 organic vapor concentrations correspond to an ideal gas. Activity coefficients near 1.0 mean that

1 the gas and liquid phase concentrations behave like an ideal gas (Raoult's Law). Activity
2 coefficients further from 1.0 are a measure of the non-ideal behavior of the gas. Example
3 calculations using acetone are shown on pages 6 and 7.
4
5 All water entering the C-A-1 evaporator vessel [{B-1 and P-B-2 pumps seal leakage (Streams
6 30 and 31), humidity in the air purges (an input value on the Table of Constants, Table 2B-4),
7 deentrainer pad flushes (Stream 2)] and 30% of the feed stream water is evaporated overhead.
8 The remaining water flows through the slurry pump as part of Stream 2. The density calculation
9 is similar to the density calculation of Stream 1. Vessel C-A-1 temperature is calculated using
10 the equation of the PREDICT program. An example of the calculation is presented on page 8 of
11 the design calculation sheets.
12
13 The radionuclide, inorganic, and organic concentrations in the P-B-2 pump seal water leakage
14 flow (Stream 31) are assumed to flow with the slurry flow. This assumption is opposite for the
15 P-B-2 pump seal leakage-water flow (Stream 31), which is assumed to flow with the overhead
16 vapors. This means that the pump P-B-2 seal water leakage rate does not dilute the slurry flow
17 but merely adds a minor amount of chemicals to the slurry flow.
18
19 The calculated specific gravity for the slurry (**Table 2-15**) of 1.4 is an indication that this flow
20 sheet is near the maximum expected concentrations for future 242-A Evaporator campaigns. In
21 the past and evaporator product has been considered a DSSF product if the density is in the 1.4 to
22 1.5 range.
23
24 Stream 3, Filtered Raw Water: Filtered raw water flows into C-A-1 vessel as a spray on the
25 deentrainment pads to wash the overhead vapors. All water entering through Stream 3 is
26 assumed to be evaporated overhead with the vapor flow. Any organic, inorganic, and
27 radionuclide compounds are assumed to be in equilibrium with the other C-A-1 vessel
28 compounds and either exit with the slurry flow or the overhead vapor flow. The density of the
29 water flow is calculated by suing a regression equation developed for pure water (page 8 of the
30 design calculations). The raw water temperature in an input value. The temperature comes from
31 the raw water samples taken for the Part B Permit.
32
33 Stream 4, Vessel C-A-1 Overhead Vapor Flow: Column 8 contains all other compounds that
34 enter C-A-1 vessel and do not flow with the slurry flow. The vacuum for this flow is a value
35 selected for the flow sheet (i.e., 50 torr as shown in Table 2B-4). The gas temperature is also a
36 value selected for the flow sheet (Table 2B-4). The vacuum and temperature values are used to
37 determine the volume flow rate of gases for this stream. The vapor flow rate, the slurry flow
38 rate, the partition coefficient values, and the activity coefficients are used in the equations to
39 calculate the slurry and overhead flow rates of the stream components.
40
41 Stream 5, E-C-1 Condensate Flow: Vapors condensed in the primary condenser are assumed to
42 be in equilibrium with the vapor flow exiting from the condenser. Different partition coefficients
43 are used for these calculations because data collected for partition coefficients show the pure
44 water partition coefficient (steam condensate is considered to be pure water) to be lower than
45 that for liquids containing dissolved salts (Bendixsen 1989). An assumed water leakage rate
46 [note constant in Table 2B-4 of 0.01 g/m (2.2×10^{-5} lb/m)]. for the condenser also adds organic,
47 inorganic and radionuclide concentrations to both the condensate and vapor flows from E-C-1.
48

1 Stream 6, E-C-1 Vapor Flow: The E-C-1 vapor flow vacuum is calculate using an input value for
2 the E-C-1 pressure differential (20 torr), not value in the Table of Constants, Table 2B-4. The
3 vapor flow also includes ambient air and water vapor flows (Stream 27). Both the vapor
4 temperature and humidity are calculated using equations that assume saturated steam for the
5 E-C-1 vapor flow. Heat transferred to the raw water flowing through the condenser assumes a
6 10% heat loss to the room. and the remaining heat raises the cooling water temperature.
7 Examples of heat transfer calculations are shown on pages 9 and 10 of the design calculation
8 pages.

9

10 Stream 7, E-C-2 Condensate Flow: Vapors condensed in the E-C-2 intercondenser also include
11 the steam condensate flow (Stream 25) from the steam eductor J-LC1-1. The steam flow
12 contains minor concentrations on inorganic and radionuclides that contribute to the condensate
13 concentrations. The calculation methods for the components of the condensate flow are identical
14 with the equations used for the E-C-1 condensate flow.

15

16 Stream 8, E-C-2 Vapor Flow: Vapors exiting E-C-2 contain the airflow rate from E-C-1 (Stream
17 6). The pressure in the E-C-2 condenser is an input value on the constant table, Table 2B-4. As
18 with the E-C-1 condenser, both the temperature and humidity values are calculated using the
19 saturated steam equations. The radionuclide, inorganic and organic concentrations are calculated
20 using the same equations, partition coefficients , and activity coefficients used for the E-C-1
21 vapor flow.

22

23 Stream 9, E-C-3 Condensate Flow: This stream contains the steam condensate flow and
24 radionuclides and inorganic concentrations from Stream 26. As with E-C-1 and E-C-2, the
25 radionuclide, inorganic, and organic concentrations are assumed to be in equilibrium with the
26 E-C-3 vapor flow (Stream 16) concentrations. The vapor partition coefficients for inorganics
27 and radionuclides are used to calculate the fraction of components entering from Streams 8 and
28 26 that are used in Stream 9. The pure component vapor pressure and activity coefficients for
29 the organic components at the temperature of the offgases determine the concentrations of
30 organic components in the condensate flow. The equations for these calculations are identical to
31 the equations for E-C-1 and E-C-2. The E-C-3 vacuum in an input value shown in Table 2B-4.

32

33 Stream 10, Condensate Flow from Tank C-100: The water flow rate for this stream is the sum of
34 condensate flows from Streams 5, 7, and 9 minus a small vapor loss to Stream 32, the air exhaust
35 flow from C-100. The condensate concentrations for radionuclides, inorganics, and organics are
36 assumed to be in equilibrium with the concentrations in the exhaust airflow, Stream 32. The
37 equations for calculating these concentrations are identical to the equations used for E-C-2,
38 E-C-2, and E-C-3. Similarly, the pure water partition coefficients are used for radionuclide and
39 inorganic components. As before, the organic concentrations in the condensate flow use the pure
40 component vapor pressure and activity coefficients to calculate the concentrations. A heat
41 transfer calculation for tank TK-C-100 is not done because the tank temperature is assumed to be
42 near room temperature. There are no cooling or steam coils for tank TK-C-100.

43

44 **Table 2B-1, Sheet 7**

45

46 Stream 11, Condensate Flow to Liquid Effluent Retention Facility (LERF): All flow values for
47 this stream are identical with the flow values of Stream 10 except for the total dissolved solid,

1 ^{90}Sr , ^{134}Cs , ^{135}Cs , and ^{137}Cs values. The filter efficiency of the F-C-1 filter, a constant from page
2 C-1 (95%), removes part of the total dissolved solids from Stream 10.

3

4 Stream 12, Organic Flow to Tank TK-241-AW-102: No flow values are placed in this column
5 because the organic overflow back to TK-241-AW-102 is unknown and variable. Periodic
6 overflow from tank TK-C-100 to tank TK-241-AW-102 is requested by engineering when an
7 organic layer is suspected or detected in tank TK-C-100.

8

9 Streams 13 and 14, Regeneration Eluant Flows for IX-D-1: Ion exchange column IX-D-1 is not
10 used and its removal from the 242-A Evaporator is planned.

11

12 Stream 15, Inlet Airflow for the Vessel Ventilation System: A damper controls airflow into the
13 vessel ventilation system to control vacuum downstream of the E-C-3 condenser. This airflow
14 contains ambient water vapor. The average air temperature and humidity values from the
15 Hanford Meteorological measurement for the 46-year period prior to development of the flow
16 sheet were used as the values for this flow: 10 EC (50 EF) and 50% relative humidity. The flow
17 rate is an input value (500 std/ft³/min) on the constant table, Table 2B-4.

18

19 Stream 16, Vapor Flow Upstream from the H-C-1 Heater: This gas flow is the sum of gas flows
20 from the E-C-3 condenser and Streams 15 and 32.

21

22 Stream 17, AirFlow to F-C-5 High-Efficiency Particulate Air (HEPA) Filters: Stream 16 is
23 heated by the Electric Heater, H-C-1, to 66 EC (150 EF). This value was copied from the
24 previous flow sheet, H-2-39620. The pressure differential for the heater is an input value, 3 in.
25 H₂O, shown on the Table of Constants. The concentration of radionuclide, inorganic or organic
26 components for Stream 17 are identical to the values for Stream 16.

27

28 Stream 18, Stack Airflow: The values of this flow are identical to Stream 17 flow rates. The
29 concentrations of most of the radionuclides and organics are lower than Stream 17 because the
30 F-C-5 filter efficiency and differential pressure values are constants input on the Table of
31 Constants. The assumed F-C-5 filter efficiency of 99% removes 99% of the radioactive and
32 inorganic particulates flowing in the combined vapor flows. Only the volatile and semivolatile
33 inorganic and radionuclide components and the organic components are assumed to flow through
34 the filter without being captured. The volatile and semivolatile inorganic and radionuclide
35 components passing through the F-C-5 filter have been identified as ^3H , ^{113}Sn , ^{124}Sb , ^{125}Sb , ^{126}Sn ,
36 ^{129}I , and NH_4^+ .

37

38 Stream 19, Steam Flow to the E-A-1 Reboiler: The steam flow rate is an input value from the
39 previous flow sheet H-2-69320 [12,300 Kg/h (27,000 lb steam/hr)]. The steam pressure is also
40 from the previous flow sheet [21 kPa (3 lbf/in²) (gauge)]. The concentrations of radionuclide
41 and inorganic components are input values from an average of samples of the steam condensate
42 (Loll 1990c).

43

44 Stream 20, Steam Condensate from the E-A-1 Reboiler: The steam condensate flow rates match
45 the Stream 19 values. This assumes no leaks from the system to either the process streams or the
46 atmosphere.

47

1 **Table 2B-1, Sheet 13**

2
3 Stream 21, Raw Water to E-C-1: This flow rate is an input value from the previous flow sheet,
4 H-2-69320 [13,000 L/min (3,500 gal/min)]. The water temperature and components
5 concentration values are input values from an average of samples of the used raw-water flow
6 (Loll 1990a). Heat transfer calculations for the condensate flow (Stream 5) and the vapor flow
7 (Stream 6) are used to estimate the temperature of the used cooling water flowing into Stream
8 24.
9
10 Stream 22, Raw Water to E-C-2: This flow rate is also an input value from the previous flow
11 sheet, H-2-69320 [303 L/min (80 gal/min)]. The temperature and components concentration
12 values are also input values from an average of samples of the used raw-water flow as explained
13 for Stream 21. Heat transfer calculations also estimate the temperature rise of the water exiting
14 E-C-2 to be 11 EC (52 EF) (value below the Joules/min heat transfer rate).
15
16 Stream 23, Raw Water to E-C-3: This flow rate is identical to E-C-2 because water flows directly
17 from the E-C-2 raw-water outlet pipe to the E-C-3 inlet raw-water pipe. Heat transferred to the
18 raw water flowing through E-C-3 raises the water temperature above the inlet water temperature
19 approximately 12 EC (54 EF) (value below the Joules/min heat transfer rate).
20
21 Stream 24, Used Raw Water to Treated Effluent Disposal Facility (TEDF): This flow is a
22 summation of Streams 21 and 23 subtracting the water leakage rate into E-C-1. The water
23 temperature is calculated using the combined flow rates and temperatures of Streams 21 and 23.
24 The heat transfer value is also the sum of Streams 21 and 23. The component concentrations for
25 this flow are calculated using the concentrations and flow rates of Streams 21 and 23.
26
27 Stream 25, J-EC1-1 Steam Jet Stream Flow: The stream flow rate is identical to the steam flow
28 rate on the previous flow sheet, H-2-69320, [309.09 kg/h (680 lb/h)]. Steam pressure is 7.2×10^5
29 kPa [1×10^5 lbf/in² (gauge)]. The radionuclide, inorganic, and organic concentrations are
30 identical to Stream 19.
31
32 Stream 26, J-EC2-1 Steam Jet Steam Flow: The steam flow rate is identical to the steam flow
33 rate on the previous flow sheet, H-2-69320, 341 Kg/h (750 lb/h). Stream flow properties are
34 similar to Stream 25.
35
36 Stream 27, Air Leakage into E-C-1: Air added to control C-A-1 vessel vacuum flows into E-C-1
37 and is estimated be 708 L/min (25 std. ft³/min). The temperature and humidity of the vacuum
38 are the same as Stream 16.
39
40 Streams 28 and 29, Steam Flow through H-C-1: These streams no longer have values because the
41 prior vessel ventilation steam heater has been replaced with an electric heater.
42
43 Stream 30, Pump P-B-1 Seal Water Leakage Flow: Filtered raw water leaks through the P-B-1
44 shaft seals at an estimated rate of 0.57 L/min (0.15 gal/min). This value is an input value on the
45 Table of Constants, Table 2B-4. The radionuclide, inorganic and organic concentrations are data
46 from the used raw water samples (Loll 1990a).
47

1 **Table 2B-1, Sheet 19**

2
3 Stream 31, Tank P-B-2 Seal Water Leakage Flow: Filtered raw water leaks through the P-B-2
4 pump shaft seals at an estimated flow rate of 0.38 L/min (0.1 gal/min). This value is also in the
5 Table of Constants and the component concentrations are identical to Stream 30.

6
7 Stream 32, Tank TK-C-100 Exhaust Air Flow: The exhaust vapor flow rate from tank TK-C-100
8 has been estimated to be 708 L/min (25 std. ft³/min) and the value is in the Table of Constants.
9 The radionuclide, inorganic, and organic components for this stream are in equilibrium with
10 Stream 10. As with E-C-1, E-C-2, and E-C-3, the pure water partition coefficients and activity
11 coefficients are used to calculate the equilibrium concentrations in the gas and liquid flows. The
12 vapor temperature is assumed to be the same as the water temperature in tank TK-C-100.

13
14 Table 2B-2, Columns 1 and 2: These two columns contain the component and unit information
15 for the flow sheet. These columns contain similar information found in columns 1 and 2 in Table
16 2B-1.

17
18 Columns 3, 4, 5, 6, and 7: These columns contain the most recent information on component
19 concentrations for the 242-A Evaporator. The column headed "WHC-SD-WM-PSE-008" is
20 from the hazard classification source term document identifying the maximum concentrations to
21 be used for the 242-A Evaporator accident analysis calculations. The column headed
22 "65959-87-720 Starr" was an earlier attempt by J. C. Starr to estimate the source term for the
23 accident analysis calculations. The next three columns are sample averages of three double-shell
24 tanks that contain soluble-shell slurry (DSS) and DSSF product from the 242-A Evaporator
25 (**Hendrickson 1990**).

26
27 Column 8: This column is a repeat of column 9 in Table 2B-3 showing the raw water component
28 concentrations.

29
30 Column 9: Blank.

31
32 Column 10: This column is an arithmetic average of columns 5, 6, and 7, which have values. A
33 blank space in columns 5, 6, or 7 is not averaged with the other values. If only one value is
34 shown in columns 5, 6, or 7, the value is transferred to column 10.

35
36 Column 11: This column is the standard deviation calculated for columns 5, 6, and 7. This value
37 represents a measure of dispersion of the sample data from tanks TK-AN-103, TK-AN-106, and
38 TK-AW-103. Column 11 is blank if columns 5, 6, or 7 have no values or only one value appears
39 in columns 5, 6, or 7.

40
41 Column 12: The data in column 11 was multiplied by 70% providing feed stream concentrations
42 for the flow sheet assuming a 242-A Evaporator campaign with a waste volume reduction
43 (WVR) of 30%. The flow sheet, therefore, represents current operation of the 242-A Evaporator
44 producing a DSSF product. For some components, the 70% value was adjusted upward slightly
45 to compensate for part of the components being discharged from the 242-A Evaporator with the
46 stack gas and process condensate flows. The adjustment was necessary so that the slurry flow
47 concentrations match the values in column 10. The values in this column were transferred to
48 column 3 in Table 2B-3 providing the feed input data for the flow sheets.

1

2 Table 2B-3: The first two columns of these pages contain Nuclide/Chemical and Units columns
3 identical to those in Table 2B-1. The third column is the feed stream data used by column 3 in
4 Table 2B-1. The flow sheet was designed so that this column could be replaced with another
5 feed stream composition, and the spreadsheet would recalculate all of the streams using the
6 information in this column.

7

8 Column 4: The “Mole Weight” column contains the molecular weight values of the components.
9 The Mole Weight column is used to calculate molarity of the inorganics in the feed and slurry
10 streams. Stream molarity values are also used to calculate the boiling point of the slurry flow
11 and the density of the feed and slurry streams.

12

13 Column 5: The “Ion Charge” column contains the plus or minus ionic charge of the inorganic
14 species in solution. This column was originally placed in the flow sheet to determine total ionic
15 strength of the ions in solution. The information in this column is no longer being used by the
16 flow sheet.

17

18 Columns 6 and 7: “C-A-1 Vapor Space Partition Coefficient” and “Condensate Partition
19 Coefficient” are the values used in the equilibrium equations to calculate the vapor space and
20 liquid concentrations of the radionuclides and inorganic components. These values were derived
21 from sample analyses of the 702-A Ventilation System Flowsheet (Bendixsen 1990). More
22 recent data have been used to further refine the numbers (**DOE-RL 1990**).

23

24 Table 2B-3, Sheet 3, Columns 5, 6, and 7: Titles for these columns for organic compounds are
25 “Gamma,” “A,” and “B.” Gamma is the activity coefficient calculated using the equations for
26 organic components in a water system (**Pierotti et al. 1959**). The activity coefficient is used to
27 calculate the mole fraction of the organic in equilibrium with the mole fraction of organic in the
28 liquid phase. “A” and “B” are the factors used in the regression equation for calculating the pure
29 component vapor pressure. The equation is an exponential equation of the form: Vapor Pressure
30 (mm Hg) = $\text{Exp}^{(A+C-B)}$ where C is the temperature in EC. For some low boiling point organics, C
31 is EC + 273.12 (EK). The pure component vapor pressure equation is derived by selecting vapor
32 pressure data in the 30 to 50 EC range (**Perry 1973**) and calculating the regression equation.

33

34 Table 2B-3, Sheet 1, Column 8: The “242-A Stack and Process Condensate Decontamination
35 Factors” column calculates the decontamination factor by dividing the feed concentration by the
36 effluent concentration. The evaporation stack decontamination values are generally very high
37 because the gas flow exiting from the C-A-1 vessel passes through three condensers, a demister,
38 and double HEPA filters before discharging from the stack. A majority of the components are
39 removed from the stack gas flow by the vessel ventilation process.

40

41 On the flow sheet, the lower number for each pair of values is the decontamination factor for the
42 process condensate product flow. The decontamination factor for the process condensate is
43 influenced by the scrubbing efficiency of the C-A-1 vessel demister pads.

44

45 Columns 9 and 10: These columns contain the concentrations of radionuclides, inorganic, and
46 organic components in the raw water and stream flows entering the 242-A Evaporator. This data
47 is an average of sample analysis when the 242-A Evaporator facility was operating in 1985
48 through 1987 and 1989 through 1990 respectively (**Loll 1990a and Loll 1990c**).

1
2 **Table 2B-4:** This page contains the Table of Constants used by the flow sheet. These values can
3 be changed by the user when new information concerning the process becomes available.
4 Changing one of these values changes the value of every place the value is used in the flow
5 sheet.

6

7

8 **2B.2 REFERENCES**

9

10 Bendixsen, 1989

11

12 DOE-RL 1990

13

14 Hendrickson 1990

15

16 Loll 1990a

17

18 Loll 1990c

19

20 Perry 1973

21

22 Pierotti et al. 1959

HNF-14755 REV 0

1

This page intentionally left blank.

2

HNF-14755 REV 0

1
2
Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)

Description	Units	PC to LERF	C100 to 102AW	E-101 to IX	IX to 102-AW	Eluted		Inlet Air	Air to H-C-1	Air to F-C-5	Air to Stack	E-A-1 Steam	E-A-1 Cond.	
						11	12	13	14	15	16	17	18	19
Stream Number														
Phenol	mg/L		0.0E+00											
Phenol	mg/min		0.0E+00											
2-Propanol	mg/L		0.0E+00											
2-Propanol	mg/min		0.0E+00											
Propylbenzene	mg/L		3.2E+00											
Propylbenzene	mg/min		3.9E+02											
Pyridine	mg/L		0.0E+00											
Pyridine	mg/min		0.0E+00											
Tetrachloro- ethylene	mg/L		0.0E+00											
Tetrachloro- ethylene	mg/min		0.0E+00											
Tetradecane	mg/L		3.8E-01											
Tetradecane	mg/min		4.7E+01											
Tetrahydro- furan	mg/L		0.0E+00											
Tributyl- phosphate	mg/L		1.1E+00											
Tri-n-butyl- (di-oil)-phosphate	mg/L		5.4E-01											
1,1,1-Tri- chloroethane	mg/min		0.0E+00											
Trichloro- ethylene	mg/L		0.0E+00											
Trichloromethane	mg/L		0.0E+00											
Trichloromethane	mg/min		0.0E+00											
Tridecane	mg/L		1.8E+00											
Tridecane	mg/min		2.2E+02											
Triglyme	mg/L		0.0E+00											
Triglyme	mg/min		0.0E+00											
1,3,5 Trimethyl benzene	mg/L		1.9E+02											
Toluene	mg/L		2.4E+04											
Toluene	mg/min		0.0E+00											
Vinyl Chloride	mg/L		0.0E+00											
Vinyl Chloride	mg/min		0.0E+00											
Undecane	mg/L		8.3E-01											
Undecane	mg/min		1.0E+02											
Unknown	mg/L		8.8E-02											
phthalates	mg/min		1.1E+01											

HNF-14755 REV 0

1 Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)
 2

Description	Units	RW To E-C-1	RW To E-C-2	RW To E-C-3	RW To B Pond	J-EC1-1 Steam	J-EC1-2 Steam	Air in-leaks	H-C-1 Steam	H-C-1 Cond.	P-B-1 Seal Water
Stream Number		21	22	23	24	25	26	27	28	29	30
Pentadecane	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Pentadecanoic Acid	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Pentanedioic Acid	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Phenol	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Phenol	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
2-Propanol	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
2-Propanol	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Propylbenzene	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Propylbenzene	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Pyridine	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Pyridine	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tetrachloro-ethylene	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tetradecane	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tetradecane	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tetrahydro-furan	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tributyl-phosphate	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tri-n-butyl-(di- <i>o</i> -l)-phosphate	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
1,1,1-tri-chloroethane	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Trichloro-ethylene	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Trichloromethane	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Trichloromethane	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tridecane	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Tridecane	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Triglyme	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Triglyme	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
1,3,5 Trimethyl benzene	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Toluene	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Toluene	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Vinyl Chloride	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Vinyl Chloride	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Undecane	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Undecane	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
Unknown	mg/L	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00
phthalates	mg/min	0.0E+00	0.0E+00	0.0E+00	0.0E+00						0.0E+00

3

HNF-14755 REV 0

Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)

1

2

Description	Units	P-B-2 Seal Water	C-100 Air Flow
Stream Number		31	32
Form		Liquid	Gas
L/min	Total	3.8E-01	3.2E+02
Batch	L/Batch		
Temperature	C	2.2E+01	2.8E+01
Sp. Gr.	unitless	1.0E+00	9.1E-01
Abs. Pressure	Torr	7.6E+02	7.6E+02
Abs. Pressure	Pa	1.0E+05	1.0E+05
pH		6.2E+00	
TOC	mg/L	1.7E+00	2.6E-03
TOC	mg/min	6.4E-01	8.6E-01
TDS	mg/L	0.0E+00	6.7E-05
TDS	mg/min	0.0E+00	2.2E-02
H2O	L/min	3.8E-01	1.2E+01
H2O	kg/min	3.8E-01	8.6E-03
Air	L/min	0.0E+00	3.1E+02
Air	kg/min	0.0E+00	3.7E-01
Heat	Joules/min		
Alpha	uC1/ml	8.1E-10	5.7E-16
Alpha	uC1/min	3.1E-07	1.9E-10
Beta	uC1/ml	1.0E-08	6.8E-18
Beta	uC1/min	3.8E-08	2.2E-12
3H	uC1/ml	0.0E+00	2.7E-06
3H	uC1/min	0.0E+00	8.8E-01
14C	uC1/ml	0.0E+00	2.7E-11
14C	uC1/min	0.0E+00	8.8E-06
60Co	uC1/ml	0.0E+00	6.4E-10
60Co	uC1/min	0.0E+00	2.1E-04
63Ni	uC1/ml	0.0E+00	0.0E+00
63Ni	uC1/min	0.0E+00	0.0E+00
79Se	uC1/ml	0.0E+00	2.9E-10
79Se	uC1/min	0.0E+00	9.3E-05
90Sr	uC1/ml	0.0E+00	5.1E-11
90Sr	uC1/min	0.0E+00	1.7E-05
93Zr	uC1/ml	0.0E+00	0.0E+00
93Zr	uC1/min	0.0E+00	0.0E+00
94Nb	uC1/ml	0.0E+00	4.8E-10
94Nb	uC1/min	0.0E+00	1.6E-04
99Tc	uC1/ml	0.0E+00	2.4E-09
99Tc	uC1/min	0.0E+00	7.7E-04
106Ru	uC1/ml	0.0E+00	1.6E-11
106Ru	uC1/min	0.0E+00	5.1E-06
113Sn	uC1/ml	0.0E+00	0.0E+00
113Sn	uC1/min	0.0E+00	0.0E+00
124Sb	uC1/ml	0.0E+00	0.0E+00
124Sb	uC1/min	0.0E+00	0.0E+00
125Sb	uC1/ml	0.0E+00	0.0E+00
125Sb	uC1/min	0.0E+00	0.0E+00
126Sn	uC1/ml	0.0E+00	0.0E+00
126Sn	uC1/min	0.0E+00	0.0E+00
129I	uCf/ml	0.0E+00	1.4E-09
129I	uC1/min	0.0E+00	4.6E-04
134Cs	uC1/ml	0.0E+00	3.7E-10
134Cs	uC1/min	0.0E+00	1.2E-04
135Cs	uC1/ml	0.0E+00	0.0E+00
135Cs	uC1/min	0.0E+00	0.0E+00
137Cs	uC1/ml	0.0E+00	3.0E-12
137Cs	uC1/min	0.0E+00	9.7E-07
144Ce	uC1/ml	0.0E+00	0.0E+00
144Ce	uC1/min	0.0E+00	0.0E+00
147Pm	uC1/ml	0.0E+00	0.0E+00
147Pm	uC1/min	0.0E+00	0.0E+00
151Sm	uC1/ml	0.0E+00	0.0E+00
151Sm	uC1/min	0.0E+00	0.0E+00
155Eu	uC1/ml	0.0E+00	0.0E+00

3

HNF-14755 REV 0

1
2

Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)

Description	Units	P-B-2 Seal Water	C-100 Air Flow
Stream Number		31	32
155Eu	uCi/min	0.0E+00	0.0E+00
226Ra	uCi/min	0.0E+00	0.0E+00
226Ra	uCi/min	0.0E+00	0.0E+00
230Th	uCi/min	0.0E+00	0.0E+00
230Th	uCi/min	0.0E+00	0.0E+00
233U	uCi/min	0.0E+00	0.0E+00
233U	uCi/min	0.0E+00	0.0E+00
234U	uCi/min	0.0E+00	7.2E-13
234U	uCi/min	0.0E+00	2.3E-07
235U	uCi/min	0.0E+00	3.5E-14
235U	uCi/min	0.0E+00	1.1E-08
238U	uCi/min	0.0E+00	2.6E-13
238U	uCi/min	0.0E+00	8.4E-08
237Nd	uCi/min	0.0E+00	1.2E-12
237Nd	uCi/min	0.0E+00	4.0E-07
238Pu	uCi/min	0.0E+00	8.1E-16
238Pu	uCi/min	0.0E+00	2.6E-10
239Pu	uCi/min	0.0E+00	1.7E-15
239Pu	uCi/min	0.0E+00	5.4E-10
240Pu	uCi/min	0.0E+00	0.0E+00
240Pu	uCi/min	0.0E+00	0.0E+00
241Pu	uCi/min	0.0E+00	0.0E+00
241Pu	uCi/min	0.0E+00	0.0E+00
241Am	uCi/min	0.0E+00	6.2E-15
241Am	uCi/min	0.0E+00	2.0E-09
243Am	uCi/min	0.0E+00	0.0E+00
243Am	uCi/min	0.0E+00	0.0E+00
244Cm	uCi/min	0.0E+00	4.8E-12
244Cm	uCi/min	0.0E+00	1.5E-06
A102-	mg/L	0.0E+00	4.1E-04
A102-	mg/min	0.0E+00	1.3E-01
NH4+	mg/L	0.0E+00	1.1E+00
NH4+	mg/min	0.0E+00	3.6E+02
Sb	mg/L	0.0E+00	0.0E+00
Sb	mg/min	0.0E+00	0.0E+00
As	mg/L	0.0E+00	0.0E+00
As	mg/min	0.0E+00	0.0E+00
Ba	mg/L	3.0E-02	3.0E-07
Ba	mg/min	1.2E-02	9.8E-05
Be	mg/L	0.0E+00	0.0E+00
Be	mg/min	0.0E+00	0.0E+00
Si	mg/L	0.0E+00	0.0E+00
Si	mg/min	0.0E+00	0.0E+00
B	mg/L	0.0E+00	3.5E-07
B	mg/min	0.0E+00	1.1E-04
Ca	mg/L	1.9E+01	1.9E-05
Ca	mg/min	7.3E+00	6.0E-03
Co	mg/L	2.0E-03	3.1E-07
Co	mg/min	7.6E-04	1.0E-04
CO3-	mg/L	0.0E+00	2.4E-04
CO3-	mg/min	0.0E+00	7.9E-02
C1-	mg/L	7.8E-01	2.0E-05
C1-	mg/min	3.0E-01	6.6E-03
Cr	mg/L	1.0E-02	4.1E-08
Cr	mg/min	3.9E-02	1.3E-05
Cu	mg/L	7.4E-02	1.5E-07
Cu	mg/min	2.8E-02	4.7E-05
CN-	mg/L	0.0E+00	9.5E-07
CN-	mg/min	0.0E+00	3.1E-04
F-	mg/L	0.0E+00	7.1E-08
F-	mg/min	0.0E+00	2.3E-05
Fe	mg/L	1.0E-01	8.5E-07
Fe	mg/min	3.9E-02	2.8E-04
H2	mg/L	0.0E+00	1.0E-09

3

HNF-14755 REV 0

Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)

1
2

Description	Units	P-B-2	C-100
Stream Number		Seal Water	Air Flow
		31	32
H2	mg/min	0.0E+00	3.4E-07
OH-	mg/L	0.0E+00	1.4E-03
OH-	mg/min	0.0E+00	4.4E-01
Pb	mg/L	1.3E-02	1.1E-06
Pb	mg/min	4.8E-03	3.5E-04
Mg	mg/L	4.3E-00	4.6E-06
Mg	mg/min	1.6E+00	1.5E-03
Mn	mg/L	1.1E-02	5.8E-07
Mn	mg/min	4.0E-03	1.9E-04
Hg	mg/L	0.0E+00	1.6E-07
Hg	mg/min	0.0E+00	5.1E-05
Mo	mg/L	0.0E+00	1.2E-06
Mo	mg/min	0.0E+00	3.8E-04
NH	mg/L	1.1E-02	7.9E-07
N1	mg/min	4.2E-03	2.5E-04
NO3-	mg/L	1.2E+00	3.8E-04
NO3-	mg/min	4.5E-01	1.2E-01
NO2-	mg/L	0.0E+00	4.4E-05
NO2-	mg/min	0.0E+00	1.4E-02
PO4	mg/L	0.0E+00	1.0E-04
PO4	mg/min	0.0E+00	3.4E-02
P	mg/L	0.0E+00	9.6E-05
P	mg/min	0.0E+00	3.1E-02
K	mg/L	8.0E-01	1.0E-04
K	mg/min	3.0E-01	3.3E-02
Se	mg/L	0.0E+00	0.0E+00
Se	mg/min	0.0E+00	0.0E+00
S1	mg/L	0.0E+00	5.9E-06
S1	mg/min	0.0E+00	1.9E-03
Ag	mg/L	0.0E+00	0.0E+00
Ag	mg/min	0.0E+00	0.0E+00
Na	mg/L	2.4E+00	1.6E-04
Na	mg/min	8.9E-01	5.2E-02
SO4-	mg/L	1.0E+01	4.5E-06
SO4-	mg/min	3.9E+00	1.5E-03
S-	mg/L	0.0E+00	0.0E+00
S-	mg/min	0.0E+00	0.0E+00
Ti	mg/L	0.0E+00	0.0E+00
Ti	mg/min	0.0E+00	0.0E+00
W	mg/L	0.0E+00	4.1E-06
W	mg/min	0.0E+00	1.3E-03
U	mg/L	6.4E-04	1.5E-06
U	mg/min	2.4E-04	4.8E-04
V	mg/L	0.0E+00	0.0E+00
V	mg/min	0.0E+00	0.0E+00
Zn	mg/L	4.8E-02	9.6E-07
Zn	mg/min	1.8E-02	3.1E-04
Zr	mg/L	0.0E+00	0.0E+00
Zr	mg/min	0.0E+00	0.0E+00
Acetone	mg/L	0.0E+00	1.9E-03
Acetone	mg/min	0.0E+00	6.0E-01
Alkyl hydroxy- methyl benzene	mg/L	0.0E+00	1.0E-07
Benzyl alcohol	mg/min	0.0E+00	3.3E-05
Benzyl alcohol	mg/min	0.0E+00	0.0E+00
Benzaldehyde	mg/L	0.0E+00	0.0E+00
Benzaldehyde	mg/min	0.0E+00	0.0E+00
Benzene	mg/L	0.0E+00	0.0E+00
Benzene	mg/min	0.0E+00	0.0E+00
Bromodichloro- methane	mg/min	0.0E+00	0.0E+00
Bromoform	mg/L	0.0E+00	0.0E+00
Bromoform	mg/min	0.0E+00	0.0E+00
Butanedioic	mg/L	0.0E+00	6.8E-05

3

HNF-14755 REV 0

1
2

Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)

Description	Units	P-B-2	C-100
		Seal Water	Air Flow
Stream Number		31	32
Acid	mg/min	0.0E+00	2.2E-02
1-Butanol	mg/L	1.1E-02	8.6E-09
1-Butanol	mg/min	4.2E-03	2.8E-06
2-Butanone	mg/L	0.0E+00	0.0E+00
2-Butanone	mg/min	0.0E+00	0.0E+00
Butoxy-	mg/L	0.0E+00	0.0E+00
diglycol	mg/min	0.0E+00	0.0E+00
2-Butoxy-	mg/L	0.0E+00	0.0E+00
ethenol	mg/min	0.0E+00	0.0E+00
Butoxy-	mg/L	0.0E+00	0.0E+00
glycol	mg/min	8.0E-03	0.0E+00
Butoxytri-	mg/L	0.0E+00	0.0E+00
ethyleneglycol	mg/min	0.0E+00	0.0E+00
Butraldehyde	mg/L	0.0E+00	0.0E+00
Butraldehyde	mg/min	0.0E+00	0.0E+00
C3-Alkyldienebenzene	mg/L	0.0E+00	9.0E-03
C3-Alkyldienebenzene	mg/min	0.0E+00	2.9E-02
Caproic acid	mg/L	0.0E+00	0.0E+00
Caproic acid	mg/min	0.0E+00	0.0E+00
Carbon	mg/L	0.0E+00	0.0E+00
Tetrachloride	mg/min	0.0E+00	0.0E+00
Chlorodibromo-	mg/L	0.0E+00	0.0E+00
ethane	mg/min	0.0E+00	1.1E-04
Chloroethyl-, 2-	mg/L	0.0E+00	3.7E-02
hydroxymethyl-, 8A	mg/L	0.0E+00	0.0E+00
Chloroforn	mg/L	0.0E+00	0.0E+00
Chloroforn	mg/min	0.0E+00	0.0E+00
2-Chloromethyl-	mg/L	0.0E+00	2.8E-04
hydroxymethylbenzene	mg/L	0.0E+00	8.5E-02
2-Chloromethyl-	mg/L	0.0E+00	1.7E-03
-o-xylene	mg/min	0.0E+00	5.4E-01
Citric Acid	mg/L	0.0E+00	5.4E-05
Citric Acid	mg/min	0.0E+00	1.7E-02
1,2-Dichloro-	mg/L	0.0E+00	0.0E+00
ethane	mg/min	0.0E+00	0.0E+00
1,1-Dichloro-	mg/L	0.0E+00	0.0E+00
ethylene	mg/min	0.0E+00	0.0E+00
Diethyl-	mg/L	0.0E+00	4.5E-09
phthalates	mg/min	0.0E+00	1.5E-06
Diffluorodi-	mg/L	0.0E+00	0.0E+00
chloromethane	mg/min	0.0E+00	0.0E+00
3,5-Dimethyl-	mg/L	0.0E+00	0.0E+00
pyridine	mg/min	0.0E+00	0.0E+00
Dimethylnitro-	mg/L	0.0E+00	0.0E+00
Samine	mg/min	0.0E+00	0.0E+00
Dimethyltoluidineng/L	mg/L	0.0E+00	2.2E-05
Dimethyltoluidineng/min	mg/min	0.0E+00	7.0E-03
Diocetylphthalate	mg/L	0.0E+00	6.9E-09
Diocetylphthalate	mg/min	0.0E+00	2.2E-06
Dodecane	mg/L	0.0E+00	1.4E-06
Dodecane	mg/min	0.0E+00	4.6E-04
Dodecanoic	mg/L	0.0E+00	1.0E-10
Acid	mg/min	0.0E+00	3.3E-08
Ethanediolic Acid	mg/L	0.0E+00	3.9E-06
Ethanediolic Acid	mg/min	0.0E+00	1.2E-03
Ethoxytri-	mg/L	0.0E+00	0.0E+00
ethylene glycol	mg/min	0.0E+00	0.0E+00
Ethyl, 2-methyl-,	mg/L	0.0E+00	5.3E-07
hydroxymethylbenzenes	mg/L	0.0E+00	1.7E-04
Ethyl alcohol	mg/L	0.0E+00	0.0E+00
Ethyl alcohol	mg/min	0.0E+00	0.0E+00
Ethyl Benzene	mg/L	0.0E+00	0.0E+00
Ethyl Benzene	mg/min	0.0E+00	0.0E+00
Ethylbenz-	mg/L	0.0E+00	1.8E-04
aldehyde	mg/min	0.0E+00	5.7E-02

3

1 Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)

2

Description	Units	P-B-2	C-100
		Water	Seal Air Flow
Stream Number		31	32
ED3A	mg/L	0.0E+00	2.5E-12
ED3A	mg/min	0.0E+00	8.0E-10
EDTA	mg/L	0.0E+00	7.2E-12
EDTA	mg/min	0.0E+00	2.3E-09
Ethyxylene	mg/L	0.0E+00	7.2E-07
Ethyxylene	mg/min	0.0E+00	2.3E-04
Heptadecane	mg/L	0.0E+00	0.0E+00
Heptadecane	mg/min	0.0E+00	0.0E+00
Heptadecanoic Acid	mg/L	0.0E+00	1.9E-09
Heptanedioic Acid	mg/L	0.0E+00	2.8E-08
Hexadecane	mg/L	0.0E+00	0.0E+00
Hexadecane	mg/min	0.0E+00	0.0E+00
Hexadecanoic Acid	mg/L	0.0E+00	1.5E-09
Hydroxyacetic Acid	mg/L	0.0E+00	4.9E-07
2-Hydroxymethylbenzoic Acid	mg/L	0.0E+00	2.5E-06
Methoxydiglycol	mg/L	0.0E+00	0.0E+00
Methoxystri-glycol	mg/L	0.0E+00	0.0E+00
Methylbenzaldehyde	mg/L	0.0E+00	7.0E-05
2-Methylbenzoic Acid	mg/L	0.0E+00	5.5E-06
Methylene chloride	mg/min	0.0E+00	0.0E+00
2-Methylhydroxy-methyl benzene	mg/min	0.0E+00	3.4E-02
Methyl n-propyl ketone	mg/L	0.0E+00	0.0E+00
Methyl n-butyl ketone	mg/L	0.0E+00	0.0E+00
MIBK (Hexane)	mg/L	0.0E+00	0.0E+00
2-Methyl-nonane	mg/min	0.0E+00	0.0E+00
Methyl-toluidine	mg/L	0.0E+00	1.3E-07
n-C22H46	mg/L	0.0E+00	1.3E-09
C40H82	mg/min	0.0E+00	4.2E-07
HEDTA	mg/L	0.0E+00	1.8E-06
HEDTA	mg/min	0.0E+00	5.8E-04
MAIDA	mg/L	0.0E+00	2.2E-06
MAIDA	mg/min	0.0E+00	7.1E-04
MICEDA	mg/L	0.0E+00	1.1E-07
MICEDA	mg/min	0.0E+00	3.6E-05
Nitrilotri-acetic Acid	mg/L	0.0E+00	2.3E-08
Octadecanoic Acid	mg/min	0.0E+00	7.3E-06
o-Xylene	mg/L	0.0E+00	3.5E-10
o-Xylene	mg/min	0.0E+00	0.0E+00
p-Chlorotoluene	mg/L	0.0E+00	0.0E+00
p-Chlorotoluene	mg/min	0.0E+00	0.0E+00
p-Dichlorobenzene	mg/L	0.0E+00	0.0E+00
Pentadecane	mg/L	0.0E+00	1.4E-08

3

HNF-14755 REV 0

1 Table 2B-1. Process Flow Sheet for 242-A Evaporator. (24 sheets)

2

Pentadecane	mg/min	0.0E+00	4.6E-06
Pentadecanoic Acid	mg/L	0.0E+00	1.5E-07
Pentanedioic Acid	mg/min	0.0E+00	4.8E-05
Phenol	mg/L	0.0E+00	1.2E-11
Phenol	mg/min	0.0E+00	3.7E-09
2-Propanol	mg/L	0.0E+00	0.0E+00
2-Propanol	mg/min	0.0E+00	0.0E+00
Propylbenzene	mg/L	0.0E+00	8.4E-05
Propylbenzene	mg/min	0.0E+00	2.7E-02
Pyridine	mg/L	0.0E+00	0.0E+00
Pyridine	mg/min	0.0E+00	0.0E+00
Tetrachloro-ethylene	mg/L	0.0E+00	0.0E+00
Tetradecane	mg/L	0.0E+00	2.5E-07
Tetradecane	mg/min	0.0E+00	8.2E-05
Tetrahydro-furan	mg/L	0.0E+00	0.0E+00
Tributyl phosphate	mg/min	0.0E+00	7.3E-07
Tri-n-butyl-(di-o-l)-phosphate	mg/L	0.0E+00	2.4E-04
1,1,1-Tri-chlorethane	mg/L	0.0E+00	3.6E-07
Trichloro-ethylene	mg/min	0.0E+00	1.2E-04
Trichloro-ethylene	mg/L	0.0E+00	0.0E+00
Trichloromethane	mg/L	0.0E+00	0.0E+00
Trichloromethane	mg/min	0.0E+00	0.0E+00
Tridecane	mg/L	0.0E+00	4.2E-06
Tridecane	mg/min	0.0E+00	1.4E-03
Triglyme	mg/L	0.0E+00	0.0E+00
Triglyme	mg/min	0.0E+00	0.0E+00
1,3,5 Trimethyl benzene	mg/L	0.0E+00	7.1E-03
Toluene	mg/L	0.0E+00	2.3E-00
Toluene	mg/min	0.0E+00	0.0E+00
Vinyl Chloride	mg/L	0.0E+00	0.0E+00
Vinyl Chloride	mg/min	0.0E+00	0.0E+00
Undecane	mg/L	0.0E+00	4.6E-06
Undecane	mg/min	0.0E+00	1.5E-03
Unknown phthalates	mg/L	0.0E+00	9.3E-09
Unknown phthalates	mg/min	0.0E+00	3.0E-06

3

HNF-14755 REV 0

1 Table 2B-2. 242-A Evaporator Feed to C-A-1. (4 sheets)

2

Nuclide/Chemical	Units	AN-103						Raw Water	Average TI-355 Values	Std. Dev. +-	Adjusted Feed to C-A-1				
		SD-WM		65959-87		SD-WM									
		DSSF	DSS	TI-355	DSSF	TI-355	DSSF								
Mg	mg/L								2.9E+01		2.0E+01				
Mn	mg/L								2.9E+01		2.0E+01				
Hg	mg/L								1.6E+01		8.0E+00				
Mo	mg/L								8.8E+01		3.2E+01				
Ni	mg/L								5.3E+01		2.7E+01				
NO3-	mg/L								2.6E+05		8.7E+04				
NO2-	mg/L								2.3E+05		1.2E+00				
PO4	mg/L								8.2E+04		6.0E+04				
P	ng/L										5.3E+03				
K	ng/L										4.9E+03				
Se	ng/L										1.8E+04				
Si	ng/L								2.7E+02		1.9E+02				
Ag	ng/L										8.0E+01				
Na	ng/L								6.3E+05		1.3E+01				
SO4-	ng/L								6.7E+05		2.0E+00				
S-	ng/L								3.8E+04		1.1E+03				
Ti	ng/L										2.9E+03				
W	ng/L										1.1E+03				
U	ng/L										5.8E+00				
V	ng/L										5.8E+00				
Zn	mg/L								4.8E+01		4.8E+01				
Zr	mg/L														
Acetone	mg/L														
Alkyl hydroxy- methyl benzene	mg/L								1.8E+00		1.8E+00				
Benzyl alcohol	mg/L														
Benzaldehyde	mg/L														
Benzene	mg/L														
Bromodichloro- methane	mg/L														
Bromoform	mg/L														
Butanediol	mg/L														
Acid	mg/L														
1-Butanol	mg/L										1.1E-02				
2-Butanone	mg/L														
Butoxy- glycol	mg/L														
2-Butoxy- ethanol	mg/L														
Butoxy- glycol	mg/L														
Butoxytri- ethyleneglycol	mg/L														
Butyraldehyde	mg/L														
C3-Alkylbenzene	mg/L														
Caproic acid	mg/L														
Carbon	mg/L														
Tetrachloride	mg/L														
Chlorodibromo- ethane	mg/L														
Chloroethyl 2- hydroxymethyl	mg/L														
Chloroform	mg/L														
2-Chloromethyl- hydroxymethylbenzene	mg/L														
2-Chloromethyl- -o-xylene	mg/L														
Citric Acid	mg/L														
1,2-Dichloro- ethane	mg/L														
1,1-Dichloro- ethylene	mg/L														

3

HNF-14755 REV 0

1 Table 2B-2. 242-A Evaporator Feed to C-A-1. (4 sheets)

2

Nuclide/Chemical	Units	SD-WM DSSF	65959-87 DSS	AN-103 TI-355	AN-106 TI-355	AN-101 TI-355	Raw Water	Average TI-355 Values	Std. Dev. +/-	Adjusted Feed to C-A-1
Diethyl-phthalates	mg/L				6.6E+00			6.6E+00		4.6E+00
Difluorodichloromethane	mg/L									
3,5-Dimethyl-pyridine	mg/L									
Dimethylnitro-samine	mg/L									
Dimethyltoluidine	mg/L			1.2E+01				1.2E+01		1.0E+01
Diocetylphthalate	mg/L			2.4E+01		1.8E+00		1.3E+01	1.1E+01	9.0E+00
Dodecane	mg/L			4.0E+00		1.7E+00		2.9E+00	1.1E+00	2.2E+00
Dodecanoic Acid	mg/L					9.5E-01		9.5E-01		6.6E-01
Ethanediolic Acid	mg/L			4.2E+03				4.2E+03		2.9E+03
Ethoxytriethylene glycol	mg/L									
Ethyl 2-methyl-hydroxymethylbenzenes	mg/L			4.6E+01				4.6E+01		3.3E+01
Ethyl alcohol	mg/L									
Ethyl Benzene	mg/L									
Ethylbenz-aldehyde	mg/L			6.9E+02				6.9E+02		5.2E+02
EDTA	mg/L			4.8E+00		1.8E+01		1.1E+01	6.6E+00	8.0E+00
EDTA	mg/L			8.5E+01	4.8E+00	1.1E+01		3.4E+01	3.6E+01	2.4E+01
Ethyl xylene	mg/L			3.2E-01				3.2E-01		2.7E-01
Heptadecane	mg/L									
Heptadecanoic Acid	mg/L			2.4E+00				2.4E+00		1.7E+00
Heptanedioic Acid	mg/L			2.7E+01				2.7E+01		1.9E+01
Hexadecane	mg/L									
Hexadecanoic Acid	mg/L				8.3E-01			8.3E-01		5.9E-01
Hexanedioic Acid	mg/L			6.4E+01		7.1E+00		3.6E+01	2.8E+01	2.5E+01
Hexanoic Acid	mg/L			4.3E+01				4.3E+01		3.0E+01
Hydroxyacetic Acid	mg/L				4.6E+01			4.6E+01		6.8E+01
2-Hydroxymethyl-benzoic Acid	mg/L			2.7E+01				2.7E+01		2.0E+01
Methoxydi-glycol	mg/L									
Methoxytri-glycol	mg/L									
Methylbenz-aldehyde	mg/L			6.9E+02				6.9E+02		5.0E+02
2-Methylbenzoic Acid	mg/L			1.8E+01				1.8E+01		1.4E+01
Methylene chloride	mg/L									
2-Methyl-hydroxy-methyl benzene	mg/L			3.5E+02				3.5E+02		2.6E+02
Methyl n-propyl ketone	mg/L									
Methyl n-butyl ketone	mg/L									
MIBK (Hexone)	mg/L									
2-Methyl-nonane	mg/L									
Methyl-toluidine	mg/L									
n-C2246 C40H92	mg/L			1.5E+01		2.0E+01		1.8E+01	2.5E+00	1.3E+01
HEDTA	mg/L				2.0E+01			2.0E+01		1.5E+01

3

HNF-14755 REV 0

1 Table 2B-2. 242-A Evaporator Feed to C-A-1. (4 sheets)
 2

Nuclide/Chemical	Units	SD-WM	65959-87	AN-103	AN-106	AN-101	Raw Water	Average TI-355 Values	Std. Dev. +/-	Adjusted Feed to C-A-1
		DSSF	PSE-008	720Starr DSS	TI-355 DSS	TI-355 DSSF				
MAIOA	mg/L			5.8E+02				5.8E+02		4.1E+02
MICEDA	mg/L			3.0E+01				3.0E+01		2.1E+01
Nitrilotri-	mg/L			4.6E+00		7.5E+00		6.0E+00	1.5E+00	4.2E+00
Octadecanoic Acid	mg/L					4.1E-01				
o-Xylene	ng/L									
p-Chlorotoluene	mg/L									
p-Dichloro- benzene	mg/L									
Pentadecane	mg/L			3.7E+00		8.0E-01		2.2E+00	1.5E+00	1.6E+00
Pentadecanoic Acid	mg/L			3.5E+01				3.5E+01		2.5E+01
Pentanedioic Acid	mg/L			7.0E+01				7.0E+01		4.9E+01
Phenol	mg/L									
2-Propanol	mg/L									
Propylbenzene	mg/L			1.8E+00				1.8E+00		2.4E+00
Pyridine	mg/L									
Tetrachloro- ethylene	mg/L									
Tetradecane	mg/L			9.0E+00		7.4E+00		8.2E+00	8.0E-01	5.9E+00
Tetrahydro- furan	mg/L									
Tributyl phosphate	mg/L			1.8E+01		2.7E+01		2.3E+01	4.5E+00	1.6E+01
Tri-n-butyl-(di-oL)-phosphate	mg/L			1.1E+01				1.1E+01		7.7E+00
1,1,1-Tri- chloroethane	mg/L									
Trichloro- ethylene	mg/L									
Trichloromethane	mg/L									
Tridecane	mg/L			1.5E+01		1.4E+01		1.5E+01	5.0E-01	1.1E+01
Triglyme	mg/L									
1,3,5 Trimethyl benzene	mg/L			7.8E+01				7.8E+01		1.2E+02
Toluene	mg/L									
Vinyl Chloride	mg/L									
Undecane	mg/L			5.8E-01		3.3E+00		1.9E+00	1.4E+00	1.6E+00
Unknown phthalates	mg/L			2.1E+01		5.4E+00		1.3E+01	7.8E+00	9.2E+00

3

HNF-14755 REV 0

1

Table 2B-3. Partition Coefficients and Activity Coefficients. (6 sheets)

2

<u>Nuclide/Chemical</u>	<u>Units</u>	<u>Typical Feed To C-A-1</u>	<u>Mole Weight</u>	<u>ion Charge</u>	<u>C-A-1 Vapor Space</u>	<u>Cond. Part.</u>	<u>242-A Stack & Condens.</u>
TOC	mg/L	3.3E+03	3.6E+02	2.0E+00	3.4E+05	1.0E+05	9.2E+0 1.7E+01
TOC	mg/min				1.0E+07	1.0E+05	0.0E+00
TDS	mg/L						0.0E+00
TDS	mg/min				1.0E+07	1.0E+05	2.5E+06
Alpha	uCi/ml						5.1E-01
Beta	uCi/ml				1.0E+07	1.0E+05	2.9E+11 5.3E+02
3H	uCi/ml	1.8E-02			6.6E+03	1.1E+04	1.2E+05 3.4E-01
14C	uCi/ml	9.7E-04			1.0E+07	1.0E+05	2.8E+11 5.1E+02
60Co	uCi/ml	2.3E-02			1.0E+07	1.0E+05	2.8E+11 5.1E+02
63Ni	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
75Se	uCi/ml	1.0E-02			1.0E+07	1.0E+05	2.8E+09 5.1E+02
90Sr	uCi/ml	7.6E+00			2.3E+09	1.8E+06	1.2E+15 2.3E+06
93Zr	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
94Nb	uCi/ml	1.7E-02			1.0E+07	1.0E+05	2.8E+11 5.1E+02
99Tc	uCi/ml	8.5E-02			1.0E+07	1.0E+05	2.8E+11 5.1E+02
106Ru	uCi/ml	7.0E+00			6.7E+07	1.6E+06	3.1E+11 3.4E+03
113Sn	uCi/ml				2.9E+05	5.2E+05	0.0E+00 0.0E+00
124Sb	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
125Sb	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
126Sn	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
129I	uCi/ml	2.7E-04			2.8E+04	1.4E+05	1.1E+07 1.4E+00
134Cs	uCi/ml	2.0E+00			3.5E+07	4.3E+06	4.3E+13 3.6E+04
135Cs	uCi/ml				3.5E+07	4.3E+06	0.0E+00 0.0E+00
137Cs	uCi/ml	3.5E+02			9.3E+11	3.6E+06	9.5E+17 9.4E+08
144Ce	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
147Pm	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
151Sm	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
155Eu	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
226Ra	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
230Th	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
233U	uCi/ml				1.0E+07	1.0E+05	0.0E+00 0.0E+00
234U	uCi/ml	2.6E-05			1.0E+07	1.0E+05	2.7E+11 5.1E+02
235U	uCi/ml	1.3E-06			1.0E+07	1.0E+05	2.8E+11 5.1E+02
238U	uCi/ml	9.3E-06			1.0E+07	1.0E+05	2.7E+11 5.1E+02
237Np	uCi/ml	4.4E-05			1.0E+07	1.0E+05	2.8E+11 5.1E+02

3

HNF-14755 REV 0

1 Table 2B-3. Partition Coefficients and Activity Coefficients. (6 sheets)
 2

<u>Nuclide/Chemical Units</u>	<u>Typical Feed To C-A-1</u>	<u>Mole Weight</u>	<u>ion Charge</u>	<u>C-A-1 Vapor Space Part.</u>	<u>Cond. Part.</u>	<u>242-A Stack & Condens. Coeff.</u>	<u>Decon. Factors</u>
238Pu	uCi/ml	5.1E-04		3.7E+10	4.8E+05	5.1E+15 1.9E+06	
239Pu	uCi/ml	1.1E-03		3.7E+10	4.8E+05	5.1E+15 1.9E+06	
240Pu	uCi/ml			1.0E+07	1.0E+05	0.0E+00 0.0E+00	
241Pu	uCi/ml			1.0E+07	1.0E+05	0.0E+00 0.0E+00	
241Am	uCi/ml	1.5E-03		1.4E+10	4.9E+05	2.0E+15 7.1E+05	
243Am	uCi/ml			1.4E+10	4.9E+05	0.0E+00 0.0E+00	
244Cm	uCi/ml	1.7E-04		1.0E+07	1.0E+05	2.8E+11 5.1E+02	
A102-	mg/L	2.2E+04	5.9E+01	1.0E+00	1.5E+07	1.0E+05 7.6E+02	4.2E+11
NH4+	mg/L	9.3E+02	1.8E+01	1.0E+00	1.1E+03	2.1E+03 7.0E+02	5.7E-02
Sb	mg/L		1.2E+02	3.0E+00	1.0E+07	1.0E+05 0.0E+00	0.0E+00
As	mg/L		7.5E+01	3.0E+00	1.0E+07	1.0E+05 0.0E+00	0.0E+00
Ba	mg/L	9.8E+00	1.4E+02	2.0E+00	1.0E+07	1.0E+05 4.6E+02	2.3E+10
Be	mg/L		9.0E+00	2.0E+00	1.0E+07	1.0E+05 0.0E+00	0.0E+00
B1	mg/L		2.1E+02	3.0E+00	1.0E+07	1.0E+05 0.0E+00	0.0E+00
B	mg/L	1.2E+01	1.1E+01	3.0E+00	1.0E+07	1.0E+05 4.9E+02	4.4E+10
Ca	mg/L	5.1E+01	4.0E+01	2.0E+00	1.0E+07	1.0E+05 3.9E+01	2.1E+08
Cd	mg/L	1.1E+01	1.1E+02	2.0E+00	1.0E+07	1.0E+05 5.1E+02	2.8E+11
CO3-	mg/L	8.7E+03	6.0E+01	2.0E+00	1.0E+07	1.0E+05 5.1E+02	2.8E+11
Cl-	mg/L	4.5E+03	3.5E+01	1.0E+00	5.2E+06	1.2E+06 2.6E+02	1.2E+12
Cr	mg/L	4.2E+02	5.2E+01	2.0E+00	3.5E+08	8.2E+05 1.8E+04	8.2E+13
Cu	mg/L	4.8E+00	6.4E+01	2.0E+00	1.0E+07	1.0E+05 4.7E+02	3.1E+10
CN-	mg/L	3.4E+01	2.6E+01	1.0E+00	1.0E+07	1.0E+05 5.1E+02	2.8E+11
F-	mg/L	2.7E+02	1.9E+01	1.0E+00	2.4E+08	6.1E+05 9.0E+03	1.0E+12
Fe	mg/L	2.8E+01	5.6E+01	3.0E+00	1.0E+07	1.0E+05 4.6E+02	2.4E+10
H2	mg/L	0.0E+00	2.0E+00	0.0E+00	8.3E-01	4.5E+00 A B	1.4E-04 8.4E-01
OH-	mg/L	4.9E+04	1.7E+01	1.0E+00	1.0E+07	1.0E+05 5.1E+02	2.8E+11
Pb	mg/L	5.1E+01	2.1E+02	2.0E+00	3.0E+05	4.3E+06 1.5E+01	3.6E+11
Mg	mg/L	2.0E+01	2.4E+01	2.0E+00	1.0E+07	1.0E+05 6.3E+01	3.6E+08
Mn	mg/L	2.0E+01	5.5E+01	2.0E+00	1.0E+07	1.0E+05 5.0E+02	8.2E+10
Hg	mg/L	5.6E+00	2.0E+02	2.0E+00	1.0E+07	1.0E+05 5.1E+02	2.6E+11
Mo	mg/L	4.2E+01	9.6E+01	2.0E+00	1.0E+07	1.0E+05 5.1E+02	2.8E+11
Ni	mg/L	2.8E+01	5.9E+01	2.0E+00	1.0E+07	1.0E+05 5.1E+02	2.8E+11

3

HNF-14755 REV 0

1 Table 2B-3. Partition Coefficients and Activity Coefficients. (6 sheets)

2

Nuclide/Chemical	Units	Typical Feed To C-A-1	Mole Weight	ion Charge	C-A-1	242-A	Stack & Condens. Factors
					Vapor Space Part.	Cond. Part.	
NO3-	mg/L	1.2E+05	6.2E+01	1.0E+00	5.7E+06	1.6E+06	2.6E+12 2.9E+02
NO2-	mg/L	6.0E+04	4.6E+01	1.0E+00	2.4E+07	1.6E+06	1.1E+13 1.2E+03
P04	mg/L	3.7E+03	9.5E+01	3.0E+00	1.0E+07	1.0E+05	2.8E+11 5.1E+02
P	mg/L	3.4E+03	3.1E+01	3.0E+00	1.0E+07	1.0E+05	2.8E+11 5.1E+02
K	mg/L	1.3E+04	3.9E+01	1.0E+00	3.5E+07	1.0E+05	5.7E+11 1.8E+03
Se	mg/L		7.9E+01	2.0E+00	1.0E+07	1.0E+05	0.0E+00 0.0E+00
S1	mg/L	1.3E+02	2.8E+01	4.0E+00	1.0E+07	1.0E+05	4.2E+09 3.2E+02
Ag	mg/L		1.1E+02	1.0E+00	1.0E+07	1.0E+05	0.0E+00 0.0E+00
Na	mg/L	1.7E+05	2.3E+01	1.0E+00	3.0E+08	1.0E+05	3.6E+12 1.5E+04
SO4-	mg/L	2.0E+03	9.6E+01	2.0E+00	1.4E+07	1.1E+06	1.7E+11 5.8E+02
S-	mg/L		3.2E+01	2.0E+00	1.0E+07	1.0E+05	0.0E+00 0.0E+00
Tl	mg/L		4.8E+01	3.0E+00	1.0E+07	1.0E+05	0.0E+00 0.0E+00
W	mg/L	1.5E+02	1.8E+02	2.0E+00	1.0E+07	1.0E+05	2.8E+11 5.1E+02
U	mg/L	5.3E+01	2.4E+02	3.0E+00	1.0E+07	1.0E+05	2.7E+11 5.1E+02
V	mg/L		5.1E+01	2.0E+00	1.0E+07	1.0E+05	0.0E+00 0.0E+00
Zn	mg/L	3.4E+01	6.5E+01	2.0E+00	1.0E+07	1.0E+05	9.6E+10 5.0E+02
Zr	mg/L		9.1E+01	4.0E+00	1.0E+07	1.0E+05	0.0E+00 0.0E+00
Gamma							
Acetone	mg/L	4.5E-01		7.8E+00	4.5E-02	-8.0E+00	7.5E+00 1.2E-02
Alkyl hydroxy- methyl benzene	mg/L	1.3E+00		5.3E+00	5.4E-02	-3.2E+00	9.8E+08 1.6E+01
Benzyl alcohol	mg/L			3.4E+00	7.1E-02	-4.1E+00	0.0E+00 0.0E+00
Benzaldehyde	mg/L			3.6E+00	6.5E-02	-1.7E+00	0.0E+00 0.0E+00
Benzene	mg/L			9.1E+00	4.5E-02	3.4E+00	0.0E+00 0.0E+00
Bromodichloro- methane	mg/L			2.0E+00	4.3E-02	3.4E+00	0.0E+00 0.0E+00
Bromoform	mg/L			2.0E+00	5.3E-02	4.6E-01	0.0E+00 0.0E+00
Butanedioic Acid	mg/L	3.0E+02		1.6E+00	3.6E-02	-7.9E-01	3.4E+08 1.2E+01
1-Butanol	mg/L			1.6E+00	6.2E-02	9.7E-01	7.1E+05 5.6E-01
2-Butanone	mg/L			1.7E+00	4.3E-02	3.5E+00	0.0E+00 0.0E+00
Butoxy- diglycol	mg/L			2.7E+00	6.1E-02	-1.7E+00	0.0E+00 0.0E+00
2-Butoxy- ethanol	mg/L			2.7E+00	6.1E-02	-1.7E+00	0.0E+00 0.0E+00
Butoxy- glycol	mg/L			2.7E+00	6.1E-02	-1.7E+00	0.0E+00 0.0E+00
Butoxytri- ethyleneglycol	mg/L			2.7E+00	6.1E-02	-1.7E+00	0.0E+00 0.0E+00
Butraldehyde	mg/L			1.6E+00	6.2E-02	9.7E-01	0.0E+00 0.0E+00
C3-Alkylbenzene	mg/L	3.9E+02		5.0E+00	5.4E-02	-7.8E-02	1.3E+06 1.3E+06

3

HNF-14755 REV 0

1 Table 2B-3. Partition Coefficients and Activity Coefficients. (6 sheets)
 2

<u>Nuclide/Chemical Units</u>	<u>Typical Feed To C-A-1</u>	<u>Mole Weight</u>	<u>ion Charge</u>	<u>C-A-1 Vapor Space Part.</u>	<u>Cond. Part.</u>	<u>242-A Stack & Condens. Factors</u>
Caproic acid	mg/L			2.8E+00	8.9E-02	-6.3E+00
Carbon	mg/L			2.0E+00	4.0E-02	3.7E+00
Tetrachloride	mg/L					0.0E+00
Chlorodibromo-ethane	mg/L			2.6E+00	4.7E-02	1.4E+00
Chloroethyl-2-hydroxymethyl, BA	mg/L	1.3E+01		6.4E+00	5.9E-02	-1.1E+00
Chloroform	mg/L			2.0E+00	4.3E-02	4.2E+00
2-Chloromethyl-2-hydroxymethylbenzene	mg/L	1.4E+01		1.0E+01	5.9E-02	-1.1E+00
2-Chloromethyl- <i>o</i> -xylene	mg/L	1.5E+01		6.4E+00	5.7E-02	6.6E-01
Citric Acid	mg/L	2.8E+01		2.8E+00	6.2E-02	-1.3E+00
1,2 Dichloro-ethane	mg/L			2.6E+00	4.0E-02	3.4E+00
1,1 Dichloro-ethylene	mg/L			2.6E+00	3.8E-02	5.4E+00
Diethyl-phthalates	mg/L	4.6E+00		6.5E+00	5.0E-02	-5.5E+00
Difluorodichloromethane	mg/L			2.0E+00	4.6E-02	-4.4E+00
3,5-Dimethyl-pyridine	mg/L			3.9E+00	6.2E-02	-1.8E+00
Dimethylnitrosamine	mg/L			2.1E+00	3.9E-02	4.5E+00
Dimethyltoluidine	mg/L	1.0E+01		5.1E+00	6.2E-02	-1.8E+00
Diocetylphthalate	mg/L	9.0E+00		9.0E+00	5.2E-02	-6.0E+00
Dodecane	mg/L	2.2E+00		8.4E+00	5.7E-02	-2.7E+00
Dodecanoic Acid	mg/L	6.6E-01		6.5E+00	5.4E-02	-6.6E+00
Ethanedioic Acid	mg/L	2.9E+03		4.9E-01	6.0E-02	-3.2E+00
Ethoxytriethylene-glycol	mg/L			2.2E+00	4.1E-02	2.5E+00
Ethyl,2-methyl-2-hydroxymethylbenzenes	mg/L	3.3E+01		5.3E+00	5.5E-02	-4.0E+00
Ethyl alcohol	mg/L			5.3E-01	5.4E-02	2.7E+00
Ethyl Benzene	mg/L			5.8E+00	5.1E-02	9.8E-01
Ethylbenzalddehyde	mg/L	5.2E+02		4.9E+00	5.7E-02	-2.5E+00
ED3A	mg/L	8.0E+00		9.5E+00	5.2E-02	-1.0E+01
EDTA	mg/L	2.4E+01		9.5E+00	5.2E-02	-1.0E+01
Ethylxylen	mg/L	2.7E-01		4.8E+00	6.1E-02	-1.6E+00
Heptadecane	mg/L			1.2E+01	5.3E-02	-6.1E+00
Heptadecanoic Acid	mg/L	1.7E+00		1.2E+01	5.3E-02	-6.1E+00
Heptanedioic Acid	mg/L	1.9E+01		3.4E+00	6.9E-02	-5.4E+00
Hexadecane	mg/L			1.1E+01	5.4E-02	-5.7E+00
Hexadecanoic Acid	mg/L	5.9E-01		1.1E+01	5.4E-02	-5.7E+00

3

HNF-14755 REV 0

1
2

Table 2B-3. Partition Coefficients and Activity Coefficients. (6 sheets)

<u>Nuclide/Chemical</u>	<u>Units</u>	<u>Typical Feed To C-A-1</u>	<u>Mole Weight</u>	<u>ion Charge</u>	<u>C-A-1 Vapor Space Part. Coeff.</u>	<u>242-A Stack & Condens. Part. Decon. Coeff.</u>	<u>Factors</u>
Hexanedioic Acid	mg/L	2.5E+01		2.8E+00	5.1E-02 -8.1E+00	8.3E+13 4.8E+03	
Hexanoic Acid	mg/L	3.0E+01		2.8E+00	8.9E-02 -6.3E+00	1.1E+11 1.1E+02	
Hydroxyacetic Acid	mg/L	6.8E+01		4.9E-01	5.4E-02 2.7E+00	3.9E+05 4.6E-01	
2-Hydroxymethylbenzoic Acid	mg/L	2.0E+01		4.0E+00	6.1E-02 -3.0E+00	6.0E+08 1.1E+01	
Methoxydiglycol	mg/L			2.3E+00	5.7E-02 -5.2E+00	0.0E+00 0.0E+00	
Methoxytriglycol	mg/L			2.2E+00	6.2E-02 -2.4E+00	0.0E+00 0.0E+00	
Methylbenzaldehyde	mg/L	5.0E+02		4.2E+00	6.1E-02 -3.0E+00	5.5E+08 1.1E+01	
2-Methylbenzoic Acid	mg/L	1.4E+01		3.9E+00	6.3E-02 -2.5E+00	1.9E+08 6.2E+00	
Methylene chloride	mg/L			2.0E+00	3.9E-02 5.1E+00	0.0E+00 0.0E+00	
2-Methylhydroxyethylbenzene	mg/L	2.6E+02		3.9E+00	6.3E-02 -2.5E+00	1.9E+08 6.2E+00	
Methyl n-propyl ketone	mg/L			2.1E+00	5.9E-02 1.3E+00	0.0E+00 0.0E+00	
Methyl n-butyl ketone	mg/L			2.6E+00	6.5E-02 -2.6E-01	0.0E+00 0.0E+00	
NIBK (Hexone)	mg/L			2.6E+00	6.1E-02 4.9E-01	0.0E+00 0.0E+00	
2-Methyl-nonane	mg/L			7.1E+00	5.9E-02 -4.0E+00	0.0E+00 0.0E+00	
Methyl toluidine	mg/L	2.5E+00		4.5E+00	5.6E-02 -3.3E+00	1.5E+09 1.9E+01	
n-C22H46 - C40H82	mg/L	1.3E+01		2.1E+01	4.4E-02 -7.5E+00	7.8E+11 5.0E+02	
HEDTA	mg/L	1.5E+01		4.5E+00	5.7E-02 -3.0E+00	6.4E+08 1.2E+01	
MAIDA	mg/L	4.1E+02		2.7E+00	6.3E-02 -4.2E+00	1.5E+10 5.6E+01	
MICEDA	mg/L	2.1E+01		2.7E+00	6.3E-02 -4.2E+00	1.5E+10 5.6E+01	
Nitrilotriacetic Acid	mg/L	4.2E+00		2.7E+00	6.3E-02 -4.2E+00	1.5E+10 5.6E+01	
Octadecanoic Acid	mg/L	2.9E-01		1.2E+01	5.3E-02 -6.1E+00	6.5E+10 1.3E+02	
o-Xylene	mg/L			5.8E+00	5.1E-02 8.6E-01	0.0E+00 0.0E+00	
p-Chlorotoluene	mg/L			5.8E+00	5.1E-02 7.2E-02	0.0E+00 0.0E+00	
p-Dichlorobenzene	mg/L			5.1E+00	4.8E-02 -3.4E-01	0.0E+00 0.0E+00	
Pentadecane	mg/L	1.6E+00		1.0E+01	5.5E-02 -5.0E+00	8.7E+09 4.7E+01	
Pentadecanoic Acid	mg/L	2.5E+01		8.4E+00	5.5E-02 -5.0E+00	1.3E+10 5.8E+01	
Pantanediol	mg/L	4.9E+01		2.2E+00	5.7E-02 -8.8E+00	3.4E+14 9.0E+03	
Phenol	mg/L			2.6E+00	7.2E-02 -2.9E+00	0.0E+00 0.0E+00	
2-Propanol	mg/L			1.1E+00	5.5E-02 2.4E+00	0.0E+00 0.0E+00	
Propylbenzene	mg/L	2.4E+00		6.5E+00	5.4E-02 -7.8E-02	6.5E+05 5.5E-01	
Pyridine	mg/L			2.7E+00	5.0E-02 1.8E+00	0.0E+00 0.0E+00	
Tetrachloroethylene	mg/L			9.5E+00	4.8E-02 1.7E+00	0.0E+00 0.0E+00	
Tetradecane	mg/L	5.9E+00		9.7E+00	5.4E-02 -4.2E+00	1.8E+09 2.1E+01	

3

1
2

Table 2B-3. Partition Coefficients and Activity Coefficients. (6 sheets)

<u>Nuclide/Chemical</u>	<u>Units</u>	<u>Typical Feed To C-A-1</u>	<u>Mole Weight</u>	<u>ion Charge</u>	<u>C-A-1 Vapor Space Part.</u>	<u>Z42-A Cond. Part.</u>	<u>Stack & Condens. Factors</u>
Tetrahydro-furan	mg/L				2.0E+00	4.3E-02	3.5E+00 0.0E+00
Tributyl-phosphate	mg/L	1.6E+01			8.4E+00	5.8E-02	-4.1E+00 1.7E+09
Tri-n-butyl-(di-o-l)-phosphate	mg/L	7.7E+00			8.4E+00	5.8E-02	-4.1E+00 2.0E+01
1,1,1-Tri-chlorethane	mg/L				2.6E+00	4.5E-02	2.1E+00 0.0E+00
Trichloro-ethylene	mg/L				2.6E+00	4.3E-02	3.2E+00 0.0E+00
Trichloromethane	mg/L				2.0E+00	3.8E-02	5.7E+00 0.0E+00
Tridecane	mg/L	1.1E+01			9.0E+00	4.1E-02	-2.5E+00 2.0E+08
Triglyme	mg/L				3.3E+00	4.5E-02	2.3E+00 8.3E+00
1,3,5 Trimethyl-benzene	mg/L	1.2E+02			1.1E+01	5.3E-02	-2.1E-01 4.0E-01
Toluene	mg/L				5.2E+00	5.0E-02	2.1E+00 0.0E+00
Vinyl Chloride	mg/L				2.6E+00	4.5E-02	-5.1E+00 0.0E+00
Undecane	mg/L	1.6E+00			7.8E+00	6.0E-02	-1.9E+00 2.2E+07
Unknown phthalates	mg/L	9.2E+00			6.5E+00	5.0E-02	-5.5E+00 8.0E+10 1.5E+02

3