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Title WATER BALANCE TABLES FOR NATIO	NAL ENRICHMENT FACILITY BASINS REVIEWED BY: METHOD: X DETAILED CHECK INDEPENDENT CALCULAT
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RPOSE AND SUMMARY OF RESULTS:	
e purpose of this calculation is to determine monthly wa ins in response to the Nuclear Regulatory Commission source Impacts (Part A), pursuant to the NEF Environm	ter balances for the National Enrichment Facility (NEF)'s three (NRC)'s Request for Additional Information (RAI) No. 4-2, Watental Report (ER).
e results for the Treated Effluent Evaporative Basin (TE bws on a monthly basis for the minimum discharge scer charge scenario, the basin would have standing water in	EB) show that basin outflow due to evaporation will exceed all hario with the exception of the winter months. Under the maxim in it for most of the year.
e results for the Uranium Byproduct Cylinder (UBC) Stor waporation will exceed all inflows on a monthly basis ur charge scenario, the basin would have standing water for	rage Pad Stormwater Retention Basin show that basin outflow oder the minimum discharge scenario. Under the maximum or ten months of the year.
e results for the Site Stormwater Detention Basin (SSDE eed all inflows on a monthly basis under both discharge	I) show that basin outflow due to evaporation and infiltration with scenarios.
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32-5047375-00 Page 2 of 60

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	TABLE of CONTENTS	
<u>Section</u>	an an ann an An Ann an Ann	<u>Page No.</u>
Cover Sheet	en an	1
Table of Contents	and a second second Second second	2
1.0 Purpose and Objective		3
2.0 Inputs and Assumptions		3
<ul> <li>3.0 Calculation</li> <li>3.1 Monthly Precipitation Determination</li> <li>3.2 Monthly Evaporation Determination</li> <li>3.3 Monthly Water Balance Basin Determination</li> </ul>	rmination :	5 5 5 6
4.0 Results and Conclusions		12
5.0 References		12
Appendix A – Design Verification Check	list	13
Appendix B – Excerpts from LES ER RA	Al Response 4-2A	16
Appendix C - Excerpts from Sections 1.	2.1 and 4.4.7 of the NEF Environmental Report	26
Appendix D - Western Regional Climat and Monthly Total Precipitation for Hobb	e Center NCDC 1971-2000 Monthly Normals os, New Mexico	31
Appendix E - Excerpts from Ground Wa	ter Discharge Permit Application for the NEF	37
Appendix F – Roswell Evaporation, Stat	ion ID 7604, 01/1948 to 03/1950	44
Appendix G- Lockwood Greene Electron Letter dated May 13, 2004	nic Message dated March 9, 2004 and Response	46
Appendix H – American Society of Civil	Engineers, Hydrology Handbook, Figure 3.24	51
Appendix I – Initial Water Balance Excel	Spreadsheets	<b>54</b>
	<ul> <li>A. Song Restards</li> <li>A. Song Restards</li></ul>	

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#### 1.0 PURPOSE and OBJECTIVE

Referring to Reference 1 (Appendix B), Part A of Environmental Report (ER) Request for Additional Information (RAI) 4-2, Water Resource Impacts, for the National Enrichment Facility (NEF) states:

Provide a complete water balance table identifying the estimated flow rates (maximum and minimum) discharged to each of the wastewater basins identified in Section 4.4.7 and the anticipated evaporation, soil adsorption, or evapotranspiration on a monthly basis.

Per Reference 2, Section 4.4.7 of the NEF ER (Reference 2, Section 4.4.7 - Appendix C), there are three on-site basins as follow:

- The Treated Effluent Evaporative Basin (TEEB) for the discharge of operations-generated potentially contaminated wastewater;
- The Uranium Byproduct Cylinder (UBC) Storage Pad Stormwater Retention Basin for the discharge of water from the UBC Storage Pad and cooling tower, and;
- The Site Stormwater Detention Basin (SSDB) for the controlled release of site runoff.

In response to the Nuclear Regulatory Commission (NRC)'s RAI noted above, the purpose of this calculation is to determine the monthly water balances for the NEF's three basins.

#### 2.0 INPUTS and ASSUMPTIONS

- The minimum and maximum monthly precipitation values are based on data from Hobbs, New Mexico (References 3 and 4 – Appendix D). The annual minimum and maximum precipitation amounts were distributed by month using the average annual distribution by month. Use of the minimum precipitation amounts provides a minimum discharge scenario. Use of the maximum precipitation amounts provides a maximum discharge scenario.
- Annual evaporation at the site is 80 inches per year (Reference 5 Appendix E, p. 13 of 36). Average monthly evaporation values for the site were determined by applying a factor equivalent to the annual evaporation at the site divided by that for Roswell, New Mexico, to the average monthly evaporation values for Roswell (Reference 6 – Appendix F).
- 3. TEEB design input:
  - The basin collects operations-generated potentially contaminated waste water (Reference 2, Section 4.4.7 – Appendix C). Annual discharge effluent from the Liquid Effluent Collection and Treatment System is 669,844 gallons per year (Reference 5 – Appendix E, p. 12 of 36) or 55,824 gallons per month.
  - The basin will have two synthetic liners (Reference 5 Appendix E, p. 15 of 36). Therefore, there will be no soil infiltration or evapotranspiration. Outflow will be by evaporation.
  - The surface area at the top of the basin is 1.84 acres (Reference 7 Appendix G). Conservatively, use 2 acres in determining the volume of precipitation for the basin (i.e., yields larger volume of water). The basin's bottom surface area will be between 0.75 acres (Reference 5 – Appendix E, p. 12 of 36 and Reference 9, pp. 3 and 4) to 1.39 acres (Reference 7 – Appendix G). Therefore, conservatively, use 0.75 acres in determining the volume of evaporation for the basin (i.e., yields less evaporation).
- 4. UBC Storage Pad Stormwater Retention Basin design input:
  - The basin collects stormwater runoff from the UBC Storage Pad (22.8 acres in size conservatively 23 acres) (Reference 5 Appendix E, p. 15 of 36) and cooling tower (5,050,000 gallons per year) (Reference 5 Appendix E, p. 15 of 36) and boiler blowdown (100 gallons per day) (Reference 8 Appendix G, Action Item Resolution C).

# 32-5047375-00

#### Page 4 of 60

- The basin will have a single liner (Reference 5 Appendix E, p. 15 of 36). Therefore, there will be no soil infiltration or evapotranspiration. Outflow will be by evaporation.
- The surface area at the top of the basin is 19.5 acres (conservatively use 20 acres) (Reference 7 - Appendix G) and will be used to determine the volume of precipitation into the basin. The basin's bottom surface area is 18 acres (Reference 7 - Appendix G) and will be used in determining the volume of evaporation for the basin.
- 5. SSDB design input:

The basin collects stormwater runoff. The runoff area served is 96 acres (Reference 5 -. Appendix E, p. 15 of 36). a second and a second second

- The basin will be unlined (Reference 5 Appendix E, p. 11 of 36). Therefore, outflow will be by soil infiltration and evaporation. Of the amount that infiltrates into the ground, most is expected to eventually return to the atmosphere via evapotranspiration by vegetation growing within and in
- the vicinity of the basin.
- The surface area at the top of the basin is 19.2 acres (Reference 7 Appendix G).
- Conservatively, use 20 acres in determining the volume of precipitation for the basin (i.e., yields larger volume of water). The basin's bottom surface area is 18.2 acres (Reference 7 - Appendix G). Conservatively, use 18 acres in determining the volume of evaporation for the basin (i.e., yields less evaporation). • ···
- No credit is taken for outflows from the SSDB through the discharge outlet. Any such flows will eventually infiltrate, evaporate or evapotranspirate.
- The soil infiltration rate is 1 millimeter per hour (0.04 inches per hour = 350 inches per year = 29.2 inches per month) (Reference 10 - Appendix H). However, monthly infiltration capacity in the SSDB is conservatively assumed as 24 inches.

	Key Assumptions and Related Limitations
1.	Basin size is based on preliminary design information.
2.	Discharge from the Liquid Effluent Collection and Treatment Systems for the TEEB was based on the expected average monthly flow.
3.	Cooling tower blowdown discharge to the UBC Storage Pad Stormwater Retention Basin was based on the expected average annual discharge.
4.	Heating boiler blowdown discharge to the UBC Storage Pad Stormwater Retention Basin was based on the expected average daily discharge and is not expected to vary significantly month by month.
5.	Infiltration and evaporation are based on preliminary design information.

#### **CALCULATION**

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#### 3.1 Monthly Precipitation Determination

Precipitation depths are determined based on SI units and converted to metric units for consistency with the RAI response.

Table 3-1: Precipitation

Month	Average Precipitation	Minimum Precipitation <sup>2</sup> cm (in)	Maximum Precipitation <sup>3</sup> cm (in)
January	1.3 (0.5)	0.5 (0.194)	2.0 (0.796)
February	1.8 (0.7)	0.7 (0.271)	2.8 (1.114)
March	1.3 (0.5)	0.5 (0.194)	2.0 (0.796)
April	2.0 (0.8)	0.8 (0.310)	3.2 (1.273)
May	6.6 (2.6)	2.6 (1.006)	10.5 (4.137)
June	5.1 (2.0)	2.0 (0.774)	8.1 (3.180)
July	6.1 (2.4)	2.4 (0.929)	9.7 (3.812)
August	6.4 (2.5)	2.5 (0.968)	10.1 (3.978)
September	7.9 (3.1)	3.0 (1.199)	12.5 (4.932)
October	3.6 (1.4)	1.4 (0.542)	5.7 (2.227)
November	2.3 (0.9)	0.9 (0.348)	3.6 (1.432)
December	1.8 (0.7)	0.7 (0.271)	2.8 (1.114)
Total:	46 (18.1)	17.8 (7.0)	73 (28.8)
Key:	· ·		

cm - centimeters in - Inches

Notes:

3.0

Based on the 1971-2000 monthly normal mean precipitation for Hobbs, New Maxco (Reference 3 – Appendix D). The precipitation data for Hobbs, New Maxico was used due to the proximity of Hobbs to the proposed NEF site (32 kilometers (20 miles)) (Reference 2, Section 1.2.1 – Appendix C). Average precipitation values were rounded. 1.

The minimum annual total precipitation for Hobbs, New Mexico is about 17.8 cm (7 in) based on the years 1971-2000 (Reference 4 - Appendix D) (i.e., for 1998). The monthly totals were determined by a scale factor of 7/18.1 = .387. Monthly precipitation values (SI units) have been carried out to several significant digits for input into the water balance tables below.

3. The maximum annual precipitation for Hobbs, New Mexico is 73.2 cm (28.8 in) (i.e., for 1992) (Reference 4 - Appendix D). The monthly totals were determined by a scale factor of 28.8/18.1 = 1.591.

#### 3.2 Monthly Evaporation Determination

The amounts of evaporation are determined based on SI units and converted to metric units for consistency with the RAI response.

Month	Average Evaporation for Roswell,	Evaporation for the
	New Mexico	NEF <sup>2,3</sup>
	cm (ln)	cm (în)
January	3.38 (1.33)	4.2 (1.653)
February	8,18 (3.22)	10.1 (4.002)
March	17.98 (7.08)	22.4 (8.800)
April	22.53 (8.87)	28.0 (11.025)
May	19.69 (7.75)	24.5 (9.633)
June	18.82 (7.41)	23.4 (9.211)
July	17.75 (6.99)	22.1 (8.689)
August	16.66 (6.56)	20.7 (8.154)
September	16.03 (6.31) °	19.9 (7.843)
October	9.83 (3.87)	12.2 (4.810)
November	7.09 (2.79)	8.8 (3.468)
December	5.54 (2.18)	6.9 (2.709)
Total:	163.48 (64.36)	203.2 (80.0)

Notes:

Based on evaporation data (1948-1950) for Roswell, New Mexico (i.e., Hobbs data not available) 1. (Reference 6 - Appendix F). For June, no data was available, therefore, the evaporation data for June and August were averaged to determine an evaporation value for July. For November, the maximum evaporation value of 10.91 inches appeared to be an error. Therefore, the October and December maximum evaporation values were averaged to determine that for November.

2.

80 inches is the annual evaporation for the NEF site (Reference 5 - Appendix E, p. 13 of 36). Using the average monthly evaporation values for Roswell, the average monthly evaporation values for З. the NEF site were determined by applying a scale factor of 80/64.36 = 1.243 to Roswell's values.

#### 3.3 Monthly Water Balance Basin Determination

Water balance values will be determined based on SI units. However, for consistency with the RAI response (see Appendix B), both SI units and metric units are provided in the tables below.

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3.3.1 Treated Effluent Evaporative Basin

Table 3-3.1a Water Balance for TEEB (Minimum Scenario)

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		Total Precipitation	Treated Effluent	Total Inflow to	Evaporation	Potential Evaporation Outflow	Balance	Net
Month	Precinitation	Basin <sup>2</sup>	Basin <sup>3</sup>	Basin	per Month <sup>5</sup>	from Basin <sup>6</sup>	Outflow <sup>7</sup>	Basin
	cm	·m³	m³	m³	cm	m³	m³	m°
	(in)	(gal)	(gal)	(gal)	(ln)	(gal)	(gal)	(gat)
JAN	0.5	40	211	251	4.2	128	124	124
	(0,194)	(10.508)	(55.824)	(66,332)	(1.653)	(33,694)	(32,638)	(32,638)
FEB	0.7	56	211	267	10.1	307	-40	84
·	(0.271)	(14,711)	(55,824)	(70,535)	(4.002)	(81,069)	(-10,534)	(22,104)
MAR	0.5	40	211	251	22.4	679	-428	0
	(0.194)	(10,508)	(55,824)	(66,332)	(8.800)	(179,292)	(-11,296)	(0)
APR	0.8	64	211	275	28.0	850	-575	0
•	(0.310)	(16,813)	(55,824)	(72,636)	(11.025)	(224,625)	(-151,989)	(0)
MAY	2.6	207	211	418	24.5	743	-325	0
	(1.006)	(54,641)	(55,824)	(110,465)	(9.633)	(196,241)	(-85,775)	(0)
JUN	2.0	159	211	370	23.4	710	-340	0
•	(0.774)	(42,032)	(55,824)	(97,856)	(9.211)	- (187,664)	(-89,808)	(0)
JUL	2.4	191	211	402	22.1	670	•268	0
	(0.929)	(50,438)	(55,824)	(106,262)	(8.689)	(177,045)	(-70,783)	(0)
AUG	2.5	199	211	410	20.7	628	-218	. 0
	(0.968)	(52,540)	(55,824)	(108,364)	(8.154)	(166,018)	(-57,655)	( <u>0)</u>
SEP	3.0	247	211	458	19.9	604	•147	0
	(1.199)	(65,149)	(55,824)	(120,973)	(7.843)	(159,688)	(-38,715)	(0)
OCT ·	1.4	·····111 .	211	323	12.2	371		0
	(0.542)	(29,422)	(55,824)	(85,246)	<u>(4.810)</u>	(98,018)	(-12,772)	(0)
NOV	0.9	72	211	- 283	8.8	267	15	15
	(0.348)	(18,914)	(55,824)	(74,738)	(3.468)	(70,655)	(4,083)	(4,083)
DEC	0.7	56	211	267	6.9	209	58 <sup>-</sup>	73
	(0.271)	(14,711)	(55.824)	(70,535)	(2.709)	(55,135)	(15,400)	(19,483)
FOTAL.	17.8	1,440 .	2,536	3,975	203.2	6,167		
	(7.0)	(380,389)	(669.884)	(1.050.273)	(80.0)	(1,629,144)		

m<sup>3</sup> - cubic meters gal - gallons , cm - centimeter in - inches

Notes:

Units:

Precipitation values are from Table 3-1 above. 1.

Total Precipitation Inflow to Basin = [Surface area at basin top] x [precipitation value from column 2]. Example: JAN: [(2 acres) x (43,560 ft<sup>2</sup>/acre)] x [(0.194 ln) x (1 ft/12 in)] = 1408.4 ft<sup>3</sup> x 7.48 gal/ft<sup>3</sup> = 10,535 gal ≈ 10,508 gal (i.e., table value). The Total Precipitation inflow to Basin' values were initially determined using an Excel 2. spreadsheet (Appendix I). Therefore, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is considered insignificant considering that the table value is an approximation of water

In the basin based on the anticipated monthly precipitation. Annual treated effluent discharge to the TEEB is 669,884 gal/yr (Reference 5 – Appendix E, p. 12 of 36). .3. Annual treated effluent discharge to the FEED is 609,004 gav, theorem.

Total Inflow = Total Precipitation Inflow + Treated Effluent Inflow 4

5. Evaporation values are from Table 3-2 above.

Potential Evaporation outflow from Basin = [Surface area at basin bottom] x [evaporation value from column 6]. 6. Example: JAN: [0.75 acres) x 43,560 ft<sup>2</sup>/acre)] x [(1.653 in) x (1 ft/12 in)] = 4,500.3 ft<sup>3</sup> x 7.48 gal/tt<sup>3</sup> = 33,662 gal ≈ 33,694 gal (i.e., table value). Similar to note 2 above, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is considered insignificant considering that the table value is an approximation of the monthly evaporation. ,

7. Balance = Total inflow (column 5) - Outflow (column 7).

Net in Basin (current month) = 'Balance' for current month (column B) + 'Net In Basin' for previous month 8. (column 9). For January, the 'Net in Basin' for the previous month was taken to be zero (i.e., to represent the time when basin is placed in operation). Negative 'Net in Basin' values are denoted as '0', indicating that there Is no standing water in the basin (i.e., outflow exceeds inflow).

		Total	Treated			Potential		
		Precipitation	Effluent	Total		Evaporation	Balance	Net
		Inflow to	Inflow to	Inflow to	Evaporation	Outflow	Inflow-	In Basin <sup>8</sup>
Month	Precipitation <sup>1</sup>	Basin <sup>2</sup>	Basin <sup>3</sup>	Basin <sup>4</sup>	per Month <sup>5</sup>	from Basin <sup>6</sup>	Outflow <sup>7</sup>	m <sup>3</sup>
	cm	m <sup>3</sup>	` m³	m³	cm	m³	നീ	(gal)
	(în)	(gal)	(gal)	(gai)	(in)	(gai)	(gai)	
JAN	20	163	211	375	4.2	128	247	247
•••••	(0.796)	(43,174)	(55,824)	(98,998)	(1.653)	(33,694)	(65,304)	(65,304)
FFB	2.8	229	211	440	10.1	307	133	380
	(1.114)	(60.444)	(55.824)	(116,268)	(4.002)	(81,069)	(35,199)	(100,503)
MAR	2.0	163	211	375	· 22.4	679	-304	76
	(0.796)	(43.174)	(55,824)	(98,998)	(8.800)	(179,292)	(-80,294)	(20,209)
APR	3.2	261	211	473	28.0	850	-377	0
	(1.273)	(69,079)	(55,824)	(124,903)	(11.025)	(224,625)	(-99,722)	(0)
MAY	10.5	850	211	1,061	24.5	743	318	318
	(4.137)	(224,507) ··	(55,824)	(280,331)	(9.633)	(196,241)	(84,090)	(84,090)
JUN	8.1	654	211	865	23.4	710	155	473
	(3.180)	(172,698)	(55,824)	(228,521)	(9.211)	(187,664)	(40,857)	(124,947)
JUL	9.7	.784	211	996	22.1	670	326	799
	(3.812)	(207,237)	(55,824)	(263,061)	(8.689)	(177,045)	(86,016)	(210,963)
AUG	10,1	817	211	1,028	20.7	628	400	1,199
	(3.978)	(215,872)	(55,824)	(271,696)	(8.154)	(166,018)	(105,677)	(316,640)
SEP	12.5	1,013	211	1,225	19.9	. 604	620	1,819
·	(4.932)	(267,681)	(55,824)	(323,505)	(7.843)	(159,688)	(163,817)	(480,458)
OCT	5.7	458	211	669	12.2	371	298	2,116
	(2.227)	(120,888)	(55,824)	(176,712)	(4.810)	(98,018)	(78,694)	(559,151)
NOV	3.6	294	211	505	8.8	267	238	2,354
•	(1.432)	(77,714)	(55,824)	(133,538)	(3.468)	(70,655)	(62,883)	(622,034)
DEC	2.8	229	211	440	6.9	209	231	2,586
	(1.114)	(60,444)	(55,824)	(116,268)	(2.709)	(55,135)	(61,133)	(683,167)
TOTAL	73.1	5,916	2,536	8,451	203.2	6,167		
	(28.8)	(1,562,914)	(669,884)	(2,232,798)	(80.0)	(1,629,144)	L	
Units:								

## Table 3-3.1b Water Balance for TEEB (Maximum Scenario)

in -- inches m<sup>3</sup> - cubic meters cm - centimeter Notes:

Precipitation values are from Table 3-1 above. 1.

Total Precipitation Inflow to Basin = [Surface area at basin top] x [precipitation value from column 2]. Example: JAN: [(2 acres) x (43,560 ft<sup>2</sup>/acre)] x [(0.796 in) x (1 ft/12 in)] = 5779 ft<sup>3</sup> x 7.48 gal/ft<sup>3</sup> = 43,227 gal 2. ≈ 43,174 gat (i.e., table value). The 'Total Precipitation Inflow to Basin' values were initially determined using an Excel spreadsheet (Appendix I). Therefore, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is insignificant considering that the table value is an approximation of water in the basin based on the anticipated monthly precipitation.

Annual treated effluent discharge to the TEEB is 669,884 gal/yr (Reference 5 – Appendix E, p. 12 of 36). Therefore, the monthly effluent discharge is 669,884 + 12 = 55,824 gal/month. 3.

gal - gallons

4. Total Inflow = Total Precipitation Inflow + Treated Effluent Inflow

Evaporation values are from Table 3-2 above. 5.

Potential Evaporation outflow from Basin = [Surface area at basin bottom] x [evaporation value from column 6]. Example: JAN: [0.75 acres] x 43,560 ft<sup>2</sup>/acre)] x [(1.653 in) x (1 ft/12 in)] = 4,500.3 ft<sup>3</sup> x 7.48 gal/it<sup>3</sup> = б. 33,662 gal = 33,694 gal (i.e., table value). Similar to note 2 above, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is considered insignificant considering that the table value is an approximation of the monthly evaporation.

7.

Balance = Total inflow (column 5) - Outflow (column 7). Net In Basin (current month) = 'Balance' of current month (column 8) + 'Net in Basin' of previous month 8. (column 9). For January, the 'Net in Basin' of the previous month was taken to be zero (I.e., to represent the time when basin is placed in operation). Negative 'Net in Basin' values are denoted as '0', indicating that there is no standing water in the basin (i.e., outflow exceeds inflow).

## 3.3.2 UBC Storage Pad Stormwater Retention Basin

		:	(IAI				,	
Month	Precipitation <sup>1</sup>	Total Precipitation Inflow to Basin <sup>2</sup> m <sup>3</sup>	Blowdown Inflow to Basin <sup>3</sup> m <sup>3</sup>	Total Inflow to Basin <sup>4</sup> m <sup>3</sup>	Evaporation per Month <sup>S</sup> cm	Potential Evaporation Outflow from Basin <sup>6</sup> m <sup>3</sup>	Balance Inflow- Outflow <sup>7</sup> m <sup>3</sup>	Net In Basin <sup>8</sup> m <sup>3</sup>
	(in)	(gal)	(gal)	(gal)	· (in)	(gal)	(gai)	<u>(gal)</u>
JAN	0.5 (0.194)	(226,505)	1,604 (423,875)	2,462 (650,380)	4.2 (1.653)	3,061 (808,650)	-599 (-158,270)	0 • -(0) ····
FEB	0.7 (0.271)	1,198 (316,407)	1,604 (423,875)	2,802 (740,282)	10.1 (4.002)	7,365 (1,945,661)	-4,563 (-1,205,379)	0 (0)
MAR	0.5 (0.194)	857 (226,505)	1,604 (423,875)	, 2,462 (650,380)	22.4 (8.800)	16,287 (4,302,999)	-13,827 (-3,652,619)	0 (0)
APR	0.8 (0.310)	1,370 (361,941)	1,604 - (423,875)	2,975 (785,816)	28.0 (11.025)	20,406 (5,391,000)	-17,433 (-4,605,184)	0 (0)
MAY	2.6 (1.006)	4,446 (1,174,559)	1,604 (423,875) -	6,051 (1,598,434)	24.5 (9.633)	17,827 (4,709,774)	•11,778 (•3,111,340)	0 (0)
JUN	2.0 (0.774)	3,421 (903,686)	1,604 (423,875)	5,025 (1,327,561)	23.4 (9.211)	17,048 (4,503,936)	•12,024 (•3,176,375)	0 (0)
JUL	2.4 (0.929)	4,106 (1,084,657)	1,604 (423,875)	5,710 (1,508,532)	22.1 (8.689)	16,083 (4,249,089)	-10,374 (-2,740,557)	0 (0)
AUG	2.5 (0.968)	4,278 (1,130,191)	1,604 (423,875)	5,883 (1,554,066)	20.7 (8.154)	15,082 (3,984,439)	-9,200 (-2,430,373)	· 0 (0)
SEP	3.0 (1.199)	- 5,300 (1,399,896)	1,604 (423,875)	6,904 (1,823,771)	19.9 (7.843)	14,507 (3,832,511)	-7,604 (-2,008,740)	0 (0)
OCT	1.4 (0.542)	2,395 (632,814)	1,604 (423,875)	4,000 (1,056,689)	: 12.2 (4.810)	8,904 (2,352,437)	-4,905 (-1,295,748)	0 (0)
NOV	0.9 (0.348)	, 1,538 - (406,309)	1,604 (423,875)	3,143 (830,184)	8.8 (3.468)	6,418 (1,695,715)	-3,276 (-865,531)	0 (0)
DEC	0.7 (0.271)	1,198 (316,407)	1,604 (423,875)	2,802 (740,282)	6.9 (2.709)	5,009 (1,323,246)	-2,207 (-582,964)	0 (0)
TOTAL	17.8 (7.0)	30,964 (8,179,877)	19,253 (5,086,500)	50,219 (13,266,377)	203.2 (80.0)	147,996 (39,099,456)	- t	· , .
Units:								

## Table 3-3.2a -- Water Balance for UBC Storage Pad Stormwater Retention Basin (Minimum Scenario)

cm - centimeter in - Inches m<sup>3</sup> - cubic meters gal - galons Notes:

Precipitation values are from Table 3-1 above. 1.

Total Precipitation values are from Table 3-1 above. Total Precipitation inflow to Basin = [Surface area at basin top + UBC storage pad surface area ] x [precipitation value from column 2]. Example: JAN: [(20 acres + 23 acres) x (43,560 ft<sup>2</sup>/acre)] x [(0.194 in) x (1 ft/12 in)] = 29,788.5 ft<sup>3</sup> x 7.48 gal/ft<sup>3</sup> = 226,505 gal. The 'Total Precipitation Inflow to Basin' values were initially determined using an Excel spreadsheet (Appendix I) based on the surface area at the basin top only. Runoff from the UBC Construction and the surface area at the basin top only. 2. Storage Pad was not included. For example, referring to Appendix I, 'UBC Minimum' spreadsheet, note that for January, the 'Direct Precipitation Inflow to Basin' was determined to be 105,080 gallons (i.e, about half of that indicated in the table above).

- Cooling tower blowdown and boiler blowdown are discharged to the UBC Storage Pad Stormwater Retention 3. Basin. The annual cooling tower blowdown is 5,050,000 gal/year (Reference 5 – Appendix E, p. 15 of 36) or 420,833 gal/month. Boiler blowdown is 100 gal/day (Reference 8 – Appendix G, Action Item Resolution C) = 36,500 gal/year = 3,042 gal/month. Therefore, blowdown inflow into the basin per month is 420,833 + 3,042 = 423,875 gal. . *i* . ... 12
- Total Inflow = Total Precipitation Inflow + Blowdown Inflow 4

Evaporation values are from Table 3-2 above. 5.

Potential Evaporation outflow from Basin = [Surface area at basin bottom] x [evaporation value from column 6]. 6 Example: JAN: [18 acres) x 43,560 ft<sup>3</sup>/acre)] x [(1.653 in) x (1 ft/12 in)] = 108,007.02 ft<sup>3</sup> x 7.48 gal/ft<sup>3</sup> =807,893 gal  $\approx$  808,650 gal (i.e., table value). The 'Potential Evaporation Outflow' values were initially determined using an Excel spreadsheet (Appendix I). Therefore, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is considered insignificant considering that the table value is an approximation of the monthly evaporation.

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Balance = Total Inflow (column 5) - Outflow (column 7). 7.

54.

Net In Basin (current month) = 'Balance' for current month (column 8) + 'Net In Basin' for previous month 8. (column 9). For January, the 'Net in Basin' for the previous month was taken to be zero (i.e., to represent the time when basin is placed in operation). Negative 'Net in Basin' values are denoted as '0', indicating that there is no standing water in the basin (i.e., outflow exceeds inflow).

		Total	Blowdown			Potential		
		Precipitation	Inflow to	Total	1	Evaporation	Balance	Net
		Inflow to	Basin <sup>3</sup>	Inflow to	Evaporation	Outflow	Inflow	In Basin <sup>8</sup>
Month	Precipitation	Basin <sup>2</sup>	m³	Basin <sup>4</sup>	per Month <sup>5</sup>	from Basin <sup>6</sup>	Outflow <sup>7</sup>	m³
	cm	m³	(gai)	m <sup>a</sup>	cm	i m³	<b>m</b> *	(gal)
	(In)	(gal)		(gal)	(în)	(gal)	(gai)	
JAN	2.0	3,518	1,604	5,123	4.2	3,061	2,062	2,062
	(0.796)	(929,372)	(423,875)	(1,353,247)	(1.653)	(808,650)	(544,597)	(544,597)
FEB	2.8	4,924	1,604	6,528	10.1	7,365	-837	1,225
	(1.114)	(1,300,654)	(423,875)	(1,724,529)	(4.002)	(1,945,661)	(-221,132)	(323,465)
MAR	2.0	3,518	1,604	5,123	22.4	16,287	-11,166	0
	(0.796)	(929,372)	(423,875)	(1,353,247)	(8.800)	(4,302,999)	_ (-2,949,752)	(0)
APR	3.2	5,626	1,604	7,231	28.0	20,406	-13,176	0.
	(1.273)	(1,486,295)	(423,875)	(1,910,170)	(11.025)	(5,391,000)	(-3,480,830)	(0)
MAY	10.5	18,284	1,604	19,889	24.5	17,827	2,060	2,060
	(4.137)	(4,830,168)	(423,875)	(5,254,043)	(9.633)	(4,709,774)	(544,269)	(544,269)
JUN	8.1	14,055	1,604	15,659	23.4	17,048	-1,390	670
	(3,180)	(3,712,819)	(423,875)	(4,136,694)	(9.211)	(4,503,936)	(-367,242)	(177,027)
JUL	9.7	16,848	1,604	18,452	22.1	16,083	2,368	3,038
	(3.812)	(4,450,713)	(423,875)	(4,874,588)	(8.689)	(4,249,089)	(625,499)	(802,526)
AUG	10.1	17,581	; 1,604	19,186	20.7	15,082	4,103	7,141
	(3.978)	(4,644,527)	(423,875)	(5,068,402)	(8.154)	(3,984,439)	(1,083,963)	(1,886,489)
SEP	12.5	21,798	- 1,604	23,402	19.9	14,507-	8,895	16,036
	(4.932)	(5,758,372)	(423,875)	(6,182,247)	(7.843)	(3,832,511)	(2,349,736)	(4,236,225)
OCT	5.7	9,843	1,604	11,447	12.2	8,904	2,542	18,578
	(2.227)	(2,600,141)	(423,875)	(3,024,016)	(4.810)	(2,352,437)	(671,579)	(4,907,804)
NOV	3.6	6,329	1,604	7,934	8.8	6,418	1,515	20,093
	(1.432)	(1,671,936)	(423,875)	(2,095,811)	(3.468)	(1,695,715)	(400,096)	(5,307,900)
DEC	2.8	4,924	1,604	6,528	6.9	5,009	1,519	21,612
	(1.114)	(1,300,654)	(423,875)	(1,724,529)	(2,709)	(1,323,246)	(401,283)	_(5,709,183)_
TOTAL	73.1	127,248	19,253	146,502	203.2	147,996		
	1 (28.8)	(33 615 023)	1 (5 088 500)	I (38 701 523)	I (80.0)	1 (39 099 456)		

#### Table 3-3.2b Water Balance for UBC Storage Pad Stormwater Retention Basin (Maximum Scenario)

Units:

cm - centimeter in - inches m<sup>3</sup> - cubic meters gal - gallons Notos:

1. Precipitation values are from Table 3-1 above.

2. Total Precipitation inflow to Basin = [Surface area at basin top + UBC storage pad surface area ] x [precipitation value from column 2]. Example: JAN: [(20 acres + 23 acres) x (43,560 ft<sup>2</sup>/acre)] x [(0.796 in) x (1 ft/12 in)] = 124,247.6 ft<sup>3</sup> x 7.48 gal/ft<sup>3</sup> = 929,372 gal. The Total Precipitation Inflow to Basin' values were initially determined using an Excel spreadsheet (Appendix I) based on the surface area at the basin top only. Runoff from the UBC Storage Pad was not included. For example, referring to Appendix I, 'UBC Maximum' spreadsheet, note that for January, the 'Direct Precipitation Inflow to Basin' was determined to be 431,723 gallons (i.e., about half of that indicated in the table above).

 Cooling tower blowdown and boiler blowdown are discharged to the UBC Storage Pad Stormwater Retention Basin. The annual cooling tower blowdown is 5,050,000 gal/year (Reference 5 – Appendix E, p. 15 of 36) or 420,833 gal/month. Boiler blowdown is 100 gal/day (Reference 8 – Appendix G, Action Item Resolution C) = 36,500 gal/year = 3,042 gal/month. Therefore, blowdown inflow into the basin per month is 420,833 + 3,042 = 423,875 gal.

4. Total Inflow = Total Precipitation Inflow + Blowdown Inflow

5. Evaporation values are from Table 3-2 above.

6. Potential Evaporation outflow from Basin = [Surface area at basin bottom] x [evaporation value from column 6]. Example: JAN: [18 acres) x 43,560 ft<sup>2</sup>/acre)] x [(1.653 in) x (1 ft/12 in)] = 108,007.02 ft<sup>3</sup> x 7.48 gal/ft<sup>3</sup> = 807,893 gal ≈ 808,650 gal (i.e., table value). The 'Potential Evaporation Outflow' values were initially determined using an Excel spreadsheet (Appendix I). Therefore, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is considered insignificant considering that the table value is an approximation of the monthly evaporation.

7. Balance = Total inflow (column 5) - Outflow (column 7).

8. Net in Basin (current month) = 'Balance' of current month (column 8) + 'Net in Basin' of previous month (column 9). For January, the 'Net in Basin' of the previous month was taken to be zero (i.e., represents when basin is placed in operation). Negative 'Net in Basin' values are denoted as '0', indicating that there is no standing water in the basin (i.e., outflow exceeds inflow).

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#### 3.3.3 Site Stormwater Detention Basin

• • •	·	• •	(Minimu	m Scenario)			
Month	Precipitation <sup>1</sup> cm (in)	Totai Precipitation Inflow to Basin <sup>2</sup> m <sup>3</sup> (gal)	Evaporation per Month <sup>3</sup> cm (in)	Evaporation + Infiltration per Month <sup>4</sup> cm (in)	Potential Evaporation + Infiltration Outflow from Basin <sup>5</sup> m <sup>3</sup> (gal)	Balance Inflow- Outflow <sup>6</sup> m <sup>3</sup> (gal)	Net In Basin <sup>7</sup> m <sup>3</sup> (gal)
JAN	0.5	2,376	4.2	65.2	47,460	-45,084	0
	(0.194)	(627,763)	(1.653)	(25.653)	(12,538,487)	(-11,910,723)	(0)
FEB	0.7	3,564	10.1	71.1	51,763	-48,199	0
	(0.271)	(941,645)	(4.002)	(28.002)	(13,675,498)	(-12,733,853)	(0)
MAR	0.5	2,376	22.4	83.3	60,686	-58,310	0
	(0.194)	(627,763)	(8.800)	(32.800)	(16,032,835)	(-15,405,072)	(0)
APR	0.8	3,564	28.0	89.0	64,804	-61,240	0
	(0.310)	(941,645)	(11.025)	(35.025)	(17,120,837)	(-16,179,192)	(0)
MAY	2.6 (1.006)	11,881 (3,138,817)	24.5 (9.633)	- 85.4 (33.633)	62,226 (16,439,611)	+50,345 (-13,300,793)	(0)
JUN	2.0 (0.774)	9,505 (2,511,054)	23.4 (9.211)	84.4 (33.211)	61,447 (16,233,773)	-51,942 (-13,722,719)	(0)
JUL	2.4	10,693	22.1	83.0	60,482	-49,789	0
	(0.929)	(2,824,936)	(8.689)	(32.689)	(15,978,925)	(-13,153,990)	(0)
AUG	2.5	11,881	20.7	81.7	59,480	-47,600	0
	(0.968)	(3,138,817)	(8.154)	(32.154)	(15,714,276)	(-12,575,459)	(0)
SEP	3.0	14,257	19.9	80.9	58,905	-44,648	. 0
	(1.199)	(3,766,581)	(7.843)	(31.843)	(15,562,348)	(-11,795,767)	(0)
OCT	1,4	5,940	12.2	73.2	53,303	-47,363	0
	(0.542)	(1,569,409)	(4.810)	(28.810)	(14,082,273)	(-12,512,865)	(0)
NOV	0.9	3,564	<b>8.8</b>	69.8	50,817	-47,253	<b>0</b>
	(0.348)	(941,645)	(3.468)	(27.468)	(13,425,551)	(-12,483,906)	(0)
DEC	0.7 (0.271)	3,564 (941,645)	(2.709)	67.8 (26.709)	49,407 (13,053,082)	-45,843 (-12,111,437)	0 (0)
TOTAL	17.8 (7.0)	83,166 (21,971,722)	203.2 (80.0)	934.7 (368.0)	680,782 (179,857,498)		· · ·
Holter							

#### Table 3-3.3a Water Balance for Site Stormwater Detention Basin (Minimum Scenario)

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cm - centimeter in - inches Notes:

## Precipitation values are from Table 3-1 above.

m<sup>3</sup>-cubic meters gal - gallons

2. Total Precipitation inflow to Basin = [Surface area at basin top + Runoff area served] x [precipitation value from column 2]. Example: JAN: [(20 + 96 acres) x (43,560 ft<sup>2</sup>/acre)] x [(0.194 in) x (1 ft/12 in)] = 81,689.5 ft<sup>3</sup> x 7.48 gal/tt<sup>3</sup> = 611,038 gal = 627,763 gal (i.e., table value). The Total Precipitation Inflow to Basin' values were initially determined using an Excel spreadsheet (Appendix I). Therefore, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is considered insignificant considering that the table value is an approximation of water in the basin based on the anticipated monthly precipitation.

3. Evaporation values are from Table 3-2 above.

- 4. Minimum infiltration rate = 1 millimeter/hour (approx 0.04 in /hr) (Ref. 10, Figure 3.24 Appendix H). From this figure, at 30 minutes, the infiltration rate is about 2 millimeters. Based on a ratio of 60 minutes to 30 minutes, the infiltration rate is about 1 millimeter at 60 minutes which equates to 0.04 inches per hour. Infiltration of 0.04in/hr = 350 in/year = 29.2 in/month. Conservatively, assume soil infiltration is 24 in/month (i.e., more water rotained in basin).
- 5. Potential Evaporation + Infiltration outflow from Basin = [Surface area at basin bottom] x [evaporation/infiltration value from column 5]. Example: JAN: [18 acres) x 43,560 ft²/acre)] x [(25.653 in) x (1 ft/12 in)] = 1,676,167 ft³ x 7.48 gal/ft³ = 12,537,729 gal = 12,538,487 gal (i.e., table value). Similar to note 2 above, due to rounding by the spreadsheet, the manual calculation varies slightly; however, the difference is considered insignificant considering that the table value is an approximation of the monthly evaporation.
- 6. Balance = Total inflow (column 3) Outflow (column 6).

7. Net in Basin (current month) = 'Balance' of current month (column 7) + 'Net in Basin' of previous month (column 8). For January, the 'Net in Basin' of the previous month was taken to be zero (i.e., represents when basin is placed in operation). Negative 'Net in Basin' values are denoted as '0', indicating that there is no standing water in the basin (i.e., outflow exceeds inflow).

		Total	· · · · ·		Potential		
		Precipitation		Evaporation +	Evaporation +	Balance	Net
		Inflow to	Evaporation	Infiltration per	Infiltration	Inflow-	In Basin <sup>7</sup>
Month	Precipitation	Basin <sup>2</sup>	per Month <sup>3</sup>	Month <sup>4</sup>	Outflow	Outflow <sup>6</sup>	m³
	cm	m <sup>3</sup>	cm	cm	from Basin <sup>5</sup>	m²	(gal)
	(In)	(gai)	(ln)	(in)	i m <sup>a</sup>	(gal)	(3-0
					(gal)		
JAN.	2.0	9,445	4,2	65.2	47,460	-38,014	0
	(0.796)	(2,495,360)	(1.653)	(25.653)	(12,538,487)	(-10,043,127)	(0)
FEB	2.8	13,223	10.1	71.1	51,763	-38,540	0
	(1.114)	(3,493,504)	(4.002)	(28.002)	(13,675,498)	(-10,181,994)	(0)
MAR	2.0	9,445	22.4	83.3	60,686	-51,241	0
1 s	(0.796)	(2,495,360)	(8.800)	(32.800)	(16,032,835)	(-13,537,475)	(0)
APR	3.2	15,112	28.0	89.0	64,804	-49,692	. 0
	(1.273)	(3,992,576)	(11.025)	(35.025)	(17,120,837)	(-13,128,261)	(0)
MAY	10.5	49,115	24.5	85.4	62,226	-13,111	0
	(4.137)	(12,975,871)	(9.633)	(33.633)	(16,439,611)	(-3,463,740)	(0)
JUN	8,1	37,781	23.4	84.4	61,447	-23,666	0
	(3.180)	(9,981,439)	(9.211)	(33.211)	(16,233,773)	(-6,252,333)	(0)
JUL	9.7	45,337	22.1	83.0	60,482	-15,145	0
	(3.812)	(11,977,727)	(8.689)	(32.689)	(15,978,925)	(-4,001,198)	(0)
AUG	10.1	47,226	20.7	81.7	59,480	-12,254	0
	(3.978)	(12,476,799)	(8.154)	(32.154)	(15,714,276)	(-3,237,477)	(0)
SEP	12.5	58,560	19.9	80.9	58,905	-345	0
	(4.932)	(15,471,231)	(7.843)	(31.843)	(15,562,348)	(-91,117)	(0)
OCT	5.7	26,447	12.2	73.2	53,303	-26,856	0
	(2.227)	(6,987,008)	(4.810)	(28.810)	(14,082,273)	(-7,095,266)	(0)
NON	3.6	17,001	.8.8	69.8	50,817	-33,816	0
	(1.432)	(4,491,648)	(3.468)	(27.468)	(13,425,551)	(-8,933,904)	(0)
DEC	2.8	13,223	6.9	67.8	49,407	-36,184	0
	(1.114)	(3,493,504)	(2.709)	(26.709)	(13,053,082)	(-9,559,579)	(0)
TOTAL	73.1	341,918	203.2	934.7	680,782		
1	(28.8)	(90.332.027)	. (80.0)	(368.0)	(179.857.498)		

# Table 3-3.3bWater Balance for Site Stormwater Detention Basin<br/>(Maximum Scenario)

Units:

cm - centimeter in - Inches m<sup>3</sup> - cubic meters gal - gallons Notes:

1. Precipitation values are from Table 3-1 above.

Total Precipitation inflow to Basin = [Surface area at basin top + Runoff area served] x [precipitation value from column 2]. Example: JAN: [(20 + 96 acres) x (43,560 ft<sup>2</sup>/acre)] x [(0.796 in) x (1 ft/12 in)] = 335,180 ft<sup>3</sup> x 7.48 gal/ft<sup>3</sup> = 2,507,146 gal = 2,495,360 gal (i.e., table value). The 'Total Precipitation inflow to Basin' values were initially determined using an Excel spreadsheet (Appendix I). Therefore, due to rounding by the spreadsheet, the manual calculation values slightly; however, the difference is considered insignificant considering that the table value is an approximation of water in the basin based on the anticipated monthly precipitation.
 Evaporation values are from Table 3-2 above.

Minimum infitration rate = 1 millimeter/hour (Ref. 10, Figure 3.24, - Appendix H). From this figure, at 30 minutes, the infiltration rate is about 2 millimeters. Based on a ratio of 60 minutes to 30 minutes, the infiltration rate is about 1 millimeter at 60 minutes which equates to 0.04 inches per hour. Infiltration of 0.04 in/hr = 350 in/year =

29.2 in/month. Conservatively, assume soil infiltration is 24 in/month (i.e., more water retained in basin).
5. Potential Evaporation + Infiltration outflow from Basin = [Surface area at basin bottom] x [evaporation/infiltration value from column 5]. Example: JAN: [18 acres) x 43,560 ft<sup>2</sup>/acre)] x [(25.653 in) x (1 ft/12 in)] = 1,676,167 ft<sup>3</sup> x 7.48 gal/ft<sup>2</sup> = 12,537,729 gal = 12,538,487 gal (i.e., table value). Similar to note 2 above, due to rounding by the

spreadsheet, the manual calculation varies stightly; however, the difference is considered insignificant considering that the table value is an approximation of the monthly evaporation.

6. Balance = Total inflow (column 3) - Outflow (column 6).

Net in Basin (current month) = 'Balance' of current month (column 7) + 'Net in Basin' of previous month (column 8). For January, the 'Net in Basin' of the previous month was taken to be zero (i.e., represents when basin is placed in operation). Negative 'Net in Basin' values are denoted as '0', indicating that there is no standing water in the basin (i.e., outflow exceeds inflow).

#### 4.0 **RESULTS and CONCLUSIONS**

The results for the TEEB show that basin outflow due to evaporation will exceed all inflows on a monthly basis for the minimum discharge scenario with the exception of the winter months. Under the maximum discharge scenario, the basin would have standing water in it for most of the year.

The results for the UBC Storage Pad Stormwater Retention Basin show that basin outflow due to evaporation will exceed all inflows on a monthly basis under the minimum discharge scenario. Under the maximum discharge scenario, the basin would have standing water for ten months of the year. Referring to Note 2 in Tables 3.3-2a and 3.3-2b, if runoff from the UBC Storage Pad is not included (see Appendix I), basin outflow due to evaporation will exceed all inflows on a monthly basis under both scenarios, except for one winter month under the maximum discharge scenario.

The results for the SSDB show that basin outflow due to evaporation and infiltration will exceed all inflows on a monthly basis under both discharge scenarios.

#### 5.0 REFERENCES

- Letter NEF#04-019 dated May 20, 2004, from R. M. Krich (Louisiana Energy Services, L. P.) to Director, Office of Nuclear Material Safety and Safeguards (NRC) regarding "Response to NRC Request for Additional Information Regarding National Enrichment Facility Environmental Report". Excerpts are provided in Appendix B.
- Letter NEF#03-003 dated December 12, 2003, from E. J. Fenland (Louisiana Energy Services, L. P.) to Directors, Office of Nuclear Material Safety and Safeguards and the Division of Facilities and Security (NRC) regarding "Applications for a Material License Under 10 CFR 70, Domestic Licensing of Special Nuclear Material, 10 CFR 40, Domestic Licensing of Source Material, and 10 CFR 30, Rules of General Applicability to Domestic Licensing of Byproduct Material, and for a Facility Clearance Under 10 CFR 95, Facility Security Clearance and Safeguarding of National Security Information and Restricted Data". Attachment – National Enrichment Facility Environmental Report. Excerpts are provided in Appendix C.
- 3. Hobbs, New Mexico, NCDC 1971-2000 Monthly Normals, Western Regional Climate Center, http://www.wrcc.dri.edu/cgi-bin/cliNORMNCDC2000.pl?nmhobh, (Appendix D).
- 4. Hobbs, New Mexico, Monthly Total Precipitation, Western Regional Climate Center, <u>http://www.wrcc.dri.cdu/cgi-bin/cliMONtpre.pl?nmhobb</u>, last updated June 24, 2004 (Appendix D)
- 5. Roswell Evaporation, Station ID 7604, 01/1948 to 03/1950, <u>http://weather-mirror.nmsu.cdu/Pan\_Evaporation/roswell\_evap.htm</u>, (Appendix F).
- 6. Ground Water Discharge Permit Application, National Enrichment Facility, submitted by Louisiana Energy Services, LP, dated April 26, 2004 (Appendix E)
- 7. Electronic message dated March 9, 2004 from D.E. Mickanen (Lockwood Greene) to G. A Harper (Framatome ANP), regarding "Groundwater Permit Open Items" (Appendix G).
- Lockwood Greene Response Letter dated May 13, 2004, from J. L. Shaw (Lockwood Greene) to Rod Krich regarding "LG Response to NEF Action Item – ER RAI 4-2A" (Appendix G).
- 9. Framatome ANP Document 32-5036255-01, "National Enrichment Facility, Treated Effluent Evaporative Basin Size".
- 10. Hydrology Handbook, Second Edition, American Society of Civil Engineers (Appendix H)

Note: References 1, 2, 6, 7 and 8 above are customer documents that are not available for entering into Records Management. In accordance with Framatome-ANP Administrative Procedure 0402-01, these documents have been used for design information in preparation of this calculation with the Project Manager's written approval as indicated below. Further note that although no client identification number is associated with Reference 6, excerpts from this document are provided in Appendix E. Similarly, copies of References 7 and 8 are provided in Appendix G.

George A. Harper Project, Manager Name -10/4/04 Project Manager Signature and Date

Appendix A

Design Verification Checklist

32-5047375-00 Page 14 of 60

	A DESIGN VERIFICATION CHECKLIST											
AR	EVA	ECK										
1	Document Identilier _ 32 - 5047375 - 00	- · · · ·		· · ·								
	THIS	BASIN	5	· · · /								
1.	Were the inputs correctly selected and incorporated into design or analysis?	R Y										
2.	Are assumptions necessary to perform the design or analysis activity adequately described and reasonable? Where necessary, are the assumptions identified for subsequent re-verifications when the detailed design activities are completed?	×٩	D N									
3.	Are the appropriate quality and quality assurance requirements specified? Or, for documents prepared per FANP procedures, have the procedural requirements been met?	ΣΥ	N D									
4.	If the design or analysis cites or is required to cite requirements or criteria based upon applicable codes, standards, specific regulatory requirements, including issue and addenda, are these properly identified, and are the requirements/criteria for design or analysis met?	ΠY	D N	X N/A								
5.	Have applicable construction and operating experience been considered?	DY		X NA								
6.	Have the design interface requirements been satisfied?	ΠY		D N/A								
7.	Was an appropriate design or analytical method used?	স্থি প										
8.	Is the output reasonable compared to inputs?	ΜΥ										
9.	Are the specified parts, equipment and processes suitable for the required application?	Ω`Y	N	XI N/A								
10.	Are the specified materials compatible with each other and the design environmental conditions to which the material will be exposed?	ΠY	N 🗆	M NA								
11.	Have adequate maintenance features and requirements been specified?	ΟΥ		X N/A								
12.	Are accessibility and other design provisions adequate for performance of needed maintenance and repair?	ΠY	N	🕅 N/A								
13.	Has adequate accessibility been provided to perform the in-service inspection expected to be required during the plant life?	ΠY	D N	D NA								
14.	Has the design properly considered radiation exposure to the public and plant personnel?	ΩY	Пи	X N/A								
15.	Are the acceptance criteria incorporated in the design documents sufficient to allow verification that design requirements have been satisfactorily accomplished?	ΟY	□ N	X NA								
16.	Have adequate pre-operational and subsequent periodic test requirements been appropriately specified?	ΠY	Я П									
17.	Are adequate handling, storage, cleaning and shipping requirements specified?	ΟY	П N	X NA								
18.	Are adequate identification requirements specified?	ΠΥ		X N/A								
19.	Is the document prepared and being released under the FANP Quality Assurance Program? If not, are requirements for record preparation review, approval, retention, etc., adequately specified?	XΥ	N []	🗋 N/A								

Framatome ANP, Inc., an AREVA and Slemens company

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32-5047375-00 Page <u>15</u> of 60

			22410-3 (5/10/2004) Page 2 of 2
A AREVA	DESIGN V	ERIFICATION CH	IECKLIST
Documen	t Identifier		
Comments:	······	·····	
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(First, MI, Last)	Printed / Typed Name	Signature	Date
amatome ANP. Inc	an AREVA and Slemens company		

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Appendix B

Excerpts from LES ER RAI Response 4-2A

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#### 4-2 Water Resources Impacts:

- A. Provide a complete water balance table identifying the estimated flow rates (maximum and minimum) discharged to each of the wastewater basins identified in Section 4.4.7 and the anticipated evaporation, soil adsorption, or evapotranspiration on a monthly basis.
- B. Provide the basis for assuming that the sand and gravel layer at the surface is laterally and wholly indurated across the entire proposed NEF site.
- In Section 3.3, it appears there is an assumption being made that the sand and gravel layer at the surface is laterally and wholly indurated across the entire proposed NEF site. The limited information from the geotechnical borings does not support this assumption.
- C. Discuss the contaminant pathways in a lateral direction to a groundwater source within the subsurface (i.e., contaminant migration beyond the bounds of the proposed NEF within the sand and gravet layer above the Chinle formation).
- Section 4.4.2 includes discussions on contaminant pathways only in a vertical direction to a groundwater source and not in a lateral direction within the subsurface.
- D. Discuss the potential for water or other liquids from spills or pipeline leaks to migrate and flow along the base of the Chinle Formation.
- In the construction of the proposed NEF, the site would be subject to borrow and fill from onsite. The sand and gravel "fill" could be a pathway for water or other liquids from spills or pipeline leaks. The water or liquids may flow along the base of the fill area in an apparent southwesterly direction based on the slope of the Chinle Formation.
- E. Provide any impacts to the surrounding land if the site stormwater retention basin overflows.

#### LES Response

A. Complete water balances for each of the basins identified in ER Section 4.4.7 are provided in Table ER RAI 4-2A.1a, "Water Balance for Treated Effluent Evaporative Basin (Minimum Scenario)," Table ER RAI 4-2A.1b, "Water Balance for Treated Effluent Evaporative Basin (Maximum Scenario)," Table ER RAI 4-2A.2a, "Water Balance for UBC Storage Pad Stormwater Retention Basin (Minimum Scenario)," Table ER RAI 4-2A.2b, "Water Balance for UBC Storage Pad Stormwater Retention Basin (Minimum Scenario)," Table ER RAI 4-2A.2b, "Water Balance for UBC Storage Pad Stormwater Retention Basin (Maximum Scenario)," Table ER RAI 4-2A.3b, "Water Balance for Site Stormwater Detention Basin (Minimum Scenario)," and Table ER RAI 4-2A.3b, "Water Balance for Site Stormwater Detention Basin (Maximum Scenario)," in Attachment 2 to this submittal.

The water balances consider the following components:

Direct precipitation falling within the basin berms for all 3 basins.

LES ER RAI Response

30

May 20, 2004

 Other inflows (i.e., discharge from Liquid Effluent Collection and Treatment System for the Treated Elfluent Evaporative Basin and cooling tower and heating boiler blowdown for the UBC Storage Pad Stormwater Retention Basin). . . Evaporation for all 3 basins. . K. C . . . . . . . Infiltration for the Site Stormwater Detention Basin. The Treated Effluent Evaporative Basin and the UBC Storage Pad Stormwater Retention Basin are lined. Therefore, infiltration is not considered for these basins. a set of the The water balances include the following inputs and assumptions: The minimum and maximum monthly precipitation values are based on data from Hobbs, New Mexico. The annual minimum and maximum precipitation amounts were distributed by month using the average annual distribution by month. Use of the minimum precipitation amounts provides a minimum discharge scenario. Use of the maximum precipitation amounts provides a maximum discharge scenario. These data were used in fieu of ER Table 3.6-18 which provides the extreme

Stormwater runoff for the UBC Storage Pad Stormwater Retention Basin and the

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Site Stormwater Detention Basin.

maximums and minimums for each month at Hobbs over a 30-year period of record. The information in ER Table 3.6-1B is not representative of what would occur over a very dry or very wet calendar year.

The discharge from the Liquid Effluent Collection and Treatment System for the Treated Effluent Evaporative Basin was based on the expected average monthly flow.

The cooling tower blowdown was based on the expected average annual discharge. Monthly distribution will not be available until final design.

• The heating boiler blowpown was based on the expected average annual discharge. This component is relatively small and is not expected to vary significantly month by month.

Annual evaporation at the site is 203.2 cm (80 in) per year. Monthly distribution was based on information from Roswell, New Mexico.

• Monthly infiltration capacity in the Site Stormwater Detention Basin was conservatively assumed as 61 cm (24 in).

 No credit is taken for outflows from the Site Stormwater Detention Basin through the discharge outlet. Any such flows will eventually infiltrate, evaporate or evapotranspirate.

LES ER RAI Response

May 20, 2004

The tables provide the monthly balance (inflow minus outflow). A positive value indicates that the inflow components exceed the outflow components for the respective basin. A negative value indicates that outflow components will dispose of the entire monthly inflow for the respective basin. The tables also provide the monthly net in the basin. A non-zero value indicates that the basin will contain standing water.

The results for the Treated Elfluent Evaporative Basin show that basin outflow due to evaporation will exceed all inflows on a monthly basis for the minimum discharge scenario with the exception of the winter months. Under the maximum discharge scenario, the basin would have standing water in it for most of the year.

The results for the UBC Storage Pad Stormwater Retention Basin show that basin outflow due to evaporation will exceed all inflows on a monthly basis under both discharge scenarios, except for one winter month under the maximum discharge scenario.

The results for the Site Stormwater Detention Basin show that basin outflow due to evaporation and infiltration will exceed all inflows on a monthly basis under both discharge scenarios. Prior to final design of the basin, it is not possible to accurately estimate the distribution of Infiltration and evaporation. At this stage in the design, it is reasonable to assume that the basin outflow will be 50 % by infiltration and 50 % by evaporation. Of the amount that infiltrates into the ground, most is expected to eventually return to the atmosphere via evapotranspiration by vegetation growing within and in the vicinity of the basin. As shown in Table ER RAI 4-2A.3, the combination of both potential infiltration and potential evaporation are more than sufficient to dispose of basin inflows on a monthly basis.

B. The five borings are not sufficient to adequately define subsurface conditions for final design purposes, but they are acceptable for judging the feasibility of developing the site. Assuming that the borings are generally representative of subsurface conditions, the site is considered acceptable for the facility structures supported on a system of shallow foundations.

During final design, additional geotechnical investigations will be undertaken to collect more information on the sand and gravel layer.

C. As discussed in ER Section 3.4.15, the nine groundwater exploration borings were performed in the sand and gravel layer above the Chinle Formation and no groundwater was detected. During drilling, only one of the borings produced cuttings that were slightly moist at 1.8 to 4.2 m (6 to 14 ft) below ground surface; other cuttings were very dry. Based on this, it is concluded that a continuous groundwater aquifer does not exist in this layer under the NEF site. Since there is no consistent groundwater in this layer, it does not provide a likely contaminant pathway in the lateral direction.

Due to the lack of groundwater in this layer, potential contamination would travel laterally at very small rates, if at all. The travel time to downstream users through a lateral contaminant pathway would be significant. The lack of ground water in this layer is supported by information from the adjacent Waste Control Specialists (WCS) ground water investigations.

LES ER RAI Response

32

May 20, 2004

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	Precipitation	Total Precipitation Inflow to Basin	Effluent Inflow to	Total . Inflow to Basin	Evaporation	Potential 95 Evaporation v Outflow 55 from Basin	Balance Inflow Outflow	Net. In Basin
łMonth :	cn (	m" (gài) - ;	(04) (7)	m <sup>3</sup> ) -/((gal) :	em *: *. (in)	m³ ((gal)	m)	j.m '. (gal)
JAN	(0.2)	40 (10,508)	211 (55,824)	251 (66,332)	4.2 (1.7)	128 (33,694)	124 (32,638)	124 (32,638)
FEB	0.7 (0.3)	58 (14,711)	211 (55,824)	267 (70,535)	10.1 (4.0)	307 (81,069)	-40 (-10,534)	84 (22,104)
MAR	0.5 (0.2)	40 (10,508)	211 (55,824)	251 (66,332)	22.4 (8.8)	679 (179,292)	-428 (-112,96)	0 (0)
APR	0.8 (0.3)	64 (16,813)	211 (55,824)	275 (72,636)	28.0 (11.0)	850 (224,625)	+575 (-151,989)	0 (0)
MAY	2.5 (1.0)	207 (54,641)	211 (55,824)	418 - (110,465)	24.5 (9.6)	743 (196,241)	-325 (-85,775)	(0) (0)
JUN	2.0 (0.8)	159 (42,032)	211 (55,824)	370 (97,856)	23.4 (9.2)	710 (187.664)	-340 (-89,808)	90
JUL	2.4 (0.9)	191 (50,438)	211 (55,524)	402 (106,262)	22.1 (8.7)	670 (177,045)	-268 (-70,783)	0 (0)
AUG	2.5 (1.0)	199 (52,540)	211 (55,624)	410 (108,364) <sup>1</sup>	20.7 (8.2)	628 (166,018)	-218 (-57,655)	. 0 (0)
SEP	3.0 (1.2)	247 (65,149)	211 (55,824)	458 (120,973)	19.9 (7.8)	604 (159,688)	-147 (-38,715)	(0)
ост	1.4 (0.5)	111 (29,422)	211 (55,824)	323 (85,246)	12.2 (4.8)	371 (98,018)	-48 (-12,772)	(0) (0)
NOV	0.9 (0.3)	72 (18,914)	211 (55,824)	283 (74,738)	8.8 (3.5)	267 (70,655)	15 (4,083)	15 (4,083)
DEC	0.7 (0.3)	56 (14,711)	211 (55.824)	267 (70,535)	6.9 (2.7)	209 (55,135)	58 (15,400)	74 (19,483)
Totals	17.8 (7.0)	1,440 (380,389)	2,536 (669,884)	3,975 (1,050,273)	203.2 (60.0)	6,167 (1,629,144)	- 1 1 1	

# Table ER RAI 4-2A.1a Water Balance for Treated Effluent Evaporative Basin (Minimum Scenario)

# 32-5047375-00 Page 21 of 60

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Г	•	Total	.Treated .!			Potential?		.:
	•	Precipitation	Effluent =		12 - 44	Evaporation	1.1.1.1.1.1	
		Inflow to	ol wolml,	Innow to t	Evaporation	Outriow	dinnow -	( Net
	Precipitation	Basin	Basin	224974 444	(A per Monut	A HOM DESULA	A OULIOW &	Jui Baziu.
	cm .	<b>1</b>	- cm		i cm	( m		, m
Month	(m)		~(gal) ··		- ;; (in) · ;•;	(gal) ، _4	(J_(oal)	2 (gài)
TAN	2.0	163	211	375	4.2	. 128	247	247
3/11	(0.8)	(43,174)	(55.824)	(98,996)	(1.7)	(33,694)	(65,304)	(65,304)
FER	2.8	229	211	440	10.1	307	133	380
	(1.1)	(60,444)	(55,824)	(116,268)	(4.0)	(81,069)	(35,199)	(100,503)
MAR	2.0	163	211	375	22.4	679	-304	76
	(0.8)	(43,174)	(55,824)	(98,998)	(8.8)	(179,292)	(-80,294)	(20,209)
APR .	3.2	261	211	473	28.0	. 850	377	0
	(1.3)	(69,079)	(55,824)	(124,903)	(11.0)	(224,625)	(-99,722)	<u>(0)</u>
MAY	. 10.5	850	211	1,061	24.5	743	318	318
	(4.1)	(224,507)	(55,824)	(280,331)	(a.e)	(190,241)	(64,090)	(84,090)
JUN	8.1	654	211	865	23.4	710	155	473
	(J2)	(1/2,098)	(35,824)	(228,521)	(9.2)	(187,004)	(40,857)	(124,947)
JUL	9.7	- 784	211	996	Z2.1	670	326	799
<u> </u>	(3.6)	(201,231)	(35,624)	(203,001)	(0.7)	(177,045)	(00,010)	(210,963)
AUG	10.1	817	211	1,028	20.7	628	400	1,199
	(9.0)	(213,072)	(35,624)	(211,090)	(0.2)	(100,010)	(105,077)	(310,040)
SEP	12.5	(267 681)	211 (55.874)	(122) 5051	19.9 (7.8)	/150 6891	1162 8171	1,019
<u> </u>	(4.8)	(207,001)	100,024)	(323,203)	12.0	(133,000)	1105,0177	(400,450)
OCT	(2.2)	400 (120 BRA)	(55 874)	(176 712)	12.4 (4.8)	/98 018)	178 6041	2116
	3.6	204	211	505	# B	267	238	7754
NOV	(1.4)	(77.714)	(55.824)	(133,538)	(1.5)	(70.655)	(62 883)	(522 034)
	2.8	229	211	440	.4.9	209	231	2586
DEC	(1.1)	(60,444)	(55,824)	(116,268)	(2.7)	(55,135)	(61,133)	(683,167)
Totats	73.1	5,916	2,538	8,451	203.2	6,167		
	(28.6)	(1,562,914)	(669,884)	(2,232,798)	(50.0)	(1,629,144)		

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# Table ER RAI 4-2A.1b Water Balance for Treated Effluent Evaporative Basin (Maximum Scenario)

2		Total	Blowdown		1. S	E Potential Fr	Balance	
		Precipitation	Hasin V		Evaporation	Evaporation x	et inflow	- Net
	Precipitation	Basin	a file i sti	Basinta	Per Month 1	from Basin (	Outflow	Basin
	cm -	m	Articen)	in da	A cm (cr)	641 m 311	in K	m
Month	(in)	(gal)		S. ((M) (O)	的近何的	第三回的影响	(ca)))(-	(gal)
JAN	0.5	398	1,604	2,002	4.2	3,061	-1,059	0
	(0.2)	(105,080)	(423,875)	(528,955)	(1.7)	(508,650)	(-279,695)	(0)
FEB <sup>1</sup>	0.7	557	1,604	2,161	10.1	7,365	-5,203	, 0, .
	(0.3)	(147,112)	(423,875)	(570,907)	[4.0]	(1,945,001)	(-1,3/4,0/4)	101
MAR	0.5	398	1,604	2,002	22.4	16,287	-14,285	
	(0.2)	(105,080)	(423,875)	(528,955)	(8.0)	(4,302,839)	(-3,774,044)	(0)
APR	0.6	636	1,604	2,241	28.0	20,406	-18,165	0
	(0.3)	. (160,128)	(423,875)	(592,003)	(11.0)	(5,391,000)	(-4,798,998)	(0)
MAY /	2.6	2,068	1,604	3,673	24.5	17,827	-14,154	• 0 •
	(1.0)	(546,415)	(423,875)	(970,290)	(0.0)	(4,709,174)	(-3,739,484)	(0) :
JUN	2.0	1,591	1,604	3,195	23.4	17,048	-13,853	0 :
	(0.8)	(420,319)	(423,875)	(044,194)	(9.2)	(4,503,936)	(-3,659,742)	(0)
	2.4	1,909	1,604	3,514	22.1	16,083	-12,570 ·	,0
	(0.9) · 1	(504,383	(423,875)	/ (928,258)	(6.7)	(4,249,089)	(-3,320,831)	(0)
AUG	2.5	1,989	1,604	3,593	20.7 ·	15,082	-11,488	. 0
,,	(1.0)	(525,399)	(423,875)	(949,274)	(8.2)	(3,984,439	(-3,035,185)	(0)
SED	; 3.0	2,466	1,604	4,070	19.9	14,507	-10,436	0 :
ocr ;	(1.2)	(651,495)	(423,875)	(1,075,370)	(7.8)	* (3,832,511)	(-2,757,142)	(0)
OCT I	1.4	1,114	1,604	2,718	12.2	8,904	-6,186	0 .
<u> </u>	(0.5)	(294,223)	(423,875)	(718,098)	(4.8)	(2,352,437)	(-1,634,338)	· (0)
NOV -	0.9	716	1,604	2,320	. 8.8	6,418	-4,098	0
NUV .	(0.3)	· (189,144)	(423,875)	(613,019)	(3.5)	(1,695,715)	(-1,082,696)	(0)
DEC	0.7	557	1,604	2,161	6.9	5,009	-2,847	0 1
DEC	(0.3)	(147,112)	(423,875)	(570,987)	(2.7)	(1,323,246)	(-752,259)	(0) '
	47.0	44.000	40.070	1 00 054		447.000		
Totals	17.8	14,398	19,253	33,051	203.2	147,990	. `	· •
	(0.0)	(2,003,000)	(0,000,000)	10,000,000)	(00.0)	(22,022,420)	· · .	

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# Table ER RAI 4-2A.2a Water Balance for UBC Storage Pad Stormwater Retention Basin (Minimum Scenario)

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	÷	Total . Precioitation	Blowdown			Potential .	Balance	Net
		Inflow to	Riela	Total million	Evaporation	Outflow St.	Solation	12.6
5.1	Precipitation	Bailn		w to Basin	per Month 12	Sfrom Basinin	, Outliow	, Basin
1	ст, ; ;	3 <sup>45</sup> m <sup>8</sup> 7	(gal)	П <b>(</b> , ),	r1	та, т <sup>а</sup> .	m.	m
Month.	(iń) ;	(nai)	<b>这个时</b> 一个	Restored Free	·?∰(In)).	362 (gal)	i (gal) 3-1-	(gal)*
IAN	2.0	1,634	1,604	3,239	4.2	3,061	178	178
100	(0.8)	(431,723)	(423,875)	(855,598)	(1.7)	(808,650)	(46,948)	(46,948)
FFR	2.8	: 2,288	1,604	3,892	10.1	7,365	-3,472	0
	(1.1)	(604,412)	(423,875)	(1.028,287)	(4.0)	(1,945,661)	(-917,374)	(0)
MAR	2.0	1,634	1,604	3,239	22,4	16,287	+13,049	0
	(0.6)	(431,723)	(423,875)	(855,598)	(8.8)	(4,302,999)	(-3,447,400)	(0)
APR	3.2	2,615	1,604	4,219	. 28.0	20,408	-16,187	0
	(1.3)	(690,757)	(423,875)	(1,114,632)	(11.0)	(5,391,000)	(-4,276,368)	(0)
MAY	10.5	8,497	1,604	10,102	24.5	17,827	-7,725	0
	(4.1)	(2,244,960)	(423,875)	(2.668,835)	(9.6)	(4,709,774)	(-2,040,939)	(0)
JUN	8.1	6,536	1,604	8,141	- 23.4	17,048	-8,907	0
	(3.2)	(1,728,893)	(423,875)	(2,150,768)	(9.2)	(4,503,936)	(•2,353,168)	(0)
.nn	9.7	:- 7,844	1,604	9,448	22.1	16,083	-6,635	0
	(3.8)	(2,072,271)	(423,875)	(2,496,146)	(8.7)	(4.249.089)	(-1,752,942)	(0)
ALIG	10,1	8,171	1,604	9,775	20.7	15,082	-5,307	0
	(4.0)	(2,158,615)	(423,875)	(2,582,491)	(8.2)	(3,984,439)	(-1,401,949)	(0)
SEP	12.5	10,132	1,604	11,736	19,9	14,507	-2.771	0
	(4.9)	(2.678,684)	(423,875)	(3,100,559)	(7.8)	(3,832,511)	(-731,953)	(0)
ост	5.7	4,576	1,604	6,180	12.2	8,904	-2,724	0
	(2.2)	(1,208,825)	(423,875)	[1,632,700]	(4.8)	(2,352,437)	(-719,737)	(0)
NOV	3.6	2,941	1,604	4,548	8.8	6,418	-1,873	0
	(1.4)	(777,102)	(423,875)	(1,200,977)	(3.5)	(1,695,715)	(-494,738)	(0)
DEC	2.8	2,288	1,604	3,892	6.9	5,009	-1,116	0
	(1.1)	(604,412)	(423,875)	(1,028,287)	(2.7)	(1,323,246)	(-294,958)	(0)
	73.1	59.155	19,253	78.408	. 203.2	147 998		
TOTAIS	(28.8)	(15,628,378)	(5,088,500)	(20,714,878)	(80.0)	(39.099.456)		

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# Table ER RAI 4-2A.2b Water Balance for UBC Storage Pad Stormwater Retention Basin (Maximum Scenario)

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# 32-5047375-00 Page 24 of 60

	Precipitation	Total Precipitation Inflow to Basin	Evaporation +	Potential Evaporation Outflow	Balance Inflow	I. Net
Month	ćm ((in)	m³ (gal)	:cm z?(in)	, ( <b>gal</b> )	.m'	· · · · · · · · · · · · · · · · · · ·
JAN	0.5	2,376 (627,763)	65.2 (25.7)	47,460 (12,538,487)	-45,084 (-11,910,723)	0 (0)
FEB	0.8 (0.3)	3,564 (941,645)	71.1 (28.0)	51,763 (13,675,498)	-48,199 (-12,733,853)	0 (0)
MAR	0.5	2,376	83.3	60,686	-58,310	· 0
	(0.2)	(627,763)	(32.8)	(16,032,835)	(-15,405,072)	(0)
APR	0.8	3,564	89.0	64,804	-61,240	0
	(0.3)	(941,645)	(35.0)	(17,120,837)	(-16,179,192)	(0)
MAY	2.5	11,881	85.4	62,226	-50,345	0
	(1.0)	(3,138,817)	(33.6)	(16,439,611)	(-13,300,793)	(0)
NUL	2.0	9,505	84.4	61,447	-51,942	0
	(0.8)	(2,511,054)	(33.2)	(16,233,773)	(-13,722,719)	(0)
JUL.	2.3	10,693	83.0	60,482	-49,789 .	0
	(0.9)	(2,824,936)	(32.7)	(15,978,925)	(-13,153,990)	(0)
AUG	2.5	11,881	81.7	59,480	-47,600	0
	(1.0)	(3,138,817)	(32.2)	(15,714,276)	(-12,575,459)	(0)
SEP	3.0 (1.2)	14,257 (3,766,581)	80.9 (31.8)	58,905 (15,562,348)	-44,648 (-11,795,767)	0 (0)
ост	1.3 (0.5)	5,940 (1,569,409)	73.2 (26.8)	53,303 (14,082,273)	-47,363 (-12,512,865)	0 (0)
NOV	0.8	3,564	69.8	50,817	-47,253	0
	(0.3)	(941,645)	(27.5	(13,425,551)	: (-12,483,906)	(0)
DEC	0.8	3,564	67.8	. 49,407	-45,843	; 0
	(0.3)	(941,645)	(28.7)	(13,053,082)	(-12,111,437)	(0)
Totals	17.8 (7.0)	83,166 (21,971,722)	934.7 (368.0)	680,782 (179,857,498)		

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# Table ER RAI 4-2A.3a Water Balance for the Site Stormwater Detention Basin (Minimum Scenario)

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	Precipitation	Total Precipitation Inflow to Basin	Evaporation + +	Potential Evaporation Outflow from Basin	Balance : Inflow : C.F. Outflow : A	Net In Basin
Month	cm (in)	m" · (gal)	(in)	(gal)	1040	in' (gal)
NAL	2.0	9,445	65.2	47,460	-38,014	0
	(0.8)	(2,495,360)	(25.7)	(12,538,487)	(-10,043,127)	(0)
FEB	2.8	13,223	71.1	51,763	-38,540	0
	(1.1)	(3,493,504)	(28.0)	(13,675,498)	(-10,181,994)	(0)
MAR	2.0	9,445	83.3	60,686	-51,241	0
	(0.8)	(2,495,360)	(32.8)	(16,032,835)	(-13,537,475)	(0)
APR	3.2 (1.3)	15,112 (3,992,576)	89.0 (35.0)	64,804 (17,120,837)	-49,692 (-13,128,261)	0 (0)
MAY	10.5	49,115	65.4	62,226	-13,111	0
	(4.1)	(12,975,871)	(33.6)	(16,439,611)	(-3,463,740)	(0)
JUN	8,1	37,781	84.4	61,447	-23,666	0
	(3.2)	(9,981,439)	(33.2)	(16,233,773)	(-8,252,333)	(0)
JUL	9.7	45,337	83.0	60,482	-15,145	0
	(3.8)	(11,977,727)	(32.7)	(15,978,925)	(-4,001,198)	(0)
AUG	10,1	47,226	81.7	59,480	-12,254	0
	(4.0)	(12,476,799)	(32.2)	(15,714,276)	(-3,237,477)	(0)
SEP	12.5 (4.9)	58,560 (15,471,231)	80.9 (31.6)	58,905 (15,562,348)	-345 - (-91,117)	0 (0)
ост	5.7	26,447	73.2	53,303	-26,858	0
	(2.2)	(6,987,008)	(28.0)	(14,082,273)	(-7,095,266)	(0)
NOV	3.6	17,001	t 69.8	50,617	-33,816	0
	(1.4)	(4,491,648)	(27.5)	(13,425,551)	(-8,933,904)	(0)
DEC	2.8	13,223	67.8	49,407	-36,184	0
	(1.1)	(3,493,504)	(26.7)	(13,053,082)	(-9,559,579)	(0)
Totals	73.1 (28.8)	341,918 (90,332,027)	934.7 (368.0)	680,782 (179,857,498)		

# Table ER RAI 4-2A.3bWater Balance for the Site Stormwater Detention Basin(Maximum Scenario)

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. Appendix C

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Excerpts from Sections 1.2.1 and 4.4.7 of the NEF Environmental Report :.

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#### 1.2 PROPOSED ACTION

The proposed action is the issuance of an NRC license under 10 CFR 70 (CFR, 2003b) for the construction and operation of a uranium enrichment facility 8 km (5 mi) east of Eunice, New Mexico in Lea County. The NEF will use the gas centrifuge process to separate natural uranium hexafluoride feed material containing approximately 0.71 Uranium-235 ( $^{235}$ U) into a product stream enriched up to 5.0 "/<sub>o</sub>  $^{235}$ U and a depleted UF<sub>6</sub> stream containing approximately 0.2 to 0.34 "/<sub>o</sub>  $^{235}$ U. Production capacity at design throughput is approximately 3.0 million Separative Work Units (SWU) per year. Facility construction is expected to require eight (8) years. Construction will be conducted in six phases. Operation will commence after the completion of the first cascade in the first Cascade Hall. The facility is licensed for 30 years of operation. Decommissioning and Decontamination (D&D) is projected to take nine (9) years. LES estimates the cost of the plant to be approximately \$1.2 billion (in 2002 dollars) excluding escalation, contingency, interest, tails disposition, decommissioning, and any replacement equipment required during the operational life of the facility.

#### 1.2.1 The Proposed Site

The proposed NEF site is located in Southeast New Mexico, approximately 32 km (20 mi) south of Hobbs, New Mexico (population 28,657). The site is located in Lea County, approximately 0.8 km (0.5 mi) west of the Texas state border, 51 km (32 mi) west-north-west of Andrews, Texas (population 10,182) and 523 km (325 mi) southeast of Albuquerque, New Mexico (population 712,728). The nearest large population center (>100,000 population) and commercial airport is the Midland-Odessa, Texas area which is approximately 103 km (64 mi) to the southeast. The approximate center of the NEF is located at latitude 32 degrees, 26 min, 1.74 sec North and longitude 103 degrees, 4 min, 43.47 sec West. Refer to Figure 1.2-1, Location of Proposed Site and Figure 1.2-2, NEF Location Relative to Population Centers Within 80 Kilometers (50 Miles).

Lea County is situated at an average elevation of 1,220 m (4,000 ft) above mean sea level (msl) and is characterized most often by its flat topography. Lea County covers 11,381 km<sup>2</sup> (4,393 mi<sup>2</sup>) or approximately 1,138,114 ha (2,822,522 acres) which is three times the size of Rhode Island and only slightly smaller than Connecticut. From north to south, Lea County spans 173 km (108 mi) and 70 km (44 mi) from east to west spans at its widest point.

The proposed NEF site location is Section 32, Township 21S, Range 38E. The site is located approximately 8 km (5 mi) east of the nearest city, which is Eunice, New Mexico (population 2,562). Eunice is located at the crossing junction of New Mexico Highway 207 and New Mexico Highway 234, 32 km (20 mi) south of Hobbs, New Mexico. New Mexico Highway 234 (east-west) and New Mexico Highway 18 (north-south) are the major transportation routes near the site. These two highways intersect about 6.4 km (4 mi) west of the proposed NEF site. An active railroad line operated by the Texas-New Mexico Railroad runs parallels to New Mexico Highway 18 and just east of Eunice within 5.8 km (3.6 mi) of the NEF site. There is also an active railroad spur line that runs from the Texas-New Mexico Railroad, along the North boundary of the NEF site and terminates at the Waste Control Specialists (WCS) facility, just across the New Mexico-Texas border.

NEF Environmental Report

December 2003 Page 1.2-1

#### 4.4.7 Control of Impacts to Water Quality

Site runoff water quality impacts will be controlled during construction by compliance with NPDES General Permit requirements and BMPs will be described in a site Stormwater Pollution Prevention (SWPP) plan.

Wastes generated during site construction will be varied, depending on activities in progress. Any hazardous wastes from construction activities will be handled and disposed of in accordance with applicable state regulations. This includes proper labeling, recycling, controlling and protected storage and shipping offsite to approved disposal sites. Sanitary wastes generated at the site will be handled by portable systems until such time that the site septic system is available for use.

The need to level the site for construction will require some soll excavation as well as soil fill. Fill placed on the site will provide the same characteristics as the existing natural soils thus providing the same runoff characteristics as currently exist due to the presence of natural soils on the site.

During operation, the NEF's stormwater runoff detention/retention system will provide a means to allow controlled release of site runoff from the Site Stormwater Detention Basin only. Stormwater discharge will be periodically monitored in accordance with state and/or federal permits. This system will also be used for routine sampling of runoff as described in ER Section 6.1.1.2, Liquid Effluent Monitoring. A Spill Prevention Control and Countermeasure (SPCC) plan will be implemented for the facility to identify potential spill substances, sources and responsibilities. A SWPP will also be implemented for the NEF to assure that runoff released to the environment will be of suitable quality. These plans are described in ER Section 4.1, Land Use Impacts.

Water discharged to the NEF site septic system will meet required levels for all contaminants stipulated in any permit or license required for that activity, including the 10 CFR 20 (CFR, 2003q) and a Groundwater Discharge Permit/Plan. The facility's Liquid Effluent Collection and Treatment System provides a means to control liquid waste within the plant. The system is fully described in SAR Section 3.2 and ER Section 3.12, and it provides for collection, treatment, analysis, and processing of liquid wastes for disposal. Effluents unsuitable for release to the Treated Effluent Evaporative Basin are processed onsite or disposed of offsite in a suitable manner in conformance with pertinent regulations.

The UBC Storage Pad Stormwater Retention Basin, which exclusively serves the UBC Storage Pad and cooling tower blowdown water discharges, is lined to prevent infiltration. It is designed to retain a volume slightly more than twice that for the 24-hour, 100-year frequency storm plus an allowance for cooling tower blowdown. Designed for sampling and radiological testing of the contained water and sediment, this basin has no flow outlet. All discharge is through evaporation.

The Site Stormwater Detention Basin is designed with an outlet structure for drainage. Local terrain serves as the receiving area for this basin.

Discharge of operations-generated potentially contaminated waste water is made exclusively to the Treated Effluent Evaporative Basin. Only liquids meeting site administrative limits (based on

NEF Environmental Report

December 2003 Page 4.4-7 prescribed standards) are discharged to this basin. The basin is double-lined with leak detection and open to allow evaporation.

Mitlgation measures will be in place to minimize potential impact on water resources. These include employing BMPs and the control of hazardous materials and fuels. In addition, the following controls will also be implemented:

- Construction equipment will be in good repair without visible leaks of oil, greases, or hydraulic fluids.
- The control of spills during construction will be in conformance with Spill Prevention Control and Countermeasures (SPCC) plan.
- Use of the BMPs will assure stormwater runoff related to these activities will not release runoff into nearby sensitive areas (EPA, 2003g). See ER Sections 4.1.1 and 4.2.5 for construction BMPs.
- BMPs will also be used for dust control associated with excavation and fill operations during construction. Water conservation will be considered when deciding how often dust suppression sprays will be applied (EPA, 2003g).
- Silt fencing and/or sediment traps will be used.
- External vehicle washing (no detergents, water only).
- Stone construction pads will be placed at entrance/exits if unpaved construction access adjoins a state road.
- All temporary construction and permanent basins are arranged to provide for the prompt, systematic sampling of runoff in the event of any special needs.
- Water quality impacts will be controlled during construction by compliance with the National Pollution Discharge Elimination System – General Permit requirements and by applying BMPs as detailed in the site Stormwater Pollution Prevention (SWPP) plan.
- A Spill Prevention Control and Countermeasure Plan (SPCC), will be implemented for the facility to identify potential spill substances, sources and responsibilities.
- All above-ground diesel storage tanks will be bermed.
- Any hazardous materials will be handled by approved methods and shipped offsite to approved disposal sites. Sanitary wastes generated during site construction will be handled by portable systems, until such time that plant sanitary facilities are available for site use. An adequate number of these portables systems will be provided.
- The NEF Liquid Effluent Collection and Treatment System provides a means to control liquid waste within the plant including the collection, analysis, and processing of liquid wastes for disposal.
- Control of surface water runoff will be required for activities covered by the EPA Region 6 NPDES General Permit.

The NEF is designed to minimize the use of natural and depletable water resources as shown by the following measures:

**NEF Environmental Report** 

December 2003 Page 4.4-8

- The use of low-water consumption landscaping versus conventional landscaping reduces water usage.
- The installation of low flow toilets, sinks and showers reduces water usage when compared to standard flow fixtures.
- Localized floor washing using mops and self-contained cleaning machines reduces water usage compared to conventional washing with a hose twice per week.
- The use of high efficiency washing machines compared to standard machines reduces water usage.
- The use of high efficiency closed cell cooling towers (water/air cooling) versus open cell design reduces water usage.
- Closed-loop cooling systems have been incorporated to reduce water usage.

## 4.4.8 Identification of Predicted Cumulative Effects on Water Resources

The NEF will not extract any surface or groundwater from the site or discharge any effluent to the site other than into the engineered basins. As a result, no significant effects on natural water systems are anticipated. Thus no cumulative effects are predicted.

# 4.4.9 Comparative Water Resources Impacts of No Action Alternative Scenarios

ER Chapter 2, Alternatives, provides a discussion of possible alternatives to the construction and operation of the NEF, including an alternative of "no action," i.e., not building the NEF. The following information provides comparative conclusions specific to the concerns addressed in this subsection for each of the three "no action" alternative scenarios addressed in ER Section 2.4, Table 2.4-2, Comparison of Environmental Impacts for the Proposed Action and the No-Action Alternative Scenarios.

The discussion of alternative scenarios in ER Section 2.0 compares the impacts of NEF with those that could result from expansion of the existing USEC gaseous diffusion plant (GDP) and a proposed centrifuge plant. Plant water usage by the GDP is reported to be 26 million gal/d (USEC, 2003a). NEF water usage is projected to be 87,625 m<sup>3</sup>/yr (23.15 million gal/yr), less than 0.5% of the GDP usage.

Significant water usage is also required to generate the electric power needed for GDP operations. NEF will use far less electric power and thus far less water per SWU compared with GDP.

Alternative Scenario B - No NEF; USEC deploys a centrifuge plant and continues to operate the Paducah gaseous diffusion plant (GDP): The water resources impact would be greater because of the higher water usage of the GDP and the water use to meet GDP electricity needs.

Alternative Scenario C – No NEF; USEC deploys a centrifuge plant and increases the centrifuge plant capability: The water resources impact would be greater in the short term to

NEF Environmental Report

December 2003 Page 4.4-9

32-5047375-00 Page 31 of 60

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# Appendix D

Western Regional Climate Center NCDC 1971-2000 Monthly Normals and Monthly Total Precipitation for Hobbs, New Mexico

HOBBS, NEW MEXICO NCDC 1971-2000 Monthly Normals

Page 1 of 2

# HOBBS, NEW MEXICO 1

NCDC 1971-2000 Monthly Normals

NCDC 1971-2000	WIUII		orme	112			• • •					-	. :
~	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual Monthly
Mean Max. Temperature (F)	56.7	62.9	70.7	78.5	86.1	92.8	93.5	91.2	85.4	77.3	65.2	57.9	76.5
Highest Mean Max. Temperature (F)	64.7	71.3	79.1	83.8	94.5	101.5	102.1	96.4	92.6	84.4	73.5	65.4	102.1
Year Highest Occurred	1986	1976	1974	1972	2000	1998	1998	2000	2000	1979	1973	1981	1998
Lowest Mean Max. Temperature (F)	49.0	55.1	63.1	72.2	81.2	87.4	86.6	84.4	77.5	71.8	56.8	50.9	49.0
Year Lowest Occurred	1979	1997	1987	1997	1976	1979	1976	1971	1991	1984	2000	2000	1979
Mean Temperature (F)	42.9	48.0	54.8	62.6	70.9	77.9	80.1	78.3	72.3	63.2	51.3	44.0	62.2
Highest Mean Temperature (F)	. <b>47.</b> 8	54.6	61.6	67.8	77.9	84.8	86.0	82.0	77.5	66.6	56.4	48.9	86.0
Year Highest Occurred	1986	1976	1974	1986	2000	1990	1998	1999	1998	1979	1981	1977	1998
Lowest Mean Temperature (F)	36.6	42.5	48.7	57.0	66.6	73.7	74.8	72.9	66.0	.56.9	44.9	37.6	36.6
Year Lowest Occurred	1985	1978	1987	1983	1976	1979	1976	1971	1974	1976	2000	1983	1985
Mean Min. Temperature (F)	29.1	33.1	38.9	46.6	55.6	63.0	66.6	65.4	59.2	49.1	37.3	30.1	47.8
Highest Mean Min. Temperature (F)	34.0	38.2	44.0	51.9	61.3	69.2	69.8	68.6	63.2	53.7	41.2	36.3	69.8
Year Highest Occurred	1981	1995	1974	1986	2000	1990	1998	1982	1998	1983	1994	1994	1998
Lowest Mean Min. Temperature (F)	22.9	28.5	33.9	41.5	50.5	59.5	62.7	61.1	54.2	41.7	30.8	22.8	22.8
Year Lowest Occurred	1985	1978	1996	1987	1987	1995	1988	1975	1974	1976	1976	1983 1983	1983
Mean Precipitation (in.)	0.51	0.66	0.48	0.78	2.58	2.03	2.42	2.52	3.13	1.45	0.87	0.72	18.15
Highest Precipitation (in.)	2.03	2.21	2.98	2.86	13.83	5.37	9.41	9.06	12.99	8.15	4.33	5.08	13.83
Year Highest Occurred	1993	1973	2000	1981	1992	2000	1988	1984	1995	1985	1978	1986	1992
Lowest Precipitation (in.)	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.11	0.08	0.00	0.00	0.00	0.00
Year Lowest													

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http://www.wrcc.dri.edu/cgi-bin/cliNORMNCDC2000.pl?nmhobb

7/9/2004

32-5047375-00 Page 33 of 60

## HOBBS, NEW MEXICO NCDC 1971-2000 Monthly Normals

Page 2 of 2

 Occurred
 2000
 1999
 1996
 2000
 2000
 1990
 1980
 1994
 2000
 1989
 1999
 2000
 2000

 Heating Degree Days
 686.
 476.
 323.
 131.
 37.
 1.
 0.
 0.
 18.
 110.
 416.
 651.
 2849.

 Cooling Degree
 0.
 0.
 6.
 57.
 218.
 389.
 466.
 413.
 237.
 53.
 3.
 0.
 1842.

http://www.wrcc.dri.edu/cgi-bin/cliNORMNCDC2000.pl?nmhobb

7/9/2004

32-5047375-00 Page 34 of 60

Monthly Precipitation, HOBBS, NEW MEXICO

Page 1 of 3

17

# HOBBS, NEW MEXICO

# Monthly Total Precipitation (inches)

# (294026)

File last updated on Jun 24, 2004 \*\*\* Note \*\*\* Provisional Data \*\*\* After Year/Month 200403 a = 1 day missing, b = 2 days missing, c = 3 days, ..etc.., z = 26 or more days missing, A = Accumulations present Long-term means based on columns; thus, the monthly row may not sum (or average) to the long-term annual value.

MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS: 51 14 144

Individual Months not used for annual or monthly statistics if more than 5 days are missing. Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR (S)	JAN	FEB	MAR	APR	MAY	JÚN	JUL	AUG	SEP	ост	NOV	DEC	ANN	
1914	0.03	0.11a	0.08	0.52	2.72 .	1.92 _	2.52	3.90	0.87	2.63	0.52	1.59a	17.41	
1915	0.25	0.49	<b>1.57</b> ·	3.80	0.32 -	4.85	2.82	4.75	6.60	0.26	0.00	1.05	26.76	
1916	0.18	0.12	0.59	1.70	0.17	0.03	0.82	4.47a	3.91 a	4.08 a	0.35	0.10	16.52	
1917	0.11	0.00	0.25	0.00	0.40 a	0.93	0.04	2.22	0.75	0.00 .	0.58 a	0.00	5.28	•
1918,	0.82 a	0.05	0.00	0.07	. 1.55	5.67	0.66 a	0.99	0.22a	1.30	0.82 a	0.85a	13.00	
1919	0.16a	0.00	2.78	1.59	0.75	1.75 :	0.13	1.61	10.72Ъ	. 1.95	0.33 a	0.14	21.91	
1920	0.96	0.12a	0.05 a	0.00	2.50	0.75 :	1.02	9.17a	0.67	1.30	0.85	0.00	17.39	
1921	0.10	1.19	0.43	0.07	0.86	9.30 a	3.25 a	0.83	1.18b	0.00	0.00	0.17a'	17.38	
1922	0.37	0.03	0.12	·5.17 ·	0.69	2.23	2.01	0.77	1.45	0.39	0.37	0.02	13.62	
1923 :	0.36	2.44	0.75	2.58	0.47 🖉	1.37	2.56	1.87	4.80	6.64	0.32	1.55	25.71	!
1924	0.00	0.22	0.80	0.62	0.28	0.00	<b>0.78</b> .:	1.08	0.25	0.60	0.06	0.60	5.29	
1925	0.12	0.00	0.00	0.67 · (	1.09	1.18	1.65	1.77	0.51	0.88	0.07	0.00	7.94	
1926	0.32	0.00	0.74	2.20	1.91 .	0.30	1.58	2.19	3.97	3.74	0.60	1.60	19.15	
1927	0.05	0.22	0.00	0.00	0.23	3.17	3.56	0.40	0.69	<b>0.25</b>	0.00	1.16a	9.73	•
<b>1928</b> :	0.18	0.26 a	0.02	0.30	1.71	2.19	4.20	8.28	0.58	0.00z	0.00ż	0.00 z	17.72	`
<b>1929</b>	0.00 z	0.00 z	0.00 z	: <b>0.00 z</b> ;	0.00 z	2.07	1.07	2.53	1.78	<b>4.49</b> ···	0.40	0.07	12.41	
1930	0.24	0.00	0.00	0.03	0.00 z	0.00z	0.00 z	0.00 z	0.00z	0.00 z	0.00 ż	0.00 z	0.27	
1931	0.00 z	0.00 z	0.00z	0.00 z	0.00 z	0.00z	0.00z	0.00 z	0.00 z	0.00 z	0.00 z	0.00z	0.00	
1932	0.00z	0.00 z	0.00z	0.00 z	0.00 z	5.25	1.14	5.55	3.99	0.00 z	0.00 z	0.00 z	15.93	,
1933	0.10	0.00 z	0.00z	0.00 z	0.00z	0.00 z	0.00z	0.00 z	1.15	0.00 -	0.58	0.00	1.83	
1934	0.52	0.00	1.15	0.15 :	0.00z	0.00z	0.00 z	0.00 z	0.00z	0.00 z	0.00z	0.00ź	1.82	
1935	0.00 z	0.50 a	0.75	0.00 z	0.00 z	0.00z	0.00 z	0.00 z	0.00z	0.00 z	0.00 z	0.00z	1.25	
1936	0.00 z	0.00 z	0.00 z	0.00 z	0.00z	0.00 z	0.00z	0.00 z	0.00z	0.00 z	0.00 z	0.00 z	0.00	
1937	0.00z	0.00 z	0.00z	0.00 z	20.00 z	0.00z	0.00 z	0.00 z	0.00z	0.87	0.79 ::.	0.67	2.33	
1938	0.71	0.40	0.24	0.12	0.00	3.15	1.74	0.04	1.18	0.83	0.09	0.25	. 8.75	
1939	1.10	0.15	0.00	0.10	1.45	1.00	3.61	0.22	0.00	2.42a	1.59	0.28	11.92	
1940	0.05	0.56	0.25	1.25	0.63	4.10	0.55	2.80	0.00	3.45	1.09	0.33	15.06	
1941	0.22	0.84	2.88	0.69	9.19	3.03	2.32	1.19	6.72	4.66	0.08	0.37	32.19	
				,	·.		· • ·	t pe	· .	·	: 1.	• • • •	· · ·	;

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13

7/9/2004

32-5047375-00 Page 35 of 60

Page 2 of 3

# Monthly Precipitation, HOBBS, NEW MEXICO

1942	0.16	0.00	0.50	1.71	1.47	1.51	1.10	2.89	0.67	0.86	0.00	1.88	12.75
1943	0.00	0.08	0.09	0.10	0.72	1.66	3.01	0.30	0.51	0.09	0.50	1.98	9.04
1944	1.23	0.49	0.00	0.42	2.79	1.39	1.42	4.20	5.10	0.28	1.93	0.32	19.57
1945	1.10	0.00	0.00	0.51	0.06	0.36	1.33	1.42	· 1.30	1.48	0.00	0.16	7.72
1946	1.30	0.03	0.13	0.00	0.46	1.91	1.15	5.59	7.87	3.89	0.00	1.21	23.54
1947	0.73	0.00	0.95 a	0.45	7.05	0.10	0.00z	0.47	0.06	0.04	0.70	0.14	10.69
1948	0.84	0.86	0.20	0.56	1.18	0.20	1.90	0.26	1.99	0.39Ъ	0.00	0.13	8.51
1949	2.96b	0.27	0.18	2.46	1.77	1.99	3.96	0.81	8.03	0.45	0.00	0.43	23.31
1950	0.14	0.04	0.02	1.13	0.82	3.85	4.33	1.81	7.86	0.34	0.00	0.00	20.34
1951	0.12	0.05	0.63	0.13	2.56	0.74	0.96	2.54	0.00	0.37	0.04	0.00	8.14
1952	0.00	0.37	0.13	0.40	2.10	0.00	2.36	0.30	1.57	0.00	1.15	0.00	8.38
1953	0.00	0.22	0.49	0.47	0.66	0.27	1.04	1.22	0.78	4.82 a	0.03	0.09	PO 01
1954	0.00	0.00	0.00	1.93	5.80	0.40	0.00	4.11	0.98	2.76	0.03	0.07	16.08
1955	0.43	0.00	0.11	0.00	3.86	0.23	1.91	0.27	- 2.71	2.48	0.30	0.00	12 30
1956	0.02	0.80	0.00a	0.14	1.93	0.59	0.15	1.20	0.47	3.05	0.00	0.00	8 63
1957	0.02	0.00	0.000	1 58	4 81	0.09	0.00	3 68	1 51	3 30	1 17	0.00	19.20
1958	1 84	0.00	1 70	0.55	0.87	1.16	0.94	215	4 87	3.07	0.80	0.00	18 08
1959	0.00	0.05	0.01	0.74	2.64	2.52	2.68	2.09	0.52	2.25	0.04	1.10	14.64
1960	0.38	0.34	0.19	0.01	0.63	1.35	9.06	2.45	0.37	3.72	0.00	1.91	20.41
1961	1.28	0.11	1.19	0.02	0.85	1.03	2.40	0.63	1.07	0.03	1.03	0.12	976
1962	0.48	0.07	0.20	0.28	0.25	3.18	1.94	2.26	3.98	0.94	0.03	0.47	14.08
1963	0.00	0.19	0.00	0.88	4.12	1.86	1.34	2.88	0.63	0.20	0.21	0.29	12.60
1964	0.11	0.12	0.54	0.00	1.40	1.56	0.77	0.37	1.60	0.33	0.14	0.54	7.48
1965	0.00	0.19	0.03	0.64	0.22	1.76	2.04	2.11	0.89	0.28	0.00	0.43	8.59
1966	0.21	0.15	0.85	2.20	0.89	1.65	0.23	6.64	2.40	0.00	0.00	0.02	15.24
1967	0.00	0.03	0.13	0.59	0.07	0.05	2.18	0.96	0.26	0.00	0.48	0.65	5.40
1968	0.93	0.94	0.39c	0.54	1.93	0.88	5.96	3.88	0.11	0.61	1.63	0.27	18.07
1969	0.02	1.09	1.57	0.79	3.23	0.55	1.98	0.66	3.51	6.31	0.15	0.78	20.64
1970	0.00	0.43	1.53	0.60	0.48	2.37	1.03	0.41	3.21	0.54	0.00	0.01	10.61
1971	0.03	0.03	0.07	1.26	1.01	0.05	0.42	8.49	4.89	1.35	0.18	0.93	18.71 <sup>°</sup>
1972	0.20	0.04	0.27	0.02	1.13	2.66	2.19	4.20	6.32	3.09	0.56	0.04	20.72
1973	1.28	2.21	0.62	0.07	1.27	1.75	2.44	0.88	0.73	1.02	0.03	0.00	12.30
1974	0.02	0.05	0.31	0.99	1.96	1.62	0.33	6.85	8.46	5.93	0.43	0.39	27.34
1975	0.45	1.19 :	0.05	0.22	3.72	1.46	7.25	1.76	2.41	0.14	0.00	0.28	18.93
1976	0.20	0.36	0.04	1.52	1.35	0.39	4.44	0.58	1.75	1.57	1.45	0.00	13.65
1977	0.18	0.05	1.10	1.44	2.09	3.41	1.60	0.79	0.53	1.00	0.06	0.01	12.26
1978	0.37	0.65	<b>0.48</b>	0.44	1.95	2.23	0.57	0.75	7.14	1.51	4.33	0.31	20.73
1979	0.29	0.47	0.53	0.32	2.26	4.96	1.59	2.83	0.45	0.11	0.28	0.74	14.83
1980	1.12	0.37	0.02	0.29	4.00	1.31	0.22	3.73	7.05	0.04	1.45	0.09	19.69
1981	0.31	0.42	0.41	2.86	2.27	1.26	7.29	3.07	2.27	2.73	0.26	0.27	23.42
1982	0.35b	0.05	1.25	1.28	4.73	1.55	4.25	0.87	1.67	0.69	1.59	2.26	20.54
1983	1.73	0.41	0.22	0.60	1.87	0.51	0.67	1.12	1.20	2.46	2.91	0.27	13.97
1984	0.08	0.02	0.00	0.11	3.83	2.78	2.53	9.06	1.55	2.34	2.37	2.25 a	26.92
1985	0.20 a	0.45	0.75	1.20	1.40	4.55	2.78	1.92	3.99	8.15	0.10	0.02	25.51
1986	0.17	0.93	0.10	0.00	1.58	5.09	2.14	2.94	2.77	1.09	1.55	5.08	23.44
1987	0.10	1.80	0.63	0.90	6.01	3.93	0.42	3.59	2.22	0.08	0.36	0.47	20.51

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7/9/2004

32-5047375-00 Page 36 of 60

Page 3 of 3

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# Monthly Precipitation, HOBBS, NEW MEXICO

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1099	0.45	1 00	0.23	0.63	2 12	0 3 2	0.41	1 55	1 09	000	0.00	0 42	10.01
1200	0.45	1.50	0.23	0.03	2.12	0.52	7.41	1.22	1.70	0.00	0.00	0.42	19.01
1989	0.13	1.59	0.79	0.00	0.28	0.40	1.93	3.34	0.90	0.00	0.00	0.55a	9.91
<b>19</b> 90	0.44	0.87	0.77	1.11	1.25	0.00	2.85	2.16	2.20	0.37	1.48	0.69	14.19
1991	0.62	0.00	0.00	0.00	0.53	2.70 a	4.51	3.10	12.07	0.18	0.96	3.49	28.16
1992	1.50	2.15	0.46	0.49	13.83	2.15	1.50	2.00	1.92	0.02	1.14	1.65	28.81
1993	2.03	0.71	0.18	1.87	0.93	0.17	3.08	0.35	1.12	1.41	0.30	0.00	12.15
<b>19</b> 94	0.32	0.00	0.20	0.05	5.33	0.15	1.20	0.11	0.34	0.92	1.44	0.00	10.06
1995	1.31	0.50	0.26	0.09	1.39	2.36	0.32	1.50	12.99	0.38	0.00	0.00c	21.10
1996	0.22	0.00	0.00	0.75	2.37	3.09 .	3.40	2.80	0.93	0.25	0.76	0.00	14.57
1 <b>9</b> 97	0.62	2.06	0.50	2.77	4.26	2.07	1.11	1.34	1.26	2.00	0.00	1.11a	19.10
1 <b>9</b> 98	0.00	0.20	0.60	0.00	0.00 z	0.10	0.24	2.15	0.98	2.19	0.31	0.19	6.96
1999	0.54	0.00	0.67	1.97	2.55	2.61	0.73	1.03 a	1.81	0.07	0.00	0.00	11.98
2000	0.00	0.39	2.98	0.00	0.00	5.37	0.00 z	0.00 z	0.00z	2.38	1.70	0.00	12.82
2001	0.00 z	0.00	1.85	0.34Ъ	2.21	1.385	0.27	1.21	1.84g	0.03	1.04	0.00	8.33
2002	0.57	0.00z	2.70	1.56	0.56	1.40	0.84	0.60	0.00z	0.00 z	0.00	0.00 z	8.23
2003	0.00 z	0.70	0.00	0.00	0.00z	0.00 z	0.00z	0.00 z	0.00z	0.00z	0.75	0.00 z	1.45
2004	0.00 z	0.00 z	0.93	5.27 m	0.000	0.00t	0.00z	0.00 z	0.00z	0.00 z	0.00 z	0.00z	0.93
					Period	of Reco	ord Stat	istics					
MEAN	0.45	0.45	0.54 ·	0.80	2.06	·1.88	2.11	2.37	2.63	1.57	0.58 3	0 56	16 10
S.D.	0.56	0.58	0.68	0.95	2.20	1.67	1.91	211	2.89	1 79	0.76	0.50	635
SKEW	1.95	1.78	2.00	195	2 69	1.55	1.86	1 55	1 60	1 4 8	2 10	0.05 777	. 0.33
MAX	2.96	2 44	2.00	5 17	13.83	0 30	0.41	0.17	12.00	Q 15	A 22	5.09	22.10
MIN	0.00	0.00	0.00	0.00	10.00	9.50	0.00	9.17	0.00	0.13	4.33	5.08	52.19
NO	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	5.28
YRS	82	83	85	83	79	82	80	81	80	81	83	81	74

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7/9/2004

32-5047375-00 Page 37 of 60 Appendix E

Excerpts from Ground Water Discharge Permit Application for the NEF

LES-05165

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#### 6. Permit Plans (20.6.2.3106.C.7, 20.6.2.3107.A, and 20.6.2.3109.C NMAC):

6.a. Operational Plan (20.6.2.3106.C.7 and 20.6.2.3109.C NMAC):

The operational plan must describe how the system(s) for conveyance, collection, treatment, distribution, and disposal of wastewaters or other discharges will be constructed, operated, inspected, and maintained. The operational plan must demonstrate that ground water standards will not be exceeded.

6.a.i.	In the following table, identify all proposed conv	veyance, collection, treatment distribution, and
	disposal units included in the operational plan.	Add rows as necessary to include all units.

Treatment/Storage/ or	Construction Material	Volumetric
Disposal Unit		Capacity*/Area*
Treatment units (lagoon; mechanical		(gallons or cubic yards/
treatment plant, manure separator,		acres)
clarifier, etc.)		
Disposal Units (land application area,		
leachfield, evaporative lagoon,	•	
Biachstockpile, etc.)	The back will be encetwated using a	The heals is sized to exclude
Disposal Unic Sile Storm Water	Combination of exception below the ground	The basin is sized to contain
disposal of basin water (site storm	surface and an earth herm above grade. The	that for the 24-hour 100-
water runoff) will be through infiltration	basin is unlined. The basin will have a minimum	year return period storm.
to the ground and evaporation.	of 2 feet of freeboard. The basin will have an	
	outfall. The outfall will consist of a concrete	The basin will have
	structure with a discharge pipe sized and	approximately 23,350 m <sup>3</sup>
	located to provide the proper flow attenuation.	(100 acre-ft) of storage
	<b>The base of the b</b>	capacity.
	I no basin will be maintained free of debris and	Contain Annu at Mak Makana
	will be enclosed by a fence to prevent entry by	Sunace Area at High Water
	animals and unaumonzed personner.	Eigradion = 19.0 acres.
Disposal Unit: UBC Storage Pad Storm	The basin will be constructed using a	The basin is sized to contain
Water Retention Basin	combination of excavation below the ground	runoff for a volume equal to
(USPSRB) - The ultimate disposal	surface and an earth berm above grade. The	twice that for the 24-hour.
of basin water (UBC Storage Pad	basin is designed with a synthetic membrane	100-year return frequency
storm water runoff, Cooling Tower	tining to minimize any infiltration into the ground	storm.
blowdown and Heating Boiler	and does not have an outlet. The synthetic liner	
blowdown) will be through evaporation.	will be used to impose a barrier between the	The design volume is
	contents of the basin and the underlying soils	approximately 77,700 m <sup>2</sup> (63
	and potential access to ground water. Access	acre-n).
. ·	to any ground water is further impeded by ine	Surface Area at High Water
· · · · ·	The basin liner will be selected and installed in	Flevation ± 18 9 acres
	accordance with NMED Guidelines for Liner	
·	Material and Site Preparation for Synthetically-	
	Lined Lagoons, dated December 11, 1995.	
· · ·	· · · · · · · · · · · · · · · · · · ·	1
	To provide adequate chemical resistance to the	
l l	various liquids, the liner material may consist of	•
	High Density Polyethylene (HDPE) or Ethylene	
	Interpolymer Alloy (Coolgard * XR-5* or Ultra	

20.6.2 NMAC Subpart 3 Discharge Permit Application September 2003

Page 11 of 38

**Discharge Plan Application** 

<u></u>		· · · · · · · · · · · · · · · · · · ·
• • • • • • • •	Tech"). Liner thickness will be specified during	• • • • • • • • • • • • • • • • • • • •
	final design.	1
	From the bottom up the proposed liner system	
	will consist of:	
	• A prepared layer, minimum 2-foot thick, of on	
	site clay-type solls, free from rock, compacted	
	at optimum moisture content to 95% of	}
	Standard Proctor ASTM D698. The plastic	
	the metadal will be approximately 20 and	
· · · · · · · · · · · · · · · · · · ·	ontimum maisture contracted to +3% of its	
, ,	• A page with the fabric suitable for the material	•
	being retained	
	• A prepared laver minimum 1-foot thick of on	
· · · ·	site clay, free of rock, and compacted at	}
	optimum moisture content	, · · ·
	Installation of the liner will be by manufacturer	1
	certified installers and will be installed and	1
1	tested according to project specifications.	1
	The basin will be maintained free of debris and	
	will be enclosed by a fence to prevent entry by	1
	animals and unauthorized personnel.	
Disposal Linity Tracted Effluent	The basis will be constructed using a	Total annual discharge with
Evaporative Basic (TEEB) - The	The basin will be constructed using a	ho porovimatoly 2 525 m <sup>3</sup>
ultimate disposal of liquid effluent from	surface and an earth berrn above grade. The	Der vear (669 844 gal/vr)
the Liguid Effluent Collection and	basin will be double-lined and provided with a	por your (005,044 gavyr).
Treatment System will be through	leak detection system. The two synthetic liners	The basin has a surface
evaporation.	are used to impose two barriers between the	area of 0.75 acres and a
	contents of the basin and the underlying soils	maximum normal operating
,	and potential access to ground water. Access	depth of 1.1 feet above the
	to any ground water is further impeded by the	bottom of the basin. Total
	Impervious clay layer underlying the liner.	basin depin is 4.2 teet.
	(upper) and secondary (lower) liner. The basin	Surface Area at High Water
	is designed with a synthetic membrane lining to	Flevation = 1.75 acres
	preclude any infiltration into the ground. The	
• · · · · ·	basin does not have an outlet. The basin liner	
• •	will be selected and installed in accordance with	· · · · · · · · · · · · · · · · · · ·
	NMED Guidelines for Liner Material and Site	
	Preparation for Synthetically-Lined Lagoons,	
· · ·	dated December 11, 1995.	
	Accore to around water le further imported by the	
	impervious clay layer which underline the	
	secondary liner.	
	Active liquid-sensor leak detection will be	
	provided to detect leakage through the upper	
· · · ·	primary liner. The system is a drain/sump	
	system.	
	The chemical compatibility of the liners has been	

20.6.2 NMAC Subpart 3 Discharge Permit Application September Page 12 of 38 TDischarge Plan Application

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# 32-5047375-00 Page 41 of 60

	verilled with the liner manufacturer.	
	To provide adequate chemical resistance to the various liquids, the liner material may consist of High Density Polyethylene (HDPE) or Ethylene Interpolymer Alloy (Coolgard XR-5° or Ultra Tech <sup>®</sup> ). Liner thickness will be specified during final design.	
	From the bottom up the proposed liner system will consist of: • A prepared layer, minimum 2-foot thick, of on site clawtype soils, free from rock, compacted	
	at optimum moisture content to 95% of Standard Proctor ASTM D698. The plastic limit of the clay will be approximately 20 and the material will be compacted to +3% of it's	
	<ul> <li>A geosynthetic fabric suitable for the material being retained.</li> </ul>	
	• Leak collection piping, sump, and pumping system to pump any leaks back to the primary liner system.	
	<ul> <li>A geomembrane drainage mat with the imbedded leak collection piping.</li> <li>A geosynthetic fabric suitable for the material</li> </ul>	
	<ul> <li>being retained</li> <li>A prepared layer, minimum 1-foot thick, of on site clay, free of rock, and compacted at</li> </ul>	
	Installation of the liner will be by manufacturer certified installers and will be installed and lested according to project specifications	
	The basin does not have an outlet.	·
	The basin is designed to retain 30 years of solids accumulation and annual liquid effluent discharge and direct rainfall. The basin is sized to include a safety factor of 200% times the maximum storm water from a single rainfall event. The basin is designed for an annual evaporation of 80 inches per year.	
	The basin is designed with two cells, each designed to evaporate 50% of the annual liquid effluent discharge, allowing for periodic outages of each cell, while maintaining plant operations.	
	Influent flow will be measured and totalized. Pond level gauges will be provided.	
l	i ne basin will be maintained free of debris and will be enclosed by a fence to prevent entry by animals and unauthorized personnel. The basin	•

20.8.2 NMAC Subpart 3 Discharge Permit Application September Page 13 of 38 2003

Discharge Plan Application

	will be covered by surface netting, or other suitable devices, to exclude waterfowl access to basin water.	
Disposal Unit: Septic Tanks and Leachfields (ST/L) – The ultimate disposal is discharge underground via the leachfields.	Septic tank drain field systems will be constructed in accordance with 20.7.3 NMAC and requirements of the local building officials and health department. During final design the proposed location, length of drain field and orientation of septic systems will be selected by the design engineer and approved in the field by local building officials.	The percolation rate established by actual tests on the site is 8 minutes per inch. Utilizing this rate and allowing for 20-30 gallons per person per day, each person will require approximately 9 linear foot of trench utilizing a 36 inch
	(a) (a) (b) (b) (b) (b) (b) (a) (b) (a) (b) (b) (b) (a) (b) (b) (b) (b) (b) (b) (b) (b) (b) (b	wide trench filled with 24 inches of open graded crushed stone. The site population during
	n frank a strong senten ander ander ander son en son e En son en son En son en son	operation is expected to be 210 persons. The building facilities are designed by architectural code analysis to accommodate approximately 420 persons.
$\frac{1}{2} \frac{\partial x}{\partial t} = \frac{\partial x}{\partial t} + \frac{\partial x}{\partial t} = \frac{\partial x}{\partial t} + \frac{\partial x}{\partial t} + \frac{\partial x}{\partial t} = \frac{\partial x}{\partial t}$	<ul> <li>A state of the two sets of two sets of the two sets of two sets o</li></ul>	A total of approximately 3,200 linear feet of percolation drain field will be required.
··. : : ·	en a de la companya d La companya de la comp	Thus the combined area of the leachfields will be approximately 9,600 ft <sup>2</sup> .

\*Volumetric Capacity must be provided for all tanks, chambers, and impoundments or other storage units. \*Area must be provided for all land application areas, leachfields or other area features.

6.a.ii. Describe in detail the operational plan, including all conveyance, collection, treatment, distribution and disposal systems. Attach additional pages as necessary:

#### Site Storm Water Detention Basin

The Site Storm Water Detention Basin collects a portion of general site storm water from plant areas (except for the UBC Storage Pad area). Site runoff will be collected through a series of catch basins and roof drains connected to the site underground storm water system. The runoff will be conveyed to the basin via a system of underground pipes. All runoff will be discharged into the basin.

The NEF also will have a diversion ditch and berm to divert any upstream surface runoff (overland sheet flow) around the facility. The east portion of this diversion ditch also discharges through the Site Storm Water Detention Basin. The storm water from the diversion ditch will be routed through the basin, but will not be changed in either volume or runoff rate. The western portion of the diversion ditch will drain into the natural terrain and will eventually flow into the culvert system under New Mexico Highway 234. This diversion ditch will be designed to divert the 100-year return period storm around the plant structures.

20.6.2 NMAC Subpart 3 Discharge Permit Application September - Page 14 of 36 Discharge Plan Application 2003

This basin will have an outlet. The basin is designed to cause post-construction peak flow runoff rates to equal or be less than pre-construction release rates for the facility site runoff. The basin will be below 100 acre-feet of storage capacity and less than 15 feet in height. No treatment is provided for in the basin other than some settlement of solids in the runoff.

No plant contaminants are expected to be introduced to this discharge as a result of plant operation. The ultimate disposal of basin water will be through infiltration to the ground and evaporation. The runoff area served includes about 39 ha (96 acres) with the majority of that area being the developed portion of the 220 ha (543 acres) National Enrichment Facility site.

#### UBC Storage Pad Storm Water Retention Basin

UBC Storage Pad Storm Water Retention Basin is used for the collection of liquid effluent discharges from three sources: 1) storm water runoff from the UBC Storage Pad (8,691,000 gal/yr); 2) the cooling tower blowdown (5,050,000 gal/yr); and 3) the heating boiler blowdown water (36,500 gal/yr). Area served by the basin for storm water runoff includes 9.2 ha (22.8 acres), the total area of the UBC Storage Pad.

Trench drains/catch basins inside the UBC Storage Area will collect storm water within a bermed/sloped area of approximately 22.8 acres. The underground piping system conveying the flow away from the UBC Storage Area will be reinforced concrete pipe with rubber gasketed joints. The underground piping system will discharge into the basin.

The discharge to this basin has a low likelihood of containing trace amounts of uranium washed by rainfall from the exterior of the Uranium Byproduct Cylinders (UBCs) stored on the UBC Storage Pad. Monitoring of the basin will be performed to verify the runoff does not contain uranium.

Blowdown from the Cooling Towers and the Heating Boiler will be routed to the basin via underground piping.

No treatment is provided for in the basin. The basin is designed with a synthetic membrane lining to minimize any infiltration into the ground and does not have an outlet. The synthetic liner will be used to impose a barrier between the contents of the basin and any natural soils and potential access to the underlying soil. The ultimate disposal of basin water will be through evaporation.

#### **Treated Elfluent Evaporative Basin**

The Treated Effluent Evaporative Basin receives discharge from the Liquid Effluent Collection and Treatment System. A description of the Liquid effluent Collection and Treatment System is provided in Attachment D. This description was adapted from the NEF Safety Analysis Report.

No treatment is provided for in the basin. The basin is designed with a double synthetic membrane lining system to preclude any infiltration into the ground. The basin does not have an outlet. The ultimate disposal of basin water will be through evaporation.

The basin area will be enclosed by a fence to prevent entry by animals and unauthorized personnel and the basin surface will contain a layer of netting or other suitable device to exclude waterlowl.

The facility's Liquid Effluent Collection and Treatment System provides a means to control liquid effluent within the plant including the collection, analysis, and processing of plant liquid effluents for disposal. Numerous types of aqueous and non-aqueous liquid effluents are generated in the NEF. These effluents may contain uranic compounds, may be potentially contaminated with fow-levels of uranic compounds, or may be noncontaminated. Table E.1 in Attachment E summarizes the plant sources of potential effluent contamination

20.6.2 NMAC Subpart 3 Discharge Permit Application September Page 15 of 38 2003

Discharge Plan Application



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Station: ROSWELL Stn ID: 7604 Years: 01/1948 to 03/1950 Latitude N33:19:00 Longitude W104:26:00 Elevation(m.) 1089.0

						- Evap (	in)						
	Jan's	Feb's	Mar's	Apr's	May's	Jun's	Jul's	Aug's	Sep's	Oct's	Nov's	Dec's	Year
Maximum	1.33	3.80	7.08	8.87	7.75	7.41	~	6.56	6.31	4.00	10.91	2.18	-
Minimum	1.33	2.68	7.08	B.87	7.75	7.41		6.56	6.31	3.74	2.49	2.18	-
Average		3.22								3.87	6.70		-

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http://weather-mirror.nmsu.edu/Pan\_Evaporation/roswell\_evap.htm

7/9/2004

32-5047375-00 Page 45 of 60

32-5047375-00 Page 46 of 60

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# Appendix G

Lockwood Greene Electronic Message dated March 9, 2004 and Lockwood Green Response Letter dated May 13, 2004

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32-5047375-00 Page 47 of 60

Message

Page 1 of 3

#### MAHER Edward F

From:HARPER George ASent:Wednesday, March 10, 2004 9:39 AMTo:MAHER Edward F; BELLINI Francis XSubject:FW: Groundwater Permit Open Items

George A. Harper, P.E. Manager, Regulatory Compliance Programs AREVA 400 Donald Lynch Boulevard Marlborough, MA 01752 Office: 978.568.2728 Cell: 508.795.9420 Fax: 978.568.3731 Email: george.harper@framatome-anp.com

-----Original Message-----From: Mickanen, David (LGE-AT) [mailto:dmickanen@lg.com] Sent: Tuesday, March 09, 2004 11:12 AM . To: George Harper Cc: Walker, Carroll (LGE-SP) Subject: RE: Groundwater Permit Open items

George:

My response to questions 1.2.3, and 7 are below and in red italic. If you have any questions, please coll me.

3

Thanks.

David E. Mickanen, PE, REM Sr. Civil Engineer LOCKWOOD GREENE dmickanen@lg.com (404) 818-8619 ofc (404) 818-8411 fax (770) 317-7876 cell

----Original Message-----From: HARPER George A [mailto:George.Harper@framatome-anp.com] Sent: Monday, March 08, 2004 10:26 AM To: Walker, Carroll (LGE-SP); Campbell, Randy (LGE-SP); Shaw, John (LGE-SP) Cc: MAHER Edward F; BELLINI Francis X Subject: Groundwater Permit Open Items

Carroll / Randy / John,

3/10/2004

32-5047375-00 Page 48 of 60

Page 2 of 3

Acssage

There are a few loose ends on the Information we need for the groundwater permit. I have also attached the Information Request we provided to Richard when we there on 2/24. Here they are: St. Land and

1. Is there a Basis of Design for the Site Stormwater Detention Basin? If not what document captures it's design leatures? The design basis can be found in Section 11.5 of the "Civil Design Basis" document no. L4-35-001-BOD, Rev. 1 dated 22-Oct-2003, and in the Stormwater Design Calculations dated 15-Sep-2003.

2. Verify drainage area to the Site Stormwater Detention basin is 4,164,336 sq. ft. Yes, this value matches the area used to determine the storage requirements to size the site stormwater detention basis (see Stormwater Design Calculations dated 15-Sep-2003). 

3. Verify drainage area to the UBC Storage Pad Stormwater Retention Basin is 1.746,756 sq. it. Yes, this value matches the area used to determine the storage requirements to size the UBC storage pad stormwater retention basis (see Stormwater Design Calculations dated 15-Sep-2003).

4. See Item #2 on Information Request. We need lat-long for the 3 basins (use middle of basin) and the 6 septic tanks.

5. Is there a potable water analysis available for city water?

6. One page process flow diagram for the Liquid Effluent Collection and Treatment System (Item 6.b on Information Request). ۰. . . . .

7. Surface area for the three basins (Treated Effluent, UBC and Site Stormwater) The minimum design surface areas for the three basins can be found in the Stormwater Design Calculations dated 15-Sep-2003. Since I am not 100% sure which specific surface area you need (i.e. bottom of basin, top of basin, or high water surface area), I will list each of them. The surface areas are as follows:

τ.

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Treated Effluent:

Surface Area at Top of Basin = 1.84 acres Surface Area at Bottom of Basin = 1.39 acres Surface Area at High Water Elevation = 1.75 acres

UBC Storage Pad Stormwater Retention Basin Surface Area at Top of Basin = 19.5 acres Surface Area at Bottom of Basin = 18 acres Surface Area at High Water Elevation = 18.88 acres

where the strength of the Site Stormwater Detention Basin

Surface Area at Top of Basin = 19.2 acres Surface Area at Bottom of Basin = 18,2 acres Surface Area at High Water Elevation = 18.95 acres . : \*\*\* STREETS STREETS • .--. . .

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8. Verify boller blowdown is discharged to the UBC Storage Pad Stormwater Retention Basin.

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3/10/2004

#### 32-5047375-00 Page 49 of 60



1500 International Drive Spartanburg, SC 29303-6745 Telephone 864.578.2000 Facsimile 864.579.6400 www.lg.com

May 13, 2004

#### **RESPONSE TO NEF ACTION ITEM NO. ER RAI 4-2A**

To: Rod Krich

CC: Dan Green

Subject: LG Response to NEF Action Item - ER RAI 4-2A

#### NEF Action Item No. ER RAI 4-2A

Conf. Call Date: Not Applicable

#### Action Item 2. ER RAI 4-2A\*

Description:

Need monthly maximum and minimum flows to the three site basins. Please provide the following:

- a. Does the liquid effluent system discharge flow to the TEEB vary by month of the year? Or should we assume that the flow is fairly constant throughout the year? Also, is there a maximum and minimum flow for each month? If not, is there a +/- % for maximum/minimum around the average.
- b. Does cooling tower blowdown flow to the UBC Storage Pad Stormwater Retention Basin vary by month of the year? If so how does it vary? It likely would vary through the year. Also is there a minimum and maximum flow each month? If not is there a +/-% for maximum/minimum around the average?
- c. Does heating boiler blow-down flow to the UBC Storage Pad Stormwater Retention Basin vary by month of the year? If so how does it vary? It likely would vary through the year. Also, is there a maximum and minimum flow each month? If not is there a +/-% for a maximum/minimum around the average?
- d. Any guidance on breakdown of evaporation, infiltration, and evapotranpiration in % for the Site Stormwater Detention Basin? Did LG look at this? Did LG look at how the mix would vary month by month?

Action Item Resolution: a. The flow to the TEEB from the liquid effluent system will vary somewhat dependant on frequency of use. It is made up of flows from floor washings, miscellaneous condensates, lab effluents, degreaser water, citric acid, laundry, and hand wash/ shower water. An average annual daily flow rate of 1835 GPD (see L4-50-05-CALC) and a daily peak flow of 5350 GPD (see PFD 1500-R-1108) were calculated. A 1 calculation to determine the-variation of this flow by month has not yet been completed.

b. The blow-down rate from the cooling towers will vary with the evaporation rate on the towers (based on weather conditions), the quality of the incoming water (estimated as an average from the six wells tested that serve Eunice), and the chemical treatment utilized (acid injection will be utilized to maximize cycles of concentration).

For the purpose of the results summarized below, average weather data was utilized, water quality as estimated from the six wells that feed Eunice, and chemical treatment to facilitate 3 cycles of concentration has been utilized. Lockwood Greene calculated water consumption on an annual basis for average yearly conditions. L4-50-05-CALC indicates that the average blow-down rate for the process towers is 5912 GPD, and the average blow-down rate for the HVAC towers is 7929, GPD. Avenonthby-month calculation based on average weather data and minimum and maximum weather data has not yet been completed.

c. The boiler the blow-down will occur in each month that the boiler is operational. Since the HVAC system is set up to operate with reheat coils that are fed from the boiler, the boilers will be required to run year round. We have estimated the boiler blow down to be 100 gallons a day. The blow down will be automated and should not vary much from month to month.

P:\20\DC\Conf calls\RAI\_Environ Rpt\LG ER RAI Responses\ER RAIs +2A & +4C\ER RAI +2A\_LG Response.doc NF-3-01-04 018511 Form Rev, Date 15-APR-2004

#### 32-5047375-00 Page 50 of 60

#### **RESPONSE TO NEF ACTION ITEM NO. ER RAI 4-2A**

Page 2 of 2

d. Evaporation was estimated on an annual basis. L4-53-55-CALC states that lake evaporation was estimated from USDA Soil Conservation Service gross annual lake evaporation. The annual number was adjusted for salinity and utilized to size the Stormwater Retention Basin. Since there is a liner, infiltration should essentially be zero. In addition, no credit was taken for plant growth; therefore evapotranspiration was estimated as zero. The variation on a monthly basis was not calculated. However, the 100 year 24 hour storm of 6" was utilized to calculate maximum rainfall from a single rainfall event.

Supporting Discussion (if required): a. Since the pump that is used to move the water from the liquid effluent collection room to the basin is either on or off, the minimum instantaneous flow to the basin would be zero and the maximum instantaneous flow would be the rating of the pump.

Average Flow: From PFD 1500-R-1108, the yearly discharge from the TSB into the TEEB is 669,853 gallons per year. For one day this averages to 1835 gal per day.

Peak Flow: Because we don't know exactly what days the Laundry Tanks, the Hand Wash and Shower Tanks, and the Treated Effluent Monitor Tanks will discharge to the TEEB, we need to assume all emptying in the same day. Therefore, for the peak discharge per one day-

- One Laundry Tank =
- 1,000 gal / + One Hand Wash and Shower Tank = 4,000 gal
- + One Treated Effluent Monitor Tank =\_\_\_ <u>350 gal</u>
  - TOTAL 5,350 GPD (Max.)

A calculation to determine the variation of this flow by month has not been completed. If desired, such a study could be conducted now or at a later date.

- b. When the cooling towers are operated in the "dry" mode there is no evaporation. The dry mode switch point is such that November through January the evaporation and thus blow down is essentially zero. Thus the blow-down flows must be distributed within the remaining nine months with July and August being the highest use rates. A month-by-month calculation based on average weather data and minimum and maximum weather data has not been completed. However, such a study could be conducted now or at a later date.
- c. Not Applicable.
- d. The current design did not include the use of rainwater for feed to the cooling towers. It is a potential water savings measure to filter the water from the Stormwater Detention Basin for this use.

Source Documents (if required): LA-50-05-CALC, City Water Consumption, Rev. 2

LA-53-55-CALC, UBC Storage Pad Storm Water Retention Basin Size, Rev. 0

PFD 1500-R-1108, Process Flow Diagram System 680 Treated Effluent Polishing, Rev. 0

\* Action Item Description taken from George Harper's "Figures and Inputs for ER RAIs" sheet, dated May 5, 2004.

LG Authorization: Chris Funk Date iyd Sauvê Date Mech. Discipline Ld. **Design Coordinator** 

Shaw **Project Manager** 

Attachment(s): Not Applicable

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32-5047375-00 Page 51 of 60

• Appendix H

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American Society of Civil Engineers Hydrology Handbook Figure 3.24

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ASCE Manuals and Reports on Engineering Practice No. 28



#### 32-5047375-00 Page 53 of 60





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Month	Precipitation		Direct Precipitation Inflow to Basin		Treated Effluent Inflow to Basin		Total Inflow to Basin	Evaporation p	
	cm	in	m-3	gaj	m-3	gal	m-3	gal	cm
January	0.5	0.2	40	10,508	211	55,824	251	66,332	4.2
February	0.7	0.3	56	14,711	211	55,824	267	70,535	10.1
March	0.5	0.2	40	10,508	211	55,824	251	66,332	22.4
April	0.8	0.3	64	16,813	211	55,824	275	72,636	28.0
May	2.6	1.0	207	54,641	211	55,824	418	110,465	24.5
June	2.0	0.8	159	42,032	211	55,824	370	97,856	23.4
July	2.4	0.9	191	50,438	211	55,824	402	106.262	22.1
August	2.5	1.0	199	52,540	211	55,824	410	108.364	20.7
September	3.0	1.2	247	65,149	211	55,824	458	120,973	19.9
October	1.4	0.5	111	29,422	211	55,824	323	85.246	12.2
November	0.9	0.3	72	18,914	211	55,824	283	74,738	8.8
December	0.7	0.3	- 56	14,711	211	55,824	267	70,535	6.9
Totals	17.8	7.0	1,440	380,389	2,536	669,884	3,975	1,050,273	203.2
Maximum									
January	2.0	0.8	163	43,174	211	55,824	375	98,998	4.2
February	2.8	1.1	229	60,444	211	55,824	440	116,268	10.1
March	2.0	0.8	163	43,174	211	55,824	375	98,998	22.4
April	3.2	1.3	261	69,079	211	55,824	473	124.903	28.0
Мау	10.5	4.1	850	224,507	211	55,824	1,061	280.331	24.5
June	8.1	3.2	654	172,698	211	55,824	865	228.521	23.4
July	9.7	3.8	784	207,237	211	55,824	996	263.061	22.1
August	10.1	4.0	817	215,872	211	55,824	1.028	271.696	20.7
September	12.5	4.9	1,013	267,681	211	55,824	1,225	323,505	19.9
October	5.7	2.2	458	120,888	211	55,824	669	176.712	12.2
November	3.6	1.4	294	77,714	211	. 55,824	505	133.538	8.8
December	2.8	1.1	229	60,444	211	55,824	440	116,268	6.9

# TEEB Minimum

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32-5047375-00 Page 55 of 60

	Potential				. •	· · · · ·		·· · · ·		
per Month	Evaporatio	on Outflow	Balance	;	Net in Bas	in	. '	•••		-:
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(in)	m-3	gal`́	<b>m-3</b>	gal	m-3	gal				· · .
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4.0	307	81,069	-40	-10,534	B4	22,104			• • .	
8.8	679	179,292	-428	-112,960	0	0	· · ·	2.14		•
11.0	850	224,625	-575	-151,989	0	0			. '	••
; <sup>.</sup>	743	196,241	-325	-85,775	· ` O '	0		1		
9.2`	710	187,664`	-340	-89,808	0	0	•;		. :	
8.7	670	177,045	-268	•70,783	0	0				
8.2	628	166,018	-218	-57,655	0	0				
7.8	604	159,688	-147	-38,715	0	0				
4.8	371	98,018	· <b>-</b> 48	-12,772	0	0				
3.5	267	70,655	15	4,083	15	4,083		Sec. 1 + 127	· • •	
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4.0	3/1	98,018	298	78,694	2,116	559,151			• •	
3.5	267	70,655	238	62,883	2,354	622,034				
2,7	209	55,135	231	61,133	2,586	683,167				

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32-5047375-00 Page 56 of 60

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# UBC Minimum

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Month	Precipitation		Direct Precipitation Inflow to Basin	n	Blowdown Inflow to B	asin	Total Inflow to Basin		Evaporation p	per Month
	cm	in	m-3	gal	m-3	gal	m-3	gal	cm	(in)
January	0.5	0.2	398	105,080	1,604	423,875	2,002	528,955	4.2	1.7
February	0.7	0.3	557	147,112	1,604	423.875	2,161	570,987	10.1	4.0
March	0.5	0.2	398	105,080	1,604	423,875	2,002	528,955	22.4	8.8
April	0.8	0.3	636	168,128	1,604	423,875	2,241	592,003	28.0	11.0
May	2.6	1.0	2068	546,415	1,604	423,875	3,673	970,290	24.5	9.6
June	2.0	0.8	1591	420,319	1,604	423,875	3,195	844,194	23.4	9.2
Juty	2.4	0.9	1909	504,383	1,604	423,875	3,514	928,258	22.1	8.7
August	2.5	1.0	1989	525,399	1,604	423,875	3,593	949,274	20.7	8.2
September	3.0	1.2	2466	651,495	1,604	423,875	4,070	1,075,370	19.9	7.8
October	1.4	0.5	1114	294,223	1,604	423,875	2,718	718,098	12.2	4.8
November	0.9	0.3	716	189,144	1,604	423,875	2,320	613,019	8.8	3.5
December	0.7	0.3	557	147,112	1,604	423,875	2,161	570,987	6.9	2.7
Totals	17.8	7.0	14,398	3,803,888	19,253	5,086,500	33,651	8,890,388	203.2	80
Maximum					•					
January	2.0	0.8	1634	431,723	1,604	423,875	3,239	855,598	4.2	1.7
February	2.8	1.1	2288	604,412	1,604	423,875	3,892	1,028,287	10.1	4.0
March	2.0	0.8	1634	431,723	1,604	423,875	3,239	855,598	22.4	8.8
April	3.2	1.3	2615	690,757	1,604	423,875	4,219	1.114.632	28.0	11.0
May	10.5	4.1	8497	2,244,960	1,604	423,875	10,102	2.668.835	24.5	9.6
June	8.1	3.2	6536	1,726,893	1,604	423,875	8,141	2,150,768	23.4	9.2
July	9.7	3.8	7844	2,072,271	1,604	423,875	9,448	2,496,146	22.1	8.7
August	10.1	4.0	8171	2,158,616	1,604	423,875	9,775	2,582,491	20.7	8.2
September	12.5	4.9	10132	2,676,684	1,604	423,875	11,736	3.100.559	19.9	7.8
October	5.7	2.2	4576	1,208,825	1,604	423,875	6,180	1,632,700	12.2	4.8
November	3.6	1.4	2941	777,102	1,604	423,875	4,546	1,200,977	8.8	3.5
December	2.8	1.1	2288	604,412	1,604	423,875	3,892	1,028,287	6.9	2.7

32-5047375-00 Page 57 of 60

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Potential				1. (1. s. ) 1. (1. s. )		•	54 575 - 2	· · ·		· · · · ·
Evaporation	Outflow	Balance	· •	Net in Basin	•••			• ;•		1 ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) (
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7.365	1,945,661	-5.203	-1.374.674	0	0		•		: •	
16,287	4,302,999	-14,285	-3.774.044	<u>0</u>	ō '		, ·	· ·.	· '.	· · · ·
20,405	5.391.000	-18,165	-4.798.998	0	0		•	••		
17,827	4,709,774	-14,154	-3,739,484	0	0					
17,048	4,503,936	-13,853	-3,659,742	0	0.1		· · ·		1 C #	1
16,083	4,249,089	-12,570	-3,320,831	.0	0		•	•••		
15,082	3,984,439	-11,488	-3,035,165	0	0					
/: 14,507	3,832,511	-10,436	-2,757,142	0	0					
8,904	2,352,437	-6,186	-1,634,338	0	0					
6,418	1,695,715	-4,098	-1,082,696	0	0.					
5,009	1,323,246	-2,847	-752,259	0	0					
		,	• • دم	·		<b></b>	· · · · ·	1 Th 201	· · · · · ·	• • • • • • • •
::147,996	39,099,456	1. A.							• • • •	
			•••			• •		i ye evas		
						•		e ' 1 *	· · · · ·	• .
						•	. •	•		
0.001	000.050	170	10.010				1 (1) (1)	•		
3,061	808,650	1/8	46,948	178	46,948		. · ·	1. 1.		
46 007	1,945,001	-3,472	-917,374	0	0	1 / A	I			• •
10,207	4,302,999	*13,049	-3,447,400	U .	0.		~	• • • • • •	•	
47 007	5,391,000	-10,107	-4,2/0,308	U	0	÷ ,			·•	
17,021	4,109,114	•/,/25	-2,040,939	0	· U					· .
17,040	4,303,936	•0,907	-2,303,100	0.	U .				• .	
15,003	7,243,009	+0,033 -E 207	-1,/32,942	v	U O					
13,002	3,304,439	-3,307	-1,401,949	U	U U		· ·			
9 004	0,002,011	-2,//1	-131,933	. <u>v</u> .	U				•	
6,904	2,332,437	*4,124	-/ 19,/3/	U O	U,			• .		
0,410	1,095,715	-1,8/3	-494,738	U	U t		· · · · ·			
2,003	1,323,240	-1,110	•<24,328	U	U					

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32-5047375-00 Page 58 of 60

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Minimum							Potential				
			Direct		Evacpration + Infiltration		Evaopration + Infiltration				
				Precipitation		per Month		Outflow from Basin		Balance	
Month	Precipitation		Inflow to Basir					Inflow - Outflow			
	cm	in	m-3	gai	cm	(in)	m-3	gal	m-3	gai	
January	0.5	0.2	2376	627,763	65.2	25.7	47,460	12,538,487	-45,084	-11,910,723	
February	0.8	0.3	3,564	941,645	71.1	28.0	51,763	13,675,498	-48,199	-12,733,853	
March	0.5	0.2	2,376	627,763	83.3	32.8	60,686	16,032,835	-58,310	-15,405,072	
April	0,8	0.3	3,564	941,645	89.0	35.0	64,804	17,120,837	-61,240	-16,179,192	
May	2.5	1.0	11,881	3,138,817	85.4	33.6	62,226	16,439,611	-50,345	-13,300,793	
June	2.0	0.8	9,505	2,511,054	84.4	33.2	61,447	16,233,773	-51,942	-13,722,719	
July	2.3	0.9	10,693	2,824,936	83.0	32.7	60,482	15,978,925	-49,789	-13,153,990	
August	2.5	1.0	11,881	3,138,817	81.7	32.2	59,480	15,714,276	-47,600	-12,575,459	
Septembe	er 3.0	1.2	14,257	3,766,581	80.9	31.8	58,905	15,562,348	-44,648	-11,795,767	
October	1.3	0.5	5,940	1,569,409	73.2	28.8	53,303	14,082,273	-47,363	-12,512,865	
Novembe	r 0.8	0.3	3,564	941,645	69.8	27.5	50,817	13,425,551	-47,253	-12,483,906	
Decembe	r 0.8	0.3	3,564	941,645	67.8	26.7	49,407	13,053,082	-45,843	-12,111,437	
Totals	17.8	7.0	83,166	21,971,722	934.7	368.0	680,782	179,857,498			
Maximum											
January	2.0	0.8	9445	2,495,360	65.2	25.7	47,460	12,538,487	-38.014	-10.043.127	
February	2.8	1.1	13,223	3,493,504	71.1	28.0	51,763	13,675,498	-38,540	-10.181.994	
March	2.0	0.8	9,445	2,495,360	83.3	32.8	60,686	16.032.835	-51.241	-13.537.475	
April	3.2	1.3	15,112	3,992,576	89.0	35.0	64.804	17,120,837	-49,692	-13.128.261	
May	10.5	4.1	49,115	12,975,871	85.4	33.6	62.226	16,439,611	-13,111	-3.463.740	
June	8.1	3.2	37,781	9,981,439	84.4	33.2	61.447	16.233.773	-23.666	-6.252.333	
July	9.7	3.8	45,337	11,977,727	83.0	32.7	60,482	15.978.925	-15,145	-4.001.198	
August	10.1	4.0	47,226	12,476,799	81.7	32.2	59,480	15.714.276	-12.254	-3.237.477	
Septembe	u 12.5	4.9	58,560	15,471,231	80.9	31.8	58,905	15.562.348	-345	-91.117	
October	5.7	2.2	26,447	6,987,008	73.2	28.8	53,303	14.082.273	-26.856	-7.095.266	
November	r 3.6	1.4	17,001	4,491,648	69.8	27.5	50,817	13,425,551	-33.816	-8.933.904	
December	r 2.8	1.1	13,223	3,493,504	67.8	26.7	49,407	13,053,082	-36,184	·9,559,579	

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32-5047375-00 Page 59 of 60 ••

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# LES-05188

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Net in Basin

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32-5047375-00 Page 60 of 60