Luminant

Rafael Flores
Senior Vice President &
Chief Nuclear Officer
rafael.flores@luminant.com

Luminant Power
P O Box 1002
6322 North FM 56
Glen Rose, TX 76043

T 254.897.5590
F 254.897.6652
C 817.559.0403

CP-201000406
Log # TXNB-10023

Ref. # 10 CFR 52

March 19, 2010

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
SUPPLEMENTAL INFORMATION FOR RESPONSES TO ENVIRONMENTAL REVIEW REQUEST FOR ADDITIONAL INFORMATION GEN-03 AND GEN-07

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein supplemental information regarding the responses to Environmental Review Request for Additional Information GEN-03 and GEN-07 for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4.

Should you have any questions regarding this response, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

I state under penalty of perjury that the foregoing is true and correct.

Executed on March 19, 2010.

Sincerely,

Luminant Generation Company LLC

Donald R. Woodlan for

Rafael Flores

Attachment: Supplemental Response to Request for Additional Information GEN-03 and GEN-07
Enclosure: CD containing "2008 Guidance for Assessing and Reporting Surface Water Quality in Texas" and "Texas Surface Water Quality Standards"

D090
NRO

cc: Michael Willingham w/attachment and CD

Electronic distribution w/o CD

mike.blevins@luminant.com
Rafael.Flores@luminant.com
mlucas3@luminant.com
jeff.simmons@energyfutureholdings.com
Bill.Moore@luminant.com
Brock.Degeyter@energyfutureholdings.com
rbird1@luminant.com
Matthew.Weeks@luminant.com
Allan.Koenig@luminant.com
Timothy.Clouser@luminant.com
Ronald.Carver@luminant.com
David.Volkening@luminant.com
Bruce.Turner@luminant.com
Eric.Evans@luminant.com
Robert.Reible@luminant.com
donald.woodlan@luminant.com
John.Conly@luminant.com
JCaldwell@luminant.com
David.Beshear@txu.com
Ashley.Monts@luminant.com
Fred.Madden@luminant.com
Dennis.Buschbaum@luminant.com
Carolyn.Cosentino@luminant.com

Luminant Records Management (w/CD)

masahiko_kaneda@mnes-us.com
masanori_onozuka@mnes-us.com
ck_paulson@mnes-us.com
joseph_tapia@mnes-us.com
russell_bywater@mnes-us.com
diane_yeager@mnes-us.com
kazuya_hayashi@mnes-us.com
mutsumi_ishida@mnes-us.com
nan_sirirat@mnes-us.com
masaya_hoshi@mnes-us.com
nicolas_kellenberger@mnes-us.com
rjb@nei.org
kak@nei.org
michael.takacs@nrc.gov
cp34update@certrec.com
michael.johnson@nrc.gov
David.Matthews@nrc.gov
Balwant.Singal@nrc.gov
Hossein.Hamzehee@nrc.gov
Stephen.Monarque@nrc.gov
jeff.ciocco@nrc.gov
michael.willingham@nrc.gov
john.kramer@nrc.gov
Brian.Tindell@nrc.gov
Donald.Palmrose@nrc.gov
Elmo.Collins@nrc.gov
Loren.Plisco@nrc.com
Laura.Goldin@nrc.gov
James.Biggins@nrc.gov
Susan.Vrahoretis@nrc.gov
sfrantz@morganlewis.com
jrund@morganlewis.com
tmatthews@morganlewis.com

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI REGARDING THE ENVIRONMENTAL REVIEW

DATE OF RAI ISSUE: 6/26/2009

QUESTION NO.: GEN-03

The original request for additional information (RAI) for GEN-03 is:

> Provide a detailed description of the construction and proposed operation of the evaporation ponds and the "three-month storage" pond and their associated physical and chemical characteristics.
>
> Supporting Information: The Environmental Report briefly describes the construction and operation of new ponds that would to be used in conjunction with the water to be returned from the new cooling towers to Lake Granbury. Additional information is needed on the purpose of these ponds and how they would be operated including the chemical characteristics of the water to be discharged, the quantities of wastes (i.e., dried salts) to be generated, and the proposed disposition of these wastes.
>
> Luminant and the staff have had difficulty in reaching consensus on the level of detail for the staff to develop an independent analysis of the environmental impacts from the BDTF on land use, water quality, waste disposal, and transportation. Therefore, to assist Luminant in refocusing on providing the technical information needed to assess environmental impacts of the BDTF complex, the staff requests the following information:

Land Use Impacts

The staff must independently evaluate the impacts of the building and operation of Comanche Peak Nuclear Power Plant (CPNPP) Units 3 and 4 over the license period of the proposed project with regard to changes to the existing use of the land where Luminant desires to place the BDTF complex and to the land use nearby and outside of Luminant's property. For example, the BDTF complex will have a system of evaporation ponds, spray nozzles, and salt drift fences. Currently, the staff does not know if there will be a buffer strip of land between these components of the BDTF complex and the site boundary. This buffer information is necessary for the staff to independently evaluate the potential impacts (including existing land use, terrestrial ecology, and visual) to property owners (residential or businesses) directly next to the Luminant site boundary around the BDTF complex. Therefore, provide the following

- A figure showing the layout of the BDTF including the footprint of both BDTF buildings housing the pre-filter/ultra-filter, the reverse osmosis systems, the evaporation and storage ponds, salt drift fences, any buffer strip of land, and the fence line for the site boundary.

- The area of land to be disturbed by building and operating the BDTF complex (i.e., filter and reverse osmosis systems and evaporation and storage ponds).

Water Quality and Non-radioactive Waste Impacts

The main purpose of the BDTF complex is to ensure blowdown circulation water discharged back into Lake Granbury meets State of Texas water quality standards. Luminant has stated that the BDTF complex (e.g., the evaporation pond sizing for treatment capacity and expected operational discharges to Lake Granbury) is adequate to meet the expected State of Texas discharge limits. Luminant should provide the State of Texas water quality standards, as well as references, and details as to how the BDTF complex will meet those standards so that the staff can assess the impacts of the waste stream generated by the BDTF. Additionally, include in your answer: (1) Luminant's proposed method of waste minimization via volume reduction by water removal in the evaporation ponds, and (2) the water quality of the discharge flow from the BDTF after mixing with the bypass flow.

Finally, the staff must also evaluate the impacts of reasonably foreseeable conditions over the time period of the combined license. The Freese and Nichols study entitled "Lake Granbury Dissolved Minerals Study" dated October 10, 2008, states the anticipated 2060 conditions could be as high as 4000 mg/L TDS. The findings of this study and an explanation of why the 4000mg/l TDS was not used as part of the BDTF analysis should be addressed in your response. In order for the staff to assess the impacts of operating the BDTF throughout the initial combined license period, the staff must also consider projections of the potential Lake Granbury water conditions through the end of the initial licensing period. Accordingly, provide a response to the following:

- The volume and surface area of the evaporation (including the internal cells) and storage ponds accounting for volume losses due to sloped walls, cell dividers, access ramps and other components.

- The basis for the evaporation of waste water discharged, including mister system efficiency and the expected evaporation rates for the evaporation and storage ponds.

- The anticipated flow rates and concentrations of solids/salts throughout the circulating water system shown in Figure 3.6-1 (ML093620032) including combined flow rate from the cooling towers and the ultimate heat sink prior to the piping junction for directing flow bypassing the BDTF, the flow path into the BDTF, the discharge from the BDTF to the evaporation/storage ponds and the discharge back to Lake Granbury as analyzed for Lake Granbury's current TDS and chloride concentrations (i.e., 2500 or 3525 mg/L).

Transportation of Waste Impacts

Based on the estimated mass loading of the evaporation ponds provided in Luminant's December 18, 2009 response to RAIs, the disposal of potentially almost half a million tons of solids/salt residue per year from the evaporation ponds could have significant transportation impacts. To date, Luminant has not analyzed the transportation impacts associated with the disposal of this waste stream. Traditionally, transportation impacts include not just the impact on the affected transportation infrastructure (volume of traffic, conditions of existing roads and railways, etc.) but also incident-free and accident impacts to members of the public. Therefore, for the staff to be able to conduct an independent assessment of disposal-related transportation impacts, the following should be provided for the transportation of solids/salts wastes from the evaporation ponds:

- Frequency of disposal campaigns,
- Volume and mass of solids/salts (including circ water treatment chemicals) to be removed during a disposal campaign,
- The method of transporting the solids/salts to the disposal sites,
- Number of loads required for the transportation method (trucks or railcars & number of railcars per train), and
- Expected one-way travel distances to the likely disposal sites for the transportation method.

SUPPLEMENTAL INFORMATION:

(The text in italics was extracted from the NRC letter)

Land Use Impacts

- *A figure showing the layout of the BDTF including the footprint of both BDTF buildings housing the pre-filter/ultra-filter, the reverse osmosis systems, the evaporation and storage ponds, salt drift fences, any buffer strip of land, and the fence line for the site boundary.*

  The exact location of the BDTF within the 400 acres has not yet been determined and the layout on attached Figure 1 is conceptual only to confirm that sufficient land has been set aside for this function. There will be a security fence within the designated 400 acres that will surround the BDTF. Based on the salt drift information provided in the responses to RAI TE-21 submitted via Luminant letter TXNB-10013 dated February 24, 2010 (ML100630660) and RAI TE-04 via Luminant letter TXNB-10021 dated March 5, 2010, a salt fence will surround the evaporation ponds and misters within the security fence. A minimum distance of 20 feet between the salt fence and the security fence will allow maintenance of both fences. In addition, a buffer strip approximately 500 feet wide will be provided between the first bank of misters and the outside edge of the evaporation ponds to provide sufficient distance between the mister nozzles and the salt fence barrier to ensure proper functioning of the salt fence. This is illustrated on Figure 1 and drawings entitled "Area Plan BDTF GAS-05-11-100-007" and "Blowdown Treatment Facility Equipment Layout BDT-11-13-400-002" provided in ML100630660.

- *The area of land to be disturbed by building and operating the BDTF complex (i.e., filter and reverse osmosis systems and evaporation and storage ponds).*

  Please refer to the drawings mentioned above. The area required for the ponds is approximately 175 acres and the chemical facility [ultra-filter/reverse-osmosis (UF/RO) building, storage tanks, etc.] will require an additional 2 to 3 acres. Additional space will be required for access roads, buffer strip surrounding the evaporation ponds and misters, salt drift fences, and security fencing. The entire 400 acres was assumed to be completely disturbed and all buildings will be contained within the 400 acres.

Water Quality and Non-radioactive Waste Impacts

Luminant should provide the State of Texas water quality standards, as well as references, and details as to how the BDTF complex will meet those standards so that the staff can assess the impacts of the waste stream generated by the BDTF.

There are two non-radioactive waste streams generated by the BDTF. Both are discussed in this portion of the response and listed as item 1 and 2 below:

1) Effluent Waste Streams – Discharge to Lake Granbury

   There are two effluent waste streams that will be discharged to Lake Granbury:

   (a) Discharge direct from the cooling towers when such discharge would meet Lake Granbury water quality standards without treatment

   (b) Blended discharge of cooling tower effluent and BDTF effluent when BDTF operation is used to improve water quality before discharge

   Analyte concentrations in both effluent waste streams were evaluated based on the surface water quality sampling data collected for COLA development and summarized in ER Table 2.3-26. Both effluent waste streams were compared to the same water quality standards provided in the response to RAI HYD-29 (ML100630660). These standards are also described in detail in calculation package TXUT-001-ER-5.2-007, Rev 1, which is available in the electronic reading room. The most conservative water quality standards were used as the "screening levels" summarized in ER Table 2.3-26. The screening levels were taken from Attachment 1 to this response (on CD), "*2008 Guidance for Assessing and Reporting Surface Water Quality in Texas,*" dated March 19, 2008 (2008 Guidance). Attachment 2 is a copy of "*Texas Surface Water Quality Standards,*" dated April 20, 1997, also provided on the CD.

   As provided in TXUT-001-ER-5.2-007 and in Attachment 1, some of the water quality standards for "Specific Metals in Water for Protection of Aquatic Life" and screening levels used in ER Table 2.3-26 are required to be calculated instead of the State establishing a standard. For example, copper screening values are calculated, but the State has established a surface water quality value for arsenic.

   The waste stream analysis under discussion in RAI HYD-29 and TXUT-001-ER-5.2-007 only includes the periods in which the BDTF is not operating. When the BDTF is operating, the waste stream back to Lake Granbury will be a blended discharge as shown on Figure 2 (attached). The analyte concentrations of the blended discharge are described in Table 1 (attached). This analysis was developed based on the maximum concentrations reported in ER Table 2.3-26, except for chlorides, where the input value of 1800 mg/l was used and the value of TDS was calculated to be 3525 mg/l. The maximum concentration (conservative approach as opposed to using the mean value) was increased by a factor of 2.4 due to the cooling tower concentrating effect, and then it was evaluated using an RO vendor's mass balance equations. This estimate may differ once the actual RO vendor is selected. The blended discharge concentrations for the metals in Table 1 are estimated to be less than the screening levels provided in ER Table 2.3-26 and TXUT-001-ER-5.3-007. Furthermore, the BDTF blended discharge concentrations reported in Table 1 represent the "end of pipe" concentrations and do not account for low-flow or annual mean flow dilution conditions, thus providing a conservative bases for comparison.

   These conservative analyses are estimates of water quality and water quality standards that may apply. However, discharge concentrations will meet the Texas Pollution Discharge

Elimination System (TPDES) permit conditions that will be established by the State of Texas at the time of permit issue.

2) Composition of Evaporation Pond Solids

The composition of evaporation pond solids is also described in Table 1. This waste stream was described in Section II of RAI Supplemental Response for GEN-03/HYD-23/LU-03 sent via Luminant letter TXNB-09087 dated December 18, 2009 (ML093620032). The waste stream is anticipated to be Class 2 non-hazardous industrial waste; however for purposes of the assessment for that response, it was conservatively evaluated as Class I non-hazardous industrial waste. This assessment was based on the concentrations provided in Table 1.

The findings of this study and an explanation of why the 4000mg/l TDS was not used as part of the BDTF analysis should be addressed in your response.

The findings of the Freese and Nichols study entitled "Lake Granbury Dissolved Mineral Study" dated October 10, 2008 were described in Luminant letter TXNB-09087 (ML093620032) and the historical findings were described in the supplemental information for GEN-03, HYD-23, and LU-03 in the same letter. A concentration of 4000 mg/l TDS was not used as a design input because it is a postulated value based on the drought-of-record conditions being repeated and the expected durations were shown to be less than two months. Since the chloride concentration constitutes approximately 50 percent of the TDS concentration, and the 60-year USGS gauge data monthly averages provided in the Freese and Nichols study indicate that the monthly TDS average concentration could range from 2500 to 3500 mg/l for a period of four to nine months, a conservative TDS and corresponding chloride concentration was chosen to account for periods of higher TDS and associated chloride concentrations. The average maximum chloride concentration of 1800 mg/L (3525 mg/L TDS) was considered a conservative input.

The BDTF is designed to be a flexible system to treat chloride and TDS concentrations above 1800 mg/l and 3525 mg/l, respectively. As described in the response to GEN-03, HYD-23, and LU-03 in Item Ic, third paragraph, in the event the blended flow back to Lake Granbury would exceed discharge limits due to higher Lake Granbury makeup water chemistry, a larger stream of untreated blowdown will be diverted to the BDTF for treatment as necessary to not exceed the discharge limits. To accommodate this additional flow, the spare pre-filters, UFs, and RO membrane treatment train would be placed into service. There is an equivalent of 50 percent spare capacity available. Excess reject flow from the pre-filters, UFs, and RO membrane would also be diverted to the storage pond until the system demand became less than the design capacity of the misters and the storage volume could be evaporated. The storage capacity was designed to take into consideration the possibility of a spiked TDS value. Should the period extend beyond the designed three months capacity, CPNPP Units 3 and 4 power generation would be reduced to insure that the discharge is within the TPDES permit limits.

The BDTF is non-safety related and may be modified throughout the life of the plant to accommodate the TPDES permit discharge limits The TCEQ has not established permit conditions for CPNPP Units 3 and 4 discharges. As a conservative approach, the BDTF is designed to meet current Lake Granbury water quality standards of 2500 mg/l and 1000 mg/l for TDS and chloride, respectively for effluent concentrations at the end of the discharge pipe at Lake Granbury.

- *The volume and surface area of the evaporation (including the internal cells) and storage ponds accounting for volume losses due to sloped walls, cell dividers, access ramps and other components.*

Based on evaporation data for Somervell County using a 10-year average monthly pan evaporation rate from 1997 to 2007 (see attached Table 2), it was concluded that an evaporator operating continuously will evaporate 15,033,937 gallons in an average year. This is equivalent to 46.14 acre feet of water (46.14 acres 1 foot deep or 4.3 inches on a 128-acre lake).

The 128-acre (effective surface area) evaporation ponds are sufficient for evaporating a total of 5200 gpm for Units 3 and 4 using 182 misters (Figure 2). A contingency storage volume is provided to allow maintenance of the misters. The combination of the storage and evaporation ponds will provide up to 90-days storage for UF/RO system waste at the 5,200 gpm discharge rate. The 128-acre evaporation pond is 4 feet deep, providing approximately 513 acre-feet of capacity. The storage pond is 32 ft deep, providing approximately 1,505 acre-feet of storage. These values take into account sloped walls, dividers, access ramps, etc. The overall arrangement and dimensions of the ponds may be adjusted during detailed design while maintaining the required surface area and storage volumes.

	Evaporation Pond	Storage Pond	Total
Volume	513 ac-ft	1505 ac-ft	2018 ac-ft
Dimensions	2364 ft x 2364 ft	1436 ft x 1436 ft	
Surface Area	128 ac	47 ac	175 ac
Depth	4 ft	32 ft	

- *The basis for the evaporation of waste water discharged, including mister system efficiency and the expected evaporation rates for the evaporation and storage ponds.*

The mister system is designed to evaporate the backwash water from the treatment system. There will be a total of 182 misters arranged in the evaporation ponds to facilitate continuous evaporation of the water from the waste reject flow, which is a total of 5200 gpm for two units. Any evaporation occurring at the storage pond surface will be purely natural and is not included in the overall evaporation estimate. All forced evaporation will occur above the evaporation pond surface.

The number of misters was derived as follows:

One mister is comprised of 30 nozzles; the design of each nozzle is 2.67 gpm at 150 psi and results in the average water droplet size of 90 micron.

The mister efficiency is 35.7 percent based on the local evaporation rate (Table 2) and the mister data sheet (Attachment 3). Total design flow to each mister is 80.1gpm. Factoring in the evaporation efficiency of 0.357 results in an evaporation rate of 28.6 gpm, and

5200 gpm/28.6 gpm = 182 misters

- *The anticipated flow rates and concentrations of solids/salts throughout the circulating water system shown in Figure 3.6-1 (ML093620032) including combined flow rate from the cooling towers and the ultimate heat sink prior to the piping junction for directing flow bypassing the*

BDTF, the flow path into the BDTF, the discharge from the BDTF to the evaporation/storage ponds and the discharge back to Lake Granbury as analyzed for Lake Granbury's current TDS and chloride concentrations (i.e., 2500 or 3525 mg/l).

All of the supporting information for Lake Granbury water quality of 3,525 mg/l TDS, including flow rates and TDS concentrations at various points throughout the system are included in Figure 2. All flow rates and mass loadings in Figure 2 are provided on a per unit basis.

As shown in Figure 2, when the TDS concentration in the makeup water (Lake Granbury raw water) is 3525mg/l, the TDS concentration in the blended discharge into Lake Granbury is 1902 mg/l, well below the TCEQ Surface Water Quality Standard of 2500 mg/l. The quarterly surface water quality data collected for COLA development, and presented in ER Table 2.3-26 does not indicate that TDS concentrations are likely to reach 4000 mg/l. Although peak values could be projected to 4000 mg/l, they are highly unlikely as discussed above.

Transportation of Waste Impacts

Quantities for BDTF solid/salt waste removal are provided below. The expected case is representative of the actual operating conditions. The maximum case is a worst-case condition and does not represent anticipated operating conditions.

- *Frequency of disposal campaigns*

  The precise details for disposal campaigns have not been determined. Annual waste disposal information is provided in the bullets below.

- *Volume and mass of solids/salts (including circulating water treatment chemicals) to be removed during a disposal campaign*

  The expected BDTF operating case will produce 3.91E+8 lbs/yr or 177,324 tons/yr of total solids/salts for two operating units, with the BDTF operating 85% of the time.

  The maximum BDTF operating case will produce 8.31E+8 lbs/yr or 376,871 tons/yr of total solids/salts for two operating units, with the BDTF operating 100% of the time.

- *The method of transporting the solids/salts to the disposal sites*

  The solids/salts will be transported to the disposal sites by truck or railroad car or some combination of both.

- *Number of loads required for the transportation method (trucks or railcars & number of railcars per train)*

  The expected BDTF operating case will require approximately 8,866 trucks/yr or 1,773 railroad cars/yr for two operating units.

  The maximum BDTF operating case will require approximately 18,844 trucks/yr or 3,769 railroad cars/yr for two operating units.

- *Expected one-way travel distances to the likely disposal sites for the transportation method*

  The average highway distance from the CPNPP site to possible landfill disposal options located within a 50-mile radius is approximately 46 miles (attached Table 3). The included landfills are taken from the TCEQ publication *2007 Municipal Solid Waste in Texas: A Year in Review.* All of these landfills are Type I landfills in the North Central Texas Council of Governments (NCTCOG) region, which encompasses the CPNPP site and surrounding area, and can accept Class 2 and 3 wastes. These landfills will be able to receive the salt waste if it is classified as a Class 2 or 3 waste. If the salt waste is classified as a Class 1 waste, additional arrangements to accept the waste at a Type I landfill will need to be made with the TCEQ and the landfill. If the salt waste is classified as a hazardous waste, there are two possible landfill options. The average highway distance for these two landfills is 101 miles. This is outside the 50-mile radius, but could be an option depending on the classification of the salt waste. These two landfills were taken from the publication *Commercial Management Facilities for Hazardous and Industrial Solid Wastes (TCEQ 2006).* In addition, there are 10 more possible Type I landfills that are located in the same NCTCOG region, but not within the 50-mile radius. The average highway distances to possible landfills are shown in attached Table 3.

  The average railroad distance from the CPNPP site to possible landfill options located within a 50-mile radius is approximately 64 miles. The average railroad distance for the two landfills capable of accepting hazardous materials, Phibro-Tech, Inc. and Chemical Reclamation Services, is approximately 109 miles. The landfills included for analysis are described above. Because only three of the landfills were located near a railroad spur (City of Grand Prairie, Phibro-Tech, Inc., and Hunter Ferrell Landfill), the distances listed in Table 3 are an estimate based on the location of the nearest railroad. Additionally, in some cases multiple potential routes exist, but no information is available at this time identifying the specific routes to be used. In these cases the shortest distance was identified.

The total number of vehicles related to the operation of CPNPP, including all worker vehicles, outage worker vehicles, and solids/salt removal trucks, is approximately 2169 vehicles. The estimated vehicles associated with construction, as described in ER Section 4.4.1.3, is 2661 vehicles. Therefore, the transportation impact of solids/salt removal is bounded by the construction-related transportation impact discussed in ER Section 4.4.1.3. As discussed in that section, a rail spur already exists on site and the increase in traffic on the highways is not significant considering the projected capacities of the local highways and roads. It is reasonable to project a potential increase in traffic accidents commensurate with the increase in traffic; however, because the solids/salt waste is classified as non-hazardous industrial waste and the increase in traffic is probably less than will be seen during construction, the impact is expected to be SMALL.

Impact on R-COLA

None.

Impact on S-COLA

None.

Impact on DCD

None.

<u>Attachments</u>

Figure 1 - Preliminary Conceptual Layout of the BDTF

Figure 2 - Simulation of Chloride for 1,800 mg/l

Table 1 - Simulation Results of Makeup Water Data and BDTF

Table 2 - Pan Evaporation Rates Texas Water Board Quadrant 510 (Somervell County)

Table 3 - Distance to Area Landfills

Attachment 1 - 2008 Guidance for Assessing and Reporting Surface Water Quality in Texas," dated March 19, 2008 prepared by the TCEQ Surface Water Quality Monitoring Program (on CD)

Attachment 2 - Texas Natural Resource Conservation Commission, Chapter 307 – Texas Surface Water Quality Standards, April 30,1997 (on CD)

Attachment 3 - Mister Data Sheet

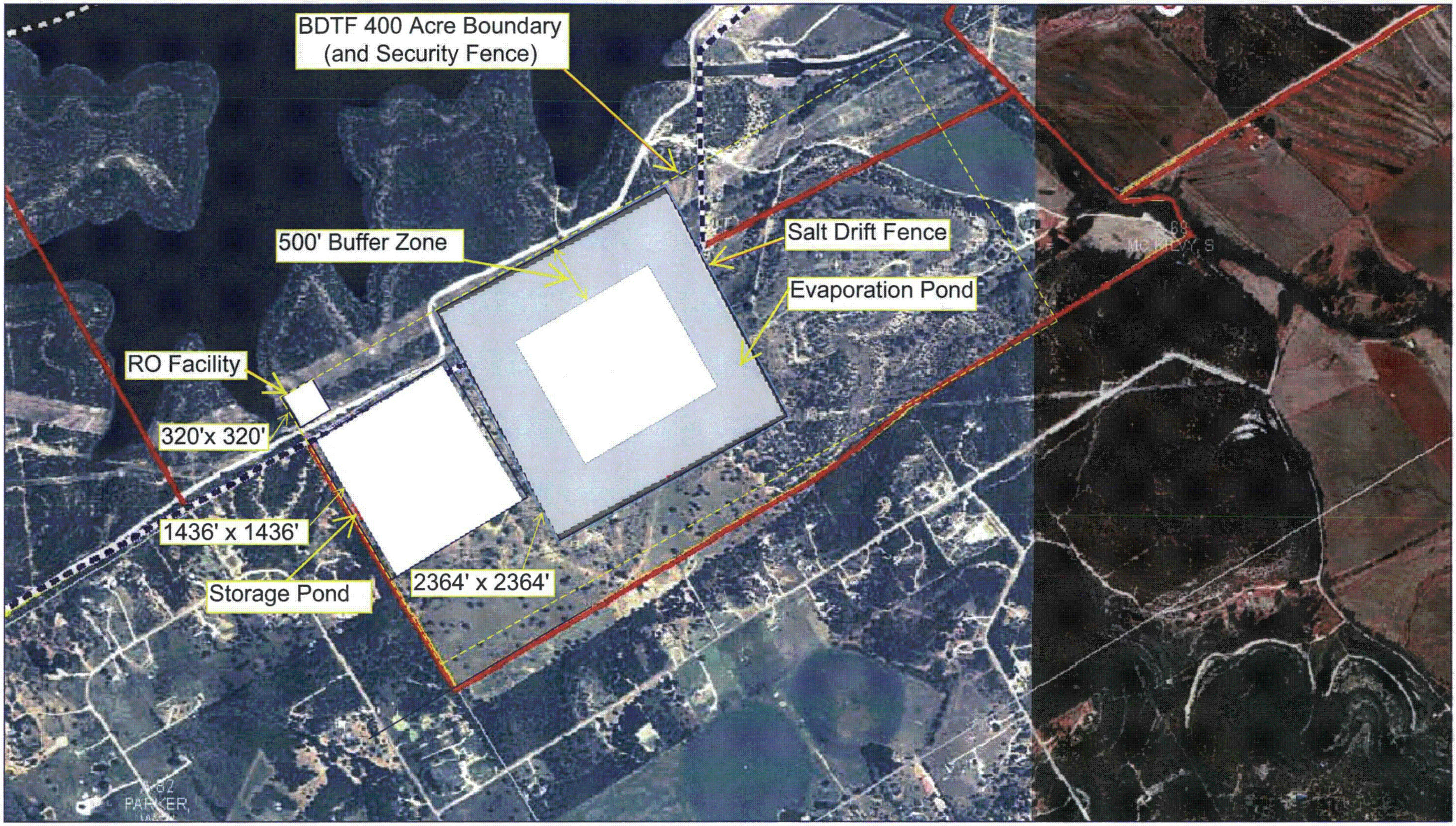
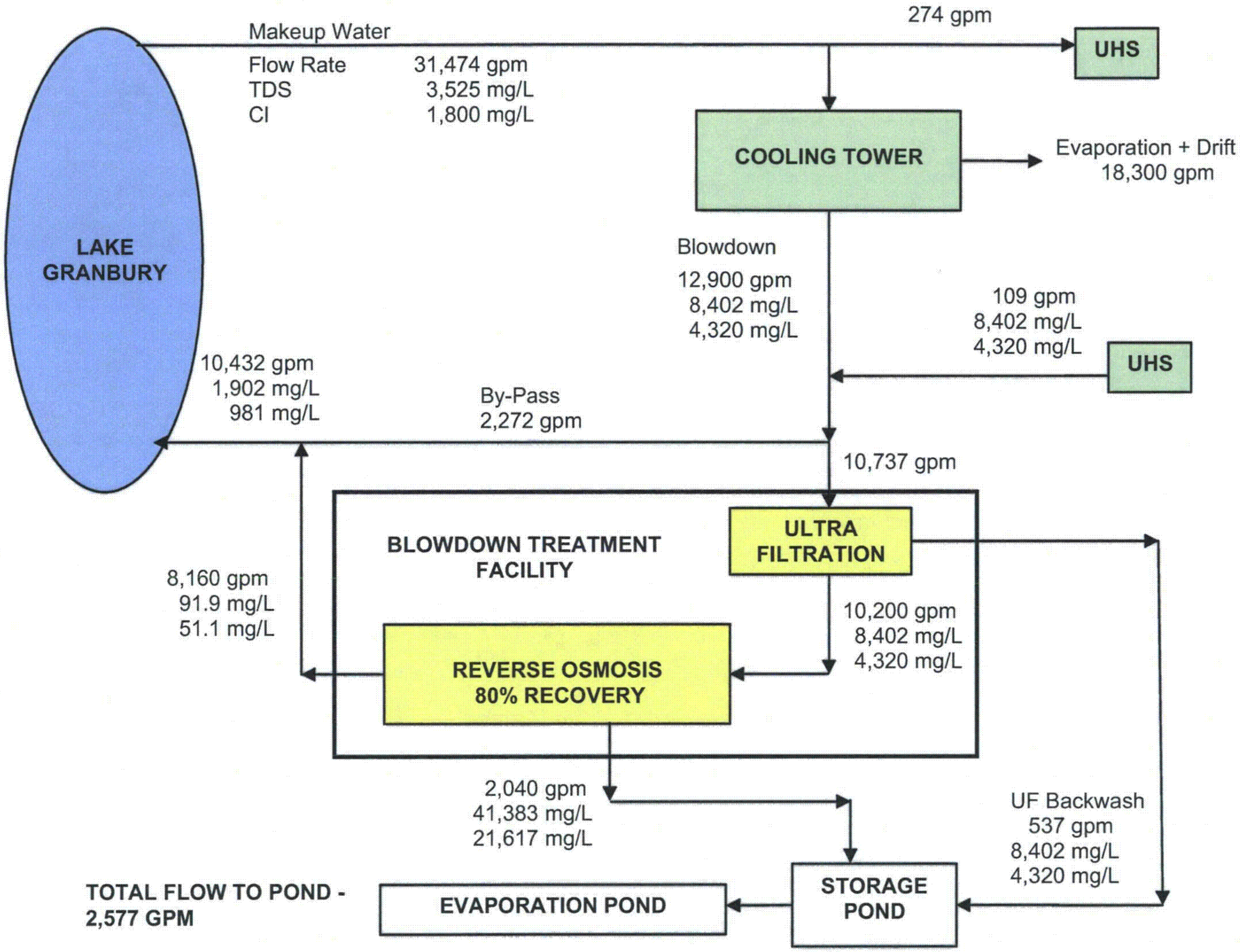


Figure 1
Preliminary Conceptual Layout of the BDTF

Figure 2
Simulation of Chloride for 1,800 mgl



Note: All flow rates are presented on a per Unit basis.

Table 1
Simulation Results of Makeup Water Data and BDTF

12/10/2009 REV 1

CWS COOLING TOWER BLOWDOWN	12,900	GPM
UHS COOLING TOWER BLOWDOWN	109	GPM
BDTF BYPASS	2,272	GPM
UF FEED	10,737	GPM
UF BACKWASH	537	GPM
RO FEED	10,200	GPM
RO PERMEATE	8,160	GPM
RO CONCENTRATE	2,040	GPM
BLENDED DISCHARGE TO LAKE	10,432	GPM
DISCHARGE TO POND	2,577	GPM

Values based on RO design basis (note 1)
Calculated value: (Ca*2.5) +(Mg*4.1)= Hardness as CaCO3
MAX - No 1st quarter TSS x 2.4 COC (note 2)
Estimated RO membrane rejection %
Estimated concentration, col/100 mL (note 3)

ALL FLOW RATES AND QUANTITIES ARE PRESENTED ON A PER UNIT BASIS

		COC=2.4	CT BLOWDOWN + UHS	BDTF BYPASS	UF FEED	UF BACKWASH	RO FEED		RO CONCENTRATE			RO PERMEATE		DISCHARGE TO POND		POND SOLIDS COMPOSITION	BLENDED DISCHARGE TO LAKE	
CONSTITUENT	UNITS	MAX	LB/HR	LB/HR	LB/HR	LB/HR	CONCENTRATION	LB/HR	CONCENTRATION	% REJECT	LB/HR	CONCENTRATION	LB/HR	CONCENTRATION	LB/HR	mg/kg	CONCENTRATION	LB/HR
Total Alkalinity	mg/L	122.0	793.55	138.60	654.95	413.72	47.30	241.23	232.6		237.25	0.9930	3.98	505.25	650.97	14,277.60	27.33	142.6
Total Arsenic	mg/L	0.0060	0.0390	0.0068	0.0322	0.0016	0.0060	0.0306	0.0294	98%	0.0300	0.0002	0.0006	0.0245	0.0316	0.69	0.0014	0.0074
Total Barium	mg/L	0.39	2.56	0.45	2.11	0.1036	0.39	2.01	1.966		2.01	0.0010	0.0041	1.6368	2.1089	46.25	0.0865	0.4512
Bicarbonate Alkalinity	mg/L	122.0	793.55	138.60	654.95	413.7174	47.30	241.23	232.6		237.25	0.9930	3.98	505.25	650.97	14,277.60	27.33	142.6
Total Boron	mg/L	6.00	39.03	6.82	32.21	1.6105	6.00	30.60	19.13		19.51	2.7170	11.09	16.39	21.12	463.29	3.43	17.90
Total Cadmium	mg/L	0.0012	0.0078	0.0014	0.0064	0.0003	0.0012	0.0061	0.0058	97%	0.0059	0.0000	0.0002	0.0049	0.0063	0.14	0.0003	0.0015
Total Calcium	mg/L	239.3	1,556.4	271.8	1,284.6	64.2	239.3	1,220.3	1,194.1		1,218.0	0.6	2.3	995.2	1,282.2	28,122.48	52.6	274.2
Carbonate Alkalinity	mg/L	12.00	78.05	13.63	64.42	64.4211	-	0.00			-		-	50.00	64.42	1,412.94	2.61	13.63
Chloride	mg/L	4,320.0	28,099.4	4,907.9	23,191.6	933.1	4,364.4	22,258.4	21,617.3		22,049.6	51.1	208.8	17,837.9	22,982.8	504,077.38	980.9	5,116.7
Chlorophyll a	mg/L	0.624	4.06	0.71	3.35	0.17	0.624	3.18	2.81	90%	2.86	0.08	0.32	2.35	3.03	66.49	0.20	1.03
Total Chromium	mg/L	0.0060	0.0390	0.0068	0.0322	0.0016	0.0060	0.0306	0.0294	98%	0.0300	0.0002	0.0006	0.0245	0.0316	0.69	0.0014	0.0074
Fecal Coliform (note 4)	col/100mL	2,640							2,376	90%		264.0		1,881		TBD	781.5	
Total Coliform (note 4)	col/100mL	60,000							54,000	90%		6000		42,750		TBD	17,761	
Total Copper	mg/L	0.0432	0.2810	0.0491	0.2319	0.0116	0.0432	0.2203	0.2138	99%	0.2181	0.0005	0.0022	0.1783	0.2297	5.04	0.0098	0.0513
Hardness, $CaCO_3$	mg/L	831.4	5,407.9	944.5	4,463.3	223.2	831.4	4,240.2	4,149.2		4,232.2	2.1	8.0	3,458.0	4,455.4	97,719.33	182.6	952.5
Total Iron	mg/L	5.18	33.72	5.89	27.83	1.39	5.18	26.44	25.66	99%	26.17	0.0648	0.26	21.39	27.57	604.59	1.18	6.15
Total Lead	mg/L	0.0060	0.0390	0.0068	0.0322	0.0016	0.0060	0.0306	0.0294	98%	0.0300	0.0002	0.0006	0.0245	0.0316	0.69	0.0014	0.0074
Total Magnesium	mg/L	56.88	369.98	64.62	305.36	15.27	56.88	290.09	283.9		289.58	0.1410	0.51	236.60	304.85	6,686.13	12.49	65.13
Total Manganese	mg/L	0.39	2.54	0.44	2.10	0.1050	0.39	2.00	1.90	97%	1.94	0.0147	0.06	1.58	2.04	44.75	0.10	0.50
Dissolved Mercury	mg/L	0.00024	0.00156	0.00027	0.00129	0.00006	0.00024	0.00122	0.00118	98%	0.00120	0.00001	0.00002	0.00098	0.00126	0.03	0.00006	0.00030
Total Mercury	mg/L	0.00024	0.00156	0.00027	0.00129	0.00006	0.00024	0.00122	0.00119	99%	0.00121	0.00000	0.00001	0.00099	0.00128	0.03	0.00005	0.00028
Total Nickel	mg/L	0.0060	0.0390	0.0068	0.0322	0.0016	0.0060	0.0306	0.0291	97%	0.0297	0.0002	0.0009	0.0243	0.0313	0.69	0.0015	0.0077
Nitrate as N	mg/L	0.50	3.25	0.57	2.68	0.1342	0.50	2.55	2.3		2.35	0.0420	0.20	1.93	2.48	54.40	0.15	0.77
Nitrite	mg/L	1.20	7.81	1.36	6.44	0.3221	1.20	6.12	4.80	80%	4.90	0.3000	1.22	4.05	5.22	114.45	0.50	2.59
Orthophosphate	mg/L	10.56	68.69	12.00	56.69	2.8345	10.56	53.86	51.74	98%	52.78	0.2640	1.08	43.16	55.61	1,219.76	2.51	13.07
Total Phosphorous	mg/L	5.90	38.40	6.71	31.70	1.5848	5.90	30.11	28.93	98%	29.51	0.1476	0.60	24.13	31.09	681.96	1.40	7.31
Total Potassium	mg/L	17.52	113.96	19.90	94.05	4.7027	17.52	89.35	86.5		88.23	0.2590	1.12	72.13	92.93	2,038.28	4.03	21.03
Total Selenium	mg/L	0.0060	0.0390	0.0068	0.0322	0.0016	0.0060	0.0306	0.0294	98%	0.0300	0.0002	0.0006	0.0245	0.0316	0.69	0.0014	0.0074
Silica	mg/L	43.92	285.7	49.90	235.8	123.6	22.00	112.2	109.2		111.4	0.1900	0.82	182.37	234.97	5,153.45	9.72	50.71
Total Silver	mg/L	0.0012	0.0078	0.0014	0.0064	0.0003	0.0012	0.0061	0.0059	98%	0.01	0.0000	0.00	0.00	0.01	0.14	0.00	0.00
Total Sodium	mg/L	2,824.1	18,369.4	3,208.4	15,161.0	758.0	2,824.1	14,402.9	13,986.4		14,266.1	33.5	136.8	11,660.9	15,024.2	329,522.61	641.3	3,345.2
Fecal Streptococci (note 4)	col/100mL	192.0							190.1	99%		1.92		150.5		TBD	43.32	
Sulfate	mg/L	770.6	5,012.4	875.5	4,136.9	206.8	770.6	3,930.1	3,843.9		3,920.8	2.3	9.3	3,203.6	4,127.6	90,530.43	169.6	884.7
Total Dissolved Solids	mg/L	8,402.0	54,650.8	9,545.3	45,105.5	2,519.5	8,350.2	42,586.0	41,383.4		42,211.1	91.9	375.0	34,717.3	44,730.5		1,901.9	9,920.3
Total Kjeldahl Nitrogen	mg/L	2.21	14.36	2.51	11.85	0.5927	2.21	11.26	8.83	80%	9.01	0.5520	2.25	7.45	9.60	210.58	0.91	4.76
Turbidity	NTU	840.0																
Total Zinc	mg/L	0.0576	0.3747	0.0654	0.3092	0.0155	0.0576	0.2938	0.2736	95%	0.2791	0.0036	0.0147	0.2286	0.2945	6.46	0.0154	0.0801
Total Suspended Solids	mg/L	160.80	1045.92	182.68	863.2	863.2	-	0.00			-		-	670.00	863.24		35.02	182.68
Ammonia Nitrogen	mg/L	1.20	7.81	1.36	6.44	0.3221	1.20	6.12	5.9		6.02	0.0180	0.10	4.92	6.34	139.06	0.28	1.47
pH		7.73		7.73			6.00		6.6			4.7		TBD			TBD	
Temperature	deg F	88.5		88.5			88.5											

Notes:
1. Mass balance will be revised upon receipt of vendor RO prepared projections.
2 TSS MAX value of 67 mg/L from Comanche Peak Water Quality Data.xls, "No 1st Quarter TSS" used as basis for mass balance.
3. URS has predicted concentrations (col/100 mL) based on MNES furnished data. Note that the concentration of these constituents will be affected by cooling tower treatment program that includes use of biocides (e.g. sodium hypochlorite).
4. The values provided for Lake Granbury concentrations of Coliform and Streptococci in the ER data Table 2.3-26 appear to be high for cooling tower makeup water.

Table 2

Pan Evaporation Rates

Texas Water Board Quadrant 510 (Somervell County)

Month	Pan Evaporation (inches)	Turbomister Efficiency (%)
January	2.5	29
February	2.7	29
March	4.3	35
April	5.0	36
May	5.5	37
June	7.2	40
July	8.5	43
August	8.1	42
September	6.4	39
October	5.1	36
November	3.6	32
December	2.8	30

10-year average pan evaporation rate = 5.1 inches

Table 3

Distance to Area Landfills

Landfill Name	Address	Accepted Waste	Highway Miles	Railroad Miles	Inside 50-mile Radius
Arlington Municipal Landfill	800 Mosier Valley Road Arlington, TX 76006	Class 2 & 3	70	85.4	no
Skyline Landfill	1201 North Central St. Ferris,TX 75125	Class 2 & 3	96.3	119.8	no
McCommas Bluff Landfill	5100 Youngblood Rd Dallas, TX 75241	Class 2 & 3	90	130.1	no
Southeast Landfill	**699 N. Dick Price Rd. Kennedale, TX 76060**	**Class 2 & 3**	**57.1**	**64.8**	**yes**
City of Cleburne Landfill	**1700 Island Grove Rd. Cleburne, TX 76031**	**Class 2 & 3**	**35.3**	**55.2**	**yes**
McKinney Landfill	500 Old Mill Road McKinney, TX 75069	Class 2 & 3	110	121.2	no
City of Grand Prairie	1102 MacArthur Boulevard Grand Prairie, TX 75050	Class 2 & 3	74.5	83.2	no
Republic Maloy Landfill	2811 FM1568 Campbell,TX 75422	Class 2 & 3	150	160.2	no
Camelot Landfill	580 Huffines Blvd. Lewisville, TX 75056	Class 2 & 3	89.8	102	no
Hunter Ferrell Landfill	220 East Hunter Ferrell Road Irving,TX 75060	Class 2 & 3	76.8	84.7	no
Turkey Creek Landfill	**9100 S. Interstate 35 W. Alvarado,TX 76009**	**Class 2 & 3**	**46.6**	**72.7**	**yes**
ECD Landfill	North I-H 45 Ennis, TX 75119	Class 2 & 3	111	108.2	no
C.M. Hinton Landfill	3171 Elm Grove Rd. Rowlett, TX 75098	Class 2 & 3	109	115.4	no
DFW Landfill	1600 South Railroad Street Lewisville, TX 75057	Class 2 & 3	87.4	95.3	no
City of Denton Landfill	2001 West Windsor Drive, Denton 76201	Class 2 & 3	91	100.8	no
		AVERAGE OF SITES WITHIN 50-MILE REGION	**46**	**64**	
		TOTAL AVERAGE	86	100	
Phibro-Tech Inc.	1000 N. First St. Garland, TX 75040	Haz, Class 1 & 2	107	108.2	no
Chemical Reclamation Services	405 Powell St. Avalon, TX 76623	Haz, Class 1 & 2	95.3	110.5	no
		AVERAGE	101	109	

ER RAI GEN-03
Attachment 3

SLIMLINE MANUFACTURING LTD.

How to Estimate the proper number of Evaporators

Step 1: Determine the volume of water you wish to evaporator

- You may have a inflow figure you wish to evaporate
- May need to calculate the size of the pond and determine and average depth.
- You will need to know objective, does the company wish to maintain the level of the pond or lower the level or eliminate the pond.
- See our description of Pond Volume Calculations on following page to figure out what you have. Just how big is your problem?

Take the volume determined from the above analysis and get that figure into US gallons.

- Depending upon the above results you will get a figure for an annual basis, or monthly or daily.
- You must chose what time period you wish to work with, a daily volume is easy because you can take the results and determine the length of your operating season by days.

Step 2: Determine which nozzle configuration is going to be used.

- The standard configuration is 30 nozzles using hollow cone pattern with D12 discs and DC45 cores. The output on this combination is varied depending upon the pressure used.
- If Spiral jet Teflon pigtail style configuration is chosen (they will pass more organic matter, a higher TDS) they also utilize 30 nozzles.

Step 3: Determine the pressure that will be available at the machine.

- This figure will be used with the nozzle configuration from step 2 to look up the output each nozzle will have based upon the manufacturers output chart. (Tee Jet output chart included for both hollow cone disc-core tips and Spiral jet spray nozzles)

Step 4: Use the configuration and pressure to determine the output per nozzle.

- Both configurations at 100 Psi will yield 2.2 gallons per minute per nozzle for a total of 66 US gallons per minute. This is 3,960 gallons per hour and 95,040 gallons per day. Remember, this is the amount pumped aloft, not evaporated. You must still determine the % of evaporation to find the amounts evaporated.
- See chart below to get the gallons per minute per nozzle

Spray Systems Hollow cone spray flow rates

Orifice	Core	**Gallons Per Minute at PSI**		
Disc #	No.	100 PSI	150 PSI	200 PSI
D5	45	0.71	0.86	0.99
D6	45	0.93	1.15	1.33
D7	45	1.11	1.35	1.57
D8	45	1.35	1.68	1.94
D10	45	1.77	2.18	2.5
D12	45	2.2	2.69	3.11
D14	45	2.45	3.00	3.49
D16	45	2.89	3.54	4.11

Spray system Spiral jet hollow cone flow rates

Pipe Size	Spray Angle	Capacity Size	Gallons Per Minute at PSI 100 PSI	150PSI	200PSI
1/4	90 degrees	7	2.2	2.69	3.11

Step 5: Multiple the result of step 4, the per nozzle output x 30 to obtain total output in US gallons per minute for one S30P evaporator. If the pressure is different than the 100 PSI example shown above, the results will vary.

- If you find you have a pressure below or above the chart please contact Bob McIntyre at Slimline Manufacturing Ltd for formula to determine actual output.
- Please note we recommend everyone use at least 100 PSI to obtain a water droplet size that is desirable. The higher the pressure the smaller the water droplet size, the smaller the water droplet size the higher the evaporation rate will be, but along with that increase in evaporation, will be an increase in the drift, which is what increases the evaporation efficiency.
- The spiral jet hollow cone Teflon nozzles (BSJ90) will give us an average size water droplet of 110 microns at 100 PSI.
- The standard disc-cone stainless steel nozzle system (DC45/D12) will give a water droplet size of 450 microns, but after air shear effective of the evaporator will be in range of 300 microns. (Using data from University of Ohio to establish this reduction, paper available upon request.)

Step 6: Determine the pan evaporation rate at the site, consult our estimate of evaporation rate obtainable at given pan evaporation levels. See this website for graph up to 19 inches net pan evaporation under Turbomist Evap rates on the main page.

- The pan evaporation rate is often available from weather information services at a site close to your location. Almost all airports have pan evaporation rates. You may have to estimate from closest available.
- Most clients will have engineering available to construct a simple pan evaporation test if they have the time line available to do so. It will take them one season to collect this data on a daily basis.

This chart is indicating *Inches per month:*

If you have an annual pan evaporation rate in feet, convert to inches and divide by 12 months to determine the average pan evaporation rate per month to use below.

** Please note that these figures were based upon an average humidity at the site of between 50 and 60%. If you have a lower humidity level the evaporation rate will be considerably higher.

Net pan evaporation (inches/month)	Percentage of volume pumped by evaporator	Net pan evaporation (inches/month)	Percentage of volume pumped by evaporator
1.5	20	7.0	40
2.0	28	7.5	41
2.5	29	8.0	42
3.0	30	8.5	43
3.5	32	9.0	44
4.0	34	9.5	45
4.5	35	10	46
5.0	36	10.5	47
5.5	37	11	48
6.0	38	11.5	49
6.5	39	12	50
7.0	40	12+	up to 85

Step 7: The final step

Assume the following as an example and replace your actual figures to calculate the number of evaporators needed!

- Assumption 1: You wish to evaporate 25 million gallons in a season and you have 10 months in your season. March thru December.
- Assumption 2: You have a pan evaporation rate of 6.5 inches per month
- Assumption 3. You can achieve 100 psi the most economically.

a. First determine what one machine can do in this window, given these assumptions.
At 100psi using the standard nozzles the chart shows you pump aloft 2.2 gallons per minute (gpm) x 30 nozzles = 66 gpm x 60 minutes = 3,960 gph x 24 hours = 95,040 gallons per day. 10 months at 30 days/month =300 days. Therefore you know you can pump aloft 300 x 95,040 gallons for a total of 28,512,000 (28.512 million) gallons in a season per unit.

b. If the pan rate is 6.5 inches/month the chart estimates 39% of volume pumped aloft will be evaporated. In this example you then take the volume one unit pumps x the % that will evaporate, that is 28,512,000 x .39 and the result is 11,119,680 US gallons. (11.119 million gallons in a season.)

c. To determine the number of units needed, divide the desired amount which was 25 million gallons by 11.119 and you would need 2.25 units

d. In this case we would recommend the customer purchase 3 evaporators to ensure they reach their goal. In fact 2 evaporators should get rid of 22.2 million gallons, and the customer may be satisfied with this. Depending upon the year, he may get more or less evaporation and we wish to point out, this is not an exact science, we are predicting results based upon experience of other customers and would suggest that if the customer has a dire problem, he estimate low on the evaporation rate, in anticipation of a bad weather year. We will always prefer to be on the conservative side.

Turbomist Evaporators are Manufactured by Slimline Manufacturing Ltd.
in Penticton British Columbia

If you wish you can call 1 800 495 6145 and give our sales department your inflow or total volume to eliminate, plus the net pan evaporation information from your site, or somewhere close to your site, we will do the calculations on an excel spread sheet and will forward you the results for consideration.

SUPPLEMENTAL RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI REGARDING THE ENVIRONMENTAL REVIEW

DATE OF RAI ISSUE: 1/25/2010

QUESTION NO.: GEN-07

SUPPLEMENTAL INFORMATION:

An error was found in ER Figure 3.4-1 submitted in response to this question in TXNB-10013 dated February 24, 2010 (ML100630660). The error has been corrected in the attached revision of the figure.

Impact on R-COLA

See attached marked-up ER Figure 3.4-1.

Impact on S-COLA

None.

Impact on DCD

None.

RAI GEN-07

RAI GEN-07 S01

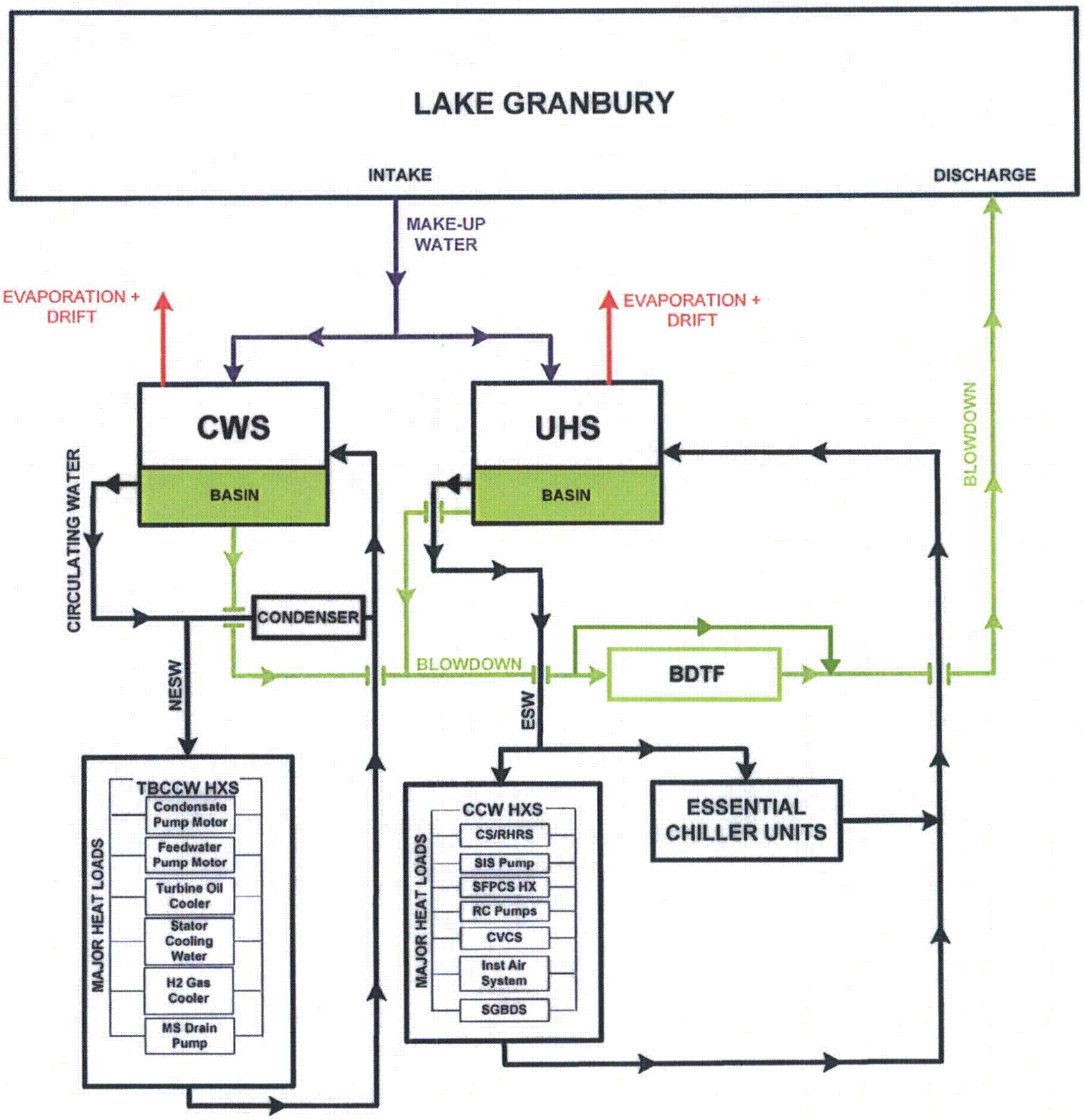


Figure 3.4-1 Simplified Water Use Diagram