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August 29, 1985
ST-HL-AE-1321
File No.: G9.15

Mr. George W. Knighton, Chief
Licensing Branch No. 3
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, DC 20555

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Submittal of Additional Information for the EHEB

References: 1) Letter NRC to HL&P; May 16, 1985; G. W. Knighton to J. H. Goldberg (ST-AE-HL-90610): Request for Additional Information.

2) Letter ST-HL-AE-1272 dated June 14, 1985; M. R. Wisenburg to G. W. Knighton

3) Letter ST-HL-AE-1308 dated July 19, 1985; M. R. Wisenburg to G. W. Knighton

Dear Mr. Knighton:

Enclosed please find Houston Lighting & Power's (HL&P) responses to your Request for Additional Information (Reference 1). In References 2 and 3, HL&P forwarded responses to questions transmitted in Reference 1 from the MEB, CSB, ASB, RSB and EHEB. In the attachment we have provided responses to EHEB questions 290.5-290.12 and 291.11-291.24. Responses to 290.13-290.15, 240.01, 291.10 and 291.25 will be provided by September 30, 1985. For your information, marked-up sections of the Environmental Report - Operating License are provided for use during your review.

If you should have any questions, please contact Mr. M. E. Powell at (713) 993-1328.

Very truly yours,

M. R. Wisenburg
Manager, Nuclear Licensing

JSP/as
Attachment

W2/NRC4/n

B001
1/1

cc:

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Office of the Secretary
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Response to Request for
Additional Information for the
Environmental and Hydrological Engineering Branch (EHEB)

Questions 290.5 - 290.12, 291.11 - 291.24

W2/NRC4/n

Question
290.5 What is the source of Fig. 2.7-7 and what is the acreage of undeveloped prime farmland?

Response

Figure 2.7-7 was deleted from the ER-OL in Amendment 7. Information concerning acreage of prime farmland on the site is present in Appendix D of the ER-OL, Page D-6.

Question
290.6 What agriculture or other management, if any, will be undertaken for prime farmland during operation?

Response

Currently, no plans exist for agriculture or other management of prime farmlands during operation.

Question
290.7 What hunting, fishing, or other recreational use, if any, will be permitted on the site during operation?

Response

Currently, no plans exist to permit hunting, fishing, or other recreational uses on site during operation.

Question 290.8

How long will the special monitoring of alligators, eagles, deer, and waterfowl be continued? What changes, if any, in numbers or habits of these species have been noted, and to what extent are any changes attributable to the presence of the project? What additional changes are anticipated when the plant becomes operational and the cooling reservoir undergoes design temperature regimes?

Response

There is no specific termination date for the special monitoring programs of alligators, eagles, deer, and water fowl. They will be conducted annually until their termination is authorized by the NRC. Detailed information concerning changes in species composition and habitat will be provided by fourth quarter, 1985, however the following general trends have been observed:

The total number of species of waterfowl and the overall population levels of ducks and geese on the STP site have generally increased from 1978 through 1984. The increase can be attributed to lessening of construction activity around the vast majority of the reservoir perimeter and to increased habitat availability due to creation of large, open expanses of water.

Alligators appear to be maintaining, if not increasing, their numbers on the STP site. The extreme cold winter of 1983-84 is known to have killed alligators all along the Louisiana and Texas coasts and may have dealt the alligator a temporary setback on the site. The increased water level inside the reservoir has made previously suitable areas unattractive to alligators and opened up new areas of good habitat. Although 1985 data have been only summarily reviewed, it appears that alligator population levels on the site are currently similar to previous high years of 1978, 1980 and 1982.

White-tailed deer appear to be increasing in abundance in the areas between the Colorado River and the east side of the reservoir dike. Since 1981, when the current survey methodology was adopted, the number of deer counted has increased steadily. The latest survey, conducted in 1984, resulted in a total deer count of at least 65, still found inside the reservoir, although their numbers have declined since reservoir filling covered a large portion of the available deer habitat in the reservoir. Most of the deer which left the reservoir probably relocated to the wooded area between the reservoir and the river, accounting for most of the increase in population densities in that area of the site.

Only two confirmed sightings of bald eagles flying over the STP site have been recorded since 1978, although numerous sightings are recorded for Matagorda and adjacent counties. As the cooling reservoir is filled, it is expected that bald eagles will be seen with increasing frequency.

No additional changes are anticipated when the plant becomes operational and the cooling reservoir is subject to design temperature regimes.

JSP-1

Question
290.9 What management, if any, will be undertaken for the Natural Lowland Habitat on the east side of the site? Will cattle grazing or herbicide use be permitted in this area?

Response

Currently, no management plans exist for the Natural Lowland Habitat. The use of herbicides is not anticipated. Also, no changes in existing cattle grazing leases after operation are anticipated at this time. Additional information is presented in ER-OL Appendix D (Page D-5).

Question
290.10 What other onsite wildlife management or mitigation activities, if any, will be practiced during operation?

Response

Currently, there are no plans for the conduct of other onsite wildlife management or mitigation activities during operation.

Question
290.11 What changes, if any, have been noted in LRS water level, overall vegetation, indicator species, and salinities since 1978, and to what extent can any changes be attributed to the presence of the project?

Response

Information on changes in Little Robbins Slough Marsh ecology will be provided by fourth quarter, 1985.

Question
290.12 How long will monitoring of the LRS be continued?

Response

There is no specific termination date for the monitoring of the Little Robbins Slough Marsh. This study will be conducted annually until its termination is authorized by the NRC.

Question	
291.11 (ER-OL Sec. 3.6.1.1)	Provide information on kind and quality of chemicals added to adjust wastes in the makeup demineralizer neutralization pit from a pH of 10.0 to 11.0 to pH 6-8.

Response

The plant neutralization basin is used to adjust the pH of plant waste streams. Regeneration waste from the Makeup Demineralized Water System is first collected in the makeup demineralizer equalization pit but is not treated until it enters the plant neutralization basin. Rayon grade sodium hydroxide and electrolytic grade sulfuric acid are used in the plant neutralization basin for pH adjustment.

Question 291.12 (ER-OL Sec. 3.6.1.2)

Identify the water quality standards that apply to discharge of the flushing water to the reservoir.

Response

There are no water quality standards that apply to discharge of flushing water to the reservoir other than the NPDES permit limits. Flushing water will be treated and sampled to ensure compliance with permit limitations.

Question
291.13 (ER-OL Sec. 5.4.4-1) Provide information on concentrations of constituents in the blowdown discharged from the cooling reservoir to the Colorado River.

Response

The expected average concentrations of the MCR is provided below. The average concentration of constituents in the blowdown are not available but would be close to the average MCR values given.

Constituent	Estimated Average Conc.
Calcium as $CaCO_3$ mg/L	205
Magnesium as $CaCO_3$ mg/L	195
Sodium as $CaCO_3$ mg/L	633
Cations as $CaCO_3$ mg/L	1033
Alkalinity as $CaCO_3$ mg/L	150
Chloride as $CaCO_3$ mg/L	782
Sulfate as $CaCO_3$ mg/L	99
Phosphate as PO_4 mg/L	2.5
Anions as $CaCO_3$ mg/L	1033
Silica as SiO_2 mg/L	19
Iron as Fe mg/L	5.5
Dissolved Solids mg/L	1220

Question 291.14 Please provide the following references:

a. Sharik, T. L., P. V. Morgan, and R. D. Groover. 1974. An Ecological Study of the Lower Colorado River Matagorda Bay Area of Texas, Cyrus Wm. Rice Division, NUS Corp. (Pittsburg, PA, 1974). (Ref. 2.7-1).

b. Groover, R. D., T. L. Sharik, and P. V. Morgan. 1974. A report on the ecology of the Lower Colorado River Matagorda Bay area of Texas, June 1973 through July 1974, R-24-05-09-1756, NUS Corp. (Rockville, MD, October 1974). (Ref. 2.7-2).

c. Groover, R. D., and P. V. Morgan. 1976. Final Report-Little Robbins Slough Aquatic Ecological Studies, April 1975-March 1976, R-32-00-12/76-656, Ecological Sciences Div., NUS Corp. (Houston, TX, December 1976). (Ref. 2.7-3).

d. Groover, R. D. and P. V. Morgan. 1976. Final Report Colorado River Entrainment Monitoring Program, Phase One Studies - April 1975 - March 1976, R-32-0012/76-676, Ecological Sciences Div., NUS Corp. (Houston, TX, December 1976). (Ref. 2.7-4).

e. Sharik, T. V., P. V. Morgan, and R. D. Groover. 1974. A Report on the Ecology of the Lower Colorado River Matagorda Bay Area of Texas, June 1973 through July 1974. Cyrus Wm. Rice Div., NUS Corp. (Pittsburg, PA 1974). (Ref. 2.5-2).

Response

a) This reference consists of a portion of the initial results of the ecological study performed on the Colorado River. This information is included in the complete study, cited as ER-OL Reference 2.7-2 (see item b below). This reference no longer exists as a separate document.

b) A copy of this reference (ER-OL Reference 2.7-2) was provided to the NRC in 1978 (ST-HL-AE-274) in response to Question 340.13 (ER-OL p. C-22).

c), d) A copy of this reference was provided to the NRC in 1978 (ST-HL-AE-274) in response to Question 340.13 (ER-OL p. C-22).

e) Reference 2.5-2 is identical to Reference 2.7-2 (see item b above).

Question
291.15 What is the disposal method for trash removed from the trash rack by the trash rake? Is it discharged to the sluiceway? What is the intake velocity across the trash rack? How is the trash rack structure designed to minimize impingement of fish?

Response

The trash removed from the trash rack will be disposed of in an approved landfill. Debris removed from the trash rack will not be discharged to the sluiceway. The intake velocity across the trash rack should be no greater than the approach velocity to the traveling water screens, which is 0.55 feet per second. The bar spacing for the trash rack is on 3 3/8" centers which precludes the impingement of all but the largest fish. Any fish large enough to be impinged on the trash rack would be fully capable of avoiding the intake structure by swimming against the approach velocity cited above.

Question
291.16 Page 3.4-2 define "excessive amounts of debris" and "excessive number of fish,'' i.e., what is the criteria for determining the discharge/disposal mode for trash and fish?

Response

"Excessive amounts of debris" would be any amount that has high potential for obstructing the fish return pipeline. The only time that fish and debris would be diverted to the trash basket would be when this condition exists.

Question
291.17 The ER-OL p. 3.4-2 states that the intake structure complies with criteria of the EPA. Specify and cite the EPA "criteria" for the intake structure.

Response

The Environmental Protection Agency criteria for the intake structure are found in "Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impacts" U. S. EPA, 1976. The recommended criteria are: the traveling water screens be flush with the shoreline; the traveling water screen approach velocity not exceed 0.5 ft per second; and that fish and other organisms moving along the shoreline have free and unrestricted movement across the face of the traveling water screens.

Question
291.18 Is there a permit for discharge of trash/fish to the river? Will there be any attempt through visual inspection of the traveling screens and screen rotation to minimize mortality of impinged organisms, e.g., fish?

Response

There are no discharge permits for the return of trash/fish to the river. There will be no attempt through visual inspection of the traveling screens and screen rotation to minimize mortality of impinged organisms.

Question
291.19

Section 3.6.1 states that the makeup demineralizer water system (MDWS) is supplied by well water and will need no pretreatment. Section 3.3 states that the well water is treated with sulfuric acid prior to demineralization. Please resolve these differences.

Response

Capability is provided to add small quantities of dilute sulfuric acid for minor pH adjustment of the Reverse Osmosis influent only to optimize efficiency of the membranes. Refer to revised sections 3.3 and 3.6.1 for resolution of the differences noted.

[Mark-up of pg. 3.6-1 & 3.3-1 attached]

3.6 CHEMICAL AND BIOCIDE WASTES

3.6.1 CHEMICAL WASTE SYSTEMS

Nonradioactive chemical wastes are produced by the following major systems:

1. Makeup demineralizer water system (MDWS)
2. Chemical cleaning wastes (startup)
3. Condensate polishing demineralizer system (CPDS)
4. Auxiliary boiler blowdown
5. Oily waste treatment
6. Circulating water system (CWS)

Wastes released by the six systems listed above are produced by chemical additives used in the particular process.

The wastes discharged from these systems fall into three basic categories as follows:

1. Floating materials such as oils, grease, and other solids that are lighter than water are treated in the oily waste treatment unit as described in Subsection 3.6.1.5.

2. Suspended matter consists of insoluble material that results in turbidity or coloring of system waste effluents, for example, that which might result from backwashing the demineralization system or from chemical cleaning.

3. Dissolved solids make up the greatest part of the chemical wastes discharged by the above systems. The greatest producers of dissolved substances are the MDWS and CPDS which use acid and caustic in the process.

Insert (A) → No significant quantity of sludge is produced by the MDWS because the water is supplied from wells and will not require pretreatment, chemical precipitation, or clarification. Biocide treatment of the condenser's circulating cooling water is discussed in Section 3.6.2.

3.6.1.1 Makeup Demineralizer Water System

The MDWS provides high quality make-up water primarily to the steam cycles of the plant's two power units. The MDWS consists of two sodium cation softeners, three cartridge filters and four reverse osmosis banks followed by two parallel demineralizer trains, each having a cation bed, an anion bed, and a mixed bed. The two demineralizer trains share a vacuum degasifier and acid and caustic regeneration systems. The two sodium cation softeners have a capacity of 400 gallons per minutes each and supply softened feed water to the reverse osmosis system. The reverse osmosis system has a product capacity of 468 gallons per minute and a maximum brine flow of 144 gallons per minute corresponding to a 75-percent recovery. Each demineralizer train has an operating capacity of 220 gallons per minute. The degasifier has a maximum capacity of 440 gallons per minute and reduces the carbon dioxide concentration to 10 parts per million (as CO_2). Each cation unit contains 173 cubic feet of strongly acidic cation resin. The cation resin is regenerated with sulfuric acid. Each anion unit contains 99 cubic feet of strongly basic anion resin. The anion resin is regenerated with ~~4-percent~~ sodium hydroxide. Each mixed-bed unit contains 30 cubic feet of ~~macroporous~~ cation resin and 30 cubic feet of ~~macroporous~~ anion resin. The mixed-bed units are regenerated in place. 7 7 7

3.3 PLANT WATER USE

Most water used by the plant is for heat dissipation. A cooling reservoir serves as the primary heat sink. The cooling reservoir and associated facilities are discussed in Section 3.4.

The circulating water pumps take water from the 7,000-acre cooling reservoir and pump it through the main condensers. There the circulating water receives the heat load given up by condensing steam. The heated water returns to the reservoir where it cools, primarily by evaporation. Auxiliary water from the main reservoir is used for mechanical equipment cooling and sealing in the turbine-generator building. This water is supplied by the open-loop auxiliary cooling water pumps. After passage through the turbine auxiliary heat exchangers, the heated water returns to the cooling reservoir.

A major portion of the seepage water from the reservoir is collected by approximately 670 relief wells located around the reservoir at the landside toe of the reservoir embankment. The relief wells have been designed and located to discharge into existing or proposed site drainage ditches. Flows from the relief well system are described in detail in Section 5.3.4. A typical relief well installation is shown on Figure 3.3-2. Q321.01

The two units of the plant have an essential cooling pond (ultimate heat sink) which serves as the essential water supply. Details of this pond are found in Section 3.4. Water is drawn from the essential cooling pond by the essential cooling water pumps, and is distributed to heating, ventilating and air conditioning systems, the diesel generator heat exchanger, the component cooling water heat exchanger, and other miscellaneous coolers. The heated water is then returned to the essential cooling pond. Water flow paths to and from the essential cooling pond and the cooling reservoir are shown on Figure 3.3-1. Flow for various plant conditions is tabulated in Table 3.3-1.

Insert (B) →

Service water taken from onsite wells is treated with sulfuric acid prior to demineralization (described in Section 3.6). It supplies water to several of the plant closed-loop systems, the fire protection system, and the makeup demineralization system. Well water for the laundry and for sanitary and drinking water requirements will be filtered and chlorinated to meet Texas Department of Health standards for potable water supplies. Treatment of the sanitary waste is described in Section 3.7.

Closed-loop systems using this service water include the primary, secondary, component cooling, and safeguards systems. The raw water is filtered and demineralized prior to use in these systems. After filling the systems initially, small quantities of water as needed will be required on a continuous basis to replace leakage and draining of equipment as shown on Figure 3.3-1 and noted in Table 3.3-1. The fire protection tanks are normally filled with service water; however, provisions are made to obtain emergency makeup water from the cooling reservoir. For potable uses, water from the service water supply is filtered and chlorinated. Figure 3.3-1 shows the flow paths of the service water. Water flow is tabulated for various plant conditions in Table 3.3-1.

INSERT A

No significant quantity of sludge is produced by the MDWS. Influent to the system is service water treated as discussed in Section 3.3. Biocide treatment of the condenser's circulating water is discussed in Section 3.6.2.

INSERT B

Service water is taken from onsite wells and first treated by natural sedimentation in the setting basin where it is also ozonated for bacteriostasis. It is then coagulated in-line with polyelectrolyte and filtered through dual media (activated carbon and sand) pressure filters. Service water is then supplied to several of the plant closed loop systems, and Fire Protection System and the Makeup Demineralizer System. Drinking water will be chlorinated. Treatment of sanitary waste is described in Section 3.7.

Question
291.20 Is the 49,500 gal of waste water produced when each train is regenerated an aggregate of the cation exchange unit, anion exchange unit, and the mixed-bed unit, or is this the volume of waste produced per unit? If an aggregate, specify the constituent streams and the frequency of occurrence.

Response

The maximum amount of waste water produced when each train is regenerated is about 46,700 gal and represents an aggregate of the three units. The constituent streams are identified in Table 3.6-1 and will be updated along with Section 3.6.1.1 to clarify the constituent streams and the frequencies, which is conservatively based on a daily regeneration of each unit.

[Revised Table 3.6-1 and Section 3.6.1.1 attached]

3.6 CHEMICAL AND BIOCIDE WASTES

3.6.1 CHEMICAL WASTE SYSTEMS

Nonradioactive chemical wastes are produced by the following major systems:

1. Makeup demineralizer water system (MDWS)
2. Chemical cleaning wastes (startup)
3. Condensate polishing demineralizer system (CPDS)
4. Auxiliary boiler blowdown
5. Oily waste treatment
6. Circulating water system (CWS)

Wastes released by the six systems listed above are produced by chemical additives used in the particular process.

The wastes discharged from these systems fall into three basic categories as follows:

1. Floating materials such as oils, grease, and other solids that are lighter than water are treated in the oily waste treatment unit as described in Subsection 3.6.1.5.

2. Suspended matter consists of insoluble material that results in turbidity or coloring of system waste effluents, for example, that which might result from backwashing the demineralization system or from chemical cleaning.

3. Dissolved solids make up the greatest part of the chemical wastes discharged by the above systems. The greatest producers of dissolved substances are the MDWS and CPDS which use acid and caustic in the process.

This paragraph has been revised per Q291.19.

No significant quantity of sludge is produced by the MDWS because the water is supplied from wells and will not require pretreatment, chemical precipitation, or clarification. Biocide treatment of the condenser's circulating cooling water is discussed in Section 3.6.2.

3.6.1.1 Makeup Demineralizer Water System

The MDWS provides high quality make-up water primarily to the steam cycles of
the plant's two power units. The MDWS consists of two sodium cation soft- 7
eners, three cartridge filters and four reverse osmosis banks followed by two
parallel demineralizer trains, each having a cation bed, an anion bed, and a
mixed bed. The two demineralizer trains share a vacuum degasifier and acid
and caustic regeneration systems. The two sodium cation softeners have a
capacity of 400 gallons per minutes each and supply softened feed water to the
reverse osmosis system. The reverse osmosis system has a product capacity of 7
468 gallons per minute and a maximum brine flow of 144 gallons per minute
corresponding to a 75-percent recovery. Each demineralizer train has an
operating capacity of 220 gallons per minute. The degasifier has a maximum
capacity of 440 gallons per minute and reduces the carbon dioxide
concentration to 10 parts per million (as CO_2). Each cation unit contains 173
cubic feet of strongly acidic cation resin. The cation resin is regenerated
with sulfuric acid. Each anion unit contains 99 cubic feet of strongly basic 7
anion resin. The anion resin is regenerated with ~~4 percent~~ sodium hydroxide.
Each mixed-bed unit contains 30 cubic feet of ~~macroporous~~ cation resin and 30
cubic feet of ~~macroporous~~ anion resin. The mixed-bed units are regenerated in
place.

TABLE 3.6-1

CYCLE MAKEUP DEMINERALIZER WASTE FLOW

	Cation Unit (gal)	Anion Unit (gal)	Mixed-Bed (gal)
Backwash	1,710	750	750
Regeneration			
% H_2SO_4	2,088	--	589
% NaOH	--	2,172	494
Slow rinse	4,005	840	642
Rinse	7,040	8,775	
Final rinse	--	--	6,600
Waste/regeneration (total)	19,163	12,537	12,455

Total waste flow per regeneration--44,155 gal

Maximum regeneration waste per day*--49,500 gal

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* Based on one regeneration of one primary train per day and one regeneration of one mixed-bed per day.

Table 3.6-1
CYCLE MAKEUP DEMINERALIZER WASTE FLOW

	Cation Unit w/backwash	Cation Unit wo/backwash	Anion Unit	Mixed Bed Unit
Backwash	1700	-	750	1125
Regeneration				
5% H_2SO_4	12864	6432	-	732
4% NaOH			1716	1292
Slow Rinse	3800	3800	540	2670
Rinse	7040	7040	8800	1128
Preservice Rinse	1100	1100	880	500
Waste/Regen Total	26504	18372	12686	7447

Notes:

1) Cation unit backwash required once every twenty fifth regeneration

2) Average design regeneration rates:

Cation Unit	1 per 4 days
Anion Unit	1 per 2 days
Mixed Bed Unit	1 per 40 days

3) Daily average waste flow over a 40 day cycle is 11,122 gallons per day per train

4) Daily maximum waste water produced assuming all units require regeneration on the same day (with cation unit backwash) is 46,637 gallons per day per train.

Regenerant rinse from sodium cation softeners and the brine flow from the reverse osmosis unit are routed to the plant neutralization basin. 7

At normal operating condition, reverse osmosis product water is treated by one demineralizer train. Under this condition, each cation unit will produce 1,300,000 gallons of water per service run and will require regeneration every 98 hours. Each anion unit will produce approximately 590,000 gallons of water per service run and require regeneration every 45 hours. ~~The~~ [Each] mixed-bed unit ~~is regenerated periodically.~~ [will produce approximately 13,000,000 gallons of water per service run and require regeneration every 40 days.] 7

The maximum amount of waste water produced when each train is regenerated is about ~~49,500~~ [46,700] gallons. The brine waste from the reverse osmosis system is approximately 210,000 gallons per day maximum. [Insert A] 7

The maximum production of regenerant waste occurs when the reverse osmosis unit is out of service. Under this condition, the sodium cation softeners, the cation and anion demineralizers remove the majority of the ionic impurities from the well water and are followed by the mixed-bed demineralizer, which produces the required effluent quality. However, because of the increase in dissolved solids loading, the cation and anion unit service runs are reduced to 6 and 11 hours, respectively. The mixed-bed unit requires regeneration every 75 hours. The maximum amount of waste water produced, both primary trains and one mixed-bed unit being regenerated, is 49,500 gallons. 7

The reverse osmosis product analysis on which the design of the MDWS was based shows that the main constituent of the influent cations is sodium, which necessitates the use of countercurrent regeneration when regenerating the primary cation units. The analysis also shows that over half of the total anions are made up of bicarbonate alkalinity which is economically removed as carbon dioxide by the degasifier, thereby reducing the volume of anion resin required in the primary units. The resulting backwash, spent regenerant, and rinse wastes are [first] collected in the makeup demineralizer equalization pit [and then transferred to the plant neutralization basin.] ~~At the regenerant dosages specified above and based on a normal day's regeneration schedule, the resulting day's waste solution has a pH between 10.0 and 11.0.~~ Wastes are equalized and neutralized to a pH of 6 to 8 in the neutralization ~~pit~~ [basin using acid or caustic as required]. The neutralized waste is pumped ~~from the neutralization pit to the plant neutralization basin prior to sending it to the circulating water outfall. This process is represented schematically on Figure 3.6-1.~~ [through a permitted outfall to the main cooling reservoir.]

The well water fed to the reverse osmosis unit requires [minor] acidification to prevent $CaCO^3$ precipitation in the reverse osmosis module due to the concentration effect. ~~The acid dosage is 0.54 pounds of 66°B sulfuric acid per 1,000 gallons of feedwater. For one day's operation at 360 gallons per minute of feedwater, 280 pounds of acid are used.~~ The quantities of chemicals used per regeneration are ~~1,038~~ [998] pounds of 66°B sulfuric acid for the cation unit, ~~594~~ [1180] pounds of ~~100~~ [50]-percent sodium hydroxide for the anion unit, ~~180~~ [177] pounds ~~each~~ of 66°B sulfuric acid and [300 pounds of 50] ~~100~~-percent sodium hydroxide for the mixed bed unit. Therefore, under normal operating conditions, the quantities of chemicals used per day for regeneration average ~~1,100~~ [507] pounds of 66°B sulfuric acid and ~~650~~ [1200] pounds of ~~100~~ [50]-percent sodium hydroxide. ~~Total sulfuric acid used per day by the MDWS is about 1,382 pounds.~~ 7

There is no seasonal variation in the amount or quality of wastes discharged by the MDWS. The primary cause of variation in the discharge quantity and quality is operational demand.

INSERT A

The 46,700 gallons of waste water produced when each train is regenerated is an aggregate of the three units. The constituent streams are identified on Table 3.6-1.

Question
291.21 What is the composition, the amount, and the concentration of the chemicals in the alkaline cleaning solution, including chelant, inhibitor, and surfactant? What is the composition and quantity of passivating solution in the chemical cleaning wastes (p. 3.6-3)?

Response

Section 3.6.1.2 (Amendment 7) decribes the composition, and the concentration of the chemicals in the cleaning solution. The passivating solution will consist of ammonia to raise pH to 10.0 - 10.5 and hydrazine to control oxygen (250 ppm). Estimated volume for each solution is less than one million gallons.

Question
291.22 What are the Texas Dept. of Water Resources standards for the Lower Colorado River?

Response

The applicable TDWR standards are attached for information.

TEXAS WATER QUALITY STANDARDS

(Texas Administrative Code, Title 31, Natural Resources and Conservation, Chapter 333 — Water Quality Management, Sections 11—21, Surface Water Quality Standards; Adopted effective April 14, 1981; Amended effective March 28, 1984)

333.11. Policy Statement

It is the policy of this state and the purpose of this chapter to maintain the quality of water in the State consistent with the public health and enjoyment, the propagation and protection of terrestrial and aquatic life, the operation of existing industries, and the economic development of the State; to encourage and promote the development and use of regional and area-wide waste collection, treatment, and disposal systems to serve the waste disposal needs of the citizens of the State; and to require the use of all reasonable methods to implement this policy.

333.12. Antidegradation Statement

(a) In implementing the legislative policy expressed in the Texas Water Quality Act, it is the policy of the Texas Department of Water Resources that:

(1) The waters in the State whose existing quality is better than the applicable water quality standards described herein as of the date when these standards become effective will as provided hereafter be maintained at their high quality, and no waste discharges may be made which will result in the lowering of the quality of these waters unless and until it has been demonstrated to the Texas Department of Water Resources that the change is justifiable as a result of desirable economic or social development.

(2) Water uses identified in the numerical criteria of these standards will be maintained. Identified uses will be reviewed when appropriate and changed, if necessary, will be proposed and justified in accordance with 40 Code of Federal Regulations Part 35.1550(c)(2), (3), and (4). Additionally, no degradation shall be allowed in high quality waters within or adjacent to national parks and wildlife refuges or wild and scenic rivers designated by law if such degradation would significantly impact the use of an area for its designated purposes. Existing instream water uses shall be protected consistent with provisions of the Texas Water Code, Chapter 11, and in accordance with the Federal Clean Water Act, §101(g).

(3) The department will not authorize or approve any waste discharge which will result in the quality of any of the waters in the State being reduced below the water quality standards without complying with the Federal and State laws applicable to the amendment of water quality standards.

(4) Anyone making a waste discharge from any industrial, public or private project or development which would constitute a new source of pollution or an increased source of pollution to any of the waters in the State will be required, as part of the initial project design to provide the highest and best degree of waste treatment available under existing technology consistent with the best practice in the particular field affected under the conditions applicable to the project or development.

(b) The executive director will keep the Environmental Protection Agency informed of its activities and will furnish to the agency such reports in such form, and containing such information as the Administrator of the Environmental Protection Agency may from time to time reasonably require to carry out his functions under the Water Pollution Control Act Amendments of 1972. Additionally, the executive director will consult and cooperate with the Environmental Protection Agency on all matters affecting the federal interest.

333.13. Classification of Surface Waters

The surface waters of the State have been divided into the following categories for ease of classification.

(1) River Basin Waters — those surface inland waters comprising the major rivers and their tributaries, including listed impounded waters, and including the tidal portion of the river to the extent that it is confined in a channel.

(2) Coastal Basin Water — those surface inland waters, including listed impounded waters, exclusive of paragraph (1) of this section, discharging or flowing or otherwise communicating with bays or the gulf including the tidal portion of streams to the extent that it is confined in channels.

(3) Bay Waters — all tidal waters exclusive of those included in river basin waters, coastal basin waters, and gulf waters.

(4) Gulf Waters — those waters which are not included in or form a part of any bay or estuary but which are a part of the open waters of the Gulf of Mexico to the limit of Texas' jurisdiction.

333.14. Description of Standards

(a) The General Statement is an integral part of the standards and the standards shall be interpreted in accord with the General Statement.

(b) These standards consist of three parts;

(1) General Criteria applicable to all surface waters of the State at all times to the maximum extent feasible.

(2) Numerical Criteria applicable to specific surface waters designated in the standards.

(3) Water Uses deemed desirable for specific surface waters designated in the standards. The designation of a segment as desirable for a particular water usage reflects the objective of the Texas Water Quality Board to attain and/or maintain a quality of water appropriate to a specific water usage for a stream segment.

(c) The numerical criteria and water uses deemed desirable are set out in Appendix A of §333.21 of this title (relating to Appendices A-C) for specific surface waters designated in the standards.

333.15. General Criteria

The general criteria enumerated below are applicable to all surface waters of the State at all times and specifically apply with respect to substances attributed to waste discharges or the activities of man as opposed to natural phenomena. Natural waters may, on occasion, have characteristics outside the limits established by these criteria; in which these criteria do not apply. The criteria adopted herein relate to the condition of waters as affected by waste discharges or man's activities. The following criteria do not override a specific exception to any one or more of the following if the exception is specifically stated in a specific water quality standard.

(1) Taste and odor producing substances shall be limited to concentrations in the waters of the State that will not interfere with the production of potable water by reasonable treatment methods, or impart unpalatable flavor to food fish, including shellfish, or result in offensive odors arising from the waters, or otherwise interfere with the reasonable use of the waters.

(2) The surface waters of the State shall be maintained so as to be essentially free of floating debris and settleable suspended solids conducive to the production of putrescible sludge deposits or sediment layers which would adversely affect benthic biota or other lawful uses.

(3) The surface waters of the State shall be maintained so as to be essentially free of settleable suspended solids conducive to changes in the flow characteristics of stream channels, top the untimely filling of reservoirs, lakes, and bays.

(4) The surface waters in the State shall be maintained in an aesthetically attractive condition.

(5) There shall be no substantial change in turbidity from ambient conditions due to waste discharges.

(6) There shall be no foaming or frothing of a persistent nature.

(7) There shall be no discharge of radioactive materials in excess of that amount regulated by the Texas Radiation Control Act, Article 4590(f), Revised Civil Statutes, State of Texas and Texas Regulation for Control of Radiation.

(8) Radioactivity levels in the surface waters of Texas, including the radioactivity levels in both suspended and dissolved solids for the years 1958 through 1960, were measured and evaluated by the Environmental Sanitation Services Section of the Texas State Department of Health in a report prepared for and at the direction of the Health Department by the Sanitary Engineering Research Laboratory at the University of Texas. The document is entitled, "Report on Radioactivity — Levels in Surface Waters — 1958-1960" pursuant to contract No. 4413-407 and is dated June 30, 1960. This document comprises an authoritative report on background radioactivity levels in the surface waters in the State and quite importantly sets out the locations where natural radioactive deposits have influenced surface water radioactivity. The impact of radioactive discharges that may be made into the surface waters of Texas will be evaluated and judgments made on the basis of the information in the report which was at the time made, and may still be the only comprehensive report of its kind in the nation.

(9) Radioactivity in fresh waters associated with the dissolved minerals (measurements made on filtered samples) shall not exceed those enumerated in U.S. Public Health Service, Drinking Water Standards, revised 1962, or latest revision, unless such conditions are of natural origin.

(10) The surface waters of the State shall be maintained so that they will not be toxic to man, fish and wildlife, and other terrestrial and aquatic life.

(11) With specific reference to public drinking water supplies, toxic materials not removable by ordinary water treatment techniques shall not exceed those enumerated in U.S. Public Health Service, Drinking Water Standards, 1962 edition, or latest revision, or established by EPA pursuant to the Safe Drinking Water Act, when issued.

(12) For a general guide, with respect to fish toxicity, receiving waters outside mixing zones should not have a concentration of nonpersistent toxic materials exceeding 1/10 of the 96-hour LC50, where the bioassay is made using fish indigenous to the receiving waters. Similarly, for persistent toxicants, the concentrations should not exceed 1/20 of the 96-hour LC50.

(13) For evaluations of toxicity, bioassy techniques will be selected as suited to the purpose at hand. However,

bioassasy will be conducted under water quality conditions (temperature, harness, pH, salinity, dissolved oxygen, etc.) which approximate those of the receiving waters.

(14) At the present time sufficient information is not available concerning:

(A) cause-effect relationships between nutrient concentrations and water quality; and

(B) nutrient cycling mechanisms in Texas waters, to establish appropriate water quality standards for nutrients.

As such information becomes available standards for nutrients will be established, if appropriate. Decisions regarding the establishment of nutrient standards will be made on a case-by-case basis by the department after proper hearing and public participation. The establishment of a schedule for decisions as to the need for nutrient standards for specific waters and what standards should be adopted is not feasible at this time.

(15) The surface waters of the State shall be maintained so that no oil, grease, or related residue will produce a visible film of oil or globules of grease on the surface, or coat the banks and bottoms of the watercourse.

(16) A dissolved oxygen concentration of at least 2.0 mg/l shall be maintained in all waters of the state with the exception of intermittent streams and inland effluent dominated streams, for all flow conditions for which a dissolved oxygen limit is not enumerated elsewhere in these standards (note also §333.18(d) (156.21.01.008(d)) of this title (relating to Application of Standards).

(17) The quality of surface waters of the state, other than intermittent streams and those segments with specifically identified desired uses and numerical criteria, will be protected so that certain minimal uses such as navigation, agricultural water supply, or industrial water supply will be maintained. The foregoing statement is not to be construed to mean that the criteria enumerated in quality criteria for water shall be applied in determining suitable water quality for the uses identified.

(18) Consistent with its water resource management responsibilities, the state has determined that in most areas of the state the use of man-made impoundments for industrial cooling accomplishes both water conservation and water quality management objectives. While numerical criteria for temperature are not established for all such reservoirs, temperatures in these reservoirs and all other surface waters of the state shall be maintained so as not to interfere with the reasonable use of such waters for beneficial purposes consistent with the policy statement and in accordance with water rights permits.

333.16. Numerical Criteria

(a) The numerical criteria apply to the specific waters identified. A detailed description of the inland segment boundaries is contained in Appendix C, segment descriptions, of §333.21 (156.21.01.011) of this title (relating to Appendices A through C). Boundaries of coastal estuarine segments have not yet been precisely defined; however, approximations are illustrated in the segment identification maps, Texas River and Coastal Basins, Texas Department of Water Resources, LP-132, October 1980. Stream standards are established and specifically apply with respect to substances attributed to waste discharge or the activities of man as opposed to natural phenomena. Other surface waters are covered by the criteria in the general statement and §333.18(d) of this title.

(b) Chemical concentration parameters, with the exception of dissolved oxygen and pH, apply to the approximate midpoint of the segment. The numerical values shown represent arithmetic average conditions over a period of one year. Whenever an unusual chemical concentration is found, an investigation of its origin will be made and such action is warranted initiated. These chemical parameters, as identified in the numerical criteria, will be maintained through the permit review process. Salinity levels in estuarine areas are discussed in §333.20(b) of this title.

(c) The dissolved oxygen values are minimum values which are applicable except as qualified in §333.18 of this title. For short periods of time, diurnal variations of 1.0 mg/l below the standard specified in the table shall be allowed for not more than 8 hours during any 24-hour period.

(d) The pH range represents maximum and minimum conditions throughout the segment except as qualified in §333.18 of this title.

The temperature limitations are intended to be applied with judgment and are applicable to the waters specifically identified herein with the qualifications enumerated in §333.18 of this title. Temperature standards are composed of two parts, a maximum temperature and a maximum temperature differential attributable to heated effluents.

Fresh Water Streams:

Maximum Temperature — See Table for Specific Waters

Maximum Temp. Diff. — 5 degrees F rise over ambient Fresh Water Impoundments:

Maximum Temperature — See Table for Specific Waters

Maximum Temp. Diff. — 3 degrees F rise over ambient Tidal River Reaches, Bay and Gulf Waters:

	Fall, Winter, Spring	*Summer*
Maximum Temp.	95 degrees F	95 degrees F
Max. Temp. Diff.	4 degrees F	1.5 degrees F

(f) The specific temperature differentials shall not apply where the temperature increase is due to the discharge of a treated domestic (sanitary) sewage effluent.

(g) The maximum temperature differential applies only to temperatures below the maximum criteria. If a recorded temperature exceeds the maximum criteria for

a specific segment it will be considered a violation of the water quality standards.

(h) Bacteriological water quality standards consist of two parts:

(1) a measure of general quality, and

(2) a limit on variations from the general quality.

(i) For all waters except gulf and bay waters, the measure of general quality is the logarithmic mean (geometric mean) of fecal coliform determinations. The number specified in the tables applies to the logarithmic mean (geometric mean) of data from a representative sampling of not less than 5 samples collected over not more than 30 days. All aspects of the sampling shall be such that a truly representative result is obtained. For routine observation and evaluation of water quality, lesser numbers of samples collected over longer periods will be used. In bay waters (exclusive of bay waters in the buffer zone), the number specified in the tables applies to the median total coliform density as specified in the "National Shellfish Sanitation Program Manual of Operation, Part 1, Sanitation of Shellfish Growing Areas," 1965 Revision, or latest revision.

(j) The limit on variations from the general bacteriological quality on all waters except gulf and bay waters is a fecal coliform density which shall not be equaled or exceeded in more than 10 percent of the samples. This density is twice the numerical criteria specified in the table. In the instance of gulf and bay waters (exclusive of the buffer zone), the criteria for shellfish growing water shall apply.

333.17. Water Uses.

(a) Contact recreation waters.

(1) Surface waters suitable for contact recreation shall not exceed a logarithmic mean (geometric mean) fecal coliform content of 200 oranisms per 100 ml from a representative sampling of not less than five samples collected over not more than 30 days, as determined by either multiple-tube fermentation or membrane filter techniques. No more than 20% of the total samples taken during any 30-day period shall exceed a logrithmic mean fecal coliform content of 400 organisms per 100 ml.

(2) Simple compliance with bacteriological standards does not insure that waters are safe for primary contact recreation, such as swimming. Long-standing public health principles mandate that a watershed sanitary survey be conducted in order to adequately evaluate the sanitary hazards potentially present on any natural watercourse.

(b) Noncontact recreation. Surface waters for general or noncontact recreation should, with specific and limited exceptions, be suitable for human use in recreation activities not involving significant risks of ingestion. These waters shall not exceed a logarithmic mean (geometric mean) fecal coliform content of 2,000/100 ml, nor equal or exceed 4,000/100 ml in more than 10% of the samples, except in specified mixing zones adjcent to outfalls.

(c) Domestic raw water supply.

(1) It is the goal that the chemical quality of all surface waters used for domestic raw water supply conform to the interim drinking water regulations. However, it must be realized that some surface waters are being used that cannot meet these standards. Since in these cases it is the only source available, these surface waters may be deemed suitable for use as a domestic raw water supply, where the chemical constituents do not pose a potential health hazard.

(2) The evaluation of raw water for domestic use cannot be reduced to simply counting bacteria of any kind and the foregoing must be used with judgment and discretion. This paragraph is not intended to limit the responsibilities and authorities of responsible local governments or local health agencies.

(d) Propagation of fish and wildlife.

(1) The water quality requirements necessary to support the propagation of fish and wildlife are too diverse to be defined by a single set of numerical criteria. Different but equally desirable biological communities may have substantially different water quality requirements. Also, the impact of a given chemical or physical component on a biological community can be assessed only when the other components of the system are known since synergistic and antagonistic interactions are common. Determination of the suitability of a stream for the propagation of fish and wildlife is most effectively accomplished by an assessment which consideres both the physical-chemical parameters of the stream and the biological community present in the stream.

(2) Specific criteria do exist with respect to shellfish waters. In shellfish areas in the bays and outside the buffer zones, the total coliform criteria shall be limited and guided by the latest revision of the U.S. Public Health Service Manual, Sanitation of Shellfish Growing Areas.

333.18. Application of Standards

(a) Flow Conditions

(1) The flow conditions as defined below and listed specifically for each segment at referenced stations (see Appendix B) apply only to river and coastal basin waters. They do not apply to bay and gulf waters, or lakes and reservoirs. Flow conditions were computed from historic USGS daily stream-flow records where available. In cases where there was not a USGS flow station at the TDWR monitoring station, the base flow condition was interpolated/extrapolated from the nearest comparable USGS stations. The seven-day, two-year low flows shown in Appendix B of §333.21 (156.21.01.022) of this title (relating to Appendices A through C) were calculated using USGS data. When the calculated seven-day, two-year low flow was less than 0.1 cfs the base flow was set at 0.1 cfs.

(2) The flows will be recomputed periodically to reflect any alterations in the hydrologic characteristics of a segment which may result from upstream activities in the basin, including construction of new reservoirs, climatological trends or other phenomena.

(A) Chemical parameters: The water quality standards for chemcial parameters, including chlorides, sulfates and total dissolved solids, exclusive of temperature, dissolved oxygen and pH, represent annual arithmetic mean concentrations which will not be exceeded for any year.

(B) The dissolved oxygen and pH standards represent minimum and minimum/maximum values, respectively, and shall apply at all times that the daily flow equals or exceeds the specified flow criterion.

(C) Temperature. The temperature standard represents a maximum value that shall apply at all times that the daily flow exceeds the specified flow criterion.

(D) Other Parameters and General Criteria: The general criteria and the numerical criteria not specifically discussed above shall apply at all times regardless of flow unless specifically excepted under §333.18(d).

(b) Mixing Zones

(1) Where mixing zones are specifically defined in a valid waste control order issued by the Texas Department of Water Resources or a National Pollutant Discharge Elimination System permit, the defined zone shall apply.

(2) Where the mixing zone is not so defined, a reasonable zone shall be allowed. Because of varying local physical, chemical, and biological conditions, no single criterion is applicable in all cases. In no case, however, where fishery resources are considered significant, shall the mixing zone allowed preclude the passage of free-swimming and drifting aquatic organisms to the extent of significantly affecting their populations. Normally mixing zones should be limited to no more than 25 percent of the cross-sectional area and/or volume of flow of the stream or estuary, leaving at least 75 percent free as a zone of passage unless otherwise defined by a specific Board Order or permit.

(c) Buffer Zones in Bay and Gulf Waters

For all bay and gulf waters, exclusive of those contained in river or coastal basins as defined in §333.13 a buffer zone of 1,000 feet measured from the shoreline at ordinary high tide is hereby established. In this zone, the bacteriological requirements enumerated in other sections of these standards shall not apply. In these zones, the logarithmic mean (geometric mean) density of fecal coliform organisms shall not exceed 200/100 ml, nor shall more than 10 percent of the total samples exceed 400/100 ml. The foregoing percentages are applicable when examining data from not less than 5 samples collected over not more than 30 days. For routine observation and evaluation of water quality, lesser numbers of samples collected over longer periods will be used.

(d) Exceptions

(1) The water quality standards will not apply to treated effluents and except general criteria, will not apply to:

(A) water in mixing zones as defined in this section or in a waste discharge operating under a valid permit issued by the Texas Department of Water Resources or a National Pollutant-Discharge Elimination System permit, or

(B) dead-end barge and dead-end ship channels, intermittent streams, and inland effluent dominated streams, a minimum goal shall be to maintain a concentration of 2.0 mg/l dissolved oxygen except in areas where it is not feasible or justifiable. Nothing in this statement precludes requiring waste treatment over and above that required to meet a 2 mg/l dissolved oxygen standard.

333.19. Determination of Compliance

In making any tests or analytical determination on classified surface waters to determine compliance or noncompliance with water quality standards, representative samples shall be collected at locations approved by the Texas Department of Water Resources.

(1) Collection and Preservation of Samples

(A) Samples for determing compliance with the standards, excepting temperature as explained below, will be collected one foot below the water surface unless the water depth is less than 1.5 feet, in which case the collection depth shall be one-third of the water depth measured from the water surface.

(B) For impoundments, the temperature standards enumerated shall apply to the representative temperature of the receiving water outside the mixing zone measured by averaging temperature measurements made at equal and appropriate intervals from the surface to the bottom except where the impoundment is stratified. In these cases, the bottom is defined as the thermocline and the temperature measurements for determining compliance shall be confined to the epilimnion. The thermocline shall be that point of rapid temperature change with vertical depth as defined in standard textbooks on the subject.

(C) In tidal river reaches, the temperature standards apply to the fresh water layer in stratified situations similar to impoundments.

(D) Samples will be collected from the present established sampling stations to insure continuance in monitoring with that done in the past. In those cases where there are not sufficient established point, it may be necessary to establish additional stations. This statement does not preclude sampling at other points in the conduct of field investigations.

(E) Collection and preservation of samples will be in accordance with accepted procedures to assure representative samples of the water and to minimize alterations prior to analysis.

(2) Analysis of samples

Numerical values in the water quality standards will be determined by analytical procedures outlined in the latest edition of "Standard Methods for the Examination of Water and Wastewater" as prepared and published jointly by the American Public Health Association, the American Waterworks Association, and the Water Pollution Control Federation. Also, tests may be in accordance with other acceptable methods which have proven to yield reliable data to the satisfaction of the Texas Water Quality Board.

333.20. Comments

(a) Inadequate Data

(1) The Board reserves the right to amend these standards following the completion of extensive studies

presently under way or being planned in the near future on some of the major river basins.

(2) Errors in these water quality standards resulting from clerical or human errors, or erroneous data, will be subject to correction by the Texas Water Quality Board; and the discovery of such errors does not render the remaining or unaffected standards invalid.

(b) Estuarine Salinity

(1) It is recognized that the maintenance of proper salinity gradients during various periods of the year within estuarine waters is very important to the continuation of balanced and desirable populations of estuarine dependent marine life. The dominant force in determining salinity gradients is weather — although gradients can be affected by waste discharges; modifications in the flow regime of in-flow rivers and streams, by the construction of impoundments, water diversions, etc.; and by physical alterations of gulf passes and other interconnections between estuarine and gulf waters. Since the dominant force controlling salinity gradients is beyond control, meaningful salinity standards cannot be enforced. Careful consideration, however, should always be given to all activities of any nature which can or might detrimentally affect salinity gradients in estuarine waters.

(2) All phases of the natural mineral composition of estuarine and marine waters commonly known as salinity or salinity gradient are outside the scope of these standards, but are not outside the scope of the interest, responsibility, and authority of the several State agencies concerned with water quality, quantity, development, regulation, and administration. For the State's purposes, using both existing data and data yet to be collected, the State proposes to adopt carefully considered estuarine salinity criteria upon which future State evaluations and regulatory actions might be based. Such evluations and regulatory actions shall not be precluded because of the absence of established salinity standards.

333.21. Appendicies A Through C.

The following appendices will be used for the purposes of the surface water quality standards (Appendix A—Texas Surface Water Quality Standards, Appendix B—Base Flow Conditions, Appendix C—Segment Descriptions).

APPENDIX A
TEXAS WATER QUALITY STANDARDS
FRESH AND TIDAL WATERS

CANADIAN RIVER BASIN		WATER USES DEEMED DESIRABLE				CRITERIA						
SEGMENT											COLIFORM	
NUMBER	DESCRIPTION	CONTACT RECREATION	NONCONTACT RECREATION	PROPAGATION OF FISH & WILDLIFE	DOMESTIC RAW WATER SUPPLY	CHLORIDE (mg/l) avg. not to exceed	SULFATE (mg/l) avg. not to exceed	TOTAL DISSOLVED SOLIDS (mg/l) avg. not to exceed	DISSOLVED OXYGEN (mg/l) not less than	pH RANGE	FECAL/(100ml) - log. avg. not more than (see Gen. Statement)	TEMPERATURE °F (see Gen. Statement)
0101	Canadian River - Oklahoma to Lake Meredith (Sanford Dam)	X	X	X		1,000	600	3,500	5.0	6.5-9.0	200	90
0102	Lake Meredith	X	X	X	X	350	350	1,250	5.0	7.0-9.0	200	85
0103	Canadian River - Lake Meredith to New Mexico	X	X	X		900	500	2,500	5.0	6.5-9.0	200	90
0104	Wolf Creek	X	X	X		300	100	1,000	5.0	6.5-9.0	200	93
0105	Rita Blanca Lake	X	X	X	X	50	40	300	5.0	6.5-9.0	200	85
	RED RIVER BASIN											
0201	Red River - Arkansas state line at Index to Oklahoma state line	X	X	X	X	375	250	1,100	5.0	6.5-9.0	1,000	93
0202	Red River - Oklahoma state line to Lake Texoma	X	X	X	X	375	250	1,100	5.0	6.5-9.0	200	93
0203	Lake Texoma	X	X	X	X	600	300	1,500	5.0	7.0-9.0	200	92
0204	Red River - Lake Texoma headwater to Wichita River confluence	X	X	X		2,000	1,200	6,000	5.0	6.5-9.0	200	93
0205	Red River - Wichita River confluence to Pease River confluence	X	X	X		5,000	2,000	10,000	5.0	6.5-9.0	200	93
0206	Red River - Pease River confluence to Prairie Dog Town Fork Red River	X	X	X		12,000	4,000	25,000	5.0	6.5-9.0	200	93
0207	Prairie Dog Town Fork Red River	X	X	X		30,000	4,500	65,000	5.0	6.5-9.0	200	93
0208	Lake Crook	X	X	X	X	75	150	350	5.0	6.5-9.0	200	90

BRAZOS RIVER BASIN

1226	Bosque River - Lake Waco headwater to Bosque River headwater, including North, Middle, and South Forks	X	X	X		250	150	800	5.0	6.5-9.0	200	91
1227	Nolands River - Whitney Reservoir to Pat Cleburne Dam		X	X		75	75	500	5.0	6.5-9.0	2,000	95
1228	Lake Pat Cleburne	X	X	X	X	100	100	300	5.0	6.5-9.0	200	93
1229	Paluxy River	X	X	X	X	100	100	450	5.0	6.5-9.0	200	93
1230	Lake Palo Pinto	X	X	X	X	100	100	450	5.0	6.5-9.0	200	93
1231	Lake Graham	X	X	X	X	200	75	500	5.0	6.5-9.0	200	95
1232	Clear Fork Brazos River		X	X		800	800	1,000	5.0	6.5-9.0	200	93
1233	Hubbard Creek Reservoir	X	X	X	X	350	75	750	5.0	6.5-9.0	200	93
1234	Lake Cisco	X	X	X	X	75	75	350	5.0	6.5-9.0	200	93
1235	Lake Stamford	X	X	X	X	425	350	1,100	5.0	6.5-9.0	200	93
1236	Lake Fort Phantom Hill	X	X	X	X	200	100	600	5.0	6.5-9.0	200	93
1237	Lake Sweetwater	X	X	X	X	175	225	500	5.0	6.5-9.0	200	93
1238	Salt Fork of Brazos River		X	X		23,000	4,000	40,000	5.0	6.5-9.0	200	93
1239	White River - Salt Fork Brazos River confluence to White River dam	X	X	X	X	100	100	500	5.0	6.5-9.0	200	92
1240	White River Lake	X	X	X	X	150	100	450	5.0	6.5-9.0	200	89
1241	Double Mountain Fork Brazos River - Salt Fork Brazos River confluence to North Fork Double Mountain Fork Brazos River confluence	X	X	X		2,100	1,900	5,500	5.0	6.5-9.0	200	95
1242	Brazos River - Navasota River confluence to Whitney Dam	x	x	x	x	400	250	1,650	5.0	6.5-9.0	200	95
1243	Salado Creek-Lampasas River confluence to headwaters	x	x	x	x	50	50	300	5.0	6.5-9.0	200	90
1244	Brushy Creek - San Gabriel River confluence to headwaters		x	x	x	125	150	600	5.0	6.5-9.0	1,000	91

BRAZOS-COLORADO COASTAL BASIN

1301	San Bernard River Tidal	X	X	X					4.0	6.5-9.0	200	95
1302	San Bernard River - above tidal	X	X	X	X	100	50	500	5.0	6.5-9.0	200	90
1303	Cedar Lakes*	X	X	X					4.0	6.5-9.0		95
1304	Caney Creek Tidal	X	X	X					4.0	6.5-9.0	200	95
1305	Caney Creek - above tidal		X	X		200	75	1,000	5.0	6.5-9.0	2,000	90

* Shellfish sanitation bacteriological standards apply - 70/100 ml total coliform

EAST MATAGORDA ESTUARY

2442	East Matagorda Bay	x	x	x					5.0	6.5-9.0	70	95

COLORADO RIVER BASIN

1401	Colorado River Tidal	X	X	X					5.0	6.5-9.0	200	95
1402	Colorado River - above tidal to Tom Miller Dam, including Town Lake	X	X	X	X	100	75	500	5.0	6.5-9.0	200	95
1403	Lake Austin	X	X	X	X	100	75	400	5.0	6.5-9.0	200	90
1404	Lake Travis	X	X	X	X	100	75	400	5.0	6.5-9.0	200	90
1405	Lake Marble Falls	X	X	X	X	100	75	400	5.0	6.5-9.0	200	94
1406	Lake Lyndon B. Johnson	X	X	X	X	100	75	400	5.0	6.5-9.0	200	94
1407	Inks Lake	X	X	X	X	100	75	400	5.0	6.5-9.0	200	90
1408	Lake Buchanan	X	X	X	X	100	75	400	5.0	6.5-9.0	200	90
1409	Colorado River - Lake Buchanan headwater to San Saba River confluence	X	X	X	X	200	200	500	5.0	6.5-8.5	200	91

Question
291.23

Sects. 3.6.2 and 5.4.3. Is the chlorine residual remaining in the condenser effluent being discharged to the cooling reservoir total residual chlorine or free residual chlorine? What is the combined concentration of the chlorine residual discharged to the cooling reservoir from the condenser effluent and from the 20-minute, periodic chlorination of the circulating water intake structure and essential cooling water system intake structure?

Response

As described in Section 3.6.2, the residual concentration measured in the condenser effluent is free residual chlorine. The normal concentration discharged to the reservoir from the 20 minute periodic chlorination is .2 ppm free residual chlorine. Total residual chlorine will be discharged in the condenser effluent but is not measured or limited at this point and will vary as described in Section 3.6.2. During periods other than the 20 minute chlorination cycle, no measurable concentration at the condenser discharge is expected. Wording in 3.6.2 will be clarified to reflect that the chlorination of the essential cooling water is separate from the circulating water. The essential cooling water will also be chlorinated periodically for 20 minutes to a level of .2 ppm free residual chlroine at the point of discharge to the essential cooling pond.

[Mark up of Sections 3.6.2 and 5.4.3 attached]

3.6.1.5 Oily Waste Treatment

Small amounts of oily wastes may occasionally result from the normal operation of equipment in the turbine-generator building, diesel generator building, machine shop, firewater pumping building, and lighting diesel generator 7 building. The floor drains of that building are therefore connected to an oily waste surge tank. The surge tank content is routinely processed through a gravity oil separator, and skimmer. 7 This system also serves to contain spills which may result from equipment failures, although the probability of such failures is remote.

In the event of a power transformer failure, any oil spilled will be collected in the curbed transformer area. The oil or oil-water mixture is transferred by gravity to the oily waste surge tank. The oil-water mixture is transferred 7 by pump to a gravity separator and skimmer along with an air floatation unit to reduce the total oil content to less than 15 milligrams per liter. The effluent water is pumped to the plant cooling reservoir. The separated oil is transferred to a storage tank and disposed of offsite by a licensed contractor.

3.6.1.6 Circulating Water System

Each of the plant's two units is served by a condenser having 96,234 titanium 7 tubes. No corrosion inhibitors are added to the circulating water stream. Tube fouling by biological growths is treated by sodium hypochlorite injection and is discussed below.

3.6.1.7 Steam Generator Blowdown System

During power plant operation the steam generator blowdown is routed back to the condenser hotwell through filters and mixed bed demineralizers. The mixed 7 bed resins are not regenerated. Depleted resin is replaced with a fresh charge and disposed of as a potentially radioactive solid waste.

3.6.2 BIOCIDE WASTE SYSTEM

Each unit is served by a three-shell condenser and uses the cooling reservoir to supply circulating water. Four circulating pumps are interconnected by a common discharge header serving the condenser. The effluent from the three shells is discharged through a common effluent header into the cooling reservoir.

The actual operating chlorine dosage is determined by a free residual chlorine monitor located in the condenser's effluent header. When the free chlorine residual reaches 0.2 parts per million, an alarm is sounded. 7 Thus the chlorine dosage is controlled so that a free chlorine residual of no more than 0.2 parts per million remains in the condenser effluent being discharged to the cooling reservoir.

Chlorine in the form of a sodium hypochlorite solution is applied periodically separately, to the circulating water intake structure and to the essential cooling water system pump intake structure to control slime growth in the system heat exchangers and piping ~~condenser tubes and in the circulating water lines.~~ 1 Shock treating is performed three times a day for each system using 20-minute chlorination periods. The interconnection of the circulating water pumps necessitates shock treatment of all three of the condenser

shells at once. The shock chlorination of the total 907,400 gallons per minute circulating water, 52,500 gallons per minute essential cooling water and 23,294 gallons per minute auxiliary cooling water flow is accomplished with a maximum dosage of 6 parts per million for three 20-minute periods a day by the onsite sodium hypochlorite generation system. With two units in operation, the amount of hypochlorite solution required will be doubled.

Although it is not routinely measured, the total residual chlorine present in the condenser effluent being discharged to the reservoir or in the essential cooling water discharged to the essential cooling pond, is the sum of the free available chlorine and the combined available chlorine, which is chlorine in chemical combination with ammonia or organic nitrogen compounds. The total Kjeldahl nitrogen (total organic nitrogen plus ammonia) of the Colorado River fluctuates throughout the year from 0.37 to 0.69 milligrams per liter as nitrogen at the point along the river where the reservoir makeup is taken. The fraction of the concentrated reservoir Kjeldahl nitrogen which combines with the sodium hypochlorite during each 20-minute cooling water treatment period cannot be established.

The hypochlorite solution from the hypochlorination system is diffused into the intake bay of each pump.

The actual chlorine dosage is subject to seasonal variation. During the summer months, with the increased chlorine demand, the maximum dosage of 6 parts per million may be required whereas in the cooler winter months, a lesser chlorine dosage may suffice.

Chlorine in the form of a sodium hypochlorite solution will be applied periodically to the circulating water intake structure and the essential cooling pond. Shock treating will be performed three times a day using 20-minute chlorination periods. The interconnection of the circulating water pumps necessitates shock treatment of all three of the condenser shell at once.

The actual operating chlorine dosage will be determined by a residual chlorine monitor located in the condenser's effluent header. The chlorine dosage will be controlled so that a chlorine residual of no more than 0.2 parts per million remains in the condenser effluent being discharged into the cooling reservoir. 7

5.4.4 EFFECTS

5.4.4.1 Surface Water Effects

The effects of water temperatures, turbulence, and additional chlorine demand in the cooling reservoir will result in rapid depletion of the chlorine residual. Therefore, the chlorine residual resulting from biocide treatment is expected to have negligible effect on the cooling reservoir. It is expected that there will be minor effects on biota in the immediate area of the discharge outfall into the cooling reservoir. Approximately 5,000 pounds of 3 weight percent sodium chloride solution will be discharged to the reservoir daily as a by-product of the sodium hypochlorite generation process. This addition will not significantly affect the sodium chloride concentration of the reservoir. 7

Blowdown water will be discharged from the cooling reservoir to the Colorado River. At these times, the Colorado River flowrate will be at least eight times that of the blowdown. This will result in excess concentrations less than or equal to one-ninth of the discharge excess concentrations during that portion of the time at which discharge occurs. At these concentrations, the discharges from the reservoir will meet the requirements of the TWQB for this portion of the Colorado River and will not affect the use of water downstream. 7

Seasonal variation in concentrations within the cooling reservoir will be due to variations in ambient intake water conditions, evaporation rates, and makeup and blowdown schedules for the cooling reservoir since the STP site is located along tidal reaches of the Colorado River. Intake concentrations of major chemical components will vary considerably with salinities of the intake water. Comparisons made in this section between plant waste discharges and ambient conditions were based on data taken when concentrations of major chemical components in the Colorado River should be near their lowest values because of the high river flow at the time of the study. Therefore, during periods when river flow is low and chemical concentrations of the intake water are much greater, there will be even less effect due to the waste discharges.

The aquatic biota near the plant site is typified by both fresh water and estuarine forms, most of which are tolerant of the stressful conditions characteristic of that area. Those that are not tolerant can be classified as temporary or occasional inhabitants and will not be found under all environmental conditions. Because most inhabitants of the Colorado River near the plant site are adapted to the natural stressful conditions present, the chemical discharges from the plant are anticipated to have no adverse environmental effect on them since these contributions will be minor compared to ambient conditions and natural variations of these conditions.

Question
291.24 What are the present projected concentrations of constituents in the blowdown discharged to the cooling reservoir?

Response

The projected average concentrations of constituents in blowdown from the ECP to the MCR are shown below. The inputs to the MCR from ECP blowdown and other wastes represents only 1.2% of the makeup and will have negligible effect on the overall MCR water quality.

Constituent	Estimated Average Conc.
Calcium as $CaCo_3$ mg/L	410
Magnesium as $CaCO_3$ mg/L	390
Sodium as $CaCO_3$ mg/L	1266
Cations as $CaCO_3$ mg/L	2066
Alkalinity as $CaCO_3$ mg/L	300
Chloride as $CaCO_3$ mg/L	1564
Sulfate as $CaCO_3$ mg/L	198
Phosphate as $CaCO_3$ mg/L	4
Anions as $CaCO_3$ mg/L	2066
Silica as SiO_2 mg/L	38
Iron as Fe mg/L	11
Dissolved Solids mg/L	2510