Nuclear Operating Company

South Texas Project Electric Generating Station 4000 Avenue F – Suite A Bay City, Texas 77414

September 14, 2009
U7-C-STP-NRC-090137

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Response to Request for Additional Information

Reference: Letter, Jessie Muir to Scott Head, "Request for Additional Information, Letter Number Four Related to the Environmental Report for the South Texas Combined License Application", dated August 14, 2009 (ML091620673).

The above referenced letter contained 16 Requests for Additional Information (RAI) pertaining COLA Part 3 Environmental Report. This letter provides responses to 11 of the RAIs including:

01.02-01	05.03.01-01	Corps-01
02.07-06	05.03.02.01-01	Corps-02
04.02-14	05.03.03.01-03	Corps-03
05.02-09	05.09.05-01	

The remaining five RAIs will be transmitted to the NRC on or before September 28, 2009. These include:

03.03-01	05.02-08
05.02-06	05.10-04
05.02-07	

There are no commitments in this letter.

D091
NRO

STI: 32533202

If you have any questions, please feel free to contact me at (361) 972-7136, or Russell W. Kiesling at (361)-972-4716

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

Executed on 9/14/09

Scott Head
Manager, Regulatory Affairs
South Texas Project, Units 3 & 4

rwk

Attachments:
- Attachment 1: RAI 01.02-01
- Attachment 2: RAI 02.07-06
- Attachment 3: RAI 04.02-14
- Attachment 4: RAI 05.02-09
- Attachment 5: RAI 05.03.01-01
- Attachment 6: RAI 05.03.02.01-01
- Attachment 7: RAI 05.03.03.01-03
- Attachment 8: RAI 05.09.05-01
- Attachment 9: RAI Corps-01
- Attachment 10: RAI Corps-02
- Attachment 11: RAI Corps-03

Enclosure:
AEP Avian Protection Plan for RAI 05.03.01-01

cc: w/o attachment except*
(paper copy)

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Question Number: 01.02-01

QUESTION:

Provide a description of the route along the Colorado River to the STP site for barging materials to be utilized for Units 3 and 4.

FULL TEST (Supporting Information):

For cumulative impact and ESA consultation purposes, provide the route for barging material to STP. Will the access to the Colorado River be through the GIWW or the diversion canal in Matagorda Bay? Will travel be from the south (e.g., through the Matagorda Shipping Channel), or from the north (e.g., from Port of Freeport down the GIWW)?

RESPONSE:

At this time, no firm shipping contracts have been developed for transportation of materials to the STP site. However, use of barge transportation will serve a critical role in materials delivery during the construction of STP Units 3 & 4.

Barge transportation will be used for three primary types of cargo including:

- Prefabricated modules
- Large components fabricated overseas
- Bulk commodities

The current plans call for prefabricated modules and components fabricated overseas to be shipped to the Port of Freeport (or points north) where they would be transferred from ocean-going ships to inland barges. These barges would then traverse the Gulf Intracoastal Waterway (GIWW) to the south and proceed upstream along the Colorado River to the site. No traffic is expected to traverse the diversion canal in Matagorda Bay or the Matagorda Shipping Channel since neither have port facilities adequate for the transfer of heavy cargo from ocean-going vessels to inland barges.

Bulk commodities such as aggregate or structural fill materials will likely also be shipped in via inland barge. Depending on the source of the materials, access to the Colorado River would be either from the north or south along the GIWW. No bulk commodity traffic is expected to traverse the diversion canal in Matagorda Bay or the Matagorda Shipping Channel.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 02.07-06:

QUESTION:

Provide updated atmospheric dispersion factors for ER Section 2.7.5.2, updated Exclusion Area Boundary (EAB) distances for Table 7.1-7, and updated dose calculations for Tables 7.1-8 through 7.1-15.

FULL TEXT (Supporting Information):

Safety RAI 02.03.05-8 pointed out apparent discrepancies in distances used for calculation of long-term dispersion analyses for assessing the potential consequences of routine releases for the proposed STP Units 3 and 4. Safety RAIs 02.03.04-3 and 02.03.04-5 dealt with the determination of distances from potential release points for the proposed STP Units 3 & 4 and the exclusion area boundary. STPNOC's responses to these RAIs included changes to the distances used in dose calculation and resultant changes to the atmospheric dispersion and deposition parameter values used in dose calculations in the FSAR and ER. The changes in distances used for the calculations have not been incorporated into the ER. Please incorporate these changes as appropriate.

RESPONSE:

The information requested in this question was provided in the response to Environmental Report RAI 5.4.2-1 (Reference 1). Specifically, revisions to atmospheric dispersion factors in ER Sections 2.7.5.2, 2.7.6.2 and ER Table 7.1-7; updated distances to the Exclusion Area Boundary (EAB), Low Population Zone (LPZ) boundary, site boundary and receptors of interest in ER Tables 2.7-12, 14 and 15; and updated dose calculations for ER Tables 7.1-8 through 7.1-15 were provided in the RAI 5.4.2-1 response.

REFERENCE:

"Response to Request for Additional Information," STPNOC letter, U7-C-STP-NRC-090075, dated July 20, 2009.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 04.02-14

QUESTION:

Clarify the water body(ies) into which dewatering and storm waters would be discharged from construction excavation activities. Specify the anticipated flow rates into Little Robbins Slough if discharge waters would flow into this water body.

FULL TEXT (Supporting Information):

In response to RAI 4.2-6 (letter dated July 2, 2008) regarding water disposal during dewatering activities, STPNOC stated in part "The options could include the following or a combination of the following: 1) water could be decanted to the MCR after pumping to a retention pond. This would not result in impacts to site surface water drainage features. 2) Pump to retention pond(s) then **discharge under TPDES Permit to site surface water body (ies)**. This could impact existing ecologic communities as a result of raising the water levels of the receiving water bodies ..." In response to RAI 4.2.2 (letter dated July 15, 2008), STPNOC stated "Water pumped from construction excavations during dewatering activities would be pumped to the MCR for use. The water could also be discharged to a retention pond where the silt would settle prior to allowing the water to discharge out of a retention pond(s) to site drainage swales and the site ditch system. **If water from dewatering activities were discharged in this manner, the flow in Little Robbins Slough could increase substantially** during this phase of construction ..." However, in FSAR Rev 2 Section 2.5S.4.5.4.1 "Dewatering Method", STPNOC states "The effluent from the dewatering well system will be controlled, and discharged into drop structures. **The discharge points are located in the existing MCR.**" There is no mention of possible discharge to Little Robbins Slough. Regarding the storm water system for the excavated area, FSAR Rev 2 Section 2.5S.4.6.2.2 states "**(t)he storm water will then be pumped into the MCR.**" Again, there is no mention of an alternative involving Little Robbins Slough. In order for the staff to evaluate impacts to aquatic communities on site and within the vicinity of the site, the location for discharge of water from dewatering activities needs to be clarified.

RESPONSE:

Dewatering and storm waters from construction excavation activities will be discharged to the Main Cooling Reservoir (MCR). Since STPNOC's submittal of the July 2, 2008 and July 15, 2008 RAI responses cited in the NRC's RAI question above, STPNOC has determined that maintaining the option to use discharge points other than the MCR for these waters will not be necessary.

For clarification, the "dewatering and storm waters from construction excavation activities" that would be discharged to the MCR are considered to be the groundwater and rain water that enter (and thus require removal from) the excavated area(s). As detailed further in Section 4.2.1.1 of the STP Units 3 and 4 Environmental Report, storm water that falls on other (i.e., grade level) ground surfaces surrounding the excavated area(s) will be controlled under the construction

Stormwater Pollution Prevention Plan (SWPPP) to prevent it from entering the excavated area(s), and to remove sediment prior to its release to site drainage features.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this RAI response.

Question Number: 05.02-09

QUESTION:

Provide details of the calibration of the MCR thermal model.

FULL TEXT (Supporting Information):

The applicant provided a brief description of the calibration of the MCR thermal model in response to staff's RAI 5.2-4. Provide the following additional information:

1. A schematic representation of the MCR used within the model,
2. A list of model parameters that were included in the calibration,
3. The objective function used in the calibration,
4. Goodness-of-fit measures used, and
5. A description of the data and methods used to validate the model predictions of natural and forced evaporation from the MCR.

Also include a description of any analysis performed to determine the sensitivity of the model to parameter values.

RESPONSE:

Response to Item 1:

As stated in the July 30, 2009 response to RAI 5.2-4 (STP Letter U7-C-STP-NRC-090091), the thermal response of the MCR was estimated using a one-dimensional multi-layer hydrothermal model. The model uses a finite difference numerical scheme to solve the governing conservation of mass and heat equations and the surface heat transfer equations. Details about the equations used to calculate the various components of heat fluxes can be found in References 1 and 2.

The configuration of the MCR (shown in Figure 1) was represented numerically in the model by 15 segments of equal surface area and volume as depicted in the schematics in Figure 2. Each segment contains a surface layer where heat transfer with the atmosphere takes place, and 2 bottom layers to account for potential vertical stratification and the return flow for entrainment at the cooling water discharge. The model calculates the rate of net heat fluxes through the free surface of each segment and by applying the heat and mass balance principles, computes the heat flux into the next segment.

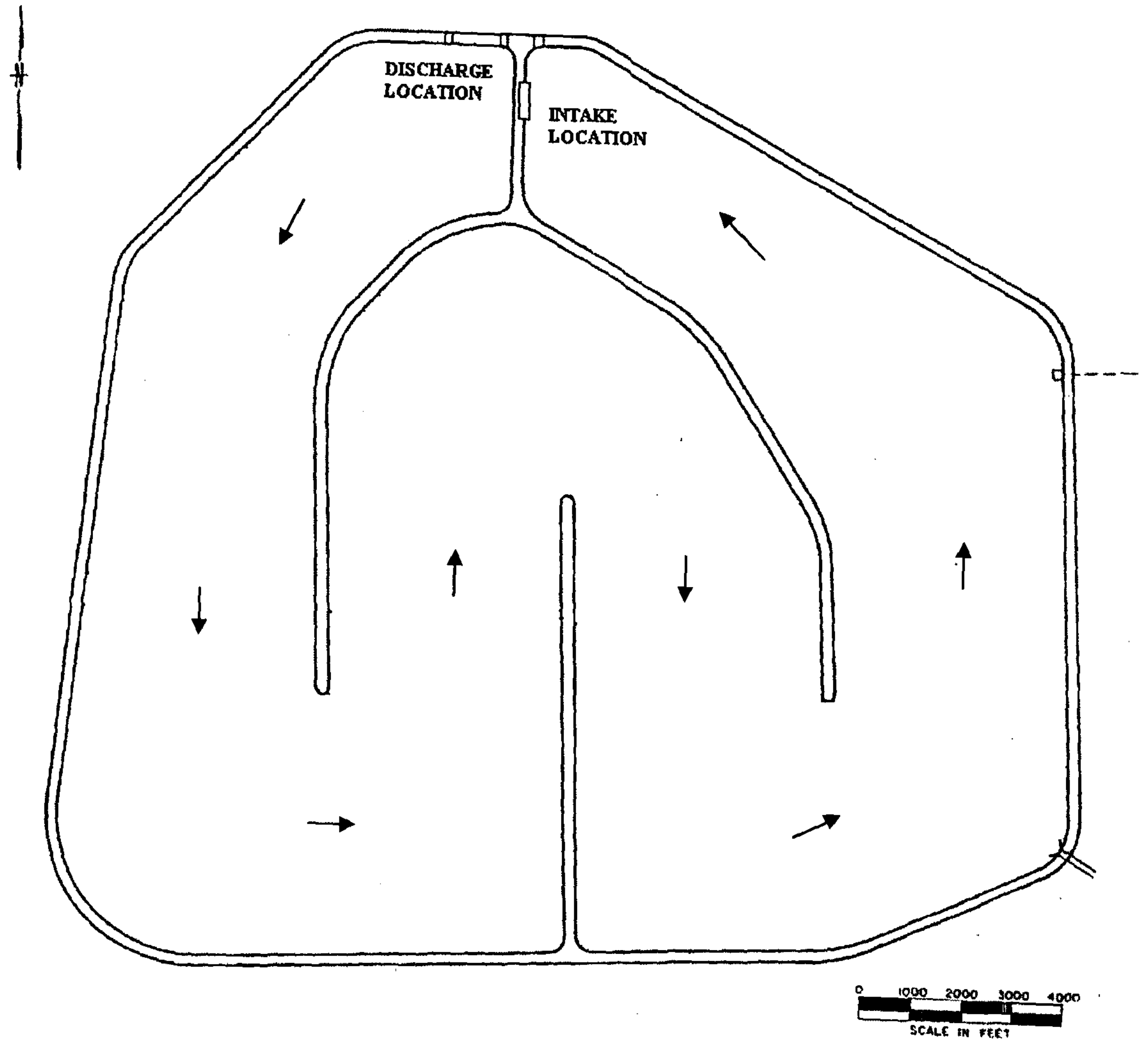


Figure 1: Schematic of the MCR and the predominant flow path.

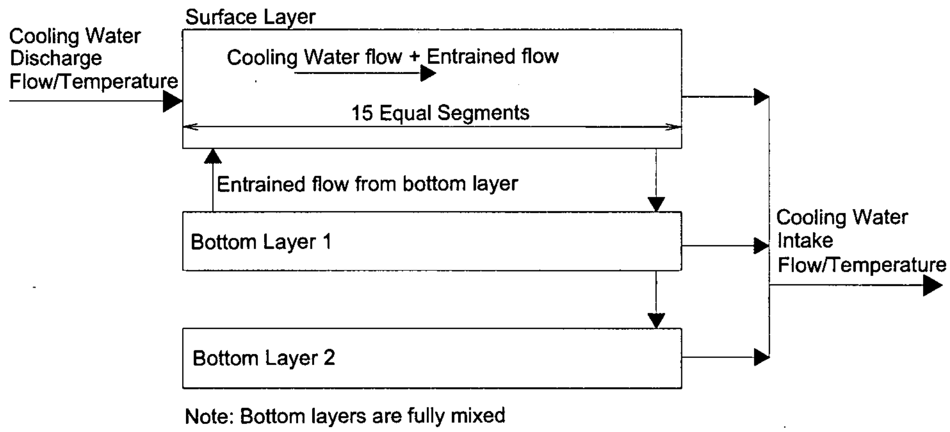


Figure 2: Schematics of the MCR as represented in the model

Response to Item 2:

The MCR thermal model was calibrated using historical meteorological data and historical STP 1 & 2 plant and reservoir operation data from 2002 to 2005 as described in the response to RAI 5.2-4. The historical meteorological data used include:

- Dry bulb air temperature (°F),
- Wind speed (mph),
- Relative humidity (%),
- Cloud cover (Fraction),
- Clear sky solar radiation (Langleys/Day).

The first four data sets were taken from two National Climate Data Center (NCDC) meteorological stations: Victoria (WBAN # 12922) and Victoria Regional Airport (WBAN # 12912). The last data set (clear sky solar radiation) was taken from the Hamon Chart (Figure 3 in Reference 1).

The historical plant data used for the model calibration include the cooling water flow rate and the daily plant heat load input to the MCR as developed from STP 1 & 2 station operation record.

The water surface area of MCR for heat transfer is 6,987 acres in the calibration runs, based on the average MCR water level of 44 ft MSL over the calibration period and in accordance with the MCR stage-surface area relationship provided in Figure 2.4.8-7 of STP UFSAR for Units 1 and 2 (Reference 3) . The corresponding reservoir volume is 164,550 acre-ft.

The first part of the model calibration process was focused on the selection of a wind speed function that can best estimate the evaporative flux across the water surface. Seven wind speed functions were evaluated as discussed in the response to RAI 5.2-4. The Ryan wind speed function (Reference 2), formulated for cooling ponds with imposed heat loads, was selected because it produces more realistic thermal predictions for operating cooling reservoirs. During the MCR thermal model calibration, the predicted water temperature at the cooling water intake and discharge was compared against the temperature observed at the condenser inlet and outlet for the period of 2002 to 2005 by adjusting the calibration parameter, which is the wind speed coefficient of the Ryan function (Reference 2). The calibration objective was to select a wind speed function coefficient that would result in the best agreement between the predicted and observed temperatures, as described further in the following response to Item 3.

Response to Item 3:

As part of the model calibration process, the Ryan wind speed function coefficient was tested over a range varying from 0.90 to 1.08, and the value of 0.94 was found to produce the most satisfactory predictions when comparing with the observed temperatures. The predicted temperatures are plotted against the observed temperatures at the intake and discharge of the MCR in Figures 3 and 4 for the years 2004 and 2005, respectively.

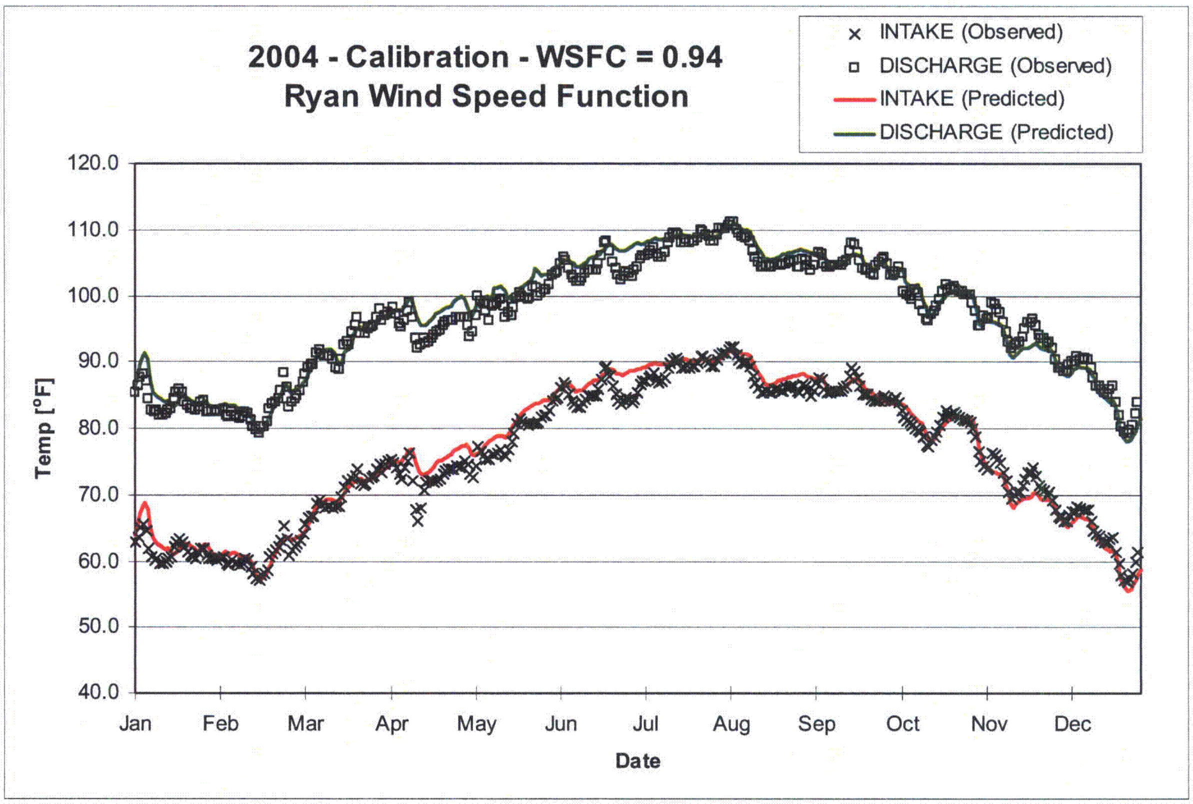


Figure 3: Comparison of the predicted temperature by the thermal model and observed temperatures for 2004.

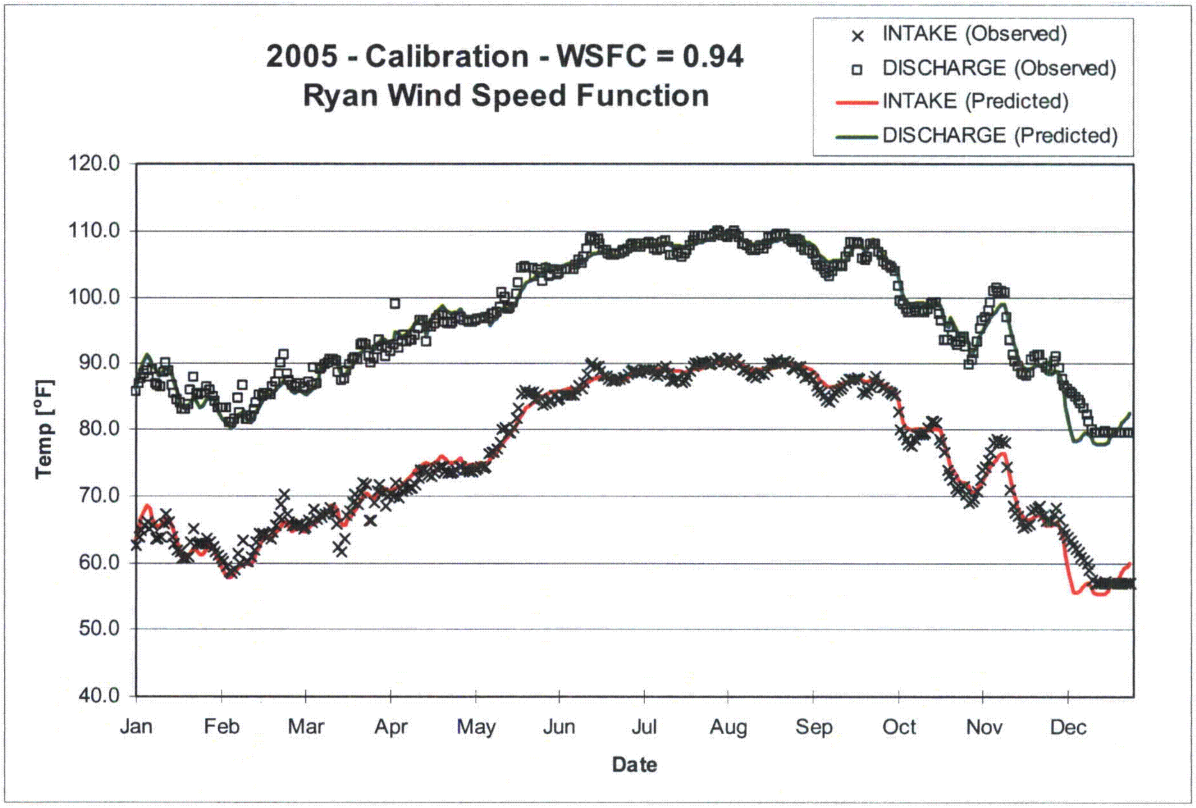


Figure 4: Comparison of the predicted temperature by the thermal model and observed temperatures for 2005.

Two objective functions were used in the calibration: the mean square error (M.S.E.) and the mean error (M.E.) and they are defined as follows:

$$\text{M.S.E.} = \frac{\sum\left(T_{\text{predicted}} - T_{\text{measured}}\right)^2}{N_{\text{values}}} \qquad \text{M.E.} = \frac{\sum\left(T_{\text{predicted}} - T_{\text{measured}}\right)}{N_{\text{values}}}$$

Where: $T_{predicted}$ = temperature predicted by the model

$T_{measured}$ = measured temperature at the intake and discharge of MCR

N_{values} = number of $T_{measured}$ values

The calibrated wind speed function coefficient was determined by both minimizing the mean square error and mean error, and by visual inspection of the temperature time histories, especially the peaks of the intake temperature during the summer months (critical period). The wind speed function coefficient of 0.94 was found to produce the most realistic temperature predictions and was adopted for the calibrated MCR thermal model.

Response to Item 4:

The following table summarizes the goodness-of-fit measures used for the calibrated wind speed function coefficient of 0.94.

Table 1: Mean Square Error and Mean Error of the calibration model runs for the years 2002-2005

		Goodness-of-fit			
Location	**YEAR**	2002	2003	2004	2005
Discharge Temperature (°F)	Mean Square Error	2.3	3.3	2.8	2.3
	Mean Error	0.0	0.2	0.6	-0.1
Intake Temperature (°F)	Mean Square Error	2.1	3.5	3.0	2.4
	Mean Error	0.0	0.2	0.6	-0.1

Response to Item 5:

The thermal model uses a heat flux budget method to estimate the heat transfer through the surface of a water body. One of the heat flux components that the model estimates is the evaporative heat flux, Φ_E. There is an extensive literature that addresses the calculation of the evaporative heat flux and the general equation, from Section 2.4 of Reference 2, as shown below:

$$\Phi_E = \rho\, L_V\, F(W)\, (e_s - e_a)$$

Where Φ_E is the evaporative heat flux from a water surface (BTU/ft^2-day)
ρ is the density of water (lbm/ft^3)
L_V is the latent heat of evaporation, equal to 1060 Btu/hr
F(W) is the wind speed function (Btu/ft^2-day-mm Hg)
e_s is the saturation vapor pressure of the air at the temperature of the water surface (mm Hg)
e_a is the vapor pressure at 2 meters above the water surface (mm Hg).

This equation is used by the thermal model to estimate the natural and forced evaporation from the MCR. As part of the calibration process, seven wind speed functions, which are Lake Hefner, Meyer, Lake Colorado City, Brady, Ryan, Throne, and EPRI, were evaluated. The Lake Hefner function was selected for the prediction of the natural evaporation of the MCR, following the recommendation in Reference 2 for cooling pond systems with no imposed heat load. For the MCR thermal model simulations with imposed heat load from the 2 existing units and from Units 3 and 4, the Ryan function was selected.

An extensive review of laboratory experiments and field data that validate the use of the above equation for predicting the natural and forced evaporation in cooling ponds is presented in Reference 2. The validation of the MCR natural and forced evaporation predictions is presented in the January 22, 2009 response to RAI 2.3-6 (STP Letter U7-C-STP-NRC-090006) as part of the validation of the water quality model using the following historical STP 1 & 2 operational data from January 1, 2004 to December 31, 2005:

- Daily diversion flows from the Colorado River
- Heat load from Units 1 & 2 to MCR.
- Water level in the MCR

Based on the historical operational data of Units 1 & 2, the thermal model predicts the total (natural plus forced) evaporation from the MCR for the years 2004 to 2005. This information is used as an input to the water quality model that also tracks the water surface elevation in the MCR. Other input parameters to the model for predicting the water surface elevation are the daily diversion flows from the Colorado River, daily rainfall and seepage loss from the MCR. The good agreement between the predicted water surface elevation and the observed data as demonstrated in Figure 5 validates the capability of the thermal model to predict the evaporative flux from the MCR.

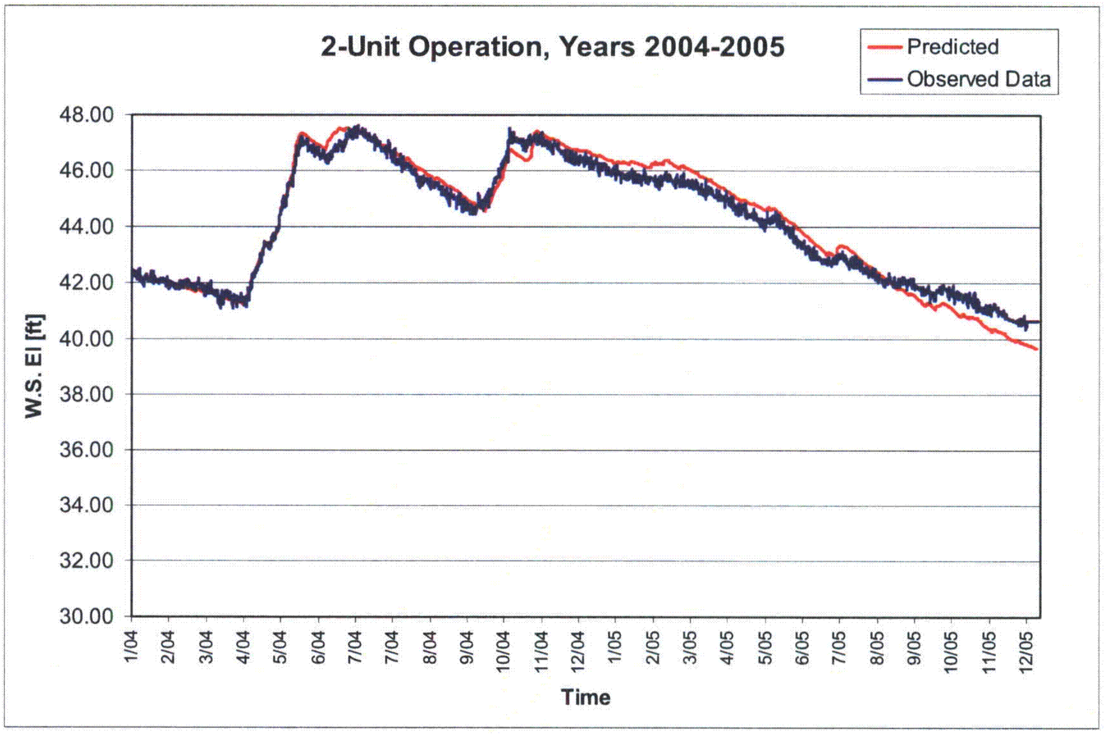


Figure 5: Comparison of Predicted and Observed Water Levels in the MCR for 2-Unit Operation from 1/2004 to 12/2005

Response on Sensitivity of the MCR Thermal Model

The sensitivity of the thermal model with respect to the different wind speed functions and wind speed function coefficients were evaluated as part of the calibration process described above. In addition, the number of segments and the bottom layer allocation in terms of the number and the depth of bottom layers were evaluated. The simulated thermal response was found to be relatively insensitive, and as an example, was within a range of 0.2°F for the test cases with different bottom layer configurations.

REFERENCES:

1. Proceedings of Stormwater and Water Quality Model Users, Group Meeting, April 12-13, 1984, EPA-600/9-85-003.

2. Ryan, P .J. and D. R. F. Harleman 1973. "An Analytical and Experimental Study of Transient Cooling Pond Behavior", Report No. 161, Ralph M. Parsons Laboratory, Department of Civil and Environmental Engineering, Massachusetts Institute of Technology, Cambridge, MA, 1973.

3. "STPEGS Updated Final Safety Analysis Report (UFSAR) for Units 1 & 2" Revision 13.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this RAI response.

Question Number: 05.03.01-01

QUESTION:

Provide a description or document that outlines the procedures followed by electrical transmission line operators to minimize bird strikes and electrocution risk. If an *Avian Protection Plan* or avian protection policies are used by transmission line operators to implement protective measures, provide copies of these documents.

FULL TEXT (Supporting Information):

STP lies within the Central migratory flyway for birds and is within 10 miles of several migratory songbird stopover areas. The Texas Parks and Wildlife Department has provided a scoping letter to the NRC (May 18, 2008) that requests an analysis of the potential increase in bird strikes from proposed new/upgraded aerial electrical transmission lines and information regarding proposed measures to reduce avian mortality (i.e., line markers).

RESPONSE:

STPNOC neither owns nor controls transmission line rights-of-way (ROW) and consequently can not control activities that occur within those ROWs. There are three transmission line service providers that own or operate transmission lines associated with the South Texas Project. They include AEP, CenterPoint Energy, and CPS Energy. Each entity was contacted and copies of applicable Avian Protection Plans or avian protection policies were requested. At the time this RAI response was due, only AEP had responded to the request. A copy of the AEP Avian Protection Plan is enclosed.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response

Question Number: 05.03.02.01-01

QUESTION:

Provide clarification of data used in STPNOC's CORMIX simulation.

FULL TEXT (Supporting Information):

In response to staff's RAI 5.3.2-1, STPNOC provided input files and previously collected data that supported a CORMIX simulation of the MCR blowdown discharge to the Colorado River. In order for the staff to evaluate if these data are suitable for input into CORMIX, provide (a) the date(s) when the cross section of the Colorado River was measured, (b) the reference datum used for these depth measurements and the reference datum for the cross section depth values reported in the files provided by STPNOC to the staff, (c) any discharge measurements made concurrently on the same date(s), (d) location in the Colorado River with respect to the blowdown discharge diffuser where the cross section was measured, (e) description of how the "cold-end pond temperature" was estimated, and (f) the location within the MCR that corresponds to the "cold end."

RESPONSE:

Based on the revised CORMIX parameters described in parts a through f of this response, STPNOC has performed a revised CORMIX simulation. The results of that simulation are described in part g) of this response.

a) The cross-section of the Colorado River used in the Cormix simulation of the MCR blowdown was taken from the bathymetric survey of November 7, 2006.

b) Since the water surface elevations are reported as zero in the bathymetric study and in the cross-sections supplied to staff, the reported depth measurements are true water depths measured on that date and are independent of reference datums. The NAVD'88 vertical reference datum was used during the bathymetry study. The NAVD'88 datum is 0.2 feet less than the NGVD'29 elevation (i.e., NAVD'88 – NGVD'29 = -0.2 feet) in the area of the survey.

c) The river discharge measured on November 7, 2006 by the USGS flow gage on the Colorado River near Bay City, Texas (the nearest USGS flow gage to STP) was 888 cfs (http://waterdata.usgs.gov/nwis/dv?referred_module=sw&site_no=08162500). There are no major river inflows to the Colorado River between this USGS gage and the STP site. The difference in gage height between river flows of 2464 cfs (the river flow used in the Cormix analysis) and 888 cfs is 2.69 feet (http://nwis.waterdata.usgs.gov/nwisweb/data/exsa_rat/08162500.rdb). That is, the river surface is 2.69 feet higher for a river flow of 2464 cfs than for the conditions during the bathymetric study.

d) Cross-sections were measured at 78 locations spanning the river from upstream of the Reservoir Makeup Pumping Facility (upstream of all blowdown discharge ports) to downstream of discharge port no. 7 (the furthest downstream blowdown discharge port). The cross-section used in the discharge impact modeling (cross-section HHH of the bathymetric study) was that most central to the seven discharge ports, being near the middle discharge port (#4). The river width and depth (cross-sectional area/width) used in the revised Cormix modeling (described in part g, below) was 321 feet x 17.59 feet. This is based on the same cross-section, accounting for the change in river surface elevation described in part c, above.

e, f) The cold-end pond temperature corresponds to the CWS Intake. The cold-end pond temperature used in the previous Cormix simulation is given in ER (Rev.02), Table 3.4-3, under the heading CWS Intake Average Monthly Temperature. Estimated discharge temperature excess was calculated for each monthly average temperature in that table by subtracting the river grab sample temperature taken during that month, as given in ER Rev.02 Table 2.3.3-1(a), from the corresponding Table 3.4-3 CWS intake (cold-end) temperature. The maximum estimated monthly discharge temperature excess, 20.41°F, was found for March 2003 (75.38°F cold-end temperature, 12.76°C river temperature) and was used in the previous Cormix simulation.

Subsequent to the previous Cormix simulation, a new MCR analysis (including temporal temperature distributions within the MCR at the CWS discharge, MCR blowdown, and CWS intake locations) was performed and described in the response to RAI 2.3-6. That analysis simulated daily historical 4-unit 100%-power temperatures at the MCR blowdown for a 50+ year period through 2005. River grab samples in the plant vicinity were taken by the Lower Colorado River Authority from 1982 and included 172 days of river temperatures corresponding to the MCR simulation period. Discharge excess temperatures (MCR blowdown location temperature – river temperature) for each of these 172 days was calculated and a maximum discharge temperature excess of 21.32°F (64.86°F blowdown temperature, 6.41°C = 43.54°F river temperature) was found, corresponding to conditions on January 4, 2001. Those January 4, 2001 temperatures were used in the revised Cormix modeling presented in part g, below.

g) Revised Cormix simulation.

Parameters Common to Previous and Revised Analysis

The revised Cormix analysis of the MCR blowdown into the Lower Colorado River, like the previous analysis, used Cormix version 5.0 (March, 2007). Physical discharge parameters were taken from the STP 3&4 COL ER. The discharge consists of a set of 7 downstream ports located near the stream bank (ER Section 5.3.2.2.1). These ports are spaced nominally 250 feet apart in a downstream direction (ER Figure 3.4-4). Each port is 3-feet in diameter, pointing 45 degrees from the flow direction into the river in the horizontal plane (ER Figure 3.4-4). Each port is ~3-feet from the river bottom; the vertical angle of each port with the horizontal plane = 0 (ER Figure 3.4-4).

The maximum blowdown discharge rate of 308 cfs (ER Section 5.3.2.2.1) was analyzed. The minimum river flow into which this blowdown flow would be discharged is 8 times the discharge flow (ER Section 5.3.2.2.1), or 2464 cfs. Since Cormix does not explicitly handle a system of ports such as used at STP (because of the relatively large distance between the ports) a single port was analyzed with Cormix and those results generalized to the 7-port STP system. A single port discharges 308 / 7 = 44 cfs.

Revised Analysis

The only parameter changes to the previous analysis are the conceptualized river cross-section (321-feet wide x 17.59-feet deep, see part d above) and the discharge (64.86°F) and river (43.54°F) temperatures (see parts e, f above). Using these parameters, the Cormix results for a single port show that the discharge acts as a bottom-attached jet, which lifts off the bottom after about 60-feet and eventually impinges the surface after about another 60-feet with a small (~9-foot) upstream intrusion wedge. The plume then undergoes buoyant spreading as it is transported downstream with the ambient river flow and becomes laterally fully mixed (end of buoyant spreading region) at about 1060-feet downstream from the discharge point.

The impact of the complete discharge system was simulated by superposing the solution for a single port at each of the 7-discharge locations which are spread 250 feet apart. The dilution parameter, S (entrained flow in the plume/ discharge flow), was calculated for the complete system {$S_{total} = 1/\Sigma\ (1/S_i)$, where i = 1 to 7 for each of the 7-ports}. The plume temperature excess (above ambient) is then given as $\Delta T_{discharrge}/\ S_{total}$.

The plume temperature excess of 5°F was found to lie in the laterally fully mixed (i.e., across the entire width of the river) portion of the plume at a downstream distance of 2.1 miles from the furthest upstream port (1.8 miles from the furthest downstream port). Although the plume is laterally fully mixed, the plume's buoyancy restricts the thermally impacted portion of the river to the upper 9.6 feet of the river's depth at this location; the temperature in the bottom 8.0 feet of the river is at natural ambient temperatures. The discharge becomes fully mixed with the river (laterally and vertically) 4.1 miles from the downstream end of the discharge system, where the fully mixed temperature excess is 2.4°F.

Effect of MCR Salinity

The previous and above revised mixing analyses assumed no salinity difference between the discharge and river waters. The MCR analysis mentioned in parts e and f above simulated long-term daily MCR and river conductivities. The results of imposing long-term average and date (1/4/2001) specific salinities on top of the modeled temperatures are summarized here.

The MCR modeling indicated long-term (50+ years) river and MCR conductivites of 3720 and 6260 µS/cm, which were estimated to result in river and MCR discharge densities of 1001.66 and 1001.37 kg/m^3. With these conditions, the 5°F isotherm extends 730 feet downstream from the furthest downstream port and would cover about 55% of the river width and 65% of its depth; lesser temperature rises would be seen out to the river bank and over about 79% of the river's depth. Ambient river water would flow beneath this.

The MCR modeling also indicated river and MCR conductivities of 940 and 7050 µS/cm on 1/4/2001, which together with the modeled temperatures were estimated to result in densities of 1000.37 and 1001.73 kg/m^3. With these conditions, the 5°F isotherm extends 1.3 miles from the furthest downstream port, would cover the entire width of the river and would occupy the upper 54% of the river's depth.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

Question Number: 05.03.03.01-03

QUESTION:

Provide an analysis of UHS cooling tower impacts for normal operation.

FULL TEXT (Supporting Information):

The text on ER Rev 2 page 5.3-21 (Section 5.3.3.1) states that the input to the SACTI code analysis of cooling tower impacts is for the 'normal' operational mode. However, review of the information in the input files and comparison of that information with information on UHS cooling tower operation in ER Section 3.3 (Table 3.3-1), ER Section 3.4 (Table 3.4-1), and FSAR Sections 9.2.5.3 through 9.2.5.6 clearly shows that the SACTI analysis is for maximum heat rejection. The FSAR indicates that maximum heat rejection would only last for about 3 days following reactor shutdown. It is also likely that simultaneous shutdown of both Units 3 and 4 would be infrequent. Therefore, the potential impacts (visible plume characteristics and salt deposition) of UHS cooling tower operation are significantly over-estimated. The ER needs to present realistic estimates of environmental impacts. Note also that the drift eliminator description in the July 2008 SACTI input file is not the same as found in FSAR Section 9.2.5.5.2 (3) Drift Losses (Page 9.2-11). The FSAR indicates a "...2-inches center-to center Belgian wave form" drift eliminator. The SACTI input file indicates a "Standard Herringbone" drift eliminator. Update the FSAR, ER, and input to SACTI to be consistent and provide a revised SACTI analysis for normal plant operation based on the consistent cooling tower information.

RESPONSE:

The SACTI code analysis presented in ER Rev 2 was based on emergency shutdown operating conditions instead of at normal operating conditions as stated in the section. The SACTI analysis presented in the ER has been revised to incorporate normal operating conditions and provide realistic estimates of environmental impacts. The SACTI analysis was also revised to include the Belgian Wave Form drift eliminator instead of the Standard Herringbone drift eliminator. The FSAR does not require revision since the correct drift eliminator design was identified in the FSAR.

CANDIDATE COLA REVISION

ER Sections 5.3.3, 5.1.1.1, and 5.8.1.3, Table 5.10-1, and ER Figure 5.3-1 will be revised as follows.

5.3.3 Heat Dissipation Systems

This section describes the impacts of the heat dissipation system during operation of STP 3 & 4, including the impacts of heat dissipation on the atmosphere and on terrestrial ecosystems. Consideration is given to potential atmospheric phenomena resulting from operation of this heat-dissipation system and the significance of the potential environmental impacts on terrestrial ecosystems and human activities in the STP site vicinity.

5.3.3.1.1 Heat Dissipation to the Atmosphere

As described in Section 3.4, a closed-cycle cooling system will be used for STP 3 & 4, using the existing MCR. Additionally, mechanical draft cooling towers will be constructed to assist in heat load dissipation and serve as the UHS. Thermal discharges resulting from plant ~~these~~ systems will be to the MCR and to the atmosphere. During normal operating conditions, most of the heat load from STP 3 & 4 will be to the MCR, and each of the towers would operate at one-half capacity. The cooling towers would operate at full capacity during emergency reactor shutdown.

Main Cooling Reservoir

The plume from a cooling pond like the MCR would either exist as a ground level fog over the pond that will evaporate close to the edge of the pond, or lift to become stratus for moderate to calm wind conditions. Elevated plumes and the associated shadowing would not be expected from the operation of the MCR. NUREG-1555 also concludes that drift from a cooling pond or lake would not need to be considered. Therefore, only fogging and the associated icing impacts are considered for the operation of the MCR.

Mechanical Draft Cooling Towers

Cooling towers evaporate water to dissipate heat to the atmosphere. The evaporation is followed by partial recondensation which creates a visible mist or plume. The plume creates the potential for shadowing, fogging, icing, localized increases in humidity, and possibly water deposition. In addition to evaporation, small water droplets are blown out of the tops of the cooling towers. The water droplets are referred to as drift and can deposit water and dissolved salts on vegetation and surfaces.

For STP 3 & 4, STPNOC modeled the impacts from fogging, icing, shadowing, and drift deposition using the Electric Power Research Institute's Seasonal/Annual Cooling Tower Impact (SACTI) prediction code. This code incorporates the modeling concepts presented by Policastro et al., which were endorsed by the NRC in NUREG-1555 (References 5.3-29 and 5.3-16). The model provides predictions of seasonal and annual cooling tower impacts from mechanical or natural draft cooling towers. It predicts average plume length, rise, drift deposition, fogging, icing, and shadowing, providing results that have been validated with experimental data (Reference 5.3-29).

Engineering data for the ABWR was used to develop input to the SACTI model for normal operations. The SACTI model simulated two identical cooling towers, each with a maximum heat rejection rate of ~~4.6×10^8~~ 30.5 ~~Btus per hour~~ MW and a maximum circulating water flow of ~~64,200~~43,101 gallons per minute. The cooling towers are located south of each unit. The cooling tower height would be 119 feet. Three cycles of concentration were assumed for the analysis. The meteorological data was from the STP 1 & 2 meteorological tower for the years 1997, 1999, and 2000, and from the National Climatic Data Center for the same years from the Palacios Municipal Airport (Reference 5.3-30). Additional physical and performance characteristics of the mechanical draft cooling towers during normal operations would be as follows:

Parameter	Value
Number of cooling towers	2
Tower width	52 feet
Tower length	284 feet
Diameter of individual fan outlet	28.3 feet
Number of fans per cooling tower	~~6~~3
Cooling tower height (above surface elevation)	119 feet
Surface elevation (above MSL)	0 feet
Design duty	~~4.6 ×108 Btu/hr~~30.5 MW
Maximum drift rate (percentage of circulating water flow rate)	0.005%
Circulating water flow rate	~~64,200~~43,101 gpm
Cooling range	6.7°F
Approach	14.4°F
Dry bulb temperature	115°F
Wet bulb temperature	85.3°F
Air flow rate per fan	~~934,567~~923,200 cubic feet per minute
Cycles of concentration	3
Salt (NaCl) concentration	800 mg/L

5.3.3.1.2 Length and Frequency of Elevated Plumes for Mechanical Draft Cooling Towers

The SACTI code calculated the expected plume lengths by direction for each season for the combined effect of the two mechanical draft cooling towers. The plumes would occur in all compass directions. The average plume length and height was calculated from the frequency of occurrence for each plume based on the distance from the tower. The median plume length and height is the distance where half of all the plumes would be expected to be shorter than that distance.

The average plume length would range from ~~0.4~~0.2 miles in the summer season to ~~1.9~~0.4 miles in the winter season. The annual prediction for the average plume length is ~~1.2~~0.3 miles from the cooling towers. The median plume length would be less than two tenths of a mile for each season and annually. The average plume height ranges from ~~170~~ 110 feet in the summer season to ~~930~~ 720 feet in the winter season. The annual prediction for the average plume height is ~~610~~ 180 feet. The median plume height would be ~~98~~ 66 feet in every season. The annual prediction for the median plume height would also be ~~98~~ 66 feet. The plume would extend beyond the site boundary for a maximum of ~~92~~ 30 hours during the winter season to the north of the cooling towers. The annual prediction for the time that the plume extends beyond the site boundary was ~~170~~ 43 hours per year in the north-northwest direction.

The plumes from the cooling towers would occur in each direction of the compass and would be spread over a wide area, reducing the time that the plume would be visible from any particular location. The average plume lengths would be short and would not be long enough to reach the site boundary in most directions. Due to the varying directions and short average plume height and length, impacts from elevated plumes would be SMALL and not warrant mitigation.

As modeled, plumes from the mechanical draft cooling towers would be as follows:

	Winter	**Spring**	**Summer**	**Fall**	**Annual**
Predominant direction	North	North-northwest	North	South	South
Average plume length (miles)	~~1.9~~0.44	~~1.1~~0.23	~~0.4~~0.17	~~1.5~~0.37	~~1.2~~0.30
Median plume length (miles)	~~0.19~~0.12	0.12	0.12	0.12	0.12
Average plume height (feet)	~~930~~720	~~570~~140	~~170~~110	~~730~~230	~~610~~180
Median plume height (feet)	~~98~~66	66~~98~~	66~~98~~	66~~98~~	66~~98~~
Maximum hours the plume extends beyond the site boundary	~~92~~30	~~63~~9	~~6~~1	~~27~~11	~~167~~43
Direction of maximum time plume extends beyond site boundary	North	North-northwest	North-northwest	North-northwest	North-northwest

5.3.3.1.3 Ground-Level Fogging and Icing

<u>Main Cooling Reservoir</u>

The MCR is an approximately 7000 acre cooling pond that was originally designed to serve as the heat removal system for four nuclear power reactors. Only two of the four originally proposed nuclear power reactors were constructed, and these two reactors (STP 1 & 2) use the MCR for cooling. STPNOC has proposed to construct two ABWR reactors at STP. These new reactors (STP 3 & 4) would also use the MCR for heat removal. Although the MCR was designed for four reactors, the additional heat load from the new units would increase the potential for fogging from the MCR.

A fog monitoring program was initiated before the operation of STP 1 & 2 to assess the impact of operation of the MCR on local meteorology. The monitoring program was conducted in two phases. Phase I (pre-operation) began in May 1987 and continued for one year collecting data before the August 1988 commercial operation of STP Unit 1. Phase II (post-operation) began in June 1989 after commercial operation of STP Unit 2 and continued for one year until June 1990. Fog monitoring was accomplished by operation of two visibility meters. One visibility meter was located on FM 521 approximately one mile northwest of STP 1 & 2. The second visibility meter was located approximately 11 miles west-southwest of STP 1 & 2 to serve as a control site. The pre-operational monitoring results totaled 229 hours per year for the FM 521 monitoring station and 163 hours per year for the control monitoring station. The increase in actual hours of fogging was 33 hours for the FM 521 monitoring station and 56 hours per year at the control monitoring station. The control monitoring station resulted in a greater increase in fogging events, indicating an overall increase in natural fog occurrence in the area during the period of the monitoring program. The results of the fog monitoring program do not indicate that the presence of the MCR significantly increases the fog occurrence over the naturally occurring fog for STP 1 & 2.

To determine the increase in fogging potential once STP 3 & 4 becomes operational, the MCR was modeled using the Gaussian Plume Model to determine the downwind plume concentrations of moisture from MCR water evaporation. Inputs for the Gaussian Plume Model include the receptor height, release height, source strength, wind speed, and vertical and lateral plume dispersion parameters. The vertical and lateral plume dispersion parameters were functions of downwind distance and stability class. The MCR was approximated as a square with each side being 5322-meters long, which corresponds to the square root of the pond area. Because of the size of the MCR in relation to the receptor location, the Gaussian Plume model, which is for a point source, was generalized to describe an area source. The generalization was calculated by integrating the point source solution over the pond area. Additional details of the model are discussed in the calculation package (Tetra Tech 2008).

Daily evaporation rates in inches were provided from the MCR Thermal Calculation. The MCR Thermal Calculation predicts the water consumption from two unit (existing units) and four unit (existing units plus the proposed new units) operation. One of the outputs of this study is the daily evaporation rates. Values of daily evaporation for both the two unit operation and four unit operation at 93% and 100% load factors were provided. The daily evaporation for two and four unit operation at 100% load factor was converted to hourly evaporation rates using the hourly wind speed and relative humidity. Those hourly rates served as the source term in the model. The 100% load factor was assumed for conservatism.

The meteorological data used in the analysis was the same as the data used in other sections of the ER. The data was collected onsite from the STP 1 & 2 meteorological tower for the years 1997, 1999, and 2000. This data included the wind speed, wind direction, and stability class. Additional data was acquired from the National Climatic Data Center for the Palacios Municipal Airport. This data, also for the years 1997, 1999, and 2000, included the dew point temperature and the dry bulb temperature. The relative humidity of the ambient air was calculated from the dry bulb temperature and the dew point temperature.

There were two receptor locations identified, Receptor 1 is 500 meters north of the edge of the MCR on FM 521. Receptor 2 is 1800 meters north of the edge of the MCR along FM

521 where the road arcs around STP 1 & 2. These are expected to be the most sensitive locations to fogging events because of the proximity of these locations to the MCR and because they are in the predominant wind direction. Impacts at these receptor locations would bound any impact at other receptor locations. Because of the size of the MCR, wind blowing from multiple directions could pass over the MCR and reach the receptor locations. For this reason, any wind direction northward from East to West was assumed to pass over the MCR and reach the 500 meter receptor location, and any wind direction northward from Northeast to Northwest was assumed to pass over the MCR and reach the 1800 meter receptor location. The receptor locations were also assumed to be at the ground elevation of STP 1 & 2. The berm around the MCR is approximately 37 feet above the elevation of STP 1 & 2. Therefore, the plume would be released at a higher elevation than the receptor, and this elevation difference is accounted for in the model.

The number of times that the wind was blowing in one of the receptor locations for the entire meteorological period is provided in Table 1. The wind direction is toward Receptor 1 for 64 percent of the year and toward Receptor 2 for 47 percent of the year. This confirms that any impacts observed at these receptor locations would bound other receptor locations. Since the meteorological data was for three years, the total was divided by three to get an average annual number of hours that the wind direction is toward one of the receptors.

Table 1. Number of hours that the wind direction is towards a receptor.

Month	Total number of hours that the wind direction is toward Receptor 1	Annual number of hours that the wind direction is toward Receptor 1	Percentage of time that the wind direction is toward Receptor 1	Total number of hours that the wind direction is toward Receptor 2	Annual number of hours that the wind direction is toward Receptor 2	Percentage of time that the wind direction is toward Receptor 2
January	1240	413	56%	915	305	41%
February	1239	413	61%	908	303	45%
March	1494	498	67%	954	318	43%
April	1430	477	66%	1022	341	47%
May	1700	567	76%	1398	466	63%
June	1820	607	84%	1560	520	72%
July	1922	641	86%	1658	553	74%
August	1730	577	78%	1428	476	64%
September	1200	400	56%	810	270	38%
October	1168	389	52%	625	208	28%
November	937	312	43%	588	196	27%
December	849	283	38%	496	165	22%
All Months	**16729**	**5576**	**64%**	**12362**	**4121**	**47%**

The model simulation then used the inputs described above to determine the number of hours that the relative humidity of the plume from the MCR would be 100 percent when only the heat load from the existing units was applied to the MCR. This value was then divided by three, the number of years in the meteorological period, to determine the average number of hours per year that the plume would have a relative humidity of 100 percent at one of the receptor locations. These would be hours where the potential for fogging would be significantly increased. Table 2 provides this information by month and annually.

Table 2. Number of hours predicted at each receptor location where the Relative Humidity of the plume would be 100 percent for STP 1 & 2.

Month	Hours predicted with 100% Relative Humidity at Receptor 1	Percentage of the time with 100% Relative Humidity[a]	Hours predicted with 100% Relative Humidity at Receptor 2	Percentage of the time with 100% Relative Humidity[a]
January	19	3%	9	1%
February	19	3%	5	1%
March	27	4%	7	1%
April	20	3%	3	0%
May	11	1%	1	0%
June	25	3%	7	1%
July	30	4%	5	1%
August	22	3%	4	0%
September	32	4%	7	1%
October	28	4%	5	1%
November	42	6%	15	2%
December	39	5%	12	2%
Annually	**314**	**4%**	**81**	**1%**

a. Compared to the total number of hours.

The total number of discrete events associated with the above information was also determined. If two or more consecutive hourly outputs resulted in the relative humidity of 100 percent, these were counted as a single discrete event. The total number of hours presented in Table 2 could then be divided by the number of discrete events to determine the average amount of time that each event lasts. Table 3 provides this information by month and annually. It can be seen that the average time for each event is fairly constant throughout the year.

Table 3. Average time that the Plume Relative Humidity is 100 percent at each receptor location for STP 1 & 2.

Month	Number of discrete events where the Relative Humidity is 100% at Receptor 1	Average number of hours that each discrete event lasts at Receptor 1	Number of discrete events where the Relative Humidity is 100% at Receptor 2	Average number of hours that each discrete event lasts at Receptor 2
January	9	2	5	2
February	7	3	3	2
March	9	3	4	2
April	9	2	3	1
May	5	2	1	1
June	10	2	4	2
July	15	2	4	1
August	10	2	2	2
September	13	2	3	2
October	12	2	3	2
November	15	3	6	3
December	11	4	5	2
Annually	**125**	**3**	**42**	**2**

The Gaussian Plume Model described above does not predict when or if fogging may occur. The output of the model is the number of hours that the relative humidity at a receptor location is 100 percent. Fogging is dependent on a number of meteorological factors and is not easily calculated. For this determination, an approximation between the number of hours of high relative humidity and the number of hours of observed fogging was determined. Five years of additional data from the National Climatic Data Center for the Palacios Municipal Airport was acquired. The data was for the years 2002 through 2006 and contained the dry bulb temperature, the dew point temperature, the number of hours of observed fog, and observations of visibility. The number of observations where the relative humidity of this data set was equal to 100 percent (determined by the difference between the dry bulb and dew point temperatures being zero) was determined to be 3,325. Of these observations, the total number of records that also contained observations of fog was determined to be 1,379. Therefore, 41 percent of the time that the Relative Humidity at the Palacios Municipal Airport was equal to 100 percent, there was also fogging. Although this is not an ideal way to determine the relationship between fogging and relative humidity, it should give an approximation that is realistic. Further statistics with this data set were calculated, and it was determined that 87 percent of all fogging observations occurred when the difference between the dry bulb and dew point was less than or equal to 20F.

The number of events where visibility was impaired, where the visibility was less than 0.3 miles, was also determined from the 2002 through 2006 Palacios Municipal Airport meteorological data. Similar to the observed fogging events determination described above, the number of times that visibility was less than 0.3 miles and the relative humidity was equal to 100 percent was determined to be 214 hours. Therefore, 6 percent of the time that the relative humidity was 100 percent, the visibility was impaired.

Both the percentage of fogging and percentage of time that the visibility was impaired was applied to the number of times that the predicted relative humidity would be 100 percent from the MCR plume at the receptor locations. Table 4 presents the predicted fogging and impaired visibility for the two unit operation.

Table 4. Predicted fogging and impaired visibility at the downwind receptor locations for STP 1 & 2.

Month	Hours of predicted fogging events at Receptor 1	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 1	Hours of predicted fogging events at Receptor 2	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 2
January	8	1	4	1
February	8	1	2	0
March	11	2	3	0
April	8	1	1	0
May	5	1	1	0
June	10	2	3	0
July	12	2	2	0
August	9	1	2	0
September	13	2	3	0
October	12	2	2	0
November	18	3	6	1
December	16	3	5	1
Annually[a]	**130**	**20**	**33**	**5**

[a] Number of annual hours may not equal sum of monthly hours due to roundoff.

Annually, 130 hours of fogging was predicted for locations northward between the East and West and within 500 meters of the edge of the MCR. This would approximate the closest approaches of FM 521. Fogging was predicted to occur for 33 hours annually for locations farther from the MCR, such as along FM 521 north of STP. The receptor location for the fog monitoring program discussed above for STP 1 & 2 is similar to the location of Receptor 2 of this analysis. The results of the fog monitoring program were that 33 additional hours of fogging were observed at that location. Coincidentally, 33 hours of fogging were also predicted at that location using the Gaussian Plume Model described and used in this analysis.

This model was then applied to the MCR with the heat load from STP 1 & 2 and STP 3 & 4. Table 5 presents the same information from Table 2 with the addition of STP 3 & 4. The number of times that the relative humidity at each receptor location is 100 percent increased by nearly a factor of two. This would be expected from an increase in heat load on the MCR by approximately a factor of two. In addition, Table 6 presents the average number of hours that the discrete relative humidity events occur. The number of discrete events increased, but the total average time that the events occur remained similar to the prediction for two unit operation, with 3 hours for Receptor 1 and 2 hours for Receptor 2.

Table 5. Number of hours predicted at each receptor location where the Relative Humidity of the plume would be 100 percent for STP 1 & 2 and STP 3 & 4.

Month	Hours predicted with 100% Relative Humidity at Receptor 1	Percentage of the time with 100% Relative Humidity[a]	Hours predicted with 100% Relative Humidity at Receptor 2	Percentage of the time with 100% Relative Humidity[a]
January	32	4%	12	2%
February	31	5%	11	2%
March	45	6%	17	2%
April	31	4%	10	1%
May	33	4%	7	1%
June	45	6%	15	2%
July	60	8%	18	2%
August	61	8%	21	3%
September	70	10%	24	3%
October	43	6%	10	1%
November	56	8%	21	3%
December	49	7%	20	3%
Annually	**554**	**6%**	**185**	**2%**

a. Compared to the total number of hours.

Table 6. Average time that the Relative Humidity of the plume is 100 percent at each receptor location for STP 1 & 2 and STP 3 & 4.

Month	Number of discrete events with 100% Relative Humidity at Receptor 1	Average number of hours that each discrete event lasts at Receptor 1	Number of discrete events with 100% Relative Humidity at Receptor 2	Average number of hours that each discrete event lasts at Receptor 2
January	15	2	7	2
February	10	3	6	2
March	15	3	8	2
April	12	3	6	2
May	13	3	5	1
June	17	3	8	2
July	28	2	13	1
August	22	3	10	2
September	22	3	11	2
October	16	3	6	2
November	19	3	7	3
December	15	3	7	3
Annually	**202**	**3**	**94**	**2**

The same methodology described above to predict the number of hours of fogging and impaired visibility was used to determine the impacts from operation of STP 1 & 2 and STP 3 & 4 on the MCR. The ratios of 41 percent fogging and 6 percent impaired visibility were applied to the results of the modeling at each receptor location. Table 7 presents the results. The number of hours of predicted fogging and impaired visibility approximately double for the four unit operation.

Table 7. Predicted fogging and impaired visibility at the downwind receptor locations for STP 1 & 2 and STP 3 & 4.

Month	Hours of predicted fogging events at Receptor 1	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 1	Hours of predicted fogging events at Receptor 2	Hours of predicted fogging events where the visibility is less than 0.3 miles at Receptor 2
January	13	2	5	1
February	13	2	4	1
March	19	3	7	1
April	13	2	4	1
May	14	2	3	0
June	19	3	6	1
July	25	4	8	1
August	25	4	9	1
September	29	4	10	2
October	18	3	4	1
November	23	4	9	1
December	20	3	8	1
Annually	**230**	**36**	**77**	**12**

As described above, the results of the fog monitoring program indicate that the presence of the MCR does not significantly increase the natural fog occurrence for STP 1 & 2 operation. Since the operation of the MCR with STP 1 & 2 does not increase the observable fogging over naturally occurring fogging, this level of fogging could be considered consistent with background levels, or levels without an observable impact. Furthermore, fogging from the MCR with STP 1 & 2 has not created an impact to any onsite or offsite areas. However, any amount of fogging over that level, such as the additional fogging from four-unit operation, could be noticeable and potentially cause an impact. The difference between the predicted fogging for four-unit operation and two-unit operation is 100 hours per year at Receptor 1 and 44 hours per year at Receptor 2. The hours where visibility would be impaired above existing levels would be 16 hours per year at Receptor 1 and 7 hours per year at Receptor 2.

Residents of the area near the MCR and commuters on FM 521 may notice the increase in localized fogging after STP 3 & 4 is operational. The fogging, especially near bodies of water, would often occur in the early morning hours. However, the total number of additional hours of fogging from the MCR would only be a fraction of the number of hours of naturally occurring fogging. The number of hours of impaired visibility from the operation of the MCR would also be small.

Impacts from fogging of the MCR would be SMALL and would not warrant mitigation. Since the climate in the region is typically too warm for frequent and persistent freezing temperatures, impacts from icing would be SMALL and would not warrant mitigation.

Mechanical Draft Cooling Tower

Fogging from the mechanical draft cooling towers occurs when the visible plume intersects with the ground, appearing like fog to an observer. Analysis of results from the SACTI code did not predict fogging to occur from the operation of the cooling towers.

Icing from the mechanical draft cooling towers would be the result of ground-level fogging when ambient temperatures are below freezing. Icing is also not predicted to occur from the operation of the cooling towers since minimal fogging from the operation of the mechanical draft cooling towers is predicted to occur and since the climate of the region is typically too warm for frequent freezing temperatures to occur.

5.3.3.1.4 Salt Deposition

Water droplets blown from the mechanical draft cooling towers would have the same concentration of salts as the water in the cooling tower basin. Groundwater wells would be used for normal makeup water for the cooling towers. This would be supplemented by the MCR during periods where groundwater use was restricted by permit limitations. Hydrogeochemical data for wells in the vicinity of STP 3 & 4 is provided in Table 2.3.1-20, and includes sodium and chloride concentrations in the groundwater. The maximum concentration of sodium from any of the wells was conservatively used to determine the corresponding maximum concentration of sodium chloride that could potentially be in the makeup water. As the water droplets blown from the towers evaporate, either in the air or on vegetation or equipment, salts are deposited.

The maximum predicted salt deposition is to the north of the cooling towers, less than or equal to 660 feet from the centerline of both of the cooling towers combined. The maximum deposition is ~~420~~ 160 pounds per acre per month and occurs during the summer season. The maximum predicted salt deposition during each of the other seasons would also be within 660 feet from the cooling towers. The winter, spring and fall maximum salt deposition would be ~~240~~81, ~~330~~120, and ~~270~~ 95 pounds per acre per month, respectively. Annually, the maximum salt deposition is ~~260~~ 98 pounds per acre per month, also in the north direction and less than or equal to 660 feet from the cooling towers. This is greater than the NUREG-1555 significance level for possible visible effects to vegetation of 8.9 pounds per acre per month. Further discussion of the potential impacts of salt deposition on vegetation is provided in Subsection 5.3.3.2.

The summer season has the maximum deposition rates and the greatest extent of salt deposition. Each of the other seasons and annual salt deposition rates would be bounded by the summer season. As shown in Figure 5.3-1, the rate of salt deposition from the operation of the mechanical draft cooling towers rapidly decreases as the distance from the towers increases. The salt deposition rate falls below the NRC significance limit of 8.9 pounds per acre per month for all locations greater than ~~1300~~ 1600 feet from the towers. The salt deposition rates are greater than 1 pound per acre per month for some locations as far away from the towers as ~~3000~~ 4300 feet. The salt deposition rate for all distances greater than ~~3000~~ 4300 feet would be below 1 pound per acre per month. Salt deposition is only predicted to occur for locations up to two miles from the towers.

The NRC reports that visible damage from salt deposition to terrestrial vegetation at operating nuclear power plants with mechanical draft cooling towers has not been observed

(Reference 5.3-32). Therefore, the impacts from the two mechanical draft cooling towers are not expected to be different from the impacts of the currently operating nuclear power plants.

The electrical switchyard for STP 3 & 4 is located approximately 1700 feet to the north of the proposed location of the cooling towers. A maximum predicted salt deposition of ~~1.2~~8.8 pound per acre per month would be expected at this location during the summer season and ~~0.81~~5.0 pound per acre per month annually. The electrical switchyard for STP 1 & 2 is located approximately 1400 feet to the east of the proposed location of the cooling towers. The salt deposition at this location is ~~1.5~~0.65 pound per acre per month in the winter season and ~~0.81~~0.43 pound per acre per month annually.

The predicted salt deposition from the operation of the cooling towers at locations away from the immediate vicinity of the mechanical draft cooling towers would be less than the NUREG-1555 significance level where visible effects to vegetation may be observed. Impacts to vegetation from salt deposition are described in Subsection 5.3.3.2. Salt deposition in other potentially sensitive areas, including at the STP 1 & 2 switchyard and STP 3 & 4 switchyard are not expected to impact these facilities. Therefore, the impact from salt deposition from the cooling towers would be SMALL and would not require mitigation.

5.3.3.1.5 Cloud Formation, Cloud Shadowing, and Additional Precipitation

Vapor from cooling towers can create clouds or contribute to existing clouds. The SACTI code predicted the precipitation expected from the two mechanical draft cooling towers. The maximum precipitation would occur during the summer season, with a monthly total of less than an inch of precipitation within 660 feet north of the towers. The precipitation during each of the other seasons would be less than the summer season maximum. Annually, ~~5.8~~2.2 inches of rain is predicted to occur, also 660 feet to the north of the cooling towers. This value is very small compared to the average annual rainfall for the South Texas region of 48 inches for the period 1971–2000 (Reference 5.3-33). Impacts from precipitation would be SMALL and would not require mitigation.

The formation of clouds could also prevent sunlight from reaching the ground, or cloud shadowing. This is especially important for agricultural fields or other sensitive areas. As shown in Figure 2.2-2, there are many agricultural areas in the vicinity of the STP site. Shadowing in the vicinity of the cooling towers and in these agricultural areas is predicted to occur for a maximum of ~~105~~ 69 hours during the winter season ~~and fall seasons~~, 64 hours during the fall season, ~~and 87~~ 37 hours during the spring season, and ~~77~~ 31 hours during the summer season at any location. The annual prediction was for a maximum of ~~325~~ 158 hours of shadowing at any location. Shadowing in areas beyond the site boundaries would occur for less than ~~30~~ 18 hours per season and ~~62~~ 35 hours annually at any location. This represents a very small percentage of the total hours of each season and per year. Therefore, the impacts from cloud shadowing would be SMALL and would not require mitigation.

5.3.3.1.6 Interaction with Existing Pollution Sources

No other sources of pollution occur within two kilometers of the STP site. Therefore, there would be no interaction with existing pollution sources.

5.3.3.1.7 Ground-Level Humidity Increase

Increases in the absolute and relative humidity could result from the operation of the two mechanical draft cooling towers. The majority of the water evaporated in the cooling tower is buoyant and dissipates into the atmosphere. A small fraction of this evaporated water may not be as buoyant and could increase the ground level humidity. Specific meteorological conditions could also limit the dissipation into the atmosphere, but would be infrequent. The humidity in the region is typically high, and increases in the humidity would not be noticeable. In addition, the ground level increases in humidity would occur in the immediate vicinity of the cooling towers. The impacts from increases in absolute and relative humidity would be SMALL and mitigation would not be warranted.

5.3.3.2 Terrestrial Ecosystems

As discussed in Section 3.4, STP 3 & 4 would use the existing MCR for condenser cooling. Two mechanical draft cooling towers, extending approximately 119 feet above grade, would be constructed to serve as the UHS for STP 3 & 4. As planned during MCR construction, inclusion of STP 3 & 4 in the existing cooling reservoir system will lead to an increase in operating water level, potentially impacting existing shoreline vegetation and terrestrial biota using the reservoir. The only important terrestrial species as defined in NUREG-1555 that use the MCR other than the federally listed brown pelican, which is listed as threatened, are the bald eagle and common game species such as ducks (see Subsection 2.4.1) (Reference 5.3-16). The brown pelican nests in other locations of Matagorda County, but currently uses the MCR only for resting, a source of freshwater, and possibly foraging.

Impacts from cooling tower operation on terrestrial biota can result from salt drift, vapor plumes, icing, precipitation modifications, noise, and avian collisions with structures (e.g., cooling towers). Each of these topics is discussed in Subsection 5.3.3.2.2. There are no important terrestrial species in the area encompassed by construction of the two mechanical draft cooling towers other than common game species such as deer, rabbits, squirrels, and upland game birds (see Subsections 2.4.1 and 4.3.1) (Reference 5.3-16). Overall, there are no important terrestrial habitats as defined in NUREG-1555 in the area encompassed by construction of the two mechanical draft cooling towers.

5.3.3.2.1 Main Cooling Reservoir

The addition of STP 3 & 4 will result in the normal operating water level of the MCR from 47 feet MSL to 49 feet MSL, which could impact terrestrial biota associated with this impoundment. However, the reservoir side of the berm outlining the MCR is lined with "soil-cement" to prevent erosion and has largely prevented establishment of vegetation on this side (Reference 5.3-34). Recent reconnaissance indicates that shoreline vegetation is extremely sparse and thus the water level increase would have a negligible impact on terrestrial biota.

As stated in Subsection 2.4.1, several species of water birds have nested on the terminal ends of the "Y-dike" in the MCR since the mid-1980s (Figure 2.4-1, Table 2.4-1). These birds tend to nest on the road bed positioned on the crown of the dike and areas immediately adjacent to this road. An increase in water level of 2 feet will not encroach on these nests. Also, most of the 7-mile-long dike system is not being used by these nesting birds and is available as nesting habitat.

Wintering waterfowl and other water birds (recent reconnaissance) use this reservoir for foraging and resting (see Subsection 2.4.1) (Reference 5.3-35). Baker and Greene noted a shift from dabbling to diving ducks as the reservoir was initially filled (Reference 5.3-35). Diving ducks typically feed in waters less than 10 feet (3 meters) deep (References 5.3-36 and 5.3-37). Depending on the depth, some species that forage on benthos may lose a portion of the reservoir floor as foraging habitat due to the increased reservoir depth, but some of this loss should eventually be replaced as mollusks and other invertebrates colonize the newly flooded portions of the reservoir shoreline. Most piscivorous birds, such as eagles, ospreys, pelicans, herons, and gulls, forage on or near the surface of the reservoir and along its banks and will not be affected by a water level increase. These conclusions are based on the assumption that the fish populations are not affected (see Subsection 5.3.2).

5.3.3.2.2 Cooling Towers

__Salt Drift__

The two mechanical draft cooling towers will be positioned immediately south of Units 3 & 4 in an industrial/developed area. Vegetation adjacent to this area includes relatively open habitats: mowed areas and other areas dominated by bluestem grasses, dewberry, and sea myrtle, all plants common to disturbed or abandoned agricultural land in this region (Reference 5.3-34). Vegetation near the cooling towers could be subjected to salt deposition attributable to drift from the towers. Salt deposition could potentially cause vegetation stress, either directly by deposition of salts onto foliage or indirectly from accumulation of salts in the soil.

To evaluate salt deposition on plants, an order-of-magnitude approach was used since some plant species are more sensitive to salt deposition than others, and tolerance levels of most species are not well known. Deposition of sodium chloride at rates of approximately 1 to 2 pounds per acre per month is typically not damaging to plants, while deposition rates approaching or exceeding 9 pounds per acre per month in any month during the growing season could cause leaf damage in many species (Reference 5.3-16). An alternate approach for evaluating salt deposition is to use 9 to 18 pounds per acre per month of sodium chloride deposited on leaves during the growing season as a general threshold for visible leaf damage (Reference 5.3-16).

As presented in Subsection 5.3.3.1.3, the maximum expected salt deposition rate from the combination of both towers would be ~~420~~ 160 pounds per acre per month during the summer. This maximum rate is approximately ~~47~~ 18 times greater than the approximately 9 pounds per acre per month rate that is considered a threshold value for leaf damage in many species. However, the distance to the maximum deposition is only 0.12 mile (660 feet) from the center of the towers (Figure 5.3-1). No deposition greater than 8.9 pounds per acre per month would occur beyond ~~1300~~ 1600 feet (~~0.25~~ 0.3 mile), thus all deposition above 8.9 pounds will occur within the site boundary and most of the deposition will occur on facilities rather than vegetation. As previously discussed, the vegetative cover in the vicinity of the cooling towers is either mowed areas or bluestem/sea myrtle habitat found on previously disturbed agricultural lands, both marginal habitat for most wildlife. Any impacts from salt drift on the local terrestrial ecosystems would therefore be SMALL and would not warrant mitigation. Cumulative impacts are discussed in Section 10.5.

Vapor Plumes and Icing

As discussed in Subsection 5.3.3.1.1, the expected average plume length would range from ~~0.4~~0.2 to ~~1.9~~0.4 miles and the expected median plume length would be less than 0.2 miles (all seasons). As discussed in Subsection 5.3.3.1.2, ground level fogging as a result of cooling tower operation is not predicted to occur. Similarly, icing resulting from the cooling towers is not predicted to occur. Therefore the impacts of fogging and icing on terrestrial ecosystems would be SMALL and would not warrant mitigation.

Precipitation Modifications

As discussed in Subsection 5.3.3.1.4, the predicted maximum precipitation from the cooling towers would be approximately ~~6~~2 inches of rain per year at 660 feet north of the towers. This amount is very small compared to the average annual precipitation of approximately 48 inches for the South Texas region over the 1971 to 2000 period (Reference 5.3-33). Thus, additional precipitation resulting from operation of the proposed units on local terrestrial ecosystems would be SMALL and would not warrant mitigation.

Noise

Noise from the operation of each cooling tower would be approximately 65 dBA at 50 feet from the tower. This noise level is below 80 to 85 dBA, the sound level at which some birds and small mammals are startled or frightened (Reference 5.3-38). Thus, it is unlikely that noise from each tower would disturb wildlife at distances greater than 50 feet from the tower. The incremental increase in noise resulting from simultaneous operation of the two cooling towers would be insignificant. Given that estimated noise level (51 dBA at 400 feet) associated with the new cooling towers is below the 60-65 dBA the NRC considers of small significance (Reference 5.3-32), noise impacts to terrestrial ecosystems would be SMALL and would not warrant mitigation.

Avian Collisions

As discussed in Subsection 5.3.3.1, the two mechanical draft cooling towers associated with STP 3 & 4 will be 119 feet high. While tall natural draft cooling towers have been associated with bird kills, there have been no reported bird kills on the existing STP 1 & 2 buildings and the relatively lower height of mechanical draft cooling towers pose little risk to migrating birds and cause negligible mortality (Reference 5.3-32). Therefore, impacts to birds from collisions with the cooling towers would be SMALL and would not warrant mitigation.

In summary, there are SMALL impacts to terrestrial ecosystems or biota as a result of operation of the heat dissipation systems.

5.1.1.1 The Site

Land use impacts from construction are described in detail in Section 4.1.1. Impacts from operations will be primarily from elevated plumes and associated shadowing from the operation of the two mechanical draft cooling towers making up the Ultimate Heat Sink (Section 5.3.3.1). Fogging and associated icing are not expected from the operation of the two mechanical draft cooling towers and therefore are not considered to be impacts (Section 5.3.3.1). Low-level fogging from the Main Cooling Reservoir is expected to evaporate and will not impact land use (Section 5.3.3.1).

The only other additional impacts to land use from operations will be the impacts of salt deposition from cooling tower drift. Cooling tower design is discussed in Section 3.4.2, and impacts of the heat dissipation system, including salt deposition, are discussed in Sections 5.3.3.1 and 5.3.3.2. NUREG-1555 (Reference 5.1-1) lists a threshold value of salt deposition where leaf damage would potentially be visible. This range is 8.9 to 17.8 pounds per acre per month. Salt deposition in the immediate vicinity of the cooling tower, out to 660 feet from the centerline of the cooling towers, is predicted to have a maximum of ~~420~~ 160 pounds per acre per month during the Summer season. Salt deposition in areas out to ~~1300~~ 1600 feet from the cooling towers may be above 8.9 pounds per acre per month. However, salt deposition in all areas greater than ~~1300~~ 1600 feet from the centerline of both the cooling towers will be below 8.9 pounds per acre per month. Salt deposition in areas out to ~~3000~~ 4300 feet from the cooling towers may be above 0.89 pounds per acre per month. However, salt deposition in all areas greater than ~~3000~~ 4300 feet from the centerline of both the cooling towers will be below 0.89 pounds per acre per month. Salt deposition is only predicted to occur for locations less than two miles from the towers (Section 5.3.3.1.3).

There are no land use plans or anticipated changes by local or regional governmental agencies due to operations within the site. STPNOC concludes that operations impacts to land use from STP 3 & 4 will be SMALL and will not warrant mitigation.

5.8.1.3 Thermal Emissions

Heat dissipation to the atmosphere from operation of the cooling towers and the main cooling reservoir (MCR) is described in Subsection 5.3.3.1. The plumes from the cooling towers would occur in each direction of the compass and would be spread over a wide area. The average plume lengths would be short and would not be long enough to reach the site boundary in most directions. Fogging and icing from the operation of the cooling tower is not predicted to occur, and fogging from the operation of the MCR is expected to occur infrequently. Salt deposition due to water droplets drifting from the cooling towers is only predicted to occur for locations less than two miles from the towers. Shadowing in the vicinity of the cooling towers and in nearby agricultural areas was predicted to occur for less than ~~105~~ 69 hours per season and ~~325~~ 158 hours annually. This represents less than ~~11~~7% of the total hours of each season and 4% of the total hours per year. Ground-level increases in humidity would occur in the immediate vicinity of the cooling towers, on developed land within the STP site boundary.

The NRC's Environmental Standard Review Plan (NUREG-1555) notes that the plume from a cooling pond like the MCR would exist as a fog over the pond or as ground-level fog evaporating within 300 meters from the pond, or would lift to become stratus for winds less than or equal to 2.2 meters per second. Elevated plumes and the associated shadowing would not be expected from the operation of the MCR.

Because there is no residential area within the site boundary, the impacts on nearby communities from thermal emissions would be SMALL and no mitigation would be required.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.1 Land-Use Impacts			
5.1.1 The Site and Vicinity	Approximately 90 acres of land will be permanently dedicated to the plant until decommissioning. [2]	S	There are no practical measures of mitigation for this impact.
	Salt deposition affects to vegetation potentially impacting land use in the surrounding area.	S	Salt deposition in the immediate vicinity of the cooling tower, out to 660 feet from the centerline of the cooling towers, is predicted to have a maximum of ~~420~~ 160 pounds per acre per month during the Summer season. Salt deposition in all areas greater than ~~1300~~ 1600 feet from the centerline of both the cooling towers will be below 8.9 pounds per acre per month, which is the NUREG-1555 threshold for leaf damage. Cooling tower and heat dissipation system will be monitored for operate under rules and regulations governing these systems.
	Offsite land use impacts attributed to operations workforce population growth. Increase in development for commercial and residential purposes. [2]	S-M	Maintain communication with local and regional government to disseminate project information so they have the opportunity to plan accordingly.
	Operation of new units would result in an increase in the total volume of solid waste generated at the STP site.[2]	S	All federal, Texas, and local requirements and standards would be met regarding handling, transportation, and offsite land disposal of the solid waste at licensed facilities. STPNOC has recycling and waste minimization programs currently in place.
5.1.2 Transmission Corridors and Offsite Area	Impacts to offsite land from disposal of radiological (low and high level) and non-radiological wastes that would be generated at STP 3 & 4. The wastes would be disposed of in offsite disposal facilities. [2]	S	Disposal area(s) for non-radiological and low level radiological waste would be a permitted waste disposal facility with a land use designated for such activities. For high level wastes. Disposal area would be operated under appropriate regulations and guidelines until such time an NRC-licensed high-level waste disposal facility is constructed. At that time, the storage area could be restored for other uses.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.1.3 Historic Properties	Potential impacts to historic resources due to operation of project.	NA	Texas Historic Commission concurs that ongoing operations and maintenance activities of STP 1 & 2 would have no effect on historic properties. Since no additional corridors are required for STP 3 & 4, there should also be no effect on historic properties.
5.2 Water-Related Impacts			
5.2.1 Hydrologic Alterations and Plant Water Supply	Potential hydrologic impacts from the withdrawal from the Chicot Aquifer. Makeup water for the ultimate heat sink (mechanical draft cooling towers) would be pumped from five existing and proposed groundwater wells. [2]	S	STPNOC will apply to Coastal Plains Groundwater Conservation for an increase in the site's current groundwater permit from 3000 acre-feet per year to 3500 acre-feet per year up to the current permitted limit with the remainder of the water requirements met by water from the Main Cooling Reservoir (MCR). Withdrawal groundwater from the deep confined Chicot aquifer, limiting impacts to those local wells in the deep aquifer. Conduct groundwater monitoring as required by groundwater use permit.
5.2.2 Water-Use Impacts	Potential hydrologic impacts to the Colorado River from pumping of water to the MCR. Water would be withdrawn from the Colorado River and added to the MCR to replace water lost to evaporation, seepage, blowdown from the MCR, and as needed as the result of maximum operating conditions at the rate of 42,604 gpm during normal operations and 44,779 gpm during maximum operations, as contained in the current permit. [2]	S	No mitigation would be required.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.2.3 Water Quality Impacts	Potential water quality impacts to the Colorado River from discharges from the MCR, which would receive and dilute all STP 3 & 4 water and wastewater discharges. Discharges to the Colorado River are anticipated to be needed when water quality deteriorates in the MCR. Discharge limits would be established by the Texas Commission on Environmental Quality (TCEQ).	S-M	Obtain Texas Pollution Discharge Elimination System (TPDES) permit and comply with its discharge limits and monitoring requirements.
5.3 Cooling System Impact			
5.3.1 Intake System	Entrainment and entrapment of aquatic organisms at the power plant water intake structure. [2]	S	Intake structure is designed with the "Best Available Technology." The MCR is a closed cycle cooling system that minimizes withdrawal of river water. Impingement, entrainment and entrapment were minimized by other design features: (1) the intake was oriented in such a way as to reduce attractant flows, (2) the approach velocity at the traveling screens was designed to be 0.5 fps or less, and (3) the RMPF was equipped with a fish "handling and bypass" system. This is a pre-existing system, so no mitigation is anticipated.
5.3.2 Discharge System	The addition of STP 3 & 4 is expected to increase the frequency of blowdown from the MCR to the Colorado River. [2]	S	Obtain TPDES permit and comply with its discharge limits and monitoring requirements. The MCR would be operated such that discharges would not be made when the river flow is less than 800 cubic feet per second (cfs) and the volume would not exceed 12.5% of river flow, allowing a dilution of the already diluted STP 3 & 4 cooling system effluent of at least 8. Also, per state water quality standards the discharges would be 95°F or less.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	Non-radioactive wastewater discharges will increase as a result of the operation of the new units' operation, such as additional cooling water system blowdown, permitted wastewater from the new units' auxiliary system, and storm water runoff from new impervious surfaces. [2]	S	Discharges would be in accordance with applicable TCEQ water quality standards. STPNOC will revise the existing Storm Water Pollution Prevention Plan (SWPPP). The impacts due to the new impervious surfaces will be negligible due to Best Management Practices.
	Impacts to the Colorado River riverbed due to discharge from the MCR.	S	Discharges would be diffused to limit scouring to immediate area of the discharge point.
5.3.3 Heat-Discharge System			
5.3.3.1 Heat Dissipation to the Atmosphere	Potential visual impacts from cooling tower plumes.	S	Operation of the STP 3 & 4 cooling towers would result in plumes that would occur in each direction of the compass and would be spread over a wide area, reducing the time that the plume would be visible from any particular location. The average plume lengths would be short and would not be long enough to reach the site boundary in most directions. No mitigation would be required.
	Potential impacts to agriculture and vegetation in the area due to atmospheric effects from operations of the STP 3 & 4 cooling towers.	S	Operation of the cooling towers could lead to minor shadowing, very small increase in precipitation, increases in ground-level humidity in the immediate vicinity, and salt deposition that is a fraction of the level needed to have visible effects on vegetation outside the site boundaries (greater than ~~1300~~1600 ~~feet~~). No mitigation would be required.
5.3.3.2 Terrestrial Ecosystems	Potential stressing of vegetation within the site boundary from salt deposition resulting from the operation of the STP 3 & 4 cooling towers. Vegetation stress could result either directly by deposition of salts onto foliage or indirectly from accumulation in the soil. [2]	S	Salt deposition from mechanical cooling tower operation would be a fraction of the level that leads to leaf damage outside of a ~~1300~~1600 ~~feet~~ radius from the cooling towers. Mitigation would not be required.
	Inclusion of STP 3 & 4 in the existing cooling reservoir system will lead to an increase in operating water level, potentially impacting existing shoreline vegetation and terrestrial biota using the reservoir. [2]	S	Prey species will eventually recolonize along the new shoreline. There are other foraging areas in the vicinity until recolonization. Further mitigation would not be required.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	Potential impacts to wildlife from noise from the STP 3 & 4 cooling towers.	S	Noise from cooling towers singly and cumulatively would be less than the level that startles birds or small mammals beyond the immediate vicinity of the towers. No mitigation would be required.
	Potential impact to avian populations from collisions of individuals with cooling towers. [2]	S	Cooling towers of a low height would be used. Low height would cause negligible mortality in birds.
5.3.4 Impacts to Members of the Public	Potential impact to members of the public from noise emitted by STP 3 & 4 cooling towers.	S	Noise levels 400 feet from the cooling towers are estimated to be less than <60-65 dBA, a level characterized by NRC in NUREG-1555 as of small significance. No mitigation would be required.
	Potential health impact to members of the public from contact with human disease-causing thermophilic microorganisms in the MCR.	S	No mitigation would be required since access to the MCR is restricted and design and operation of the MCR does not promote an average temperature that is optimal for thermophilic microorganisms.
5.4 Radiological Impacts of Normal Operation			
5.4.1 Exposure Pathways	Potential impacts to environment due to small discharges of radioactive liquids and gases. [2]	S	Monitor radiological releases as required by radiological monitoring program.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.4.2 Radiation Doses to Members of the Public	Potential impacts to the public within 50 miles of the plant.	S	Potential liquid pathway doses would be 2.93E-4 millirem per year per unit for total body for the maximally exposed individual and 0.0017 person-rem per year (2 units) for collective total body doses to the public within 50 miles. Potential gaseous pathway doses would be 0.4 millirem per year for total body for the maximally exposed individual and 0.50 person-rem per year for the collective total body Monitor radiological releases as required by radiological monitoring program.
5.4.3 Impacts to Members of the Public	Potential health impacts to members of the public from exposure to radiological releases. Modeling using the design and operational parameters of STP 3 & 4 results in estimated doses to the public that are within the design objectives of 10 CFR 50 Appendix I and within regulatory limits of 40 CFR 190.	S	Monitor radiological releases as required by radiological monitoring program.
5.4.4 Impacts to Biota Other than Members of the Public	Potential impacts to terrestrial and aquatic ecosystems from chronic radiation exposure (much less than 100 mrad/day) caused by the small discharges of radioactive liquids and gases from the operation of STP 3 & 4.	S	Monitor radiological releases as required by radiological monitoring program.
5.4.5 Occupational Radiation Doses	Potential health impacts to workers from radiation exposure of an annual maximum of dose of 98.9 person-rem per unit.	S	Monitor radiological releases as required by radiological monitoring program.
5.5 Environmental Impact of Waste			
5.5.1 Non-Radioactive Waste System Impacts	Potential impacts to water quality of Colorado River from increase in discharges from the MCR. The reservoir would be receiving an increased volume of wastewater, increased amount of chemicals in its receipt of water and wastewater from STP 3 & 4 systems, and treated wastewater from a new sanitary waste treatment system.	S	Obtain TPDES permit and comply with its discharge limits and monitoring requirements.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	Potential impacts to water quality of surface water due to increased volume of storm water resulting from new impervious surfaces. [2]	S	Conduct storm water monitoring as required by storm water permit. Revise the storm water pollution prevention plan to avoid/minimize releases of contaminated water.
	Potential impacts to air quality from emissions of auxiliary systems operated on an intermittent basis. [2]	S	Comply with the state of Texas permit limits and regulations for operating air emission sources.
	Operation of new units would result in an increase in the total volume of solid waste generated at the STP site. Potential impacts to environment offsite due to disposal of solid waste generated as a result of the operation of STP 3 & 4. [2]	S	Implement existing no radioactive solid waste reuse and recycling policies.
5.5.2 Mixed Waste Impacts	Potential impacts to environment offsite due to disposal of up to 5 cubic meters of mixed waste that could be generated as a result of the operation of STP 3 & 4.	S	Update existing STP waste minimization plan for operation of STP 3 & 4.
	Potential health impacts to workers due to potential exposure to chemicals during handling and storage of mixed wastes.	S	Implement materials handling and safety procedures.
	Potential health impacts to offsite workers and emergency response personnel due to exposure to chemical and radiological hazards during accidental releases and cleanup activities.	S	Revise Integrated Spill Contingency Plan as necessary to address handling and transport of mixed waste generated at STP 3 & 4.
5.6 Transmission System Impacts			
5.6.1 Terrestrial Ecosystems	Potential impacts to vegetation and habitat within the transmission line rights of way from routine maintenance of woody vegetative growth by manual and mechanical methods and herbicides.	S	There will be no increase in transmission line maintenance due to the addition of STP 3 & 4. Mitigation is not required for current maintenance activities associated with STP 1 & 2; therefore, mitigation is not anticipated with the addition of STP 3 & 4 (Note: maintenance is performed the transmission system owners).
5.6.2 Aquatic	Potential water quality impacts and subsequent impacts to	S	There will be no increase in transmission line maintenance due to the addition

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
Ecosystems	populations of important aquatic species from maintenance activities in transmission corridors that lie at or near water bodies and wetlands.		of STP 3 & 4. The use of chemicals (chiefly herbicides) in right-of-way vegetation management is also a public concern, but potentially toxic effects of these chemicals are mitigated by the use of EPA-registered formulations that are approved for use in utility rights-of-way. All four of the transmission service providers require chemical applicators to be trained in the safe use of herbicides and require supervisory personnel to hold Texas Department of Agriculture Commercial Pesticide Applicators Licenses (Note: maintenance is performed the transmission system owners).
5.6.3 Impacts of Members of the Public	Potential health impacts to members of the public from transmission lines.	S	Induced current from transmission lines would be less than 5 milliamperes. No mitigation would be required.
5.7 Uranium Fuel Cycle Impacts			
5.7.1 Land Use	Potential impacts to land use from fuel cycle. Total annual land requirements for fuel cycle support would be 21 permanently committed acres and 160 temporarily committed acres per unit.	S	Impacts to land from the fuel cycle, in comparison with land requirements for fossil fuel fired plant, are small and mitigation would not be required.
5.7.2 Water Use	Potential impacts to water resources from fuel cycle. Total annual water use for the fuel cycle would be 1.82 x 10^{10} gallons per unit. [2]	S	Practical mitigation for this impact does not exist.
5.7.3 Fossil Fuel Impacts	Potential impacts to fossil fuel resources from fuel cycle.	S	Electric energy needs for fuel cycle would be less than 5% of the output of one of the proposed units. Natural gas consumption for fuel cycle support if used instead to generate electricity would yield less than 0.4% of the energy output of one of the proposed units. No mitigation would be required.
5.7.4 Chemical Effluents	Potential impacts to air and water quality from fuel cycle. Gaseous effluents would be less than 0.052% of all 2005 US SO_2 emissions and less than 0.012% of all 2005 US NO_x emissions. Liquid effluents from fuel enrichment and fabrication are subject to federal, state, and/or local	S	All chemical discharges released into the environment are subject to requirements and limitations set by an appropriate federal, state, or local agency.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	requirements and limitations. Milling chemical effluents are not released in quantities sufficient to have significant impacts on the environment.		
5.7.5 Radioactive Effluents	Potential health impacts to members of the public from radioactive effluents from the fuel cycle. The estimated whole-body population dose commitment to the U.S. population would be approximately 2600 person-rem per year per unit an estimate that correlates with 1.9 fatalities per year to the U.S. population.	S	No mitigation would be required.
5.7.6 Radioactive Waste	Potential environmental impacts from disposal of radioactive wastes generated as a result of the fuel cycle. No significant radioactive releases to the environment are expected from low-level waste disposal. No releases to the environment are expected from the repository disposal of transuranic and high-level waste.	S	Disposal area(s) would be a permitted waste disposal facility with a land use designated for such activities. Disposal area would be operated under appropriate regulations and guidelines until such time an NRC-licensed high-level waste disposal facility is constructed. At that time, the storage area could be restored for other uses.
5.7.7 Occupational Dose	Potential health impacts to fuel cycle workers caused by radiation exposure. The estimated occupational dose (to all fuel cycle workers cumulatively) is approximately 960 person-rem per year per unit.	S	The dose to any individual would be maintained within the dose limit of 10 CFR 20.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
5.7.8 Transportation	Potential health impacts to transportation workers and members of the public caused by radiation exposure resulting from the loading, unloading, and transport of radioactive materials associated with the fuel cycle. The estimated dose to workers and the public from transportation associated with the fuel cycle is 4 person-rem per year per unit. [2]	S	Limit amounts of waste handled and disposed of through source reduction, recycling, treatment, to the extent practical and feasible. Construct onsite storage facilities, as required, for wastes and implement a waste management program in compliance with applicable regulatory requirements.
5.8 Socioeconomic Impacts			
5.8.1 Physical Impacts	Degradation of roads in the vicinity due to increased traffic from commuting of operations workers and deliveries for STP 3 & 4.	S	Increased tax revenue from STP 3 & 4 will allow for the local government to improve roads as needed.
	Potential impacts to air quality from limited, short-term operation of auxiliary systems.	S	Obtain air permits and operate systems within permit limits and monitor emissions as required.
	Visual impacts to landscape from reactor buildings, cooling towers, and associated plumes.	S	No mitigation would be required.
5.8.2 Social and Economic Impacts	Potential adverse economic impact to Matagorda County residents due to potential increase in rental rates and housing prices due to influx of operations workers. [2]	M-L	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.
	Increased demand for water by operations workers would further stress water supplies which are predicted by the water planning organization to fall short of water demand after 2010. [2]	S-M	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	Increased wastewater volume as a result of in-migrating operations workforce would contribute to an overall population-related increase in wastewater volume which could exceed wastewater treatment capabilities in the area. [2]	S-M	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.
	Potential impact to police and fire department services in Matagorda and Brazoria Counties due to small increases in the ratio of residents/residences to police and firefighters. [2]	S	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning.
5.8.2 Social and Economic Impacts	Potential impact to medical services in Matagorda and Brazoria Counties due to medical service needs of in-migrating operations workforce.	S	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning. Increased property tax revenues as a result of the increased population, and, in the case of Matagorda County, property taxes on the new reactors, would fund additional medical services.
	Impact to Matagorda County schools due to in-migrating operations workforce increasing the student population by an estimated 14 percent. [2]	M-L	Maintain communication with local and regional governmental and non-government organizations in a timely manner so that they are aware of number of workers coming (and the number of construction workers departing) and the timing of arrivals (and departures) to allow for community planning. Increased property tax revenues as a result of the increased population, and, in the case of Matagorda County, property taxes on the new reactors, would fund additional teachers and facilities for Palacios ISD.
	Traffic congestion due to operations and outage workforces commuting. Hourly vehicle capacity would be exceeded during shift changes with only the operations workforce commuting to STP. [2]	M-L	Stagger outage schedules so only one unit will be down at a time. Stagger arrival and departure times.
5.8.3	Low-income rental housing rates could increase due to	S	Analysis of housing availability in Matagorda County determined that the

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
Environmental Justice Impacts	Increased demand for housing, potentially displacing low-income renters in Matagorda County during the construction phase. [2]		probability of this being an issue is low. Because of this, control efforts would not be necessary.
5.9 Decommissioning			
5.9 Decom-missioning	Potential impact to worker health due to occupational exposures.	S	Continue applicable mitigation measures employed during the operations period for decommissioning activities.

Table 5.10-1. Summary of Potentially Adverse Impacts of Operation (Continued)

Impact	Description of Potential Impact	Potential Impact Significance [1]	Planned Control Program
	Potential health impact to transportation worker and members of the public due to exposure to radiological materials during loading, unloading, and transport.	S	Continue applicable mitigation measures employed during the operations period for transportation of waste and materials to disposal sites.
5.11 Transportation of Radioactive Materials			
5.11.1 Transportation Assessment	Potential heath impacts as a result of transportation of radioactive waste shipments at the estimated rate of 30 normalized shipments per reactor per reactor year.	S	The reactor and transportation of radioactive waste will meet all of the conditions in NRC regulation 10 CFR 51.52.
5.11.2 Incident-Free Transportation Impacts Analysis	Potential health impacts caused by exposure to radiation emitted during transportation of radiological materials. The greatest dose estimated to 15.9 person-rem per reactor year to general public onlookers.	S	Radiological protection programs would manage and limit doses to workers whose jobs would cause them to receive the greatest exposures.
5.128 Non-Radiological Health Impacts			
5.128 Non-Radiological Health Impacts	Impact to worker health due to occupational injuries and illnesses. Total recordable cases of occupational injuries and illnesses estimated per year for the onsite worker population of STP 3 & 4 is 27, 25, and 5 cases based on United States, Texas, and STP 1 & 2 incident rates, respectively.	NA	Implement existing STP industrial safety program at STP 3 & 4.

[1] The assigned significance levels [(S)mall, (M)oderate, or (L)arge] are based on the assumption that for each impact, the associated proposed mitigation measures and controls (or equivalents) will be implemented (10 CFR 51, Appendix B, Table B-1, Footnote 3).

[2] The mitigation measure specified for this impact is insufficient to eliminate or satisfactorily mitigate the impact. No other practical measures for mitigation of this impact are available. Therefore, these impacts will be considered in the evaluation of unavoidable adverse impacts (Section 10.1).

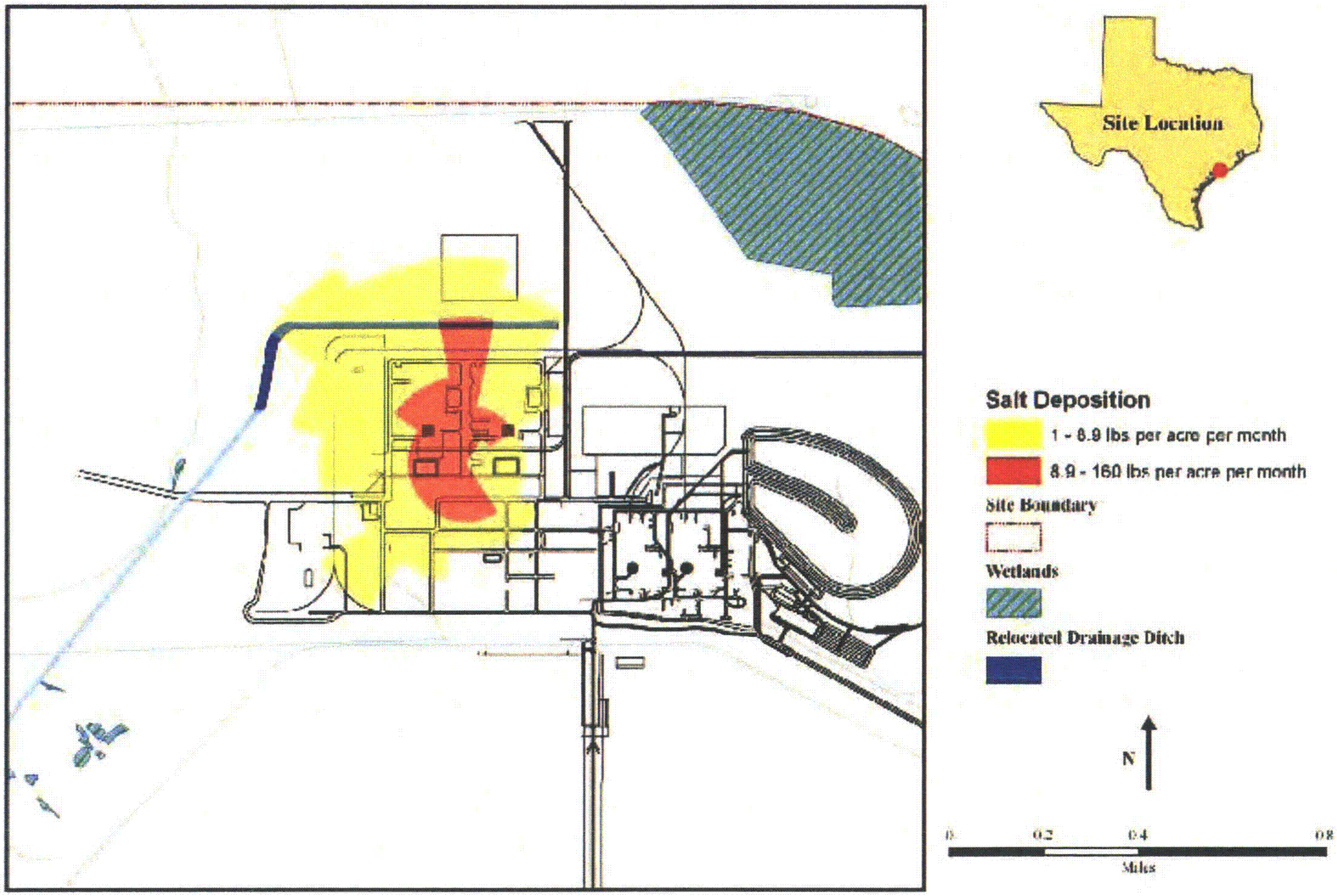


Figure 5.3-1 Summer Salt Deposition

Question Number: 05.09.05-01

QUESTION:

Provide an evaluation of doses to biota living in and around the MCR from both the liquid and gaseous effluents (use of appropriate surrogate species is acceptable). Include dose calculations for Units 1 & 2 and for proposed Units 3 & 4 (LADTAP II and GASPAR II input and output files).

FULL TEXT (Supporting Information):

ER Section 5.4.4 and Table 5.4-10 provide an evaluation of doses to biota for STP Units 3 & 4. The table addresses doses from liquid pathways at Little Robbins Slough, but does not address liquid pathways at the MCR.

RESPONSE:

Liquid

The doses to biota living in and around the MCR were calculated using LADTAP II. Such biota would be exposed to MCR waters. Lake hydrodynamics were simulated using LADTAP's *Completely Mixed* and *Partially Mixed (with plug flow)* impoundment models. The latter was found to give doses to biota greater (by up to 8%) than the former and was used to report the following liquid pathway biota doses.

LADTAP II input and output files simulate 4-unit plant cooling water system outflow to the MCR. All LADTAP II input and output files will be provided in the electronic reading room. LADTMCR1 (*.DAT are input files, *.OUT are output files) simulates Units 1 & 2 liquid releases to the MCR (except tritium), LADTMCR2 simulates Units 3 & 4 releases to the MCR (except tritium), H3MCR1 simulates tritium releases from Units 1 & 2, and H3MCR2 simulates Units 3 & 4 tritium releases to the MCR. Radionuclide release rates to the MCR are the same as those used in Section 5.4 of the ER. All impoundment simulations account for 95% of the MCR releases settling out of solution in accordance with the Offsite Dose Calculation Manual-ODCM, except for tritium; 100% of tritium remains in solution.

Fifty plus years of daily MCR behavior, including volume, blowdown flow rate, and evaporation rate, was simulated and described in the response to RAI 2.3-6. Long-term averages of those parameters (for 4-unit, 100% power operation) were incorporated into the LADTAP II analysis described here. Radionuclides other than tritium are discharged from the MCR, at the concentration of the MCR, with the long-term average blowdown of 16.5 cfs. Tritium is discharged from the MCR, again at its concentration in the MCR, with both the blowdown and evaporation (long-term average evaporation is 146 cfs = 106,000 acre-feet/year); the sum of blowdown and evaporation rates is the LADTAP discharge rate for the tritium simulations. In all cases the pond discharge is modeled with a dilution factor of 1 and transit time of 0.1 hours, thus simulating doses to biota exposed to MCR concentrations.

The resulting doses (millirad/year) to biota from the **LIQUID PATHWAY**, as reported by LADTAP II are:

Biota	Units 1 & 2	Units 3 & 4	Total
Fish	0.85	2.50	3.35
Invertebrate	1.59	5.30	6.90
Algae	0.33	0.54	0.87
Muskrat	2.30	2.44	4.75
Raccoon	0.67	1.38	2.05
Heron	2.72	2.46	5.18
Duck	2.49	3.15	5.64

Gaseous

The doses to biota from STP 3 & 4 gaseous effluents are reported in ER Table 5.4-10 and repeated here. The GASPAR II input and output files for those units (GASPONE2.DAT and GASPTWO2.DAT are input files, GAS2XOQO.DAT is required input met file, and OUT2ONEO.DAT and OUT2TWOO.DAT are output files – the 4th special receptor {the maximum along the boundary} is used) will be provided in the electronic reading room. Gaseous pathway doses from STP 1 & 2 at that same location (site boundary) were calculated using the same parameters as used in ER Section 5.4. The input, met and output files for Units 1 & 2 (GASPSTP1.DAT, GAS1XOQA.DAT, and GAS1OUTA.DAT) will be provided in the electronic reading room.

One additional set of GASPAR II files (H3MCRGAS.DAT, GAS1XOQA.DAT, and H3MCRGAS.OUT) was used to approximate the dose to biota from MCR evaporated tritium. This H3 evaporation release rate is the MCR evaporation rate (discussed above) multiplied by the MCR tritium concentration. The latter, .0153 curies/acre-foot, was conservatively taken at 40-years after Units 3 & 4 startup. The H3 evaporation release rate is then 1620 curies/year. More than 99% of this tritium evaporation release is attributed to Units 1 & 2 operation. It was conservatively assumed that all of this tritium, which would be released over the entire surface area of the MCR, was released at the same location with the same parameters as the Units 1 & 2 gaseous release.

The doses to biota were then calculated from the GASPAR II output information in the manner indicated in ER Section 5.4 (see Table 5.4-10). The resulting doses (millirad/year) to biota from the **GASEOUS PATHWAY** are:

Biota	Units 1 & 2	Units 3 & 4	MCR Evap (H3)	Total
Fish	0	0	0	0
Invertebrate	0	0	0	0
Algae	0	0	0	0
Muskrat	0.07	8.45	0.30	8.81
Raccoon	0.11	9.96	0.64	10.70
Heron	0.07	8.45	0.30	8.81
Duck	0.11	9.96	0.64	10.70

Combining the two tables, the total dose to biota from all 4-units from **LIQUID + GASEOUS PATHWAYS** are:

Biota	**Total**
Fish	3.35
Invertebrate	6.90
Algae	0.87
Muskrat	13.56
Raccoon	12.75
Heron	13.99
Duck	16.34

The discussion and conclusions of ER Section 5.4.4 remain valid. The annual dose to biota is much less than the daily allowable doses (1 rad/day) to aquatic and terrestrial organisms. Impacts to biota other than members of the public from exposure to radiation would be SMALL and would not warrant mitigation.

CANDIDATE COLA REVISION:

No COLA ER revisions are required as a result of this response.

Question Number: Corps-01

RAI SUMMARY:

Provide a detailed description and appropriate plan drawings of the proposed impacts to waters of the United States so that the Corps may conduct a proper evaluation of the project.

Full Text (Supporting Information):

The Corps is uncertain as to the proposed impacts to waters of the United States. A permit determination was completed in June 2009 that concluded the proposed activity would require a Corps permit pursuant to Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act of 1899. It is the Corps' understanding that subsequent to this determination, STPNOC's proposed impacts to waters of the United States have been modified. Therefore, provide:

(1) a plan and elevation drawing showing the general and specific site location and character of all proposed activities, including the size relationship of the proposed structures to the size of the impacted waterway and depth of water in the area drawings of the proposed construction and their impacts to waters of the United States;
(2) a description of the type, composition and quantity of the material to be dredged, the method of dredging, and the site and plans for disposal of the dredged material;
(3) the source of the fill material; the purpose of the discharge, a description of the type, composition and quantity of the material; the method of transportation and disposal of the material; and
(4) a statement describing how impacts to waters of the United States are to be avoided and minimized and either a statement describing how impacts to waters of the United States are to be compensated for or a statement explaining why compensatory mitigation should not be required for the proposed impacts to waters of the United States.

RESPONSE:

STPNOC is currently developing the Corps' Section 404 and Section 10 permit application for approval of the proposed re-dredging of the existing barge slips and the placement of culverts within waters of the U.S. At this time, STPNOC has not finalized all of the engineering design components necessary for completing the application; therefore, we are unable to address all of the specific information requests in detail. STPNOC plans to have the draft permit application completed by mid-October and will meet with the Corps to discuss the adequacy of the permit application.

(1) STPNOC plans to install six culverts within six existing site drainages associated with the construction of new roadways for this project. Three of the proposed road crossings have existing culverts, however, these will be replaced to support new construction vehicle traffic. Figure 3.9S-1 in the Construction Utilization Plan in Rev 3.0 of the Environmental Report depicts site locations for each of the proposed activities. Figures 1 through 6 depict cross

sections for Culverts A, B, C, D, E, and F and illustrate the existing profiles and information related to the crossing width, depth of water, water width, and bank height for each location. A cross-section for Culvert G is not included because it is associated with a drainage ditch to be dug wholly and totally in uplands and consequently has no jurisdictional impacts.

(2) Each crossing will be excavated to proper elevation and then culverts will be placed accordingly to maintain flow conditions within each drainage. Excavated materials will be transported to and stored in one of the existing on-site soil stockpiles. Site assessments were conducted in August 2009 to document ecological conditions associated with each crossing location.

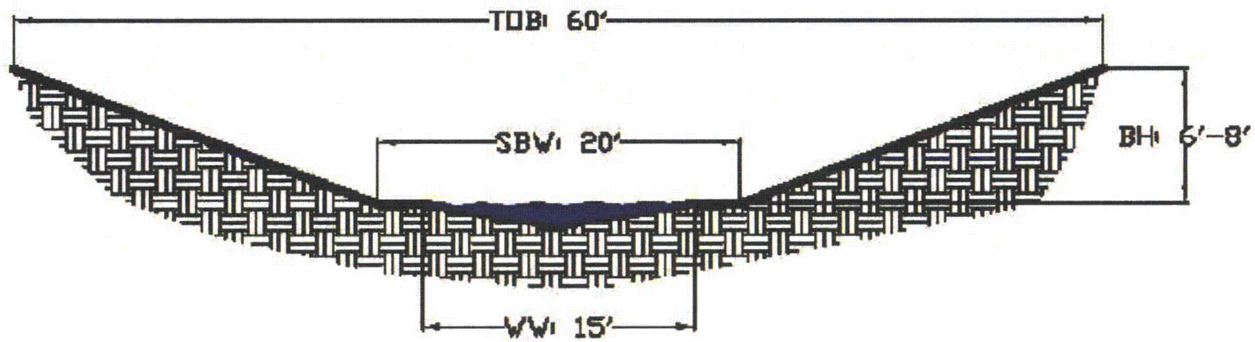
Dredging will occur within the existing barge terminals in order to deepen and widen both facilities. Dredge materials from the barge areas is comprised predominately of a silty-clay soils. The first 0 to 6 inches are comprised of detritus and silt soils while depths below 6 inches are comprised of a silt-clay matrix. Each barge slip will be dredged to a width of 80 feet and a maximum depth of 10 feet as depicted in Figure 3.9S-1. Dredged materials can be placed within the existing dredge storage area currently utilized as part of the dredge maintenance program for the River Make-up Pumping Facility (RMPF).

(3) Current plans indicate fill materials will be used in conjunction with the placement of the culverts and the construction of roadways at each of the drainage crossings. Fill material is expected to originate from on-site soil stock piles. No off-site transportation of fill material is currently anticipated. No riprap is expected to be necessary to stabilize the culverts or stream beds.

(4) A total of approximately 260 linear feet of drainage area will be replaced with 6 culverts (Culverts A, B, C, D, E, and F). Placement of culverts will be designed to allow for continuous flow in each of the drainages and will assure that impacts to the current aquatic ecology in each of the drainages will be small and temporary. Data collected during the site assessments indicates that aquatic conditions within most of these locations are low to moderate quality and all of the drainages are routinely maintained or disturbed (i.e. mowed). No compensatory mitigation is proposed for these actions due to the small impacts and disturbances and the low quality nature of the drainage systems.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.



Typical Cross-section of Culvert "A"

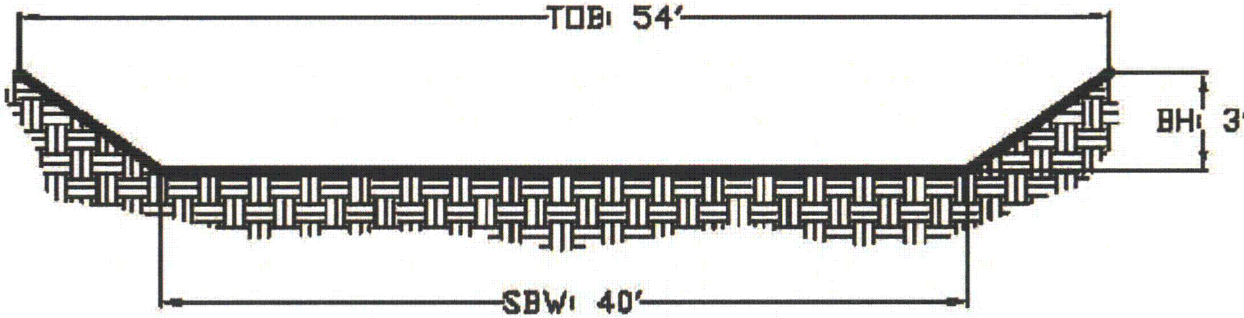
LEGEND

BH: Bank Height
SBW: Streambed Width
TOB: Top of Bank
WW: Water Width

Figure 1
South Texas Project Units 3 & 4
Matagorda County, TX

USACE:
SWG-2007-786

AECOM



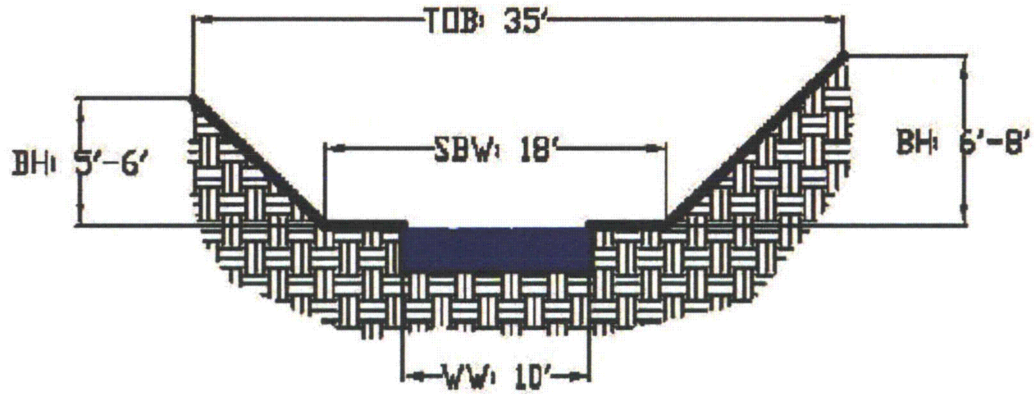
Typical Cross-section of Culvert "B"

LEGEND
BH: Bank Height
SBW: Streambed Width
TOB: Top of Bank
WW: Water Width

Figure 2
South Texas Project Units 3 & 4
Matagorda County, TX

USACE:
SWG-2007-786

AECOM



Typical Cross-section of Culvert 'C'

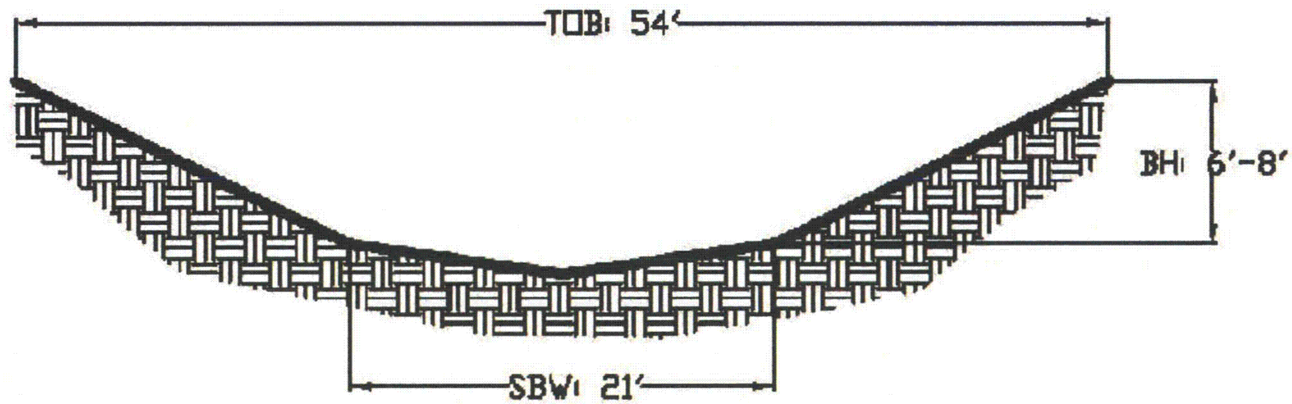
LEGEND

BH: Bank Height
SBW: Streambed Width
TOB: Top of Bank
WW: Water Width

Figure 3
South Texas Project Units 3 & 4
Matagorda County, TX

USACE:
SWG-2007-786

AECOM



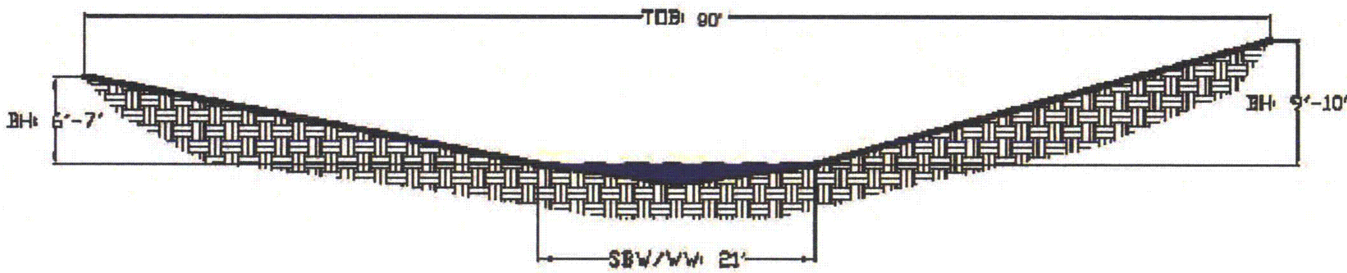
Typical Cross-section of Culvert 'D'

LEGEND
BH: Bank Height
SBW: Streambed Width
TOB: Top of Bank
WW: Water Width

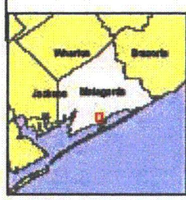
Figure 4
South Texas Project Units 3 & 4
Matagorda County, TX

USACE:
SWG-2007-786

AECOM



Typical Cross-section of Culvert "E"



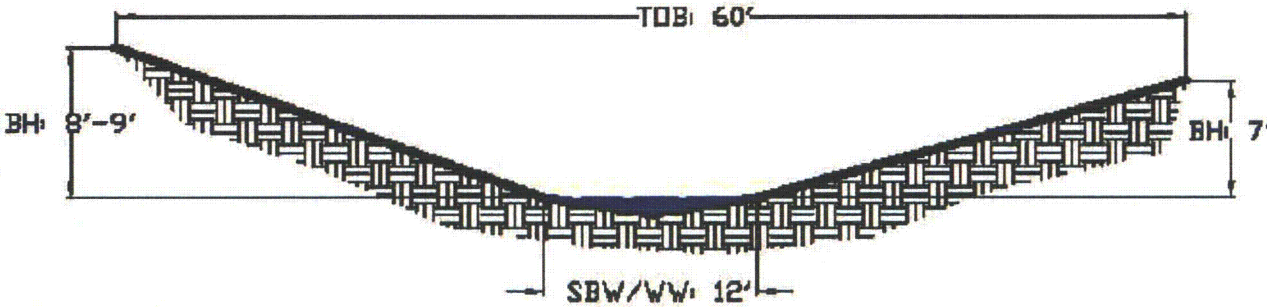
LEGEND

BH: Bank Height
SBW: Streambed Width
TOB: Top of Bank
WW: Water Width

Figure 5
South Texas Project Units 3 & 4
Matagorda County, TX

USACE:
SWG-2007-786

AECOM



Typical Cross-section of Culvert "F"

LEGEND

BH: Bank Height
SBW: Streambed Width
TOB: Top of Bank
WW: Water Width

Figure 6
South Texas Project Units 3 & 4
Matagorda County, TX

USACE:
SWG-2007-786

AECOM

Question Number: Corps-02

QUESTION:

Provide detailed information on the location, size, type, functions and amount of impact to aquatic and other resources such as aquatic insects and amphibians.

FULL TEXT (Supporting Information):

The discharge of dredged or fill material can result in the loss or change of the physical, chemical and biological processes that occur in aquatic resources. This includes the loss and fragmentation of breeding and nesting areas, escape cover, travel corridors, and preferred food sources for resident and transient wildlife species, such as resident and transient mammals, birds, reptiles, and amphibians, associated with the aquatic ecosystem.

The Corps' regulations require appropriate and practicable compensatory mitigation to replace functional losses to aquatic resources. Where appropriate, the use of a functional assessment to determine loss of aquatic function and compensatory mitigation requirements is preferred.

This information will assist the Corps in its permit evaluation and environmental documentation of the proposed actions and its alternatives. It will also help ensure that the ecological functions included in the 404 (b)(1) Guidelines are fully considered.

RESPONSE:

STPNOC is currently developing the Corp Section 404 and Section 10 permit application associated with the proposed dredging of the existing barge slips and the placement of culverts within waters of the U.S. At this time, STPNOC has not finalized the site assessment for aquatic resources nor completed a preliminary evaluation of compensatory mitigation necessary for completing the application, therefore we are unable to address specific responses in detail. STPNOC plans to have the draft permit application prepared by mid-October and will meet with the Corps to discuss the completeness of the permit application at that time.
STPNOC conducted a site assessment for each of the proposed culvert locations (Culvert A, B, C, D, E, and F shown in Figure 3.9S-1 in the Construction Utilization Plan in Rev 3.0 of the Environmental Report) to evaluate current aquatic and other resources (such as aquatic insects and amphibians). This data provides the basis for evaluating functional assessment and compensatory mitigation for the potential impacts and will be included in the Corp application. Data collected included documenting the waterbody type, stream flow, flow type, bank slope, stream depth and width, water appearance, substrate, aquatic habitats, and aquatic organisms observed. Additional components included width of riparian zone, channel condition and observed disturbances. Table 1 summarizing each of these data at each location is provided. Data collected during the site assessments indicates that aquatic conditions within most of these locations are of low to moderate quality and all of the drainages are routinely maintained or

disturbed (i.e. mowed). No compensatory mitigation is proposed for these actions due to the small impacts and disturbances and the low quality nature of the drainage systems.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response..

Table 1. Information on Proposed Culvert Sites at the South Texas Project

Culvert	Top of Bank Width	Inside Bank Width	Bank Slope*	Bank Height*	Observed Water Width	Observed Water Depth	Substrate	Aquatic Habitat Present?	Organisms Observed?	Existing Disturbances	Existing Culvert?	Overall Quality
A	60 ft	21 ft	40	6 to 8	15 ft	20 in.	Silt, Clay, Cobble	In-stream and fringing vegetation	Mammals, Insects, Beetles, Clams, Fish, Alligators	Influx from reservoir relief valves, mowing, road	No - Existing road parallels	Moderate
B	54 ft	40 ft	30	3	None	None	Silt, Clay	None	None	Mowing	No	Low
C	35 ft	12 ft	60	5 to 8	10 ft	12 in.	Silt, Clay	In-stream and fringing wetland vegetation	Fish, Insects	Mowing, road	4 steel pipes approx. 2-3' in diameter are set in concrete for existing road	Low to Moderate
D	54 ft	21 ft	30	6 to 8	None	None	Silt, Clay	None	None	Mowing, road	4 concrete pipes approx. 2-3' in diameter are under existing road	Low
E	90 ft	21 ft	30	6 to 10	5 to 6 ft	24 in.	Silt, Clay	In-stream vegetation	Fish	Mowing, road	Steel pipes approx. 2-3' in diameter are under existing road	Low to Moderate
F	60 ft	12 ft	30	7 to 9	12 ft	12 in.	Silt, Clay	In-stream vegetation	None observed, but fish are likely	Mowing	No	Low to Moderate
G	N/A	N/A	N/A	N/A	N/A	N/A	Silt, Clay	None	None	None	No	Low

*Bank Slope values are estimated in degrees, and Bank Height values are estimated in feet.

Question Number: Corps-03

QUESTION:

Provide a "no-action" alternative that would result in no construction requiring a Corps permit.

FULL TEXT (Supporting Information):

In order to embrace all of STPNOC's alternatives, the Corps requires STPNOC to include a "no action" alternative that results in no construction requiring a Corps permit. A no action alternative may result if (1) STPNOC elects to modify the proposed action to eliminate work under the jurisdiction of the Corps or (2) the Corps permit is denied.

RESPONSE:

STPNOC is currently developing the Corps Section 404 and Section 10 permit application associated with the proposed dredging of the existing barge slips and the placement of culverts within waters of the U.S. At this time, STPNOC has not completed the alternatives analysis necessary for completing the application; therefore, we are unable to address specific responses in detail. A formal alternatives analysis will be completed during the Corp permit application process. STPNOC plans to have the draft permit application completed by mid-October and will meet with the Corps to discuss any unresolved issues at that time.

The proposed action is two-fold: (1) the enhancement of the two existing barge slips along the Colorado River; and (2) the placement of culverts across six drainages determined to be jurisdictional under the Clean Water Act. A No-Action Alternative would be one which requires neither of these two proposed actions. The No-Action alternative to the first proposed action would mean that barge access would not be available for offloading components, materials and equipment. The No-Action alternative to the second proposed action would prevent the use of some site roadways in support of construction of STP 3 & 4. Either of these No-Action alternatives could ultimately result in no construction and hence no additional baseload generation for use by the owners and/or for eventual sale on the wholesale market. The No-Action Alternative is considered to be equivalent to denial of the permit by the USACE.

Potential alternatives to dredging barge slips include: 1) constructing a large crane system to offload materials barged up the Colorado River; 2) use of railroad to transport materials to the site; and 3) use of existing public roadways to transport materials to the site. As discussed below, each of these options could either result in a larger impacts or increased safety concerns for the project.

1) Alternate crane off-loading system. Were it not possible to construct or upgrade appropriate barge slips, STPNOC could construct a crane system that would unload large components directly from barges moored in the Colorado River. The footprint to support such a crane system would impact additional upland habitats and require the placement of substantial structural concrete for the crane pad. While it may be possible to offload barges in this manner, the moored barge(s) could represent a significant impediment to navigation on the Colorado River. Further, a crane system as described above would not be useful in off-loading aggregate and other bulk materials. Such items would then be brought in either by rail or truck as described below.

2) Rail Transport. While there is a railroad spur that accesses the STP site, its use is currently not planned as part of this project. This spur would likely have to be refurbished and upgraded to restore it to serviceable condition. This could require substantial offsite work that would result in impacts at numerous stream crossings. While use of the rail spur could facilitate transport of aggregate and other bulk materials to the site, it likely would not allow for the transport of large components whose weight is beyond the capacity of rail and bridge crossings. Consequently, additional methods of transporting such components would still be required.

3) Public Road Transport. The use of public roads to transport construction materials and components to the site could be considered as an alternative. However, the significant increase in truck traffic could result in the need to upgrade roadways and bridges that would result in greater impacts than the preferred alternative. Given the extreme size and weight of some components, it is unclear whether public bridges could be rebuilt to sustain the additional weight. Also the addition of significant numbers of trucks to the highway system could represent a safety concern.

Alternatives to the placement of culverts would be to use current on-site roadways or span the existing drainages. Using the existing roadways through the plant facilities is not feasible due to safety and security issues associated with the current plant infrastructure and narrow roadways. Spanning the drainages may not be preferable due to potential engineering constraints concerning weight and load bearing from heavy equipment. Additional concerns include increased impacts to upland areas at each of the crossings.

CANDIDATE COLA REVISION:

No COLA revision is required as a result of this response.

AEP: America's Energy Partner™

Avian Protection Plan for South Texas Project Transmission Corridor to Hillje Substation

Originator: David C. Bouchard
AEP Water and Ecological Resource Services
Bird and Animal Management Program

Date: 15 November 2008

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1 PURPOSE and SCOPE

1.1 The purpose of this avian protection plan (APP) is to document dead or injured birds and bird nests found during operations in the transmission line corridors (approximately 20 miles in length) between the South Texas Project and the Hillje, Texas substation.

1.2 This APP is part of AEP's program to reduce company liability under the federal bird-protection acts, and to improve system reliability. This guideline is intended to help:

- 1.2.1 Manage avian/utility interactions (electrocutions, collisions, and nests),
- 1.2.2 Document bird mortalities,
- 1.2.3 Document problem nests,
- 1.2.4 Document remedial actions taken to prevent recurring problems.

1.3 Reporting and record keeping provide the basis for compliance with federal bird protection laws and for the management of bird interactions with AEP energy delivery facilities. When the conditions that lend themselves to repeated electrocutions, collisions, and nesting are encountered and understood, similar structures may be modified proactively before outages are caused or protected birds are injured or killed.

1.4 This APP is directed toward large bird species (e.g., raptors, waterfowl, herons, and egrets) and their nests. However, it is applicable to all protected species and non-protected species that cause operational or maintenance problems. Non-protected species are: English sparrow, European starling, common pigeon (rock dove), and the monk parakeet.

2 DEFINITIONS and ABBREVIATIONS

Term	Meaning
APP	Avian Protection Plan – a plan implemented by an electric utility to reduce the operational problems encountered between birds and nests and utility facilities, and to comply with federal and state bird protection laws.
BGEPA	The Bald and Golden Eagle Protection Act of 1940 (16U.S.C. 669-668d, 54 Stat. 250), protects North American eagles, their eggs, nests, and parts. It is enforced with substantial fines and jail time.
Endangered Species[1]	Any species of fish, plant life, or wildlife that is in danger of extinction throughout all or a significant part of its range and is listed on the USFWS Threatened and Endangered Species List. Each state has its own list of endangered and threatened species as well.
ES	AEP Environmental Services
ESA	The Endangered Species Act of 1973 (16 U.S.C. 1531-1544, 87 Stat. 884), as amended – Public Law 93-205, applies to plants and to animals and their habitat. These species can be found on the USFWS Threatened and Endangered Species List. It is enforced with substantial fines and jail time.
MBTA	The Migratory Bird Treaty Act of 1918 treaty between U.S., Canada, Mexico, Japan and Russia: 16 U.S.C. 703-712), protects native North American birds, their nests, eggs and parts. It is enforced with substantial fines and jail time.
Mitigate	To make less harsh or hostile; to make less severe or painful.
Necropsy	Postmortem examination to determine the cause of death – an autopsy of an animal.
Non-protected Species	English (house) sparrow, European starling, common pigeon (rock dove), and monk parakeet.
Proactive	Provide resources and training to improve employees'

[1] A list of Texas' threatened and endangered birds can be found in **Attachment 1**.

Management	knowledge and awareness. Also, to anticipate bird interaction sites in the AEP energy delivery system so they may be designed or retrofitted or otherwise remediated before negative interactions occur.
Protected Species	All birds native to North America are protected by federal law except some upland game birds, which are protected by state laws.
Reactive Management	Document bird mortalities and problem nests; conduct remedial measures where practical, and notify the area USFWS field office in accordance with these Bird Management Guidelines.
Remediate	To apply a treatment that corrects or counteracts a problem.
Retrofit	To add parts that were not included in the original structure.
Threatened Species	Any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range, which is listed on the USFWS Threatened and Endangered Species List.
USFWS	The United States Fish and Wildlife Service

3 REFERENCES

3.1 This guideline has been prepared for managing bird/power line incidents in the right-of-way between STP and the Hillje Substation. It is consistent with the principles being used to develop the system-wide AEP Avian Protection Plan.

3.2 Requirements and recommendations for managing birds on power lines can be found in the following:

3.2.1 Migratory Bird Treaty Act (MBTA)

3.2.2 Bald and Golden Eagle Protection Act (BGEPA)

3.2.3 Endangered Species Act (ESA)

3.2.4 Federal Authority: 50 CFR 13

3.2.5 EEI/APLIC documents:

3.2.5.1 *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*

3.2.5.2 *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*

3.2.6 AEP Avian Protection Policy – EP-08-14

4 SAFETY

NOTE: Whatever the danger, the safety of AEP personnel is of paramount importance and must be assured before any action is taken.

4.1 Wildlife is regarded as property of the state or federal government. Never attempt to shoot, touch, harass, capture or transport any wildlife. Such activities are illegal without special permits or licenses.

4.2 Be aware that handling wildlife can also be dangerous. Rabies can be transmitted through bites from mammals. Birds do not carry rabies, however, wounds inflicted with beaks or talons can cause serious injuries and infections.

4.3 Other diseases can be transmitted through contact with animals/birds and their droppings. This is especially the case with colonial nesting and flocking birds that can concentrate viral, bacterial and fungal diseases, which can be transmitted to humans.

5 ELECTROCUTIONS and COLLISIONS (See Attachment 3)

5.1 EAGLE OR ENDANGERED BIRD

5.1.1 **IF** a dead/injured **eagle** or **endangered** bird species is encountered during operations, **THEN** follow these steps:

5.1.1.1 Complete the appropriate Bird Incident Report (BIRD) form **(Attachment 2)** (there is a form for TRANSMISSION LINES AND STRUCTURES and one for SUBSTATIONS).

5.1.1.2 Take photographs of the bird, structure, and surroundings.

5.1.1.3 Relay this information to your supervisor.

5.1.2 **Supervisor Responsibilities:**

5.1.2.1 Contact Environmental Services (ES) (David Bouchard, Phone: 214-777-1109 (cell: 214-536-6993),

5.1.2.2 Forward BIRD form and photographs to ES.

5.1.2.3 Review mitigation plans with ES.

5.1.3 **ES Responsibilities:**

5.1.3.1 Contact USFWS agent.[2]

5.1.3.2 Arrange for USFWS to retrieve eagle carcass.

5.1.3.3 Consult with supervisor to consider/plan remediation.

5.1.3.4 Submit USFWS bird mortality/injury report.

5.1.3.5 Keep records of all remediation work including: location, measures taken to prevent further electrocutions, and the cost of manpower, equipment, retrofitting, etc.

5.2 NON-EAGLE, NON-ENDANGERED BIRD

5.2.1 **IF** a dead/injured **protected** bird is encountered during operations, **THEN** follow these steps:

5.2.1.1 Complete the appropriate BIRD form **(Attachment 2)**, take photographs of the bird, structure, and surroundings.

5.2.1.2 Bury bird on site if possible (otherwise leave it where it was found).

5.2.1.3 Relay this information to your supervisor.

5.2.2 Supervisor Responsibilities:

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[2] Special Agent
Office of Law Enforcement
Victoria, TX
361-575-8608

5.2.2.1 Contact ES (David Bouchard, Phone: 214-777-1109; cell: 214-536-6993).

5.2.2.2 Forward BIRD form to ES.

5.2.2.3 Review mitigation plans with ES.

5.2.3 ES Responsibilities:

5.2.3.1 Consult with supervisor to consider/plan remediation.

5.2.3.2 Record all remediation work including: location, measures taken to prevent further electrocutions, and the cost of manpower, equipment, retrofitting, etc.

5.2.3.3 Submit USFWS bird mortality/injury report.

6 NESTS on POWER STRUCTURES or in RIGHTS-OF-WAY (Attachment 4)

6.1 EAGLE OR ENDANGERED BIRD SPECIES NESTS

6.1.1 **IF** an **active** or **inactive** problem nest is found that belongs to an **eagle** or **endangered** bird species, **THEN** do the following:

6.1.1.1 Leave the nest where it is - no eagle or endangered species nest may be handled without a permit issued by USFWS.

6.1.1.2 If the nest is creating operational problems, complete the appropriate BIRD form (**Attachment 2**), photograph the nest, birds if possible, the structure, and the surroundings.

6.1.1.3 Report and forward findings to your supervisor.

6.1.2 Supervisor Responsibilities:

6.1.2.1 Contact ES – (David Bouchard, Phone: 214-777-1109; cell: 214-536-6993).

6.1.2.2 Forward BIRD form and photographs to ES.

6.1.2.3 Consider mitigation plans with ES.

6.1.3 ES Responsibilities:

6.1.3.1 Contact USFWS and apprise of the circumstances, obtain permit or permission to move/remove the nest.

6.1.3.2 Consult with supervisor to consider/nest management options and make an action plan (**see 7.5**).

6.2 NON-EAGLE OR NON-ENDANGERED, PROTECTED BIRD SPECIES ACTIVE PROBLEM NEST

6.2.1 **IF an** active problem nest is found that belongs to a non-eagle or non-endangered, **protected** species, **THEN** do the following:

6.2.1.1 Complete the appropriate BIRD form (**Attachment 2**), take photographs of the nest, the bird if possible, the structure, and the surroundings.

6.2.1.2 Report and forward findings to your supervisor.

6.2.2 Supervisor's Responsibilities:

6.2.2.1 Contact ES – (David Bouchard, Phone: 214-777-1109; cell: 214-536-6993).

6.2.2.2 Forward BIRD form and photographs to ES.

6.2.2.3 Consider mitigation plans with ES.

6.2.3 ES Responsibilities

6.2.3.1 Contact USFWS for permit/permission to remove/move/dispose of the nest. USFWS will provide guidelines/recommendations for management action.

6.2.3.2 Consult with supervisor regarding nest management and make an action plan (see 7.5).

6.2.3.3 Arrange, when necessary, for a certified rehabilitator to salvage eggs or young from the nest.

6.2.3.4 Submit report to USFWS.

6.3 NON-EAGLE OR NON-ENDANGERED, PROTECTED BIRD SPECIES INACTIVE PROBLEM NEST

6.3.1 **IF** an inactive problem nest is found that belongs to a non-eagle or non-endangered, **protected** species, **THEN** do the following:

6.3.1.1 Remove nest from structure.

6.3.1.2 Identify species if possible.

6.3.1.3 Bury or burn the sticks on site. (This prevents the birds from reusing this nest material to immediately rebuild the nest).

6.3.1.4 Complete the appropriate BIRD form (**Attachment 2**), take photographs of the nest, the structure, and the surroundings.

6.3.1.5 Report and forward findings to your supervisor.

6.3.2 Supervisor Responsibilities:

6.3.2.1 Forward BIRD form and photographs to ES.

6.3.2.2 Consider nest management actions with ES.

6.3.3 ES Responsibilities:

6.3.3.1 Consider nest management actions with Supervisor.

6.3.3.2 Submit report to USFWS.

6.4 NON-PROTECTED SPECIES NEST

6.4.1 **IF** an active or inactive problem nest is found that belongs to a **non-protected** species, **THEN** do the following:

6.4.1.1 Remove the nest and humanely dispose of any young birds present. For nestling-sized birds, chest compression may be used. The thumb and forefinger are placed on each side of the chest on the ribcage; pressure is gradually and steadily applied to stop lung and heart motion. The bird will appear to faint and fall asleep. The remains should be buried.

6.4.1.2 Bury the nest as well.

6.4.1.3 Report actions to supervisor.

6.4.2 Supervisor Responsibilities:

6.4.2.1 Report action to ES.

6.4.2.2 Consider mitigation plans with ES.

6.4.3 ES Responsibilities:

6.4.3.1 Log the incident for reference file.

6.4.3.2 Consult with supervisor about remediation.

6.5 REMEDIATION

6.5.1 Regardless of the species, nest management must be considered. Management examples for non-protected species include modifications that prevent rebuilding the nest in the same place.

6.5.2 Nest management for protected species includes, among other things, moving the nest to a safe part of the structure or placing a dummy pole nearby and moving the nest to it.

7 REFERENCES

7.1 Statutes

7.1.1 Migratory Bird Treaty Act

7.1.2 Bald and Golden Eagle Protection Act

7.1.3 Endangered Species Act

7.1.4 Federal Authority: 50 CFR 13

7.2 Documents

7.2.1 AEP Bird Management Guideline

7.2.2 EEI/APLIC Manual: *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*

7.2.3 EEI/APLIC Manual: *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994*

7.3 Training

7.3.1 STP Transmission Line Bird Management and Conservation Training

ATTACHMENT 1

THREATENED AND ENDANGERED SPECIES

Threatened and Endangered Species

The following endangered bird species can be found in Texas. The *Endangered Species Act, Bald and Golden Eagle Protection Act,* and the *Migratory Bird Treaty Act* protect these species (larger species in **bold**):

FEDERAL THREATENED/ENDANGERED SPECIES

- **Bald Eagle**
- **Brown Pelican**
- **Whooping Crane**
- **Northern Aplomado Falcon**
- Mexican Spotted Owl
- Attwater's Prairie Chicken
- Eskimo Curlew
- Interior Least Tern
- Piping Plover
- Red-cockaded Woodpecker
- Ivory-billed Woodpecker
- Southwestern Willow Flycatcher
- Black-capped Vireo
- Golden-cheeked Warbler

STATE THREATENED/ENDANGERED SPECIES

- **Brown Pelican**
- **Reddish Egret**
- **White-faced Egret**
- **Whooping crane**
- **Bald Eagle**
- **Swallow-tailed Kite**
- **Grey Hawk**
- **Common Black Hawk**
- **White-tailed Hawk**
- **Zone-tailed Hawk**
- **Northern Aplomado Falcon**
- **Peregrine falcon** (all varieties)
- Cactus Pigmy Ferruginous Owl
- Mexican Spotted Owl
- Attwater's Greater Prairie Chicken
- Eskimo Curlew
- Interior Least Tern
- Piping Plover
- Red-cockaded Woodpecker
- Ivory-billed Woodpecker
- Southwestern Willow Flycatcher
- Northern Bearded Tyrannulet
- Rose-throated Becard
- Tropical Parula
- Black-capped Vireo
- Golden-cheeked Warbler
- Bachman's Sparrow
- "Texas" Botteri's Sparrow
- "Arizona" Botteri's Sparrow

ATTACHMENT 2

Bird Incident Report Forms:

Transmission Facilities

Substations

AEP Transmission Bird Fatality/Injury Reporting Form

Contact Information

Name of finder: Phone Number: Date:	OMS Area:

Location of Incident

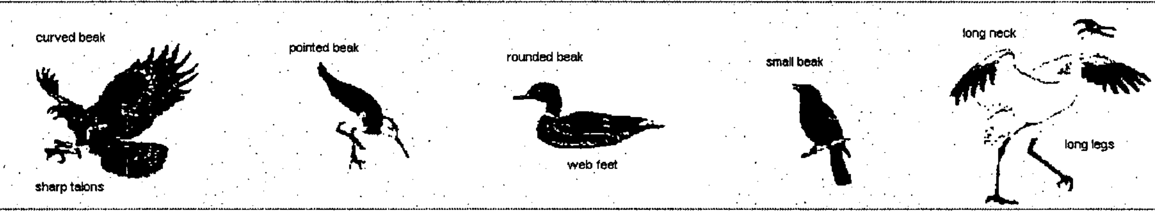
State: TX	County:	
Nearest City or Town:		
Circuit Name: STP to HILLJE		Structure No.:
GPS Coordinates, Intersection, or Street Address:		

Fatality/Injury Details

Number of birds involved _____

Date the Bird was Discovered: ___/___/___ Date of Outage if Different: ___/___/___

Type of Bird (e.g. bald eagle, vulture, red-tiled hawk, crow, etc.) or circle closest match below:



Condition of the Bird: **Alive** ☐ **Dead** ☐

If Alive, Actions Taken:

Describe the Bird's Injuries:

Was the Bird **Recovered** ☐ **Left in Place** ☐

If Recovered, Indicate One of the Following:

Buried On Site ☐ **Rehabilitation Center** ☐ **Transferred to/Picked up by USFWS** ☐ **Veterinarian** ☐

Name/Address/Phone of: **Rehab Center,** **USFWS Agent,** **Veterinarian,** **Other:**

Apparent Cause of Fatality/Injury (indicate all that apply): **Electrocution** ☐ **Probable Electrocution** ☐ **Collision** ☐ **Probable Collision** ☐ **Unknown** ☐ **Other** ☐ (explain):

Was There a Transmission Circuit Outage? **Yes** ☐ **No** ☐ **Unknown** ☐ Outage No: ( )

If **Yes**, Approx. Time ____:____ **a.m.** ☐/**p.m.** ☐ Power Restored at: ____:____ **a.m.** ☐/**p.m.** ☐

If **No**, was There a Circuit Breaker Operation: **Yes** ☐ **No** ☐

Structure Configuration

Describe the line structure configuration involved in this incident. (e.g., lattice tower, horizontal post, etc.)

Voltage: __________ **kV**

Is There an Underbuild? **Yes** ☐ **No**

Is There an Overhead Static Line? **Yes** ☐ **No** ☐

Are There Secondary Lines? **Yes** ☐ **No** ☐

If this incident was related to an **electrocution**, or **possible electrocution,** indicate where on the structure it occurred, i.e., what were the points of contact?

What is the Spacing Between Phases? __________ **ft.**

What is the Distance Between Conductor and Crossarm? _________ **ft.** **over**

AEP Transmission Bird Fatality/Injury Reporting Form

Where was the Bird Found in Relation the Structure? (e.g., on the structure, at its base, etc.) What Equipment was Damaged? Has this Structure had a Bird Incident Before: **Yes** ☐ **No** ☐ If **Yes**, when? What Action was Taken Then?

Environmental Conditions

Surrounding Environment (check all that apply): **Wooded** ☐ **Grassland** ☐ **Wetland** ☐ **Shoreline** ☐ **Lake/Pond/Stream** ☐ **Cultivated** ☐ **Flat** ☐ **Rolling** ☐ **Hilly** ☐ **Rural** ☐ **Suburban** ☐ **Urban** ☐
Weather Conditions when Bird Incident Occurred (if known): **Clear** ☐ **Fog** ☐ **Wind** ☐ **Snow** ☐ **Rain** ☐ **Other** ☐ – explain:
Food Sources Nearby (check any applicable): **Prey** ☐ **Person feeding** ☐ **Food processing facility** ☐ **Dumpster** ☐ **Landfill** ☐ **Restaurant** ☐ **Other** ☐: (describe):
Is There a Nest on the Structure? **Yes** ☐ **No** ☐ Is there a nest nearby? **Yes** ☐ **No** ☐
If **Yes**, is the Nest Active*? **Yes** ☐ **No** ☐ **Unknown** ☐

Protection / Retrofit Measures

Is There Bird/Animal Protection on the Structure? **Yes** ☐ **No** ☐
If **Yes**, Check All the Protection Devices Present: ____Bird Deterrent Device (describe): ____Bird Flapper Device – ____Bird or Swan Flight Diverter (BFD, SFD) or Vibration Damper ____Bushing Cover(s) ____Conductor Spacing Increased ____Elevated Perch ____Extension Link (non-conducting) ____Ground Wire Cover/Insulation ____Jumper Wire Cover/Insulation ____Jumper Wire(s) Suspended under Crossarm ____Perch Guard(s) (to discourage perching) ____Nest Platform ____Pole-top Extension ____Primary Insulator Cover (e.g., "Birdguard") ____Other Bird/Animal Protection (describe):

Additional Information / Photographs

Remarks regarding this fatality/injury: What was or could be done to prevent a similar incident from happening again? Include date or planned date of mitigation completion and a photo of the modifications when complete.
Include **PHOTOGRAPHS** of Structure, Surroundings, Close-up of Carcass and Injuries, Nest, Burn Marks on Structure/Equipment associated with this outage:

* eggs or young present or, in case of colonial nesters (e.g., herons) an active nest on the structure means all nests are considered active by the law.

Send Report to David Bouchard, 1201 Elm St., Suite 800, Dallas, TX 75270 or PO Box 660164, Dallas, TX 75270-0164. Email dcbouchard@aep.com, Phone: 214-777-1109, cell – 214-536-6993.

AEP Substation Bird Fatality/Injury Reporting Form

Contact Information

Name of finder: Phone Number:	OMS Area:

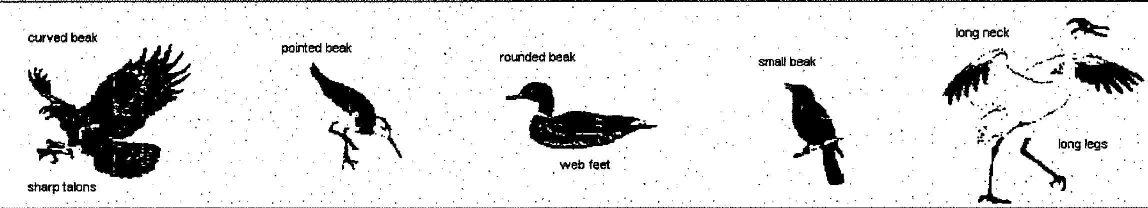
Location of Incident

State: TX	
Nearest Town or Community:	
Street Address, Intersection, or GPS Coordinates:	
Substation Name: HILLJI	Station No.:

Fatality/Injury Details

Date the bird was discovered: ___/___/___ Date of Outage if different: ___/___/___

Type of bird (e.g. bald eagle, vulture, red-tailed hawk, crow, etc.) or circle closest match below:



Condition of the bird: **Alive** ☐ **Dead** ☐

Describe the bird's injuries:

Was the bird **Recovered** ☐ **Left in Place** ☐

If recovered, indicate one of the following:
Buried on site ☐ **Rehabilitation Center** ☐ **Transferred to/Picked up by USFWS** ☐ **Veterinarian** ☐
Other ☐ (explain):

Name, Address & Phone of: **Rehab center, USFWS agent, Veterinarian, Other:**

Apparent cause of fatality/injury (indicate all that apply): **Electrocution** ☐ **Probable Electrocution** ☐
Collision ☐ **Probable Collision** ☐ **Other** ☐ (explain):

Did an outage result? **Yes** ☐ **No** ☐ **Unknown** ☐
If **Yes**, date ____/____/____, time _______:_______ duration _______:_______ of outage.
Outage No: (e.g., 70119-1):

If no outage, was there a recloser operation? **Yes** ☐ **No** ☐

Any previous bird/animal incidents at this sub: **Yes** ☐ **No** ☐
If yes, When: _____/_____/_____, ____/____/____, ____/____/____, ____/____/____
Where in the Sub did the incident occur:

Structure Configuration

Substation Voltage:

What were the contact points?

What was the voltage at the point of contact? ______kV

Was there equipment damage: **Yes** ☐ **No** ☐
If **Yes**, what equipment was damaged and what were the repair costs?

Substation Bird Fatality/Injury Reporting Form

Environmental Conditions

Surrounding Environment (check all that apply): **Wooded** ☐ **Grassland** ☐ **Wetland** ☐ **Shoreline** ☐ **River, Lake, Waterbody** ☐ **Cultivated** ☐ **Flat** ☐ **Rolling** ☐ **Hilly** ☐ **Rural** ☐ **Suburban** ☐ **Urban** ☐
Weather Conditions at the time of the incident (if known): **Clear** ☐ **Fog** ☐ **Wind** ☐ **Snow** ☐ **Rain** ☐ **Unknown** ☐ **Other** ☐ – explain:
Food sources nearby (indicate any applicable): **Prey** ☐ **Person feeding** ☐ **Food processing facility** ☐ **Dumpster** ☐ **Landfill** ☐ **Restaurant** ☐ **Unknown** ☐ **Other** ☐ describe:
Is/was there a bird nest in the sub? **Yes** ☐ **No** ☐ If no, is a nest evident nearby? **Yes** ☐ **No** ☐
If *Yes* for either situation, is the nest active*? **Yes** ☐ **No** ☐ **Unknown** ☐

Protection / Retrofit Measures

Was bird/animal protection in place on equipment in the sub? **Yes** ☐ **No** ☐
If **Yes**, check all existing bird/animal protection devices present or added: ____Bird Deterrent Device – (please describe): ____Bushing Cover(s) ____Jumper Wire Cover/Insulation ____Conductor Spacing Increased from Original Design ____Ground Wire Cover/Insulation ____Perch Guard(s) (to discourage perching) ____Primary Insulator Cover (e.g., Salisbury's "Birdguard") ____Elevated Perch ____Other equipment covers ____Other Bird/Animal Protection – (please describe):

Additional Information/Photographs

Remarks regarding this fatality/injury/nest: What was or could be done to prevent a similar incident from happening again?
Include **PHOTOGRAPHS** of Structure, Burns on Structure, Surroundings, Nest, Close-up of Carcass and Injuries:

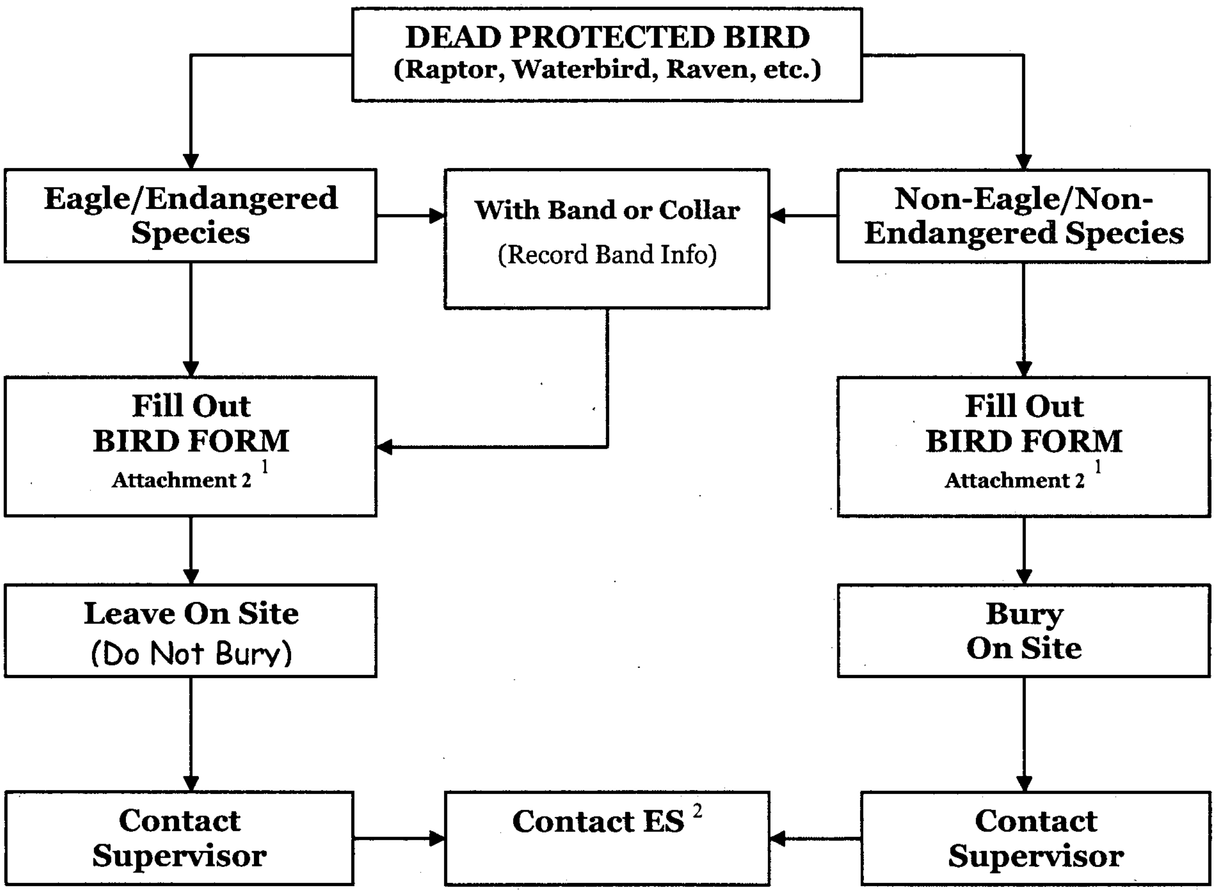
* eggs or young present or, in case of colonial nesters (e.g., herons) any active nest on the structure means all nests are considered active by the law.

Send Report to David Bouchard, 1201 Elm St., Suite 800, Dallas, TX 75270 or PO Box 660164, Dallas, TX 75270-0164. Email dcbouchard@aep.com, Phone: 214-777-1109, 8-777-1109, FAX – 214-777-1138, cell – 214-536-6993.

ATTACHMENT 3

AEP PROCEDURES FOR BIRD INCIDENT MANAGEMENT

AEP PROCEDURES FOR BIRD INCIDENT MANAGEMENT

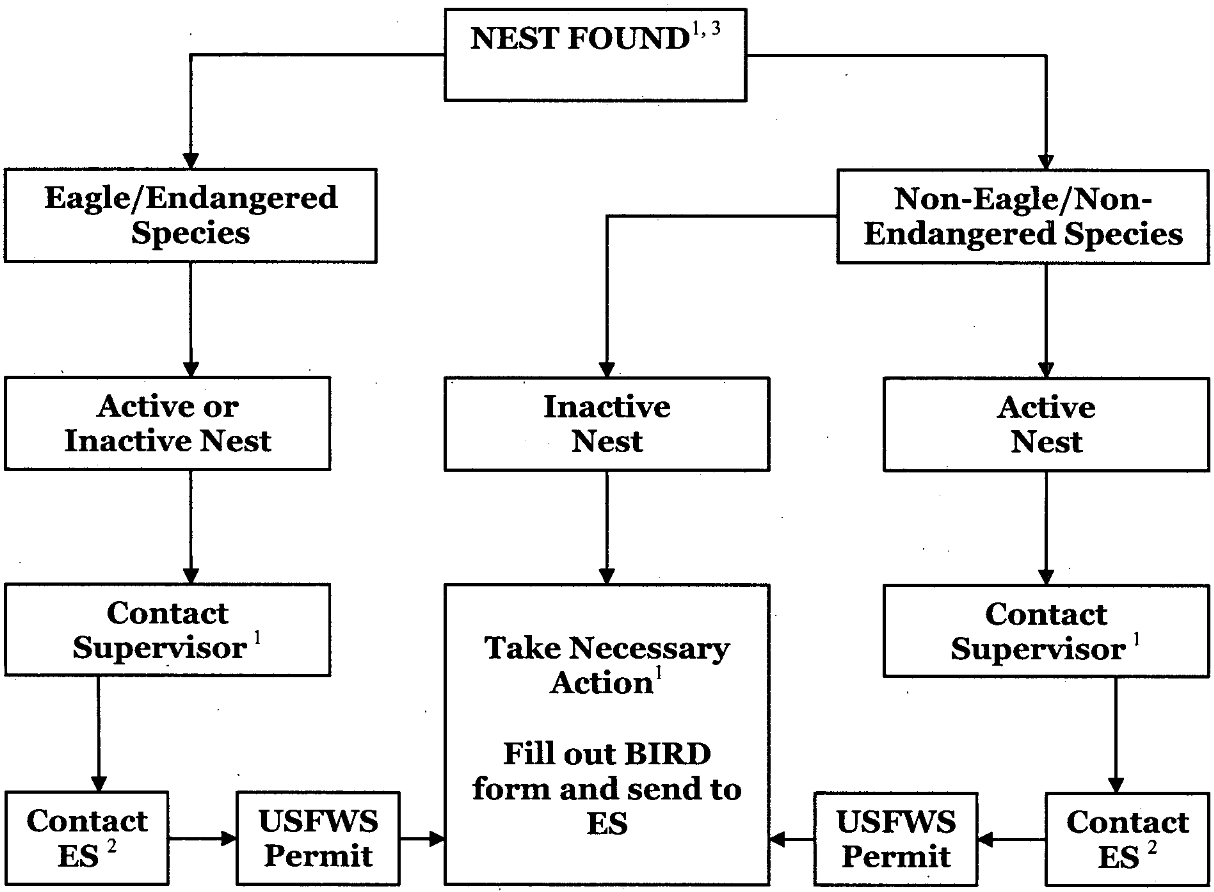


1. Bird Mortalities and Problem Nest: enter information on the BIRD form and send to ES.
2. ES: Dave Bouchard (214-777-1109) (cell: 214-536-6993)

ATTACHMENT 4

AEP PROCEDURES FOR BIRD NEST MANAGEMENT

AEP PROCEDURES FOR BIRD NEST MANAGEMENT



1. If Imminent Danger exists, take the necessary action first, then call ES immediately afterward.
2. Dave Bouchard (214-777-1109) (cell: 214-536-6993)
3. Prior to taking any action on a problem nest, personnel are required to determine:
   - **What bird species is using the nest**? Is it an eagle or endangered species nest, or is it a nest of another protected bird? (Refer to **Attachment 1** for names of Texas' endangered/threatened species).
   - **Nest Status**. Is the nest active (eggs or live young present), or inactive?

ATTACHMENT 5

Identifying Protected and non-Protected Bird Species

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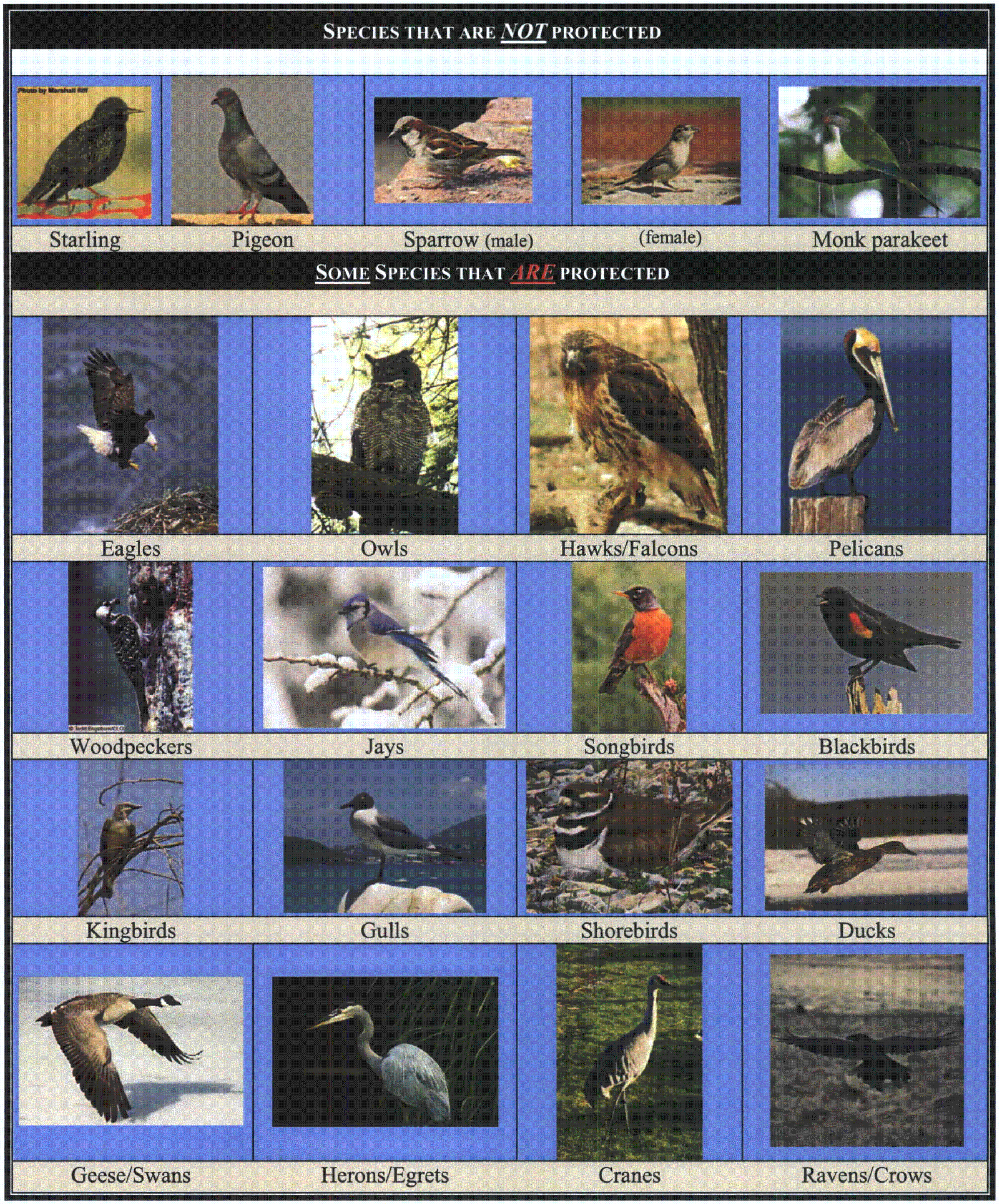
SPECIES THAT ARE NOT PROTECTED
Starling
Pigeon
Sparrow (male)
(female)
Monk parakeet
SOME SPECIES THAT ARE PROTECTED
Eagles
Owls
Hawks/Falcons
Pelicans
Woodpeckers
Jays
Songbirds
Blackbirds
Kingbirds
Gulls
Shorebirds
Ducks
Geese/Swans
Herons/Egrets
Cranes
Ravens/Crows

ATTACHMENT 6

Identifying Nests and Eggs

Egg and Nest Identification

Though there are only four species that are not protected, they appear more frequently around human activity and structures than any of the 830-plus protected species. Even with the possibility that a nest encountered on a work site is one of the unprotected species, being certain we are not disturbing a protected nest is critical. The following photos of unprotected nests and eggs provides a guide, but because of variation within a species and similarities with other species makes identification unreliable, the adults belonging to the nest need to be identified as well.