Nuclear Operating Company
South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

December 30, 2008
U7-C-STP-NRC-080076

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 Requests for Additional Information

Attached are responses to NRC staff questions included in Request for Additional Information (RAI) letter numbers 39 and 74, related to Combined License Application (COLA) Part 2, Tier 2, Sections 2.4S.12 and 2.3S.4, respectively. Attachments 1 through 4 include responses to the RAI questions listed below and complete the response to RAI letter numbers 39 and 74:

02.03.04-6	02.04.12-20
02.03.04-7	
02.03.04-8	

When a change to the COLA is indicated, the change will be incorporated into the next routine revision of the COLA following NRC acceptance of the RAI response.

There are no commitments in this letter.

If you have any questions regarding these responses, please contact me at (361) 972-7136, or Bill Mookhoek at (361) 972-7274.

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

Executed on 12/30/08

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

rhb

Attachments:
1. Question 02.03.04-6
2. Question 02.03.04-7
3. Question 02.03.04-8
4. Question 02.04.12-20

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NRO

STI 32414644

cc: w/o attachment except*
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RAI 02.03.04-6:

QUESTION:

Revise FSAR Section 2.3S.4.2 to be more coherent.

FSAR Section 2.3S.4.2 describes the short-term atmospheric dispersion estimates performed for accident releases.

(a) The discussion concerning the atmospheric dispersion computer program ARCON96 and the resulting control and technical support center χ/Q values could be moved from FSAR Section 2.3S.4.2.1.1 (Offsite Dispersion Estimates) to its own section titled "Onsite Dispersion Estimates."

(b) The couple of sentences on hazardous chemical releases scattered throughout FSAR Section 2.3S.4.2.1 (Postulated Accidental Radioactive Releases) could be moved to FSAR Section 2.3S.4.2.2 (Hazardous Material Releases).

RESPONSE:

The following revisions will be made to FSAR Subsection 2.3S.4.2:

In response to Item (a), information currently in the 4th through the 11th paragraphs of FSAR Subsection 2.3S.4.2.1.1 will be placed under a new Subsection 2.3S.4.2.1.2, Onsite Dispersion Estimates, as shown below. In response to Item (b), the information deleted in the 1st and 5th paragraphs of FSAR Subsection 2.3S.4.2.1.2 is already included in the 1st paragraph of FSAR Subsection 2.3S.4.2.2; therefore, no further revision of Subsection 2.3S.4.2.2 is required. FSAR Subsection 2.3S.4.2.1.1 will be changed as shown below:

2.3S.4.2.1.2 Onsite Dispersion Estimates

In addition, χ/Qs are estimated at the control room and the Technical Support Center (TSC) for postulated accidental radioactive airborne releases. ~~The χ/Qs are also used to estimate the pollutant concentrations at the control room for postulated accidental releases of toxic chemicals for material stored onsite, offsite and for toxic or flammable material transported on nearby transport routes.~~

Control room χ/Qs are estimated using the ARCON96 model as described in NUREG/CR-6331 (Reference 2.3S-50) and considers the control room air intake height, release height, release type, and building area. Hourly meteorological data collected onsite during 1997, 1999, and 2000 is used as part of the input for the ARCON96 program. The three years of meteorological data identified above in Subsection 2.3S.4.1 all have data recovery rates of greater than 90%, and are representative of the site dispersion characteristics as described in Subsection 2.3S.3.

As discussed in Subsection 15.6.5.5.3 of the reference ABWR DCD, the control room may be contaminated from two sources: the Reactor Building 76-meter stack or the Turbine Building truck doors. Subsection 11.3.10 of the reference ABWR DCD also provides information on radioactive releases. The locations of the sources and receptors are provided in Figure 2.3S-23.

RG 1.194 (Reference 2.3S-51) provides guidance on the use of ARCON96 for determining χ/Qs to be used in design basis evaluation of control room radiological habitability. Subsection 3.2.2 of RG 1.194 specifies that a stack release should be more than 2-1/2 times the height of the adjacent structure. Since the 76-meter stack is lower than 2-1/2 times the height of the nearby 42.7-meter turbine building, it was considered as a ground-level source in the ARCON96 modeling. The Turbine Building truck doors, located at the ground level, were also treated as a ground-level source. For STP 3 & 4, each unit has two control room air intakes and a TSC air intake (as shown in Figure 2.3S-23). These three intakes were treated as receptors in ARCON96 modeling.

The reactor building plant stack is located close to the middle of the west side of the Reactor Building; the turbine building truck doors are located to the north-west corner of the Turbine Building. The control room air intakes are located to the north-west (designated as B in Table 2.3S-25) and north-east (designated as C in Table 2.3S-25) corners of the Control Building; the TSC air intake is located close to the middle of the Service Building. Guidelines provided in RG 1.194 (Reference 2.3S-51) were followed in estimating the χ/Q values at the control room and TSC air intakes.

~~The concentrations at the control room and TSC intakes due to accidental hazardous chemical releases (toxic vapor and flammable cloud) were determined using the guidance specified in RG 1.78 (Reference 2.3S-52).~~ Control room and TSC χ/Qs for the 95% time averaging (0 to 2 hours, 2 to 8 hours, 8 to 24 hours, 1 to 4 days and 4 to 30 days) periods obtained from the ARCON96 modeling results are summarized in Table 2.3S-25.

The results provided in Table 2.3S-25 show that the χ/Q values determined by the ARCON96 modeling analyses at the control room and TSC air intakes for Reactor Building stack releases are bounded by the corresponding χ/Q values in Tables 15.6-3, 15.6-7, 15.6-13, 15.6-14, and 15.6-18 of the reference ABWR DCD, except in one instance.

The ARCON96 modeling results show that the maximum 4-30 day χ/Q value at one of the control room air intakes due to turbine building truck door releases is 9.13E-05. As discussed in a foot note for DCD Table 15.6-14, the control room χ/Q values for releases from turbine building are a factor of six less than reactor building χ/Q values.

Therefore, the 4-30 day average control room χ/Q value (5.12E-04) due to reactor building releases (see DCD Table 15.6-14) is equivalent to a control room χ/Q value of 8.53E-05 for turbine building releases. The ARCON96-calculated 4-30 day control room χ/Q value (9.13E-05) due to turbine building truck door releases slightly exceeds the corresponding DCD χ/Q value (8.53E-05). The maximum 4-30 days χ/Q values exceed the corresponding reference ABWR DCD χ/Q values by 7%. The exceedance of a χ/Q value does not result in the violation of the NRC dose limit. The ultimate factor that would affect the plant design is the radiation dose.

RAI 02.03.04-7:

QUESTION:

Justify the statement in FSAR Section 2.3S.4.2 that the assessment of atmospheric dispersion factors at the exclusion area boundary (EAB) and outer boundary of the low population zone (LPZ) is required by 10 CFR Part 50, Appendix E and revise FSAR Section 2.3S.4.2 accordingly.

FSAR Section 2.3S.4.2 describes the calculations used to derive short-term atmospheric dispersion estimates for accident releases and states that 10 CFR Part 50, Appendix E, requires an assessment of atmospheric dispersion factors at the EAB and LPZ. Elucidate this requirement as stated in Appendix E.

RESPONSE:

The reference to 10 CFR 50, Appendix E will be removed from the first paragraph of FSAR Section 2.3S.4.2 as shown below:

> The PAVAN computer code, as described in NUREG/CR-2858 (Reference 2.3S-48), is used to estimate ground-level χ/Qs at the EAB and LPZ for potential accidental releases of gaseous radioactive material to the atmosphere. This assessment is required by 10 CFR Part 100 (Reference 2.3S-46) ~~and 10 CFR Part 50, Appendix E (Reference 2.3S-49)~~.

Section 2.3S.6 will also be revised as shown below to remove Reference 2.3S-49:

> 2.3S-49 ~~10 CFR 50, Appendix E, Title 10, Energy, Part 50, Domestic Licensing of Production and Utilization Facilities, Appendix E, Emergency Planning and Preparedness for Production and Utilization Facilities~~ Not Used.

RAI 02.03.04-8:

QUESTION:

Review an apparent discrepancy between the 0-2 hour outer boundary of the low population zone (LPZ) atmospheric dispersion factor (χ/Q value) listed in FSAR Section 2.3S.4.2.1.1 and FSAR Table 2.3S-24 and revise the FSAR as necessary.

FSAR Section 2.3S.4.2.1.1 summarizes the offsite atmospheric dispersion estimates for postulated accidental radioactive releases; similarly, FSAR Table 2.3S-24 provides χ/Q results at the LPZ. The staff notes the following discrepancy between the LPZ χ/Q values listed in FSAR Section 2.3S.4.2.1.1 and FSAR Table 2.3S-24:

Section 2.3S.4.2.1.1 lists the 0-2 hour LPZ value as 4.76E-5 whereas Table 2.3S-24 lists the highest 0-2 hour LPZ value as 5.05E-5 (WSW sector).

RESPONSE:

The discrepancy between FSAR Subsection 2.3S.4.2.1.1 and FSAR Table 2.3S-24 will be corrected with revised χ/Q values in the response to FSAR RAI Question 02.03.04-5, to be submitted by January 30, 2009. Reference letter U7-C-STP-NRC-080069 from Scott Head to the Document Control Desk, "Response Date Extension to Request for Additional Information," dated December 11, 2008, (ML 083500109).

RAI 02.04.12-20:

QUESTION:

With regard to FSAR Figures 2.4S.12-17 and 2.4S.12-19: (a) while the groundwater head maps presented in these figures were used to determine contamination pathways, the staff recognize the following weaknesses in the presented information: (i) the groundwater head contours were drawn based on very limited observation data points, especially on the northeast side of MCR; (ii) while the applicant states that MCR water recharges into the Shallow Aquifer, the pattern of groundwater head distribution in and surrounding the MCR is not clearly defined (modified to address effects of MCR on exposure routes); and (iii) the projected pathways near the existing and new units are not clearly defined. Clarify the above issues and provide improved potentiometric surface maps. (b) discuss how the patterns of groundwater flow and pathways could change after the construction of the proposed units, and describe implications for the plausible pathways. (c) describe potential changes to the potentiometric surfaces of the Upper and Lower Shallow Aquifer and describe implications for the plausible pathways in cases of (i) continued greater usage of this resource (ii) prolonged periods of wet climate, and (iii) prolonged periods of dry climate. (d) Based on the above discussions and descriptions, provide refined post-construction pathway and travel time estimates in the Section 2.4S.12.3.1, "Exposure Point and Pathway Evaluation."

RESPONSE:

(a) (i) An additional 26 observation wells (13 well clusters) were installed in July and August 2008 around the existing and proposed industrial area of the STP site and to the southeast toward Kelly Lake, to obtain additional hydrogeologic information and reduce uncertainty associated with groundwater flow paths near the MCR, the STP 3 & 4 power block and the site boundary. Water levels were measured in the new and existing observation wells in September 2008 to produce updated maps of the potentiometric surfaces in the Upper and Lower Shallow Aquifers, to support Commitment # 8 (Reference 1).

(a) (ii) The MCR was formed by constructing an approximately 45-foot high embankment on top of the existing ground surface. The design operating water level in the MCR is approximately 20 feet above the original grade level. Because the MCR is not lined, this hydrostatic head induces seepage through its bottom, causing potentiometric levels in the underlying Upper Shallow Aquifer near the inside of the embankment to be higher than those farther outside the embankment.

Relief wells at the toe of the embankment are screened in the Upper Shallow Aquifer and are "flowing" wells. These wells flow spontaneously because the hydraulic head imposed by the water level in the MCR induces potentiometric levels in the relief wells that are higher than the nearby ground surface elevation. The wells discharge to the toe ditches/streams near the embankment toe. The relief well system was designed to capture at least 50% of the seepage from the MCR, with the remaining seepage flowing beyond the wells (Reference 2). The result is that groundwater in the Upper Shallow Aquifer flows outward from the MCR.

During construction of the MCR, sets of piezometers were installed at locations along the MCR embankment to monitor the hydraulic head of the underflow through and beneath the structure. These sets of piezometers generally consist of three or more piezometers in a linear array perpendicular to the alignment of the embankment and extending to the embankment toe. The first piezometer in each set is offset approximately 11 feet landward of the embankment centerline, and the second and third piezometers are offset approximately 100 and 260 feet, respectively (Reference 2).

Historical groundwater levels measured in these piezometers indicate that the hydraulic head in the Upper Shallow Aquifer beneath the entire length of the MCR embankment decreases in the landward direction, inducing groundwater seepage outward from the MCR and toward the relief wells at the embankment toe. Figure 2.4S.12-XA is a contour map of water-level elevations in these piezometers in February 2003. This map shows the piezometric surface in the Upper Shallow Aquifer in the vicinity of the MCR, and indicates that groundwater flow was outward from the MCR along the entire length of the embankment.

Figure 2.4S.12-XB is a map of the potentiometric surface in the Upper Shallow Aquifer in September 2008. This map includes water levels in the original STP 3 and 4 observation wells drilled in 2006 and 2007, and supplemental observation wells drilled in 2008, and was prepared to support Commitments # 6, 7, and 8 (Reference 3). Figure 2.4S.12-XB shows groundwater flow outward from the MCR and diversion of flow to the southeast and southwest in the area of the STP 3 & 4 power block. To the northwest of the STP 3 & 4 power block the groundwater gradient is not affected by the MCR and is toward the power block. Flow from this area converges with the outward flow from the northwest corner of the MCR and is diverted around the MCR, to the southeast and the southwest.

Figure 2.4S.12-XC is a map of the potentiometric surface in the Lower Shallow Aquifer in September 2008. This figure shows that groundwater flows from northwest to southeast, under the area of the STP 3 & 4 power block, toward and under the MCR. Groundwater flow in this aquifer does not appear to be significantly affected by seepage from the MCR.

(a) (iii) FSAR Subsection 2.4S.12.3 will be revised in a future COLA revision to include three potential pathways. Pathway 1 is within the Upper and Lower Shallow Aquifers and leads from STP 3 to an exposure point at a hypothetical well in the Shallow Aquifer at the eastern STP site boundary or to an unnamed tributary in that area. Pathway 2 is within both the Upper and Lower Shallow Aquifers and leads from STP 3 to existing Well 2004120846 located about 1,700 ft east of eastern site boundary or to an unnamed tributary in that Area. Pathway 3 is within the Shallow Aquifer and leads from STP 3 to the Colorado River. A pathway for off-site release within the Deep Aquifer is not deemed plausible because of the more than 100 feet of clay that separates the Deep from the Lower Shallow Aquifer and the likely capture by STP production wells of contaminants that might potentially enter the Deep Aquifer on site.

A numerical model of the STP groundwater system has been prepared to support Commitments # 6 and # 8. The model incorporates existing and new hydrogeologic information from installation of additional observation wells during the supplemental subsurface investigation in 2008.

Groundwater levels measured in the resulting larger network of observation wells allow preparation of improved potentiometric surface maps. The model provides for particle tracking, which shows flow paths in the Upper and Lower Shallow Aquifers from STP 3 to down-gradient areas. The model incorporates pre-construction groundwater flow conditions and provides a prediction of post-construction groundwater flow conditions.

(b) Excavation for the foundations of the Reactor Buildings for STP 3 & 4 will extend to approximately 90 feet below grade level. This depth will penetrate approximately 40 feet into the top of the Lower Shallow Aquifer. A slurry wall will be constructed to completely surround the STP 3 & 4 power block area to facilitate dewatering of the excavation.

Engineered backfill within the excavation will provide hydraulic connection between the Upper and Lower Shallow Aquifers in the vicinity of the deep foundations. Current groundwater levels in shallow/deep piezometer and observation well pairs indicate a downward vertical hydraulic gradient within the Shallow Aquifer throughout the STP site (Table 2.4S.12-8). The hydraulic connection provided by the excavation backfill will facilitate groundwater flow from the Upper to the Lower Shallow Aquifer in the vicinity of the foundations. Table 2.4S.12-17 indicates that the travel time within each of the plausible flow paths to off-site exposure points is substantially longer in the Lower compared to the Upper Shallow Aquifer. In addition, the lower hydraulic conductivity of the planned construction dewatering slurry wall relative to the engineered backfill and sand of the Shallow Aquifer will retard the flow from the area enclosed by the slurry wall. Therefore, an effect of constructing STP 3 & 4 will be to lengthen the travel time for potential contaminants that may enter the Shallow Aquifer.

Local groundwater flow will be diverted around those foundations and slurry walls that penetrate the Shallow Aquifer. However, flow down-gradient from those structures converges to a flow path essentially the same as the unobstructed flow path that exists before construction of the structures. Local diversions of groundwater flow by structures in the STP 3 & 4 power block will not significantly alter flow paths to off-site exposure points. The numerical groundwater model of the STP Shallow Aquifer groundwater system, submitted to NRC in December 2008, illustrates the effect of deep foundations and slurry walls on flow within the Shallow Aquifer.

Construction of the ultimate heat sink (UHS) for STP 3 & 4 may result in seepage of water from the UHS to the Upper Shallow Aquifer. The seepage loss will be relatively small and is estimated to be approximately 982,330 kilograms over 30 days (FSAR Section 9.2.5.5.2). Seepage from the UHS may cause minor localized mounding of the piezometric surface in the Upper Shallow Aquifer that could alter groundwater flow in its immediate vicinity.

The source of water for Units STP 3 & 4 will be groundwater pumped from the Deep Aquifer. This withdrawal will be in addition to existing withdrawals for STP 1 & 2. The result of the increased groundwater production will be to expand the area beneath the STP site over which the piezometric surface within the Deep Aquifer is lowered. A pathway for plant-related contaminants within the Deep Aquifer is very unlikely because of the thick confining layer (over 100 feet) that overlies the aquifer. Nevertheless, in the unlikely event of a release of contaminants to the Deep Aquifer, increased groundwater production from the aquifer would further enhance the capture of those contaminants and limit their transport off site.

(c) (i) The groundwater supply for STP is pumped only from the Deep Aquifer. This is a confined aquifer that is hydraulically isolated from the overlying Shallow Aquifer by a layer of clay and silt more than 100 ft thick. No significant change to the piezometric surface in the Upper or Lower Shallow Aquifer will occur as a result of increased withdrawals from the Deep Aquifer to support operation of STP 3 & 4.

The MCR was originally designed to support operation of four reactors. No change to the maximum water level in the MCR will occur because of the addition of STP 3 & 4. Therefore, no significant change in the rate of seepage from the MCR to the Upper Shallow Aquifer is expected and no related change in the piezometric surface of that aquifer would be expected from the addition of these units.

(c) (ii) Construction of STP 3 & 4 will increase the area of impermeable surfaces in the power block area. Roof drains for structures in the power block will be routed to storm drains, which will flow to engineered surface water outfalls. Ground surface within the power block area will be graded to direct storm water to drains flowing to engineered surface water outfalls. In addition, because the surficial soils in the area of STP 3 & 4 are principally clay, relatively little direct infiltration of precipitation occurs. The drainage structures and increased area of low permeability surfaces in the power block area will not significantly affect the volume of precipitation infiltration and recharge of groundwater to the Shallow Aquifer within the site boundary. These structures are not expected to significantly affect the height to which groundwater will rise within the power block area during prolonged periods of wet climate.

(c) (iii) During prolonged periods of dry climate the volume of regional groundwater recharge will be reduced and the depth to groundwater will generally increase. Lower water levels in the Shallow Aquifer will have no significant effect on plant operation because groundwater from that aquifer is not used to support operations. Although at least 50% of seepage from the MCR is removed from the Shallow Aquifer by the MCR relief wells, MCR seepage not captured by the relief wells will moderate the extent to which groundwater levels are lowered in the nearby Shallow Aquifer during periods of drought.

The water supply for STP 3 & 4 will be derived from groundwater pumped from the Deep Aquifer within the Beaumont Formation. The Beaumont Formation is a regional formation within the Gulf Coast Aquifer. At the STP site, the Deep Aquifer occurs at depths from about 250 feet to more than 700 feet below MSL. The data in Table 2.4S.12-5 show that an average of about 32,000 acre-feet per year of groundwater was pumped from the Deep Aquifer in Matagorda County during the period of 1974 to 2004. The combined withdrawals from

STP 1, 2, 3 & 4 will be about 3,000 acre-feet per year, or about 10 percent of the average withdrawals from the Deep Aquifer in Matagorda County.

Figure 2.4S.12-22 shows that groundwater levels in the Deep Aquifer during the same period were either rising (in Well 8015402 located 10 miles west of STP) or essentially unchanged (in Well 80155301 located 6 miles northeast of STP). These data suggest that the volume of groundwater recharged to the aquifer was in excess of that being withdrawn and provide evidence that additional groundwater would be available from aquifer storage during periods of drought.

(d) Based upon particle tracking analysis prepared in conjunction with a numerical groundwater model developed for the Shallow Aquifer, hypothetical contaminants released to the Upper Shallow Aquifer within the power block of STP 3 & 4 would flow vertically downward to the Lower Shallow Aquifer. From there, the contaminant flow path would be eastward through the Lower Shallow Aquifer, with discharge to the Colorado River. FSAR Table 2.4S.12-17 indicates the estimated travel time within this flow path without consideration of the effect of the construction dewatering slurry wall. The slurry wall is expected to delay the release of contaminants to the Shallow Aquifer, increasing the travel time to off-site receptors.

Kelly Lake is likely within this flow path. September 2008 groundwater levels measured in new observation wells near the lake indicate an upward flow potential from the Lower to the Upper Shallow Aquifer and a piezometric surface in the Upper Shallow Aquifer essentially equal to the water level in the lake. These findings suggest that groundwater from the nearby Shallow Aquifer discharges to Kelly Lake.

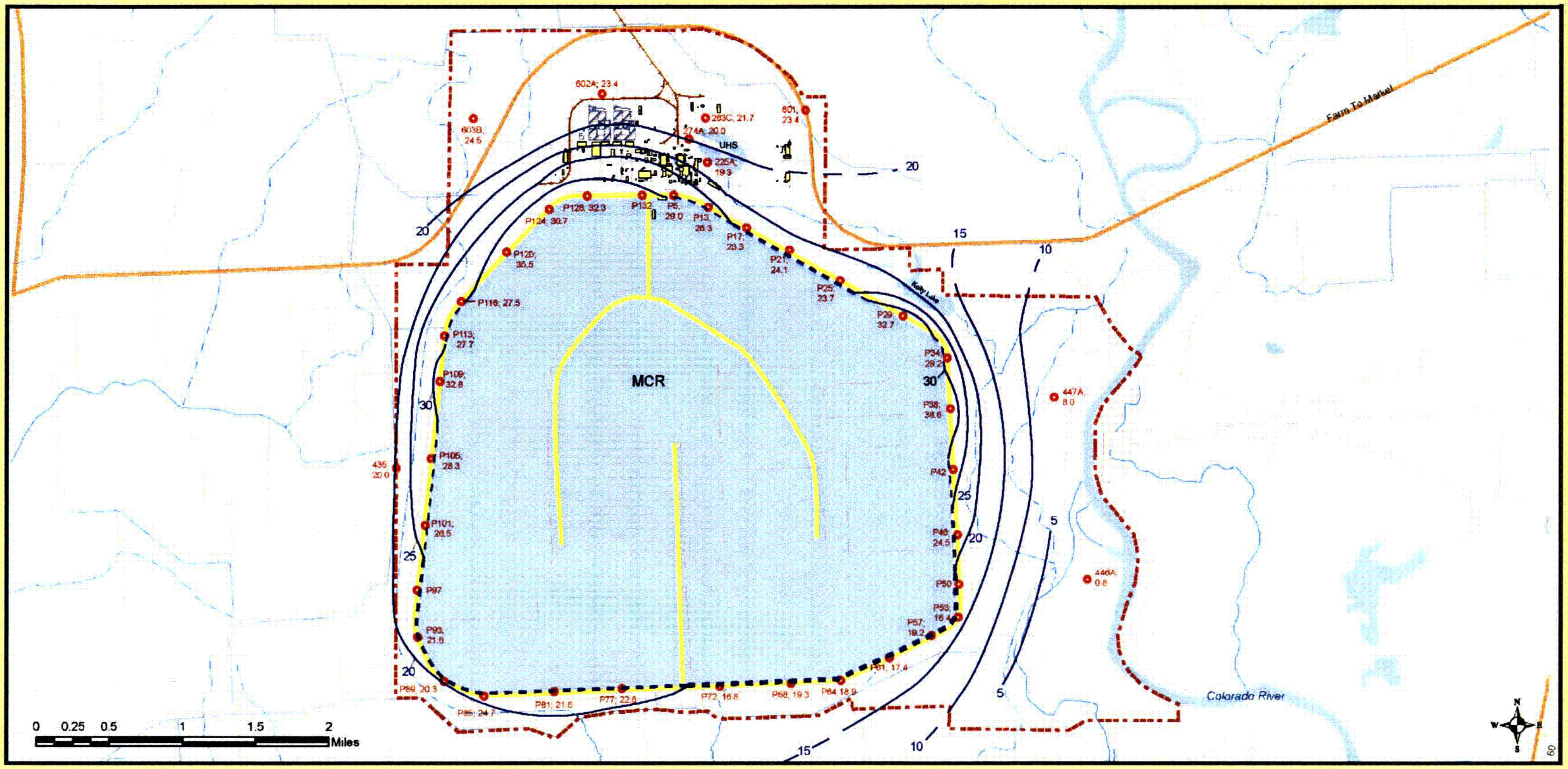
A future COLA revision is planned for FSAR Subsections 2.4S.12 and 2.4S.13 that will reference the groundwater model report "Groundwater Model Development and Analysis for STP 3 & 4" which discusses the results of pre- and post-construction groundwater flow evaluations performed during the modeling effort.

References:

1. STPNOC letter to the U. S. Nuclear Regulatory Commission, ABR-AE-08000079, "Commitments Related to Contour Maps and the Upper Shallow Aquifer Pathway in FSAR Subsection 2.4S.12," dated October 30, 2008. (ML083090782)

2. "STPEGS Updated Final Safety Analysis Report Units 1 & 2," Revision 13, (FSAR Reference 2.4S.12-9).

3. STPNOC letter to the U. S. Nuclear Regulatory Commission, ABR-AE-07000014, "Resolution of Docketing Issues," dated December 20, 2007. (ML073580003)



Legend

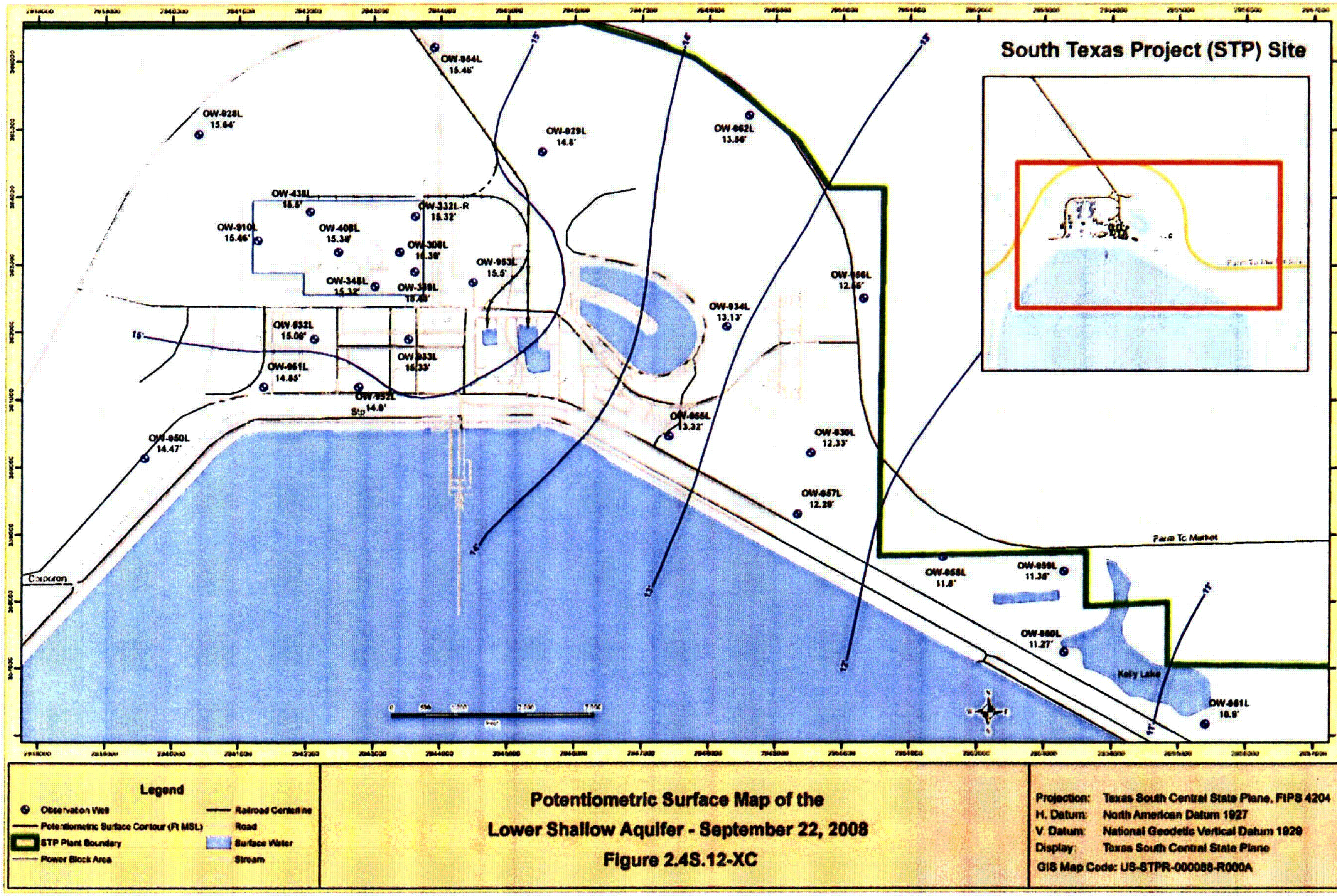
- Peizometers[1]
- Dike
- Contours of Water-Level Elevations (in feet, MSL, dashed where infered)[2]
- STP Property Line
- Stream, Permanent
- Stream, Intermittent
- Lake or Pond
- Structure, Existing
- Structure, Planned

Potentiometric Surface Map of the Upper Shallow Aquifer – March 2003[1, 2, 3]

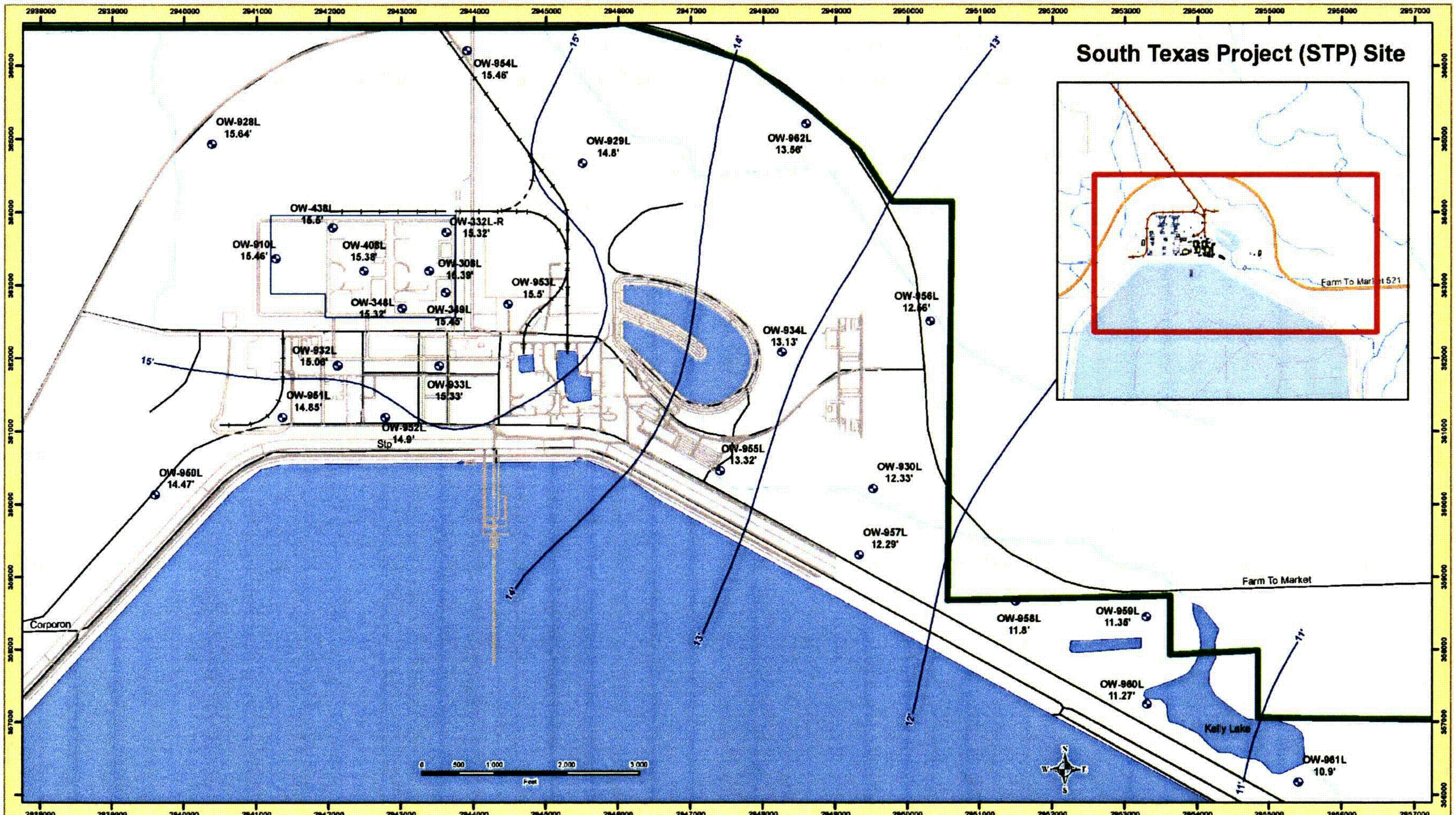
Figure 2.4S.12 - XA

Projection: South Central Texas State Plane
Datum: North American Datum 1927

Notes:
1. Locations of peizometers are approximate.
2. Water levels in MCR Embankment peizometers on March 1, 2003. Water levels in site peizometers on February 1, 2003.
3. Surface water elevation in MCR was approximately 47 feet MSL from January to April 2003.



Potentiometric Surface Map of the
Lower Shallow Aquifer - September 22, 2008
Figure 2.4S.12-XC



Legend

- Observation Well
- Potentiometric Surface Contour (Ft MSL)
- STP Plant Boundary
- Power Block Area
- Railroad Centerline
- Road
- Surface Water
- Stream

Potentiometric Surface Map of the Lower Shallow Aquifer - September 22, 2008

Figure 2.4S.12-XC

Projection:	Texas South Central State Plane, FIPS 4204
H. Datum:	North American Datum 1927
V. Datum:	National Geodetic Vertical Datum 1929
Display:	Texas South Central State Plane

GIS Map Code: US-STPR-000088-R000A