CHAPTER 2: ALTERNATIVES INCLUDING THE PROPOSED ACTION

The Proposed Action

In order to comply with CAA Section 110 of the NO_X State Implementation Plan (SIP) call TVA proposes to install and operate SCR systems that could achieve up to approximately 90 percent NO_X removal for BRF. The Unit 1 outage for installation of the SCR is planned for 2003. The outage for installation is planned for February to April. The proposed SCR system includes a reactor housing and ductwork, catalyst, and an anhydrous ammonia system for unloading, storage, vaporization, air dilution, injection and control of ammonia.

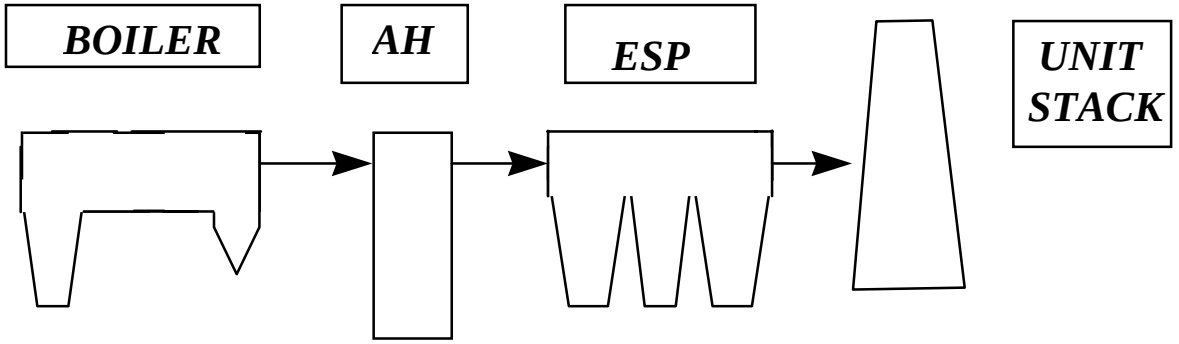
SCR System

The present flue gas treatment systems for environmental control for Bull Run Unit 1 consists of the following train of components in order of treatment: a high efficiency electrostatic precipitator (ESP) and the unit stack (see Figure 2). Also, located in the flue gas stream is the air heater which preheats boiler combustion air and is located upstream of the ESP for each unit (see Figure 2).

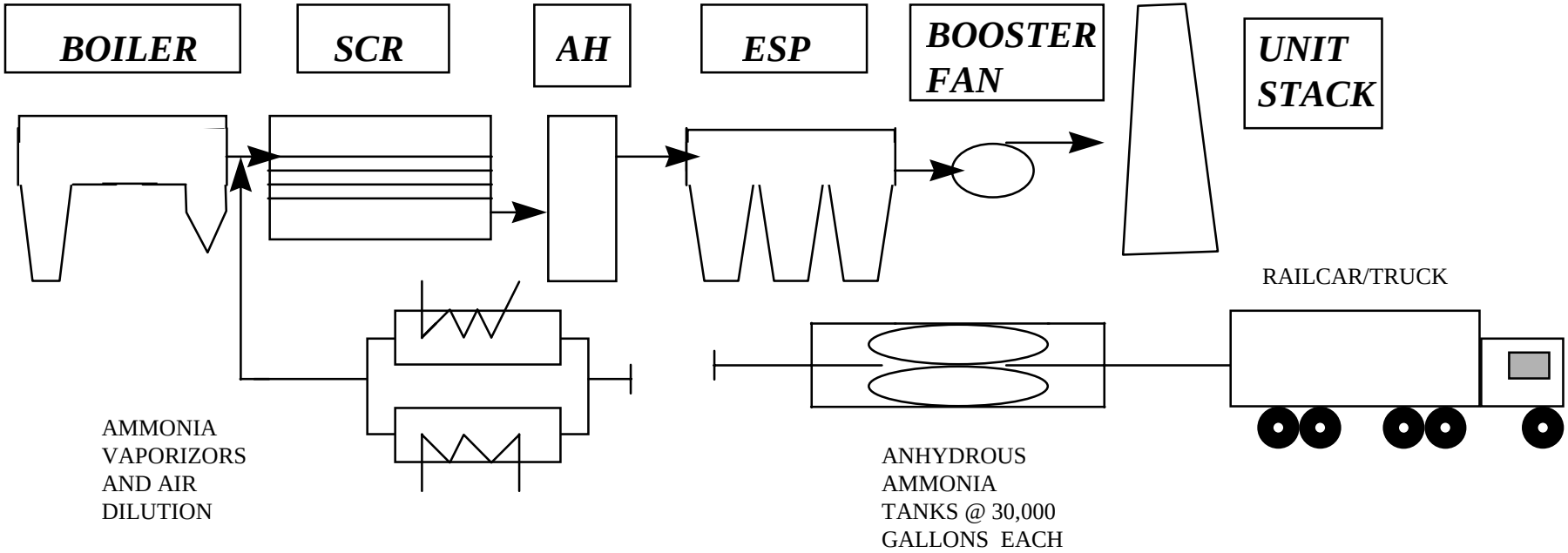
The SCR reactors would be physically installed upstream of the air heater in the gas path. The existing flue gas ductwork would be modified to accommodate the SCR reactors. The ESPs would remain the primary particulate control device providing compliance with the particulate emission standard for the units.

An ammonia system capable of serving the unit SCRs would be installed and would consist of an area for rail delivery, truck parking and unloading; storage tanks; feed pumps; vaporizers and dilution air mixing units; and necessary controls. The location of the SCR reactors, and ammonia storage tanks and unloading area are shown in Figure 3. Rail tank car size for deliveries would be approximately 26,000-33,000 gallons. On-site storage for ammonia would consist of two 30,000 gallon tanks. A water fogging system would be installed to limit the hazard from any accidental release of anhydrous ammonia from either the storage tanks or an unloading railcar or tank truck. The fogging system would combine water with a portion of the anhydrous ammonia vapor to form aqueous ammonia liquid which would be contained within a retention basin of sufficient area and volume to capture spills from the tank storage and unloading area.

Other attendant activities include a demolition scrap laydown area, and a temporary or permanent office building. Unloading of equipment from barges would be accomplished with a track crane temporarily located near the existing barge unloading area used for the original construction of the plant. This off-loading area consists of sheet piling backfilled with rock. The only alteration required of this area would be the addition of rock to bring it to grade level and improve truck access. No crane pad will be necessary for unloading materials from barges.

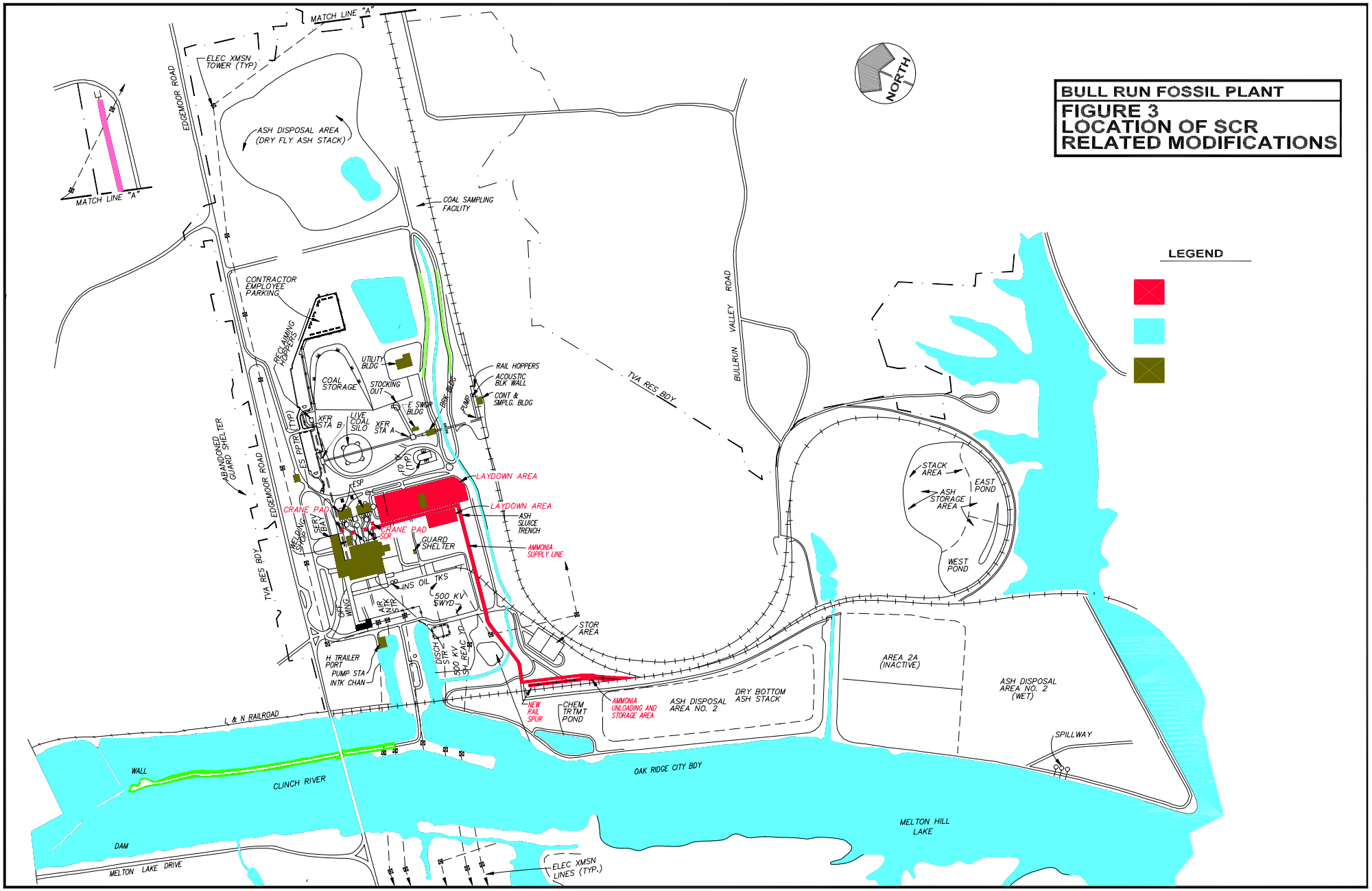


EXISTING FLUE GAS TREATMENT TRAIN -



PROPOSED FLUE GAS TREATMENT TRAIN -

Figure 2. Existing and Proposed Flue Gas Treatment Trains for Bull Run Fossil Plant Unit 1.


BULL RUN FOSSIL PLANT
FIGURE 3
LOCATION OF SCR
RELATED MODIFICATIONS
NORTH
LEGEND
MATCH LINE "A"
ELEC XMSN TOWER (TYP)
EDGEMOOR ROAD
ASH DISPOSAL AREA (DRY FLY ASH STACK)
COAL SAMPLING FACILITY
CONTRACTOR EMPLOYEE PARKING
RECLAIMING HOPPERS
UTILITY BLDG
COAL STORAGE
STOCKING OUT
E SWGR BLDG
CRR BLDG
PUMP
RAIL HOPPERS
ACOUSTIC BLK WALL
CONT & SMPLG. BLDG
XFR STA B
LIVE COAL SILO
XFR STA A
ES PPTR (TYP)
FD (TYP)
ESP
LAYDOWN AREA
CRANE PAD
ASH SLUICE TRENCH
GUARD SHELTER
AMMONIA SUPPLY LINE
ABANDONED GUARD SHELTER
TVA RES BDY
BULLRUN VALLEY ROAD
STACK AREA
ASH STORAGE AREA
FAST POND
WEST POND
INS OIL TKS
500 KV SWYD
STOR AREA
H TRAILER PORT
PUMP STA INTK CHAN
DISCH STR
500 KV SH REAC
AREA 2A (INACTIVE)
ASH DISPOSAL AREA NO. 2 (WET)
NEW RAIL SPUR
CHEM TRTMT POND
AMMONIA UNLOADING AND STORAGE AREA
ASH DISPOSAL AREA NO. 2
DRY BOTTOM ASH STACK
L & N RAILROAD
SPILLWAY
WALL
CLINCH RIVER
OAK RIDGE CITY BDY
MELTON HILL LAKE
DAM
MELTON LAKE DRIVE
ELEC XMSN LINES (TYP.)

Alternatives to the Proposed Action

No Action

Under a No Action alternative, no SCR or other NO_X -reduction systems would be installed. A No Action alternative would not meet TVA's need to comply with the NO_X SIP call under CAA Section 110. The proposed reductions from Bull Run are part of the NO_X averaging plan which is based upon a CAA Title IV requirement of an averaged 0.40 lb/mmBtu for tangentially-fired units. Bull Run operates, and under the no action alternative would continue to operate, in the 0.60-0.65 lb/mmBtu range.

Other Alternatives Not Considered in Detail

Technology Alternatives

Other commercially available, proven technologies described under **Background** can not provide the high NO_X removal rate of 90% needed to meet TVA's system-wide NO_X reduction goal of 75,000 metric tons (83,000 tons/yr). As a result, other NO_X control technologies are not considered further in this EA.

An alternative installation point was analyzed for the physical installation of the SCR arrangement (i.e., termed a "low dust" installation) into the flue gas flow and plant structure. This alternative installation would also have required construction of a natural gas pipeline to the plant. In the low dust arrangement the particulate removal device, i.e., ESP, is located upstream of the SCR. That arrangement was eliminated from consideration for installation due to: the selected arrangement physically fitting better into the existing plant structure; having lower risks; and lower costs. The low dust arrangement has higher costs because of the need to reheat the gas stream.

NO_X Reductions from Energy Efficiency, Renewable Energy and Nuclear Generation

Reduced fossil fuel use made possible by energy efficiency, use of renewable energy, and nuclear power generation are alternatives that would also reduce TVA's NO_X emissions. These alternatives are being implemented according to the short-term and long-term plans defined in the preferred alternative of *Energy Vision 2020—An Integrated Resource Plan and Programmatic Environmental Impact Statement*. The effect of these measures are already reflected in TVA's NO_X reduction requirements. Thus, these measures, by themselves would not be adequate to achieve the NO_X reduction requirements under the CAA. Together with the NO_X reductions from the proposed action, these alternatives would help TVA achieve its overall NO_X reductions requirements.

Additional nuclear power generation could offset fossil generation and thus reduce NO_X emissions. TVA has 3 partially completed nuclear units: Watts Bar 2, and Bellefonte 1 and 2. Also, Browns Ferry Nuclear Unit 1 remains shut down and would require considerable refurbishment prior to restart. TVA is presently preparing an Environmental Impact Statement which includes possible restart of BFN Unit 1 under an

alternative. Any decision to pursue additional nuclear power generation could have some influence on long-term NO_X reduction requirements but falls beyond the time frame for the required completion of TVA NO_X reductions which is estimated to be 2003.

TVA has also recently begun a pilot Green Power program. This program would provide power from renewable energy sources with little or no NO_X emissions. However, the NO_X reduction contributions would be small compared to the NO_X reductions requirements under the CAA. Another alternative is the purchase of NO_X allowances from a market—if the EPA model rule is adopted by all states. This approach would not satisfy TVA's need for reductions under CAA Title I nor would it produce the needed local ozone reductions to maintain attainment status.

Comparison of Alternatives

The potential for effects by either the proposed action or no action alternatives on terrestrial ecology, wetlands and floodplains, land use, visual aesthetics, noise, archeological and historic resources, transportation and socioeconomics is minor and insignificant.

Air Quality

The proposed action of installing and operating SCR systems will have beneficial impacts to regional air quality by reducing the NO_X available in the atmosphere for use in ozone production and thus locally and regionally reducing the ground level ozone. Other possible minor changes in plant emissions include an increase in SO_3 particulate emissions, a decrease in secondary NO_X particulate emissions (leading to an overall decrease in fine particulate), and a decrease in plume coloration from NO_X. Also, acid precipitation caused by secondary particulate NO_X emissions would be reduced.

The no-action alternative would result in no changes to the plant air emissions and thus no beneficial reduction in NO_X emissions.

Water Quality and Aquatic Life

The storage, handling, and use of anhydrous ammonia for the proposed SCR system would result in the potential for ammonia contamination of surface water and impacts to aquatic life. One pathway for impacts is a direct accidental release of ammonia to surface waters. The engineered features of the SCR systems including a retention basin for spills and emergency water fogging to minimize this risk. Another pathway for surface water impacts is ammonia contamination of combustion by-products including bottom ash and fly ash. Water discharged from the fly ash storage pond may contain ammonia. Management of water treatment system flows, including baffling of the ash pond to increase retention time, are expected to maintain discharge ammonia concentrations below levels that would safeguard water quality and protect aquatic life. If necessary to meet National Pollutant Discharge Elimination System (NPDES) permit limits, specific ammonia treatment units would be added to or integrated into the existing treatment systems.

The no-action alternative would result in no changes to existing conditions of water quality or impacts to aquatic life.

Solid Waste

Some construction wastes would result from construction of the SCR systems under the action alternative. These wastes could potentially include metal scrap, lumber, masonry, asbestos, and hazardous wastes. These wastes would all be properly managed and disposed of, as necessary, in appropriately permitted disposal units. These wastes would not occur for the no-action alternative.

The no action alternative would not affect combustion by-products. Under the action alternative the character of combustion solid waste and by-product including fly ash may be changed due to ammonia contamination. These changes may constrain some future potential uses of this by-product, which could in turn affect TVA's management of fly ash disposal for BRF. Boiler slag which is currently not marketed would not have the potential for ammonia contamination.

Ammonia Storage and Handling Safety

The storage and handling of large quantities of anhydrous ammonia creates potential hazards to plant workers and the public. Accidental releases of ammonia have the potential to create, depending on their extent and emergency response actions, a substantial hazard to plant workers, or for more extensive releases, the public.

The estimated impacts from worst case releases assume complete failure of an ammonia storage tank followed by a complete failure of the emergency water fogging system as well as no response by emergency personnel. Additionally, the most unfavorable weather conditions limiting dispersion of the ammonia vapor must occur. The complete tank failure and water fogging system failure could possibly result from a tornado or major earthquake. The occurrence of a tornado at the very location of the ammonia tanks is unlikely. Additionally, unfavorable weather conditions not associated with weather following a tornado must also occur. The probability of these events occurring simultaneously is very unlikely resulting in a low risk of such a worst case release.

The occurrence of a major earthquake which could result in complete tank failure and failure of the water fogging system is unlikely. To minimize this risk, the ammonia storage and handling facility will be designed to be earthquake resistant (see **Summary of Environmental Commitments** below).

The no-action alternative would pose none of these potential hazards.

Summary of Environmental Commitments

1. Compliance with 40 CFR 68 prior to filling of the ammonia storage tanks or transport onsite of ammonia in a quantity exceeding 10,000 lb.
2. Substantive compliance with the provisions of 29 CFR 1910.111 (Storage and Handling of Anhydrous Ammonia) and 29 CFR 1910.119 (Process Safety Management of Highly Hazardous Chemicals) including those for proper equipment design, hazard assessment, operating procedures, employee training, and emergency planning.
3. The SCR systems shall not be routinely operated with an ammonia slip exceeding 2 ppm. Brief system process excursions or process upsets would be an exception to this limit.

4. Seismic hazards to the SCR facility will be addressed by compliance with the seismic provisions of the 1997 version of the International Conference of Building Officials (ICBO) Uniform Building Code (UBC) and the 1997 National Earthquake Hazards Reduction program.
5. Use of appropriate operational controls and treatment measures to meet whole effluent toxicity (WET) and effluent discharge limits in the NPDES permit. The types of operational controls and treatment measures could include the following examples:
    - Baffling of the ash pond to limit ammonia concentrations in ash pond discharge and thus to ensure non-toxic concentrations in releases. This modification will increase the retention time to the 2.4 days necessary to achieve proper mixing and pond dynamics for limiting concentrations of ammonia.
    - the three potential sources of ammonia to the ash pond (ash sluicing, air preheater washwater via the chemical pond and dry stack runoff via the coal yard runoff pond) would be released to the ash pond by staged discharge (as reflected in Table 5 of the EA) to avoid too high ammonia concentrations at Outfall 001.
    - In order to achieve acceptable levels of ammonia concentration in effluent from the chemical treatment pond receiving air preheater wastewater, it may occasionally be necessary to use a conventional ammonia treatment measure, such as pH adjustment, air stripping or re-circulating sand filters to remove ammonia from the pond prior to discharge.
6. In order to contain and control an accidental spill of ammonia, the area around the ammonia unloading and storage area will be configured into a spill retention basin of compacted *in situ* earth.

Environmental Permits

The new or modified environmental permits and applicable environmental regulations for the proposed project are listed in Table 1.

Table 1. Permits.

Permits
Modification to NPDES permit TN0005410 for Outfall DSN 001, as required
No modification to air permits required; SCRs would be reflected in subsequent operating permit renewals
NPDES General Permit for discharge of stormwater from construction activity may be required depending upon acreage disturbed