TVA
Tennessee Valley Authority, 1101 Market Street, LP 5A, Chattanooga, Tennessee 37402-2801

March 16, 2009

10 CFR 52.79

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

In the Matter of)
Tennessee Valley Authority) Docket No. 52-014 and 52-015

BELLEFONTE COMBINED LICENSE APPLICATION – RELATED TO RAW WATER SYSTEM FOR THE BELLEFONTE UNITS 3 AND 4 COMBINED LICENSE APPLICATION

Reference: Letter from Tanya Simms (NRC) to Andrea L Sterdis (TVA), Request for Additional Information Letter No. 144 Related to SRP Section 09.02.01 for the Bellefonte Units 3 and 4 Combined License Application, dated January 28, 2009.

This letter provides the Tennessee Valley Authority's (TVA) response to the Nuclear Regulatory Commission's (NRC) request for additional information (RAI) items included in the reference letter.

A response to each NRC request in the subject letter is addressed in the enclosure which also identifies any associated changes that will be made in a future revision of the BLN application.

If you should have any questions, please contact Thomas Spink at 1101 Market Street, LP5A, Chattanooga, Tennessee 37402-2801, by telephone at (423) 751-7062, or via email at tespink@tva.gov.

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

Executed on this 16th day of March, 2009.

Jack A. Bailey

Jack A. Bailey
Vice President, Nuclear Generation Development
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Enclosure
cc: See Page 2

D085
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Enclosure
TVA letter dated March 16, 2009
RAI Responses

Responses to NRC Request for Additional Information letter No. 144 dated January 28, 2009
(18 pages, including this list)

Subject: Station Service Water System, Application Section: 9.2.11 Raw Water

RAI Number	Date of TVA Response
09.02.01-05	This letter – see following pages
09.02.01-06	This letter – see following pages
09.02.01-07	This letter – see following pages

Associated Additional Attachments / Enclosures	Pages Included
Attachment 09.02.01-06A	4
Attachment 09.02.01-06B	3

NRC Letter Dated: Jan 28, 2009

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 09.02.01-05

In accordance with 10 CFR 50, Appendix A, General Design Criterion (GDC) 2, "Design Basis for Protection Against Natural Phenomena," GDC 4, "Environmental and Dynamic Effects Design Bases," and NRC policy considerations for passive plant designs, the staff confirms that raw water system (RWS) failures are not expected to adversely affect structures, systems, and components (SSCs) that are safety-related or designated for Regulatory Treatment of Non-Safety Systems (RTNSS), impact the control room, or result in excessive releases of radioactivity to the environment.

Although Final Safety Analysis Report (FSAR) Section 9.2.11.1.1, "Safety Design Basis," states that failures of the RWS will not affect the ability of safety-related systems to perform their intended functions, more detailed information is needed to adequately describe the consequences of RWS failures and to explain why safety-related SSCs are not affected.

Likewise, additional information is needed to explain why a failure of the RWS will not adversely affect RTNSS systems and components or impact the control room, or result in an unacceptable release of radioactive material to the environment. Because the applicant did not adequately address these considerations, the staff is unable to confirm compliance with GDC 2, GDC 4, and NRC policy considerations that apply to passive plant designs. Therefore, FSAR Section 9.2.11 needs to be revised to address the impact of RWS failures accordingly, including development of plant-specific inspections, tests, analyses, and acceptance criteria; test program provisions; Technical Specifications; and availability controls as appropriate.

BLN RAI ID: 3007

BLN RESPONSE:

As described in FSAR Subsection 9.2.11, the Raw Water System (RWS) provides river water for makeup to the natural draft and mechanical draft cooling tower basins and feeds the demineralized water treatment system. The RWS also provides the backup raw water to the fire water storage tanks and an alternate supply of cooling water to the turbine building closed cooling system heat exchangers. The potential failures of the RWS and the corresponding impact on structures, systems, and components (SSCs) that are safety related or AP1000 Class D are described below.

1. Failure of RWS piping in the yard area

The systems interfacing with RWS (i.e., Circulating Water System (CWS), Standby Service Water System (SWS), Demineralized Water Treatment System (DTS) and Turbine Building Closed Cooling Water System (TCS)) do not have a safety related function. The RWS, CWS and SWS are located in the intake area or the yard. The piping is routed underground from the intake structure to the points of interface. The most extensive above ground portions of the RWS are at the intake structure, the CWS cooling tower basin and the SWS cooling tower basin. A break in the RWS is bounded by a break in the CWS. DCD Subsection 3.4.1.1.1 indicates that failure of the cooling tower, the service water or circulating water piping under the yard could result in a potential flood source. However, these potential sources are located far from safety-related structures and systems classified as subject to regulatory treatment of non-safety-related systems (RTNSS) and the consequences of a failure in the yard would be enveloped by the analysis described in DCD Subsection 10.4.5 for failure of the CWS. Site grading will carry water away from safety-related or AP1000 Class D structures systems and components (Refer to FSAR Figure 2.4.2-202, Site Grading and Drainage Plan).

The RWS piping connection to the fire water storage tanks is via a normally closed manual isolation valve as shown on FSAR Figure 9.2-201 (Attachment 09.02.01-06B). The effects of the failure of RWS piping connection to fire water storage tank is enveloped by the CWS piping break in the yard as described above.

2. Failure of the RWS piping connection inside the Turbine Building
RWS piping is routed inside the Turbine Building to the interface points with SWS, TCS and DTS. The RWS piping connections are shown on FSAR Figure 9.2-201. These connections are located above the floor of the turbine building at DCD elevation 100'-0". The RWS-to-DTS interface is upstream of the DTS filters and DTS feed pumps. The primary source of flooding from a break in the RWS piping would be limited to the time when the RWS pumps are running and would be terminated upon shutdown of these pumps. As discussed in DCD Subsections 3.4.1.2 and 10.4.5.2.3, the bounding flood is due to a break in the circulating water system. Water from a postulated system rupture above elevation 100'-0" would travel to elevation 100'-0" through floor gratings and stairwells and would run out of the building through a relief panel in the turbine building west wall. This relief panel limits the maximum flood level to less than 6 inches, which is not high enough to cause damage.

The RWS piping connection to the TCS has a normally closed valve as shown on FSAR Figure 9.2-201. Due to the size of the system piping, flooding of the turbine building resulting from a break in the RWS is less severe than flooding resulting from a break in the CWS.

The effects of flooding due to a RWS failure will not result in detrimental effects on safety-related equipment since there is no safety-related equipment in the turbine building. The component cooling water and service water components on elevation 100'-0", which provide the RTNSS support for the normal residual heat removal system, would remain functional following a flooding event in the turbine building since the pump motors and valve operators are above the expected flood level. Therefore, a failure of the RWS piping within the Turbine Building will not adversely impact any safety-related or RTNSS systems, structures, or components.

As previously provided in Bellefonte response to NRC Request for Additional Information Letter 86 (09.02.01-04) from Andrea Sterdis, TVA to the Document Control Desk (dated 9/2/2008), the RWS has no interconnection with any system that contains potentially radioactive fluids as indicated in FSAR Subsection 9.2.11.1.1 and shown in FSAR Figure 9.2-201, Sheets 1 and 2. The RWS operates at a higher system pressure than those systems that it directly interfaces with and therefore in-leakage is not feasible. The interfacing systems are the SWS, DTS, and the CWS during plant operations. The fire water storage tanks and TCS do not have any interfaces with radioactive systems and are isolated by normally closed valves from the RWS.

In summary, failure of the RWS or its components will not affect the ability of any safety- related system to perform their intended safety functions nor will it adversely affect any RTNSS systems. Postulated breaks in the RWS piping will not impact safety-related components because the RWS is not located in the vicinity of any safety-related equipment, and the water from a postulated pipe break will not reach any safety-related equipment or result in injury to occupants of the control room or result in a release of radioactivity to the environment.

Because the RWS is not safety-related or RTNSS, and its failure does not lead to the failure of any safety related systems or RTNSS systems, the requirements of GDC 2 and 4 and the guidance of SRP Section 9.2.1 regarding safety-related systems, do not apply.

RWS piping and structures are designed and constructed in accordance with nationally recognized codes and standards (such as ASME B31.1, AWWA, and IBC). Design features have been included (such as the use of buried piping and heat tracing) to ensure that the RWS is reliable and will be available to support normal plant operation and shutdown functions.

As previously provided in Bellefonte response to NRC Request for Additional Information Letter 86 (09.02.01-02) from Andrea Sterdis, TVA to the Document Control Desk (dated 9/2/2008), the raw water system was reviewed and determined to not require ITAAC, Technical Specifications or Availability Controls. Further discussion regarding availability controls is provided in response to the next RAI, 09.02.01-06.

No change to the FSAR is proposed as a result of this response. Revised FSAR Section 9.2.11 is provided as part of response to RAI 09.02.01-06 and addresses the information provided by this response, as appropriate, consistent with NRC guidance provided in Regulatory Guide 1.206, section C.III.

This response is PLANT SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURERS:

None

NRC Letter Dated: Jan 28, 2009

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 09.02.01-06

The raw water system (RWS) is relied upon for achieving and maintaining cold shutdown conditions which is necessary for satisfying Technical Specification requirements. In accordance with NRC policy considerations for passive plant designs, non-safety related active systems that are relied upon for achieving and maintaining cold shutdown conditions (i.e., transitioning from Mode 4 to Mode 5) should be highly reliable and able to accommodate single active failures without a loss of the cooldown capability that is needed. The staff found that Section 9.2.11 of the Final Safety Analysis Report (FSAR) does not provide a clearly defined design basis with respect to the RWS cooldown function, and the reliability and capability of the RWS to perform this function for the most limiting situations were not adequately described and addressed. For example, the minimum RWS flow rate, water inventory, temperature limitations, and corresponding bases for providing SWS makeup for the two Bellefonte units were not described. Also, the suitability of RWS materials for the plant-specific application and measures being implemented to resolve vulnerabilities and degradation mechanisms to assure RWS functionality over time were not addressed. Consequently, Section 9.2.11 of the FSAR needs to be revised to properly describe and address the RWS design bases in this regard and to include design specifications that are necessary to ensure the reliability and capability of the RWS to perform its cooldown function. The following guidance is generally applicable and should be considered as appropriate when revising the FSAR in response to this question:

a. The design bases should specifically recognize and describe cold shutdown functions that are credited, and applicable design considerations that pertain to these functions should be specified, such as reliability, redundancy, backup power, etc. Other parts of the DCD should not be referred to in lieu of providing a complete description of the design-bases in FSAR Section 9.2.11.

b. The system description should explain how the applicable design-bases considerations referred to in (a) are satisfied. For example:

• The minimum required system functional capability and the bases for this determination should be described (note that a minimum of seven days worth of on-site water inventory should be available for reactor decay heat removal and spent fuel cooling);

• The description should explain how design-bases considerations are satisfied;

• The guidance in SRP Sections 9.2.1 and 9.2.5 that are relevant for ensuring the capability and reliability of the RWS to perform its design-bases functions should be considered and addressed as appropriate (materials considerations, net positive suction head, waterhammer, etc.);

• Operating experience considerations that pertain to the capability and reliability of the system to perform its design-bases functions needs to be addressed (note that the relevance of operating experience is independent of safety classification considerations);

• In order to demonstrate adequate reliability, the system design should include (among other things) the capability of all necessary components (pumps, valves, strainers, instrumentation and controls, etc.) to function during a loss of off-site power and redundancy for single active failure vulnerabilities;

• Dual-unit considerations need to be addressed.

c. Major components and features that are important to ensure the capability and reliability of the system to perform its cooldown function should be described. Applicable industry codes and quality group designations that are commensurate with plant-specific RWS reliability considerations should be specified and reflected in Chapter 3, "Design of Structures, Components, Equipment, and Systems." Note that this may be different from what is specified for the standard plant design since it was based solely on regulatory treatment of non-safety systems considerations and did not include consideration of the cooldown function.

d. System design parameters that are important for performing the cold shutdown function should be specified, such as water inventory, flow rate, nominal pipe sizes, limiting flow velocities, and design temperatures and pressures.

e. The RWS operating modes for performing its cold shutdown function should be described, such as interlocks, protective features, and automatic actuation.

f. Limitations on the capability of the RWS to perform its cold shutdown function should be described, such as minimum required water inventory and temperature restrictions that apply.

g. Instrumentation (e.g., indication, controls, interlocks and alarms) that are relied upon by plant operators in the main control room and at the remote shutdown panels for performing cooldown functions should be described.

h. System diagrams should show division designations, flow paths, major components and features, nominal pipe sizes, and instrumentation that is relied upon to ensure proper operation of the system by operators in the main control room and at the remote shutdown panels.

i. The more important periodic inspections that will be completed and specified frequencies for ensuring the capability and reliability of the system should be described. For example, design provisions and actions that will be implemented to periodically assess the condition of buried or otherwise inaccessible piping and components should be described.

j. The more important periodic tests that will be completed and specified frequencies for ensuring the capability and reliability of the system should be described. For example, periodic testing of pumps, valves, self-cleaning strainers, and vacuum breakers should be described.

k. Based on the Tier 2 description, plant-specific ITAAC should be established that are appropriate and sufficient for certifying the design of the RWS.

l. The initial test program should test all modes of RWS operation that are credited for performing its cooldown function and confirm acceptable performance for the most limiting assumptions. For example, confirmation that net positive suction head requirements are satisfied for minimum pump suction head and maximum water temperature conditions with all pumps running at full flow, and that waterhammer will not occur during situations when voiding is most likely to occur should be specified. It should be clear from the information provided in Section 9.2.11 of the FSAR what constitutes acceptable performance.

BLN RAI ID: 3008

BLN RESPONSE:

As described in FSAR Subsection 9.2.11, the Raw Water System (RWS) provides a continuous supply of water from the Guntersville Reservoir for supporting various modes of plant operation. The system provides normal fill and makeup for the circulating water system (CWS), service water system (SWS) fill and makeup and the demineralized water treatment system (DTS) feed. An alternate feed is also provided to other systems, including refilling the primary and secondary fire water storage tanks. However, this response specifically focuses on the RWS interface with the SWS. This is because, as noted in the response to RAI-09.02.01-05 (this letter), the other functions performed by RWS do not have a direct interface with any other system identified within the AP1000 that is safety-related, designated for Regulatory Treatment of Non-Safety Systems (RTNSS), or designated as AP1000 Class D.

A subsystem of RWS is the ancillary RWS, which provides a water fill/make-up function for the SWS. The SWS has investment protection short-term availability controls as described in DCD Table 16.3-2, which are applicable in MODE 5 with the RCS pressure boundary open and in MODE 6 with the upper internals in place or cavity level less than full. Under these conditions, SWS is directly providing active core cooling and, as noted in the response to RAI 09.02.01-05, this letter, was evaluated by Westinghouse and determined to meet the RTNSS criteria as documented in NUREG-1793 and WCAP-15985. Unlike the SWS, the RWS does not directly provide core cooling and, as discussed in response to RAI 09.02.01-05, was evaluated in WCAP-15985 and determined to not meet the RTNSS criteria and to not require investment protection short-term availability controls.

In the unlikely event of a complete failure of the ancillary RWS subsystem to provide adequate makeup flow to the SWS cooling tower basins during the short time period in which SWS is performing a RTNSS function, the remaining inventory in the service water cooling tower basins, along with the stored water which is available in the upper region of the secondary fire water storage tank, provide ample time (more than 24 hours) to restore ancillary RWS makeup flow or take the procedural actions necessary to exit the conditions for applicability. Therefore, no part of the RWS is a RTNSS or subject to investment protection short-term availability controls. However, as described later in this response, the ancillary RWS is designed to be a highly reliable and robust system capable of operating during a loss of normal ac power to ensure SWS make up is available under normal and off-normal conditions. Procedural controls, which provide for continued operation of the ancillary RWS or re-establishment of operations under off-normal conditions, will be contained in operating procedures, where appropriate.

As defined in DCD Subsection 3.2.2.6; a structure, system or component is classified as Class D when:

- The SSC directly acts to prevent unnecessary actuation of the passive safety systems, or
- The SSC supports those SSCs which directly act to prevent the actuation of passive safety systems.

Class D has normally been applied to AP1000 systems, structures, and components that perform defense-in-depth functions. While SWS is designated in the DCD as a defense-in-depth, Class D system, RWS is designated as a Class E system. The basis for this classification is:

- In the unlikely event of a failure of the raw water system, the inventory in the service water cooling tower basin and the available stored inventory in the upper region of the secondary fire water tank ensure that the SWS can maintain the required defense-in-depth cooling functions for an extended period of time.

- A failure of the RWS will not directly cause an actuation of a passive safety system, nor will it initiate the failure of an SSC which directly acts to prevent the actuation of a passive safety system.

As described in DCD Subsection 5.4.7.1.2.1, the Normal Residual Heat Removal System (RNS) in conjunction with its associated support systems, Component Cooling Water System (CCS), and SWS are used for shutdown heat removal. Ancillary RWS provides indirect support for this function by providing a source of makeup water to the SWS cooling tower basins to compensate for evaporation, drift and blowdown.

The ancillary RWS provides this make-up water to support the cooling requirements for SWS. During a normal plant cooldown, the RNS and the CCS reduce the temperature of the reactor coolant system from approximately 350°F to approximately 125°F within 96 hours after shutdown (DCD Subsection 9.2.2.1.2.2). Each unit's ancillary RWS is designed to provide ample makeup flow requirements during these conditions. An ancillary raw water pump can provide up to 891 gpm to the SWS tower basins to support plant cooldown, which is in excess of the specified makeup flow rate of 831 gpm.

If cooldown to Cold Shutdown (Mode 5) is required within 36 hours to comply with a Limiting Condition for Operation (LCO) in accordance with Technical Specifications, heat will be transferred from the reactor coolant system via the steam generators to the main steam system for a longer period of time, allowing the RNS to be placed in service at a lower temperature with lower decay heat levels. Because of the reduced RNS heat removal requirements associated with this cold shutdown sequence, the required ancillary RWS makeup flow to the SWS cooling towers is less than normal cooldown requirements.

An ample inventory of water is available to provide makeup to the SWS cooling tower basins. As noted in FSAR Subsection 2.4.1.2.1, the Guntersville Reservoir is the second largest reservoir on the Tennessee River with 1,018,000 acre-ft. of normal maximum pool volume, and therefore has sufficient capacity to support cooldown to cold shutdown conditions and maintain the station in Mode 5 for greater than seven days.

The underground RWS piping is designed to B31.1 requirements. The RWS piping is located above the site's groundwater levels, and is protected from external corrosion.

The intake bays at the intake structure are inspected for silt buildup and cleaned as necessary based on operating experience. These inspections will be performed as part of preventive maintenance for the intake structure and support equipment.

As discussed above, the lack of designation of RWS as either RTNSS or Class D indicates there is no performance requirement for the system during a loss of normal ac power or in the event of a single active failure. Nonetheless, the ancillary RWS is highly reliable based on its design, and a single failure of an active component in the ancillary RWS would not affect normal plant cooldown. Each ancillary RWS pump can deliver makeup flow to the SWS basins to ensure available water to support SWS for long term cooling requirements. Failure of an operating pump, discharge valve, traveling screen, or strainer would not prevent the ancillary RWS pumps from providing makeup to the SWS cooling tower basins. Additionally, the power supplies for the ancillary RWS pumps, discharge valves, strainers, and their associated traveling screens and screen wash pumps are powered from normal ac and have a back-up power supply from non-safety related diesel generators. In the event of a loss of normal ac power, the components are manually loaded onto the appropriate diesel buss and are manually started by the operator. The ancillary RWS valves have handwheels to manually adjust flow as required. The ancillary RWS, therefore, continues to maintain the capability to provide makeup water to the SWS cooling tower basins during loss of normal ac power events.

As discussed above, in the unlikely event that all ancillary RWS flow to the SWS cooling towers is lost, there is ample time to identify and correct the situation or to align alternate sources of water to provide makeup to the SWS cooling tower basins. RWS is shown to not be a RTNSS system nor subject to investment protection short-term availability controls. It is also important to note that neither the RNS, CCS, SWS nor RWS are required to establish and maintain the AP1000 plant in a safe shutdown condition since passive safety-related systems perform that function. This is explicitly recognized throughout the AP1000 DCD and NRC Final Safety Evaluation Report, NUREG-1793.

FSAR Subsection 9.2.11 will be revised to include additional details to address the applicable system attributes provided in (a) through (i) of the RAI. In addition, Attachment 09.02.01-06A has been prepared as a reviewer aid to identify whether the information requested in (a) through (i) is:

1. Provided in the response to RAI 09.02.01-06 or other RAI responses
2. Provided in the revised FSAR Subsection 9.2.11, or
3. Not provided nor addressed

Where the information is not provided nor addressed, a basis for not providing the requested information or a clarification of the information provided is supplied.

This response is PLANT SPECIFIC

ASSOCIATED BLN COL APPLICATION REVISIONS:

1. COLA Part 2, FSAR Chapter 9, Subsection 9.2.11 will be revised from:

9.2.11 RAW WATER SYSTEM

BLN SUP 9.2-2 The raw water system (RWS) provides river water for makeup to the natural draft and mechanical draft cooling tower basins, and feeds the demineralized water treatment system. The RWS also provides the normal supply of municipal water and the backup supply of raw water to the fire water storage tanks.

9.2.11.1 Design Basis

9.2.11.1.1 Safety Design Basis

The RWS serves no safety-related function and therefore has no nuclear safety design basis.

Failure of the RWS or its components does not affect the ability of safety-related systems to perform their intended function.

No interconnections exist between the RWS and any potentially radioactive system.

9.2.11.1.2 Power Generation Design Basis

The RWS provides a continuous supply of river water for the following services:

• Circulating water system (CWS) fill and makeup.

• Service water system (SWS) fill and makeup.

• Demineralized water treatment system (DTS) feed.

RWS piping provides a connection to the municipal water system for normal filling and makeup to the fire protection system (FPS) primary and secondary fire water storage tanks. In addition, the RWS includes piping to provide an alternate supply of water for the following services:

• Filling of the FPS with filtered river water.

• Cooling of the turbine building closed cooling water system (TCS) heat exchangers with river water.

• Provide an alternate dilution source for radwaste discharge when the CWS is not available.

9.2.11.2 System Description

9.2.11.2.1 General Description

The RWS is shown in Figure 9.2-201. Classification of components and equipment for the RWS is given in Section 3.2.

The source of water for the RWS is the Tennessee River.

The water is drawn through an intake channel which extends from the river to an intake structure. The intake channel is protected by a floating boom to prevent floating debris from reaching the intake structure. The intake structure is divided into two independent sections for Units 3 and 4. For reliability, each unit has two independent basins, "Basin A" and "Basin B", from which the water is drawn. The intake structure is equipped with trash rakes and traveling screens. Refer to Section 2.4 for additional description of the intake structure.

The RWS consists of three RWS pumps, three automatic strainers, two ancillary raw water pumps, granular media filters, and piping to the systems requiring makeup water.

The RWS pumps discharge through strainers and supply untreated river water to the CWS natural draft cooling tower basin. A normally closed connection provides an alternate source of cooling water to the TCS heat exchangers.

The ancillary raw water pumps discharge through granular media filters and supply filtered river water to the SWS mechanical draft cooling tower basin and the DTS. A normally closed connection from the secondary fire water tank clearwell provides an alternate source of makeup to the SWS cooling tower basin by gravity feed.

The RWS provides a piping connection to the municipal water supply for filling and makeup to the primary and secondary fire water storage tanks. A normally closed connection provides a backup supply for filling the fire water storage tanks with filtered river water by the ancillary RWS pumps.

9.2.11.2.2 Component Description

Trash Rake

A rake located at the entrance to each of the two intake basins prevents large debris in the river from entering the basins. The rakes are constructed in sections that are removable for washing, inspection and repair.

Traveling Screens

Traveling screens at the inlet to each of two intake basins provide screening of floating and suspended solids in the river water, and minimize entrainment of aquatic life in the water entering the basin. The screens are sized so that the through screen velocity is less than 0.5 feet per second to reduce impingement mortality of aquatic biota. Buildup on the screens is washed off with low pressure spray water and sluiced to the river. Each traveling screen is powered by an electric motor powered from the normal ac power system.

Screen Wash Pumps

Two screen wash pumps, one for each traveling screen, draw strained river water from the RWS pump discharge flow and provide spray water to remove debris and fish from the traveling screens. The screen wash pumps are horizontal, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system.

RWS Pumps

Three 50 percent RWS pumps, two pumps located in Basin A and one pump in Basin B, draw river water and forward it to the CWS natural draft cooling tower basin. Two pumps operate to furnish normal CWS makeup requirements, with one pump on standby. The RWS pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system.

Automatic Strainers

Three 50 percent rotary basket type automatic strainers are located in the RWS pump discharge lines. Automatic valves facilitate cleaning of the strainers by backwashing the basket and flushing the strainer. The wash water from the cleaning sequence is discharged to the river. The strainer baskets are rotated by electric motors that are powered from the normal ac power system.

Ancillary Raw Water Pumps

Two 100 percent ancillary raw water pumps are located in intake Basin B. One pump provides normal SWS and DTS makeup requirements while the other is on standby. Both pumps provide makeup during maximum SWS heat loads during the cooldown mode. The ancillary RWS pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from a diesel-backed power supply.

Granular Media Filter

The river water is filtered prior to being supplied to the SWS and DTS. The filter consists of multiple units, with a minimum of one unit in cleaning mode or on standby. The filters are periodically backwashed and the wash water is discharged to the river.

Piping

The piping is designed to accommodate transient effects that may be generated by normal starting and stopping of pumps, opening and closing of valves, or other normal operating events. The system is designed so that high points do not lead to the formation of vapor voids upon loss of system pumping. Air release valves are provided in the makeup pump discharge piping to vent air on pump start.

9.2.11.3 System Operation

The RWS operates during normal modes of operation, including startup, power operation, cooldown, shutdown, and refueling.

Makeup flow to the CWS is not normally required during plant shutdown and the RWS pumps are shut off. The RWS pumps are not available during a loss of off-site power (LOOP).

The ancillary RWS pumps are available for operation during a LOOP to support the SWS. If necessary, the filters can be bypassed to provide unfiltered river water to the SWS.

9.2.11.4 Safety Evaluation

The RWS has no safety-related function and, therefore, requires no nuclear safety evaluation. It has no interconnection with any system that contains radioactive fluids.

9.2.11.5 Tests and Inspections

System performance, and structural and pressure integrity of system components is demonstrated by operation of the system, monitoring of system parameters such as flow and pressure, and visual inspections.

9.2.11.6 Instrumentation Applications

Pressure indication, with a low pressure alarm, is provided on the discharges of the RWS and ancillary RWS pumps. A low discharge pressure signal automatically starts the standby pump. The automatic strainer backwash and flushing cycle is initiated by a timer or on high pressure across the strainer. The filter wash cycle is initiated automatically by a timer or on high pressure across the filter unit.

To read:

9.2.11 RAW WATER SYSTEM

BLN SUP 9.2-2 The RWS provides raw strained river water from the Guntersville Reservoir for makeup to the circulating water system (CWS) natural draft cooling tower basins and reservoir filtered water to the Standby Service Water mechanical draft cooling tower basins and to the demineralized water treatment system (DTS). The RWS also provides an alternate supply of filtered reservoir makeup water to the primary and secondary fire protection system (FPS) water storage tanks. The RWS pumps provide an alternate supply of strained water to the Turbine Building Closed Cooling Water (TCS) Heat Exchangers and dilution flow for liquid radwaste blowdown requirements.

9.2.11.1 Design Bases

9.2.11.1.1 Safety Design Bases

The RWS does not serve a safety-related function and therefore has no nuclear safety design basis.

Failure of the RWS or its components does not affect the ability of safety-related systems to perform their intended function.

The RWS does not have the potential to be a flow path for radioactive fluids.

9.2.11.1.2 Power Generation Design Basis

9.2.11.1.2.1 Normal Operation

The RWS pumps provide a continuous supply of strained river water from the Guntersville Reservoir for the following service with two of three RWS pumps in service:

- CWS cooling tower basin fill, makeup, and blowdown;
- Provide water for the main raw water pump discharge strainer backwashes and for the screen back wash pump suctions.

The ancillary RWS pumps provide a continuous supply of filtered river water from the Guntersville Reservoir for the following services with one of two pumps in service:

- SWS cooling tower basin fill, makeup, and blowdown;
- DTS feed;

- Water for the ancillary water pump granular media filter backwashes; and
- An alternate supply of water for screen back wash pump operation.

RWS piping provides:

- Piping connection to the municipal water supply for normal filling and makeup to the fire protection system (FPS) primary and secondary fire water storage tanks.
- Piping to provide an alternate makeup supply of filtered river water to the FPS primary and secondary fire water storage tanks.

The ancillary RWS pumps provide inventory and SWS make-up flow to support normal plant cooldown.

9.2.11.1.2.2 Outage Mode Operation

During plant outages; one RWS pump may be left in service to provide alternate cooling to the Turbine Building Closed Cooling Water System (TCS) Heat Exchanger and provide an alternate dilution source for radwaste discharge when the CWS is not in available.

9.2.11.2 System Description

The RWS is shown in Figure 9.2.-201. Classification of components and equipment for the RWS is given in Section 3.2.

The water source for the RWS is TVA Guntersville Reservoir fed by the Tennessee River.

Water is drawn through an intake channel which extends from the river to an intake structure (Raw Water Intake Pumping Station). The intake channel is protected by a floating boom to prevent large floating debris from reaching the intake structure. The intake structure is divided into two independent sections for Unit 3 and Unit 4. For reliability, each section has two independent basins, "Basin A" and "Basin B", from which water is drawn. The intake structure is equipped with trash rakes and traveling screens. Refer to Subsection 2.4.1.2.3.2 for additional details pertinent to the Raw Water Intake Pumping Station.

The RWS equipment located at the raw water pumping station for each unit consists of three RWS pumps and automatic strainers and their drivers, two diesel-backed ancillary water pumps and filters with their drivers, screen wash pumps and their drivers for the traveling screens, electrical power feed equipment, and appropriate instrumentation and controls for the system. Basin A contains two RWS pumps and one ancillary RWS pump and Basin B contains one RWS pump and an ancillary RWS pump. Each RWS pump has sufficient capacity to provide 50% of the maximum raw water demand for a single unit. The RWS pumps can also be used during outages to provide alternate dilution flow for Liquid Radwaste (WLS) discharge if dilution flow requirements are high. The ancillary pumps are sized to provide maximum design flow to support all modes of plant operation. Anti-siphon protection is provided to prevent draining the SWS cooling tower basins through the ancillary RWS supply piping.

The underground RWS piping is designed to ASME Standard B31.1 requirements and is protected from external corrosion.

The flow path for the functions described in the power generation design basis is from the Guntersville Reservoir, through trash rakes, intake screens and into the basins where the water is available for distribution. The RWS pumps discharge through strainers into a common distribution header for each unit. The ancillary RWS pumps discharge into a common header to a multi-unit media filter to a distribution header for each unit. A bypass is provided for the multi-media filter.

The RWS provides a piping connection to the municipal water supply for filling and makeup to the primary and secondary fire water storage tanks. A normally closed connection provides a backup supply for filling the fire water storage tanks with raw filtered river water by the ancillary RWS pumps.

SWS has investment protection short-term availability controls as described in DCD Table 16.3-2, which are applicable in MODE 5 with the RCS pressure boundary open and in MODE 6 with the upper internals in place or cavity level less than full. Under these conditions, SWS is directly providing active core cooling and meets the RTNSS criteria. Unlike SWS, RWS does not directly provide core cooling, does not meet the RTNSS criteria and does not require investment protection short-term availability controls. Ancillary RWS provides makeup water to the SWS basins.

9.2.11.2.1 Component Description

Intake

The raw water intake structure supports the pumps and related equipment (i.e. intake screens, screen wash pumps, etc) for the RWS. The intake structure has 2 basins for each unit, Basin A has two RWS pumps and an ancillary RWS pump and Basin B has one RWS pump and one ancillary RWS pump. Each basin is equipped with a traveling screen and trash rake.

Trash Rake

A rake is located at the entrance to each of the two basins downstream from the boom and upstream of the traveling screens. The rake is to prevent debris from entering the basins. The rakes are constructed in sections that are removable for washing, inspection and repair.

Traveling Screen

Traveling screens are located at the inlet of the basins downstream of the rakes and provide screening of floating and suspended solids that may be present in the river water. Additionally, the screens minimize aquatic life in the water entering the basin area. The screens are sized so that the through screen velocity is less than 0.5 feet per second to reduce impingement mortality of aquatic biota. Buildup of debris on the screens is washed off with low pressure spray water sluiced back to the reservoir. Each traveling screen is powered by an electric motor fed from normal ac power with backup power feed from diesel generators.

RWS Pumps

Three 50% capacity RWS pumps draw water from the Guntersville Reservoir to supply the required flow for the services and functions listed in Subsection 9.2.11.1.2. The pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system. The length of each pump barrel is sized to meet minimum submergence and net positive suction head requirements during low and high reservoir level conditions. The standby RWS pump is normally isolated from the discharge header by a motor-operated valve. On a loss of normal ac power, the motor-operated valves are equipment with a handwheel for manual positioning, if required. Each pump is equipped with a pressure switch on the discharge piping that alarms on low pressure. A pressure switch on the discharge header automatically starts the standby pump on low discharge header pressure.

Ancillary RWS Pumps

Two 100% capacity ancillary RWS pumps are provided to draw water from the Guntersville Reservoir. One pump provides normal makeup requirements for the services and functions listed in Subsection 9.2.11.1.2 during normal plant operations. One ancillary RWS pump is on standby. The ancillary RWS pumps are vertical, centrifugal, constant speed electric motor driven pumps. They are powered from the normal ac power system. Non-safety related diesel generators provide backup power for these pumps and their discharge valves and other required support equipment. The length of each pump barrel is sized to meet the minimum submergence and net positive suction head requirements during low and high reservoir level conditions. The standby ancillary RWS pump is normally isolated from the discharge header by a motor-operated valve. On a loss of normal ac power, the motor-operated valves are equipment with a handwheel for manual positioning. Each pump is equipped with a pressure switch on the discharge piping that alarms on low pressure. A pressure switch on the discharge header automatically starts the standby pump on low discharge header pressure.

Screen Wash Pumps

Two screen wash pumps per unit draw strained water from the RWS pump discharge flow and provide spray water to remove debris and fish from the traveling screens. The screen wash pumps are powered by electric motors fed from the normal ac power system with backup power from the diesel generators. An alternate supply of water is provided by the ancillary RWS pumps during a loss of normal ac power.

Automatic Strainers

Three 50% rotary basket type strainers are located in the RWS pump discharge lines. Automatic valves facilitate cleaning the strainers by backwashing the basket and flushing the strainer. The wash water from the cleaning sequence is discharged to the reservoir. The strainer baskets are rotated by electric motors powered from the normal ac power system.

Granular Media Filters

A Multi-unit media filter is located upstream of the supply feeds to the SWS cooling towers, and the DTS in the common discharge header for the ancillary RWS pumps. The filter consists of multiple units, with a minimum of one unit in backwash mode or on standby. The filters are periodically backwashed and the wash water is discharged to the reservoir. A bypass is provided around the filter for operational flexibility.

Piping

The discharges of the RWS pumps and ancillary RWS pumps are routed to separate headers. Discharge check valves on the RWS pumps and ancillary RWS pumps limit reverse flow in the piping if pumps are tripped and restarted. The piping is designed to accommodate transient effects that may be generated by normal starting and stopping of pumps, opening and closing of valves, or other normal operating events. The system is designed so that high points do not lead to the formation of vapor voids upon loss of system pumping. Air release valves are provided in the piping at the pump discharges to vent air on pump start.

Valves

Motor operated valves are located on the discharge of each RWS and ancillary raw water pump. They are supplied from the normal ac power system in each unit. The pump discharge valves are motor-operated and are designed to fail "as-is" during a loss of normal ac power condition. The discharge valves for the ancillary raw water pumps have backup power feed from diesel generators. Air operated valves are designed to close on a loss of normal ac power. Handwheels on valve operators allow repositioning of the valves locally on loss of power.

9.2.11.3 System Operation

The RWS operates during normal modes of plant operation, including startup, power operation (full and partial loads), cooldown, shutdown and refueling. Makeup flow to the CWS is not normally required after the plant is shutdown. The RWS pumps are not available during a loss of normal ac power, but the ancillary RWS pumps have a backup power supply from the non-safety related diesel generators to provide SWS makeup requirements. The RWS pumps are used to fill the CWS cooling tower basin and the ancillary RWS pumps fill the SWS cooling tower basins following an outage, if required.

9.2.11.3.1 Plant Startup

During plant startup, one RWS pump supplies strained water to the CWS cooling tower basin to fill the CWS piping and to replace evaporative losses as the CWS cooling tower is placed into operation. The ancillary RWS pump provides river water to the media filters for treatment before being directed to the SWS cooling tower basins.

9.2.11.3.2 Power Operation

During normal operation, two RWS pumps normally supply strained water to the CWS cooling tower basin. A third pump remains in standby. One ancillary RWS pump provides filtered water to the SWS cooling tower basins and makeup to the DTS. One ancillary RWS pump remains in standby.

9.2.11.3.3 Plant Cooldown/Shutdown

The plant cooldown/shutdown operation uses the same system alignment as with normal power operation. As the plant approaches cold shutdown and the heat rejection from the CWS cooling tower decreases, one RWS pump will be stopped and placed in standby. The remaining RWS pump will continue in operation to support normal cooldown and may be used as an alternate source of cooling water to the TCS.

The ancillary RWS pumps will be used as necessary to provide SWS cooling water to support normal cooldown of the unit, in Mode 5 with the RCS pressure boundary open and in Mode 6 with the upper internals in place or cavity level less than full, and other cooldown requirements.

9.2.11.3.4 Refueling

Normally, RWS pumps are not used during refueling. One ancillary RWS pump provides the required RWS supply of filtered water with one ancillary RWS pump in standby. A RWS pump may be used for dilution of WLS discharge if the dilution capacity requirement is high and a discharge is required.

9.2.11.3.5 Loss of Normal AC Power Operation

In the event of a loss of normal ac power, the ancillary RWS pumps, valves, filters, backwash pumps, traveling screens, and the instrumentation associated with pump discharge pressure, intake bay level, and screen wash pump discharge pressure are loaded onto their assigned non-safety related diesel buses. The pumps, filters, and traveling screens are restarted locally. The flow control valve on the ancillary RWS make-up line to the service water cooling tower basins isolates on a loss of normal ac power and will be manually opened. The major piping runs are underground which, together with the check valves on the discharge of the ancillary RWS pumps prevents the formation of voids in the make-up line and transient water hammer conditions when the pumps are restarted providing makeup flow to the SWS cooling tower basins. Administrative procedures will govern the restarting of the ancillary RWS pumps in a loss of normal ac power condition.

9.2.11.4 Safety Evaluation

The RWS does not have a safety-related function and, therefore, does not require a nuclear safety evaluation. The RWS does not have the potential to be a flow path for radioactive fluids. The RWS operates at a higher system pressure than those systems with which it directly interfaces (at the point of interface) and, therefore, in-leakage is not feasible. The WLS discharge effluent is connected to the CWS cooling tower blowdown line. Per DCD 11.2.3.3, the WLS effluent is released offsite through a dilution flow stream. Dilution flow is available from RWS to the CWS cooling tower makeup during normal power and shutdown conditions.

9.2.11.5 Tests and Inspections

Initial test requirements for the RWS are described in Subsection 14.2.9.4.24. System performance and structural and pressure integrity of system components are demonstrated by operation of the system, monitoring of system parameters such as flow and pressure, and visual inspection. Administrative procedures provide direction for operation of the system under all modes of required operation.

Preventive maintenance requirements are established. Vendor information, industry and system operating experience considered in determining testing requirements.

9.2.11.6 Instrumentation Applications

Basin level indications are provided to alert operators of system problems with the traveling screens or stop logs. Trouble alarms are used by the operators to identify component failures and initiate actions. Power actuated valves in the RWS are provided with valve position indication. Pump discharge pressure instrumentation is provided and pressure switches automatically start the standby RWS pump on low header pressure.

2. COLA Part 2, FSAR Chapter 9, Figure 9.2.1-201 (Sheet 1 of 2) will be replaced with the figure provided in Attachment 09.02.01-06B.

ASSOCIATED ATTACHMENTS/ENCLOSURERS:

Attachment 09.02.01-06A

Attachment 09.02.01-06B

NRC Letter Dated: Jan 28, 2009

NRC Review of Final Safety Analysis Report

NRC RAI NUMBER: 09.02.01-07

The staff notes that while the service water system (SWS) is designated for regulatory treatment of non-safety systems (RTNSS) during reduced reactor inventory conditions, the raw water system (RWS) is evidently not needed to support the SWS cooling function during this condition, because RWS is not designated for RTNSS treatment. However, there is no explanation in Section 9.2.11 of the applicant's Final Safety Analysis Report (FSAR) as to why this is the case. Also, because the SWS cooling tower basins are limited in their capacity, it isn't clear why RWS makeup is not required for this situation. Consequently, Section 9.2.11 of the FSAR needs to be revised to explain why RWS makeup is not needed during reduced reactor inventory conditions and in particular, to describe controls that will be implemented to ensure that SWS makeup assumptions are valid for this situation.

BLN RAI ID:

BLN RESPONSE:

Refer to the response to RAI 09.02.01-06, above, for an explanation of why RWS is not designated as RTNSS and makeup from the RWS to the SWS cooling tower basins is not required during reduced reactor inventory conditions. The referenced RAI response also discusses that procedural controls will be established to take the required actions to exit the conditions for applicability of the SWS as a RTNSS system, in the unlikely event of a failure to re-establish RWS makeup capability. Plant documentation, in the form of the system description for the RWS, will include the information addressed in these RAI responses, as appropriate.

This response is PLANT-SPECIFIC.

ASSOCIATED BLN COL APPLICATION REVISIONS:

No COLA revisions have been identified associated with this response.

ASSOCIATED ATTACHMENTS/ENCLOSURES:

None

Attachment 09.02.01-06A

RAI 09.02.01-06 items (a) thru (l)

Response Reviews Aid

RAI 09.02.01-06 Response to items (a) thru (l)

Reviewers Aid

RAI 09.02.01-06 Subquestion	**Where RAI Response is addressed**	**Basis for Not Providing Requested Information or Clarification of Information Provided**
a.	Revised FSAR Subsection 9.2.11	The Bellefonte COL Application incorporates the AP1000 DCD by reference, and is of necessity referenced in discussions of systems other than the Raw Water System (RWS) and in discussions of Technical Specifications (TS). Otherwise, the references to the DCD are minimized to the degree possible in describing the design basis, components, functions and operation of the RWS. The cold shutdown function for RWS is covered in FSAR section 9.2.11.3.
b.	Revised FSAR Subsections 9.2.11.2, 9.2.11.3	• The seven-day water availability is addressed in the response to this RAI (09.02.01-06) • In the third bullet of this subquestion, the term "ensure" should be replaced by "provide" to appropriately represent the capability and reliability of this non-safety, but robust and highly reliable system to perform its design bases functions, • The design bases are satisfied by system and component descriptions in subsection 9.2.11.2. • As explained in response to previous NRC RAI 09.02.01-03, SRP sections 9.2.1 and 9.2.5 are not applicable to RWS. • Operating experience has been incorporated by virtue of system operation and monitoring of system parameters addressed in FSAR subsection 9.2.11.5. • FSAR Subsection 9.2.11.3 addresses the system function during a loss of normal ac power. Redundancy is discussed in subsection 9.2.11.2.1. • RWS system functions are not shared between units as described in Subsection 9.2.11.2.
c.	Response to RAI 09.02.01-06, Revised FSAR Subsection 9.2.11.3, DCD Rev 17, Subsection	• The cooldown function of RWS using ancillary RWS pumps is covered in revised FSAR section 9.2.11.3 and in response to RAI 09.02.01-06, this letter. • Applicable industry codes and standards for this non-safety system are identified in the DCD Rev 17, section 3.2.2.

RAI 09.02.01-06 Subquestion	Where RAI Response is addressed	Basis for Not Providing Requested Information or Clarification of Information Provided
	3.2.2	• No change is proposed in the current Class E classification of the RWS; the basis and justification is provided in the discussions of RTNSS applicability and Class E systems in the response to RAI 09.02.01-06.
d.	Revised FSAR Subsection 9.2.11.3	The cooldown function of RWS using ancillary raw water pumps is addressed in FSAR subsection 9.2.11.3 and in response to this RAI 09.02.01-06. Design parameters such as nominal pipe sizes, limiting flow velocities, design temperature and pressure are beyond the level of detail necessary to describe this non-safety system.
e.	Revised FSAR Subsection 9.2.11.3	RWS operating modes, to the appropriate level of detail, are discussed in the revised FSAR Section 9.2.11.3.
f.	Revised FSAR Subsection 9.2.11.3 Response to RAI 09.02.01-06	• The cooldown function of RWS using ancillary raw water pumps is covered in revised FSAR section 9.2.11.3 and in response to RAI 09.02.01-06, this letter. • Minimum required water inventory restrictions on RWS operation are not applicable due to the size of the reservoir. The impact of icing effects on the reservoir and BLN are discussed in FSAR Section 2.4.7.
g.	Revised FSAR Subsection 9.2.11.6	The RWS system does not have a direct cooldown requirement. The RWS design does not incorporate indications and controls on the remote shutdown panel. Instrumentation, alarms, and interlocks applicable to the RWS are discussed in revised FSAR section 9.2.11.6,
h.	Revised FSAR Subsection 9.2.11, Figures 9.2-201, Sheet 1 & 2 and 9.2-202	FSAR Figure 9.2-201, Sheet 1&2 and Figure 9.2-202 show the appropriate RWS system piping connections and appropriate interface breaks at proper locations. Division designations are not shown on the RWS flow diagrams . The RWS is non-divisional.

RAI 09.02.01-06 Subquestion	Where RAI Response is addressed	Basis for Not Providing Requested Information or Clarification of Information Provided
i.	Revised FSAR Subsections 9.2.11.5 and 9.2.11.6	RWS system operation, monitoring, and inspection are covered in FSAR subsections 9.2.11.5 and 9.2.11.6. Periodic inspections of the type identified in this question are typically not discussed in the DCD or the FSAR for other non-safety systems such as RWS.
j.	Revised FSAR Subsection 9.2.11.5	Periodic or surveillance tests, as appropriate, are developed as a part of the procedures process under COL Information Item 13.5-1, in DCD and FSAR Subsection 13.5.
k.	Response to RAI 09.02.01-05	As described in response RAI 09.02.01-05, this letter response, the RWS system screens out for ITAAC when the screening criteria of FSAR Subsection 14.3 are applied.
l.	Revised FSAR Subsection 9.2.11.5 and Subsection 14.2.9.4.24	The appropriate considerations for modes of RWS operation to provide assurance that the system will perform its design basis function under limiting conditions will be encompassed in the construction turnover and preoperational tests performed on the system detailed. The initial test requirements for the RWS are described in FSAR Subsection 14.2.9.4.24. Operational and preventive maintenance testing (FSAR revised 9.2.11.5) will ensure reliable operation of the system

Attachment 09.02.01-06B

FSAR Figure 9.2-201

Revised FSAR Figure 9.2-201 (Sheet 1)

(3 pages including the cover sheet)

NOTES

1. SEE SHEET 2 FOR TRASH RAKE, TRAVELING SCREEN AND SCREEN WASH PUMP.

ABBREVIATIONS

DTS DEMINERALIZED WATER TREATMENT SYSTEM
FPS FIRE PROTECTION SYSTEM
RWS RAW WATER SYSTEM
SWS SERVICE WATER SYSTEM

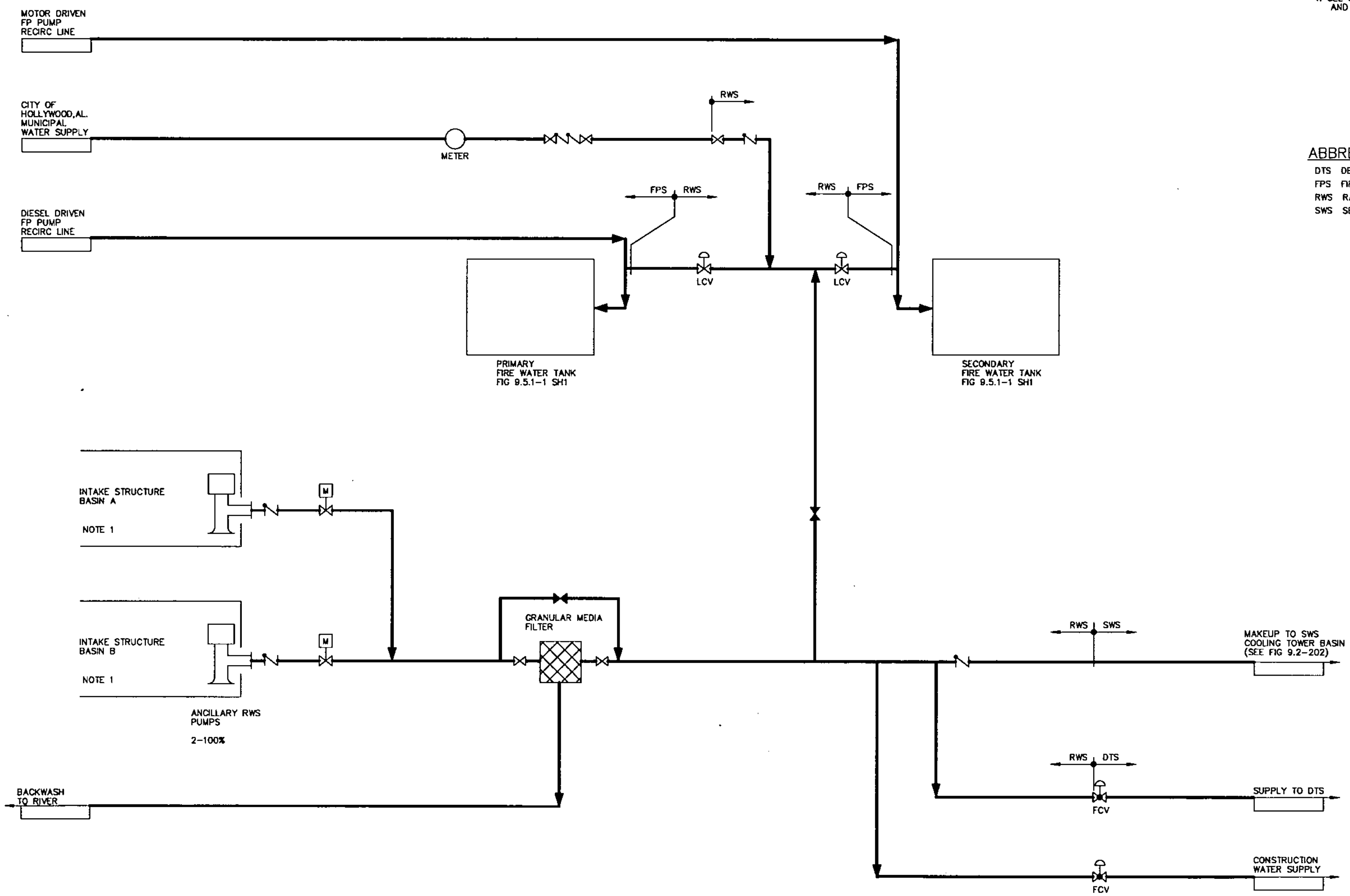

FIGURE 9.2-201 (Sheet 1 of 2)
Raw Water System Flow Diagram

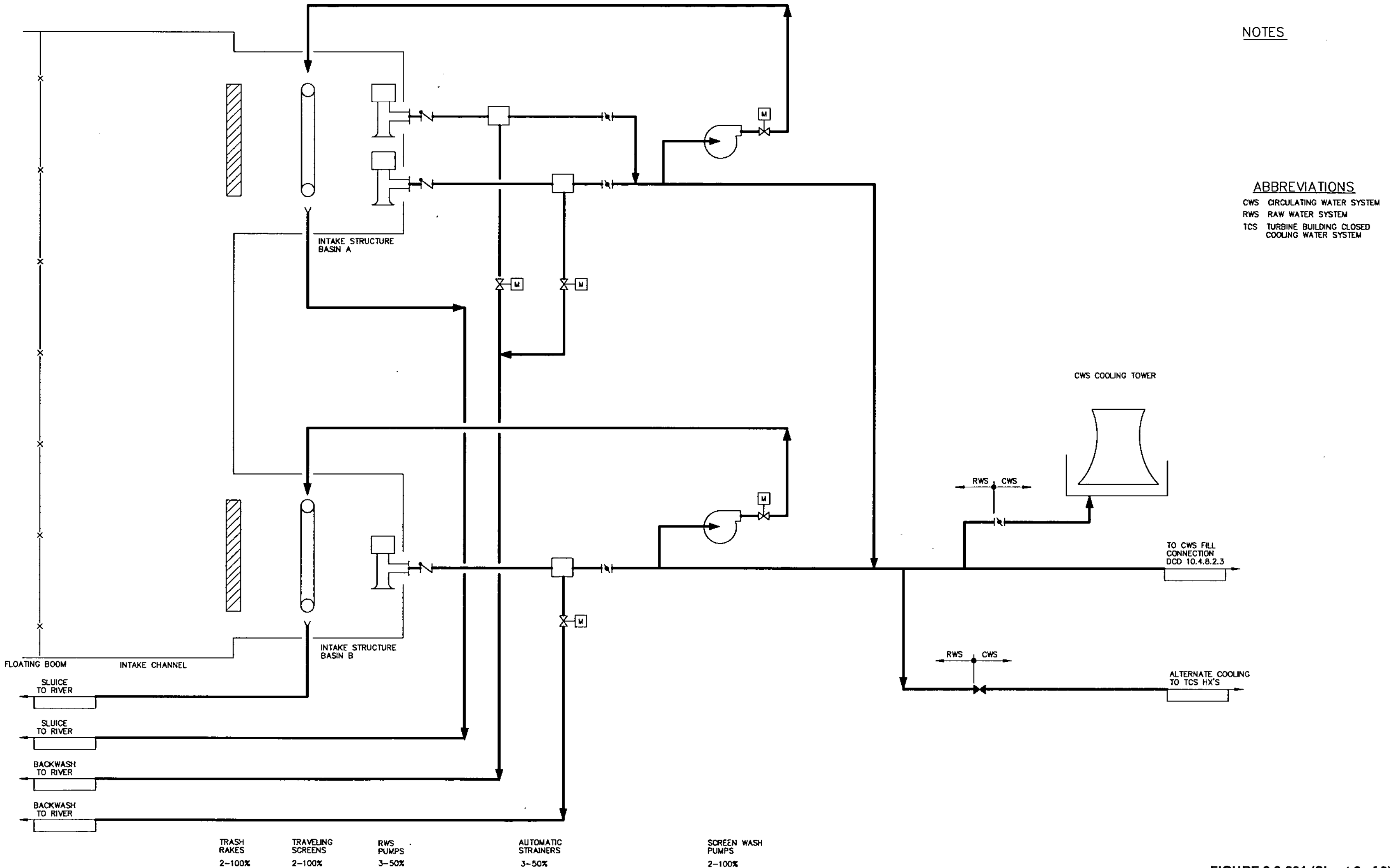

FIGURE 9.2-201 (Sheet 2 of 2)
Raw Water System Flow Diagram