Entergy

Entergy Operations, Inc.
1448 S.R. 333
Russellville, AR 72802
Tel 501 858 5000

0CAN080502

August 31, 2005

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: NRC Bulletin 2003-01 Additional Information
Arkansas Nuclear One – Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

Dear Sir or Madam:

By letter dated June 10, 2004 (0CAN060402) Entergy provided responses to requests for additional information (RAIs) to NRC Bulletin 2003-01, Potential Impact of Debris Blockage on Emergency Sump Recirculation at Pressurized-Water Reactors for Arkansas Nuclear One (ANO). On April 20, 2005, the NRC requested the following additional information. How will Entergy minimize risk associated with the emergency core cooling (ECCS) suction strainer clogging issue from now until the final implementation of Generic Safety Issue-191 corrective actions for ANO-1 and ANO-2? Specifically, describe the technical analysis resulting from the review of the WCAP-16204 eleven candidate operator actions (COAs) for each of the three plants. If actions will not be taken, give detailed reasons for that conclusion for each candidate operator action affected. If actions are considered to be applicable, when will they be implemented? This additional information for ANO-1 and ANO-2 is contained in the attachment (note that COA A11 is not applicable to the ANO units).

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There are no new commitments contained in this submittal. Should you have any questions concerning this submittal, please contact Ms. Natalie Mosher at (479) 858-4635.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 31,2005.

Sincerely,

Dale E. James
Acting Director, Nuclear Safety Assurance

DEJ/nbm

Attachment

cc: Dr. Bruce S. Mallett
Regional Administrator
U. S. Nuclear Regulatory Commission
Region IV
611 Ryan Plaza Drive, Suite 400
Arlington, TX 76011-8064

NRC Senior Resident Inspector
Arkansas Nuclear One
P.O. Box 310
London, AR 72847

U. S. Nuclear Regulatory Commission
Attn: Mr. Mohan Thadani
Mail Stop 0-7 D1
Washington, DC 20555-0001

U. S. Nuclear Regulatory Commission
Attn: Mr. Drew Holland
Mail Stop 0-7 D1
Washington, DC 20555-0001

Attachment to

0CAN080502

NRC Bulletin 2003-01 RAI

ANO-1 Response to WCAP-16204 11 COAs

COA A1a – Secure one spray pump.

Response: This step is in the ANO-1 emergency operating procedure (EOP).

COA A1b – Secure both spray pumps.

Response: This step is in the ANO-1 EOP, but is only performed if there is no evidence of containment breach.

COA A2 – Manually establish one train of containment sump recirculation prior to automatic actuation.

Response: Automatic actuation of sump recirculation is not applicable to ANO-1. Manual transfer of one train to sump recirculation early was deemed unacceptable due to net positive suction head (NPSH) requirements, borated water storage tank (BWST) draw-down rate and valve stroke times.

COA A3 – Terminate one train of HPSI/high-head injection after recirculation alignment.

Response: Termination of high-pressure injection (HPI) prior to sump recirculation is performed if termination criteria are met. The same termination criteria are applicable after initiating sump recirculation. The Framatome positions on this subject are:

ECCS flows shall not be throttled while the core outlet is not subcooled other than that required for pump protection. This directly supports throttling for observed indications of sump performance degradation, but is counter to pre-emptive throttling, e.g., to delay switchover to sump recirculation. Both trains of ECCS remain in operation while the core outlet is not subcooled. Minimum low-pressure injection (LPI) flow in both lines is verified prior to securing HPI.

COA A4 – Early termination of one low-pressure safety injection (LPSI)/Residual Heat Removal (RHR) pump prior to recirculation alignment.

Response: Termination of LPI/decay heat removal (DHR) prior to sump recirculation is not performed. The Framatome positions on this subject are as follows. ECCS flows shall not be throttled while the core outlet is not sub-cooled other than that required for pump protection. This directly supports throttling for observed indications of sump performance degradation, but is counter to pre-emptive throttling, e.g., to delay switchover to sump recirculation. Both trains of ECCS remain in operation while the core outlet is not sub-cooled. Early termination of LPI/DHR requires several manual control component manipulations. This could be required early in a loss-of-coolant accident (LOCA) event while the operator is verifying proper ECCS component operations and responding to the event. This would introduce a greater opportunity for operator error and burden that could negatively affect accident mitigation. Framatome's position is to ensure these actions are taken when necessary to protect equipment (i.e., actual sump blockage indication) rather than preemptively based upon the possibility that sump blockage may occur.

COA A5 – Refill of refueling water storage tank (RWST).

Response: The step to refill BWST after going on sump recirculation is in the currently approved ANO-1 EOP. OP-1202.012 Step 15.L states "IF possible, THEN initiate BWST refill using Chemical Addition (1104.003) Attachment L "Boric Acid and Condensate Addition to BWST (T-3)." This procedure contains the normal and alternate processes for make-up/filling of the BWST. The attachment provides instructions to calculate required boric acid and water volumes to ensure proper concentration as required for BWST operability. This repetitive task is contained in RT15 entitled "Shift to Reactor Building (RB) Sump Suction". Sump suction transfer may be required early in a LOCA event depending upon break size. BWST refill, if possible, is procedurally directed to commence immediately upon sump transfer thus ensuring additional BWST inventory when needed. The normal fill water source for the BWST is from the condensate transfer pumps (P-9A/B) and boric acid pumps (P-39A/B). The two parallel P-9 pumps are rated at approximately 400 gallons per minute (gpm) per pump. OP-1104.003 Attachment L contains direction for an alternate flow path for boric acid to the BWST through the spent fuel cooling system. This method utilizes the P-9A/B pumps for demineralized water make-up to the BWST and is also capable of supplying greater than 400 gpm.

ANO-1 SAMG Chapter III.D step 3.8.2 contains the following: Additional borated water sources available or can be made available for injection which include but are not limited too:

- BWST (T-3) any remaining inventory following suction transfer to the reactor building (RB) sump.
- Transfer any clean waste receiver tank (T-12s) inventory to the BWST or SFP.
- Batch boric acid and water additions to the BWST.
- Offsite sources of borated water delivered to the site and transferred to the BWST.

Unborated water may be added to the spent fuel pool (SFP) from any excess condensate storage tank (CST) inventory or by the service water system to then provide additional diluted but still borated make-up to the BWST. As a last resort, pure unborated water can be provided to the BWST for injection by the LPI pumps.

COA A6 – Inject more than one RWST volume from a refilled RWST or by bypassing the RWST.

Response: This is currently covered under the SAMGs.

COA A7 – Provide more aggressive cooldown and depressurization following a small break LOCA (SBLOCA).

Response: Current EOPs expedite cooldown during a LOCA and state that cooldown rate limits do not apply when the core exit thermocouples are not sub-cooled. The LOCA condition cool-down instructions are contained in OP-1202.002 (Loss of Sub-cooling Margin), OP-1203.041 (SBLOCA Cooldown), OP-1203.013 (Natural Circulation Cooldown), and OP-1203.040 (Forced Flow Cooldown). OP-1202.002 (Loss of Sub-cooling Margin) Step 19 provides direction for a "Rapid Cooldown" if sub-cooling margin (SCM) is lost and HPI flow is less than full flow from one HPI pump and either Head Voids are indicated or the

reactor coolant pumps (RCPs) are not tripped in two minutes. The procedure states "Cooldown rate limits do NOT apply" in this situation. OP-1203.041 (SBLOCA Cooldown) and OP-1203.013 (Natural Circulation Cooldown) procedures state, "If SCM is less than adequate, no Cooldown rate limits apply". OP-1203.040 (Forced Flow Cooldown) is written for a plant cooldown under LOCA conditions where SCM is adequate so normal cooldown rate limits would apply.

COA A8 – Provide guidance on symptoms and identification of containment sump blockage.

Response: This guidance is in the currently approved ANO-1 EOPs. OP-1202.012 Repetitive Tasks Step 15.G provides detailed symptoms of sump blockage as well as indicators to monitor. Specific manual operator action is detailed in the procedure in the event sump blockage is identified.

COA A9 – Develop contingency actions in response to containment sump blockage, loss of suction, and cavitation.

Response: Interim guidance has been provided by the Babcock and Wilcox Owners Group (BWOG) to address the issue of RB sump blockage in PC 03-01 to the BWOG EOPs Technical Basis Document 74-115-2414, *Generic Emergency Operating Guidelines.* The ANO-1 EOPs contain the "Specific Generic Emergency Operating Guidelines Actions" recommended by the interim guidance. These actions, to be taken whenever the ECCS is placed on RB sump recirculation, are listed in the interim guidance as follows:

IF AT ANY TIME [indications of sump degradation], THEN PERFORM THE FOLLOWING:

1 Verify suction lineups.
2 Throttle LPI to [minimum flow rate].
3 IF both reactor building spray (RBS) trains operating, THEN stop one RBS train.
4 IF no evidence of containment breach, THEN stop all RBS.
5 Refer to station management for further direction.

The actual changes to the ANO-1 EOPs are contained in procedures 1202.010, ESAS, Attachment 1 (Shift to RB Sump Suction), step 5 for large break LOCAs (LBLOCAs) and 1202.012, Repetitive Tasks, step 15 (Shift to RB Sump Suction) for small and intermediate break LOCAs. The following is the text that has been added to these procedures.

5. IF RB sump blockage is indicated by fluctuations in LPI, HPI or RBS parameters below,
   THEN perform all the following:

   - RB Sump level dropping
   - Fluctuations in LPI, HPI, or RBS parameters below,
     - Discharge press, suct press or flow on dedicated SPDS displays
     - Flow on C16/C18

- LPI discharge press, suct press, or motor amps on dedicated PDS/PMS displays.
- Discharge press, suct press, flow or motor amps on the SPDS points listed below,

SPDS Points to Monitor for RB Sump Blockage							
	LPI		RBS		HPI		
	P-34A	P-34B	P-35A	P-35B	P-36A	P-36B	P-36C
disch press	P1404	P1405	P2426	P2425	P1241	P1242	P1243
suct press	P1407	P1408	P2429	P2428	P1246	P1247	P1248
flow	F1401	F1402	F2401	F2400	F1228, F1230, F1231, F1232		F1209, F1210, F1211, F1212
motor amps	I1A305	I1A405					

A. Re-verify suction flowpath properly aligned as follows:

1) Verify the following valves open:

	P-34A	P-34B
RB Sump Outlets (Outside RB)	CV-1405	CV-1406
RB Sump Outlets (Inside RB)	CV-1414	CV-1415
Suctions From BWST	CV-1436	CV-1437

2) Verify the following valves closed:

	P-34A	P-34B
BWST Outlets	CV-1407	CV-1408

B. Override AND throttle LPI to minimum flow listed below (CV-1400 and 1401):

2 LPI pumps	1 LPI pump
≥ 2800 gpm/pump	≥ 3050 gpm

C. IF both trains of RBS are operating, THEN perform the following:

1) IF there is no evidence of Containment breach, THEN perform the following:

a) Override AND stop both RBS pumps (P-35A and B).

b) Override AND close both RBS Block valves:

P-35A	P-35B
CV-2401	CV-2400

c) GO TO step E.

2) IF there is evidence of Containment breach, THEN perform the following:

a) Override AND stop one RBS pump (P-35A or B).

b) Override AND close associated RBS Block valve.

P-35A	P-35B
CV-2401	CV-2400

c) GO TO step E.

D. IF one train of RBS is operating
AND
there is no evidence of Containment breach,
THEN perform the following:

1) Override AND stop RBS pump (P-35A or B).

2) Override AND close associated RBS Block valve.

P-35A	P-35B
CV-2401	CV-2400

E. Contact Technical Support Center (TSC) for further direction.

COA A10 – Early termination of one train of HPSI/high-head injection prior to recirculation alignment.

Response: Termination of HPI prior to sump recirculation is performed if termination criteria are met. The same termination criteria are applicable after initiating sump recirculation. The Framatome positions on this subject are:

ECCS flows shall not be throttled while the core outlet is not subcooled other than that required for pump protection. This directly supports throttling for observed indications of sump performance degradation, but is counter to pre-emptive throttling, e.g., to delay switchover to sump recirculation. Both trains of ECCS remain in operation while the core outlet is not subcooled. Minimum LPI flow in both lines is verified prior to securing HPI.

ANO-2 Response to WCAP-16204 11 COAs

COA A1a – Secure one spray pump.
COA A1b – Secure both spray pumps.

Response: The CEN-152 bases for this step states that the intent of this step is to secure unneeded CS pumps as early as possible after it has been confirmed that they have performed their safety function. The overall objective is to:

- Reduce the demand on the RWT,
- Delay the time to the start of containment recirculation during small breaks,
- Reduce the flow rate to the sump when containment recirculation begins,
- Reduce the pressure differential across the sump screens if there is a build up of debris.

This is a plant specific instruction. Each plant must consider the advantages and disadvantages as they apply to their plant specific design and incorporate this action if it is determined to be risk beneficial with respect to containment sump blockage.

In the early minutes following a LOCA, the operators are extremely busy responding to the event in accordance with their EOPs. The EOPs are symptom-based, not event-based. They are used to verify the satisfactory control or restoration of critical safety functions and provide actions to restore and maintain those safety functions when degraded conditions exist. To avoid the risk of taking an incorrect action for an actual event, the EOPs do not prescribe contingency actions until symptoms that warrant those contingency actions are identified. The EOPs are written in such a way that the operator need not diagnose an event in order to establish and maintain a safe plant configuration. To be effective in delaying the switchover to containment sump recirculation, operator actions to stop one train of ECCS must be taken in the first few minutes of the accident. The human failure probability of achieving this action is high given the short action time available. Additionally, this action would introduce a significant opportunity for operator errors based on other actions that are required during this time frame. Any risk benefit achieved by the action would have to offset the additional risk introduced by the additional action during this critical time period.

Furthermore, upon receipt of a recirculation actuation signal (RAS), LPSI pumps automatically stop and service water is aligned to the shutdown cooling heat exchanger (SDCHX). Since normal CS flow is via the SDCHX (and LPSI pumps are secured post-RAS), the Spray pumps provide a substantial means of decay heat removal during an accident post-RAS. The other means of decay heat removal is the reactor building coolers. The EOPs currently contain steps for Spray termination once it has been determined that the Spray system has adequately performed its safety function. Assuming single failure on the running train, early termination of Spray may result in the safety function of CS not being completed. Section 1, step 18 of OP-2202.003 (LOCA) directs CS be terminated if the containment temperature is less than 140°F, containment pressure is less than 22.5 psia, all containment coolers are running in emergency mode, and CS is not needed for iodine removal and/or decay heat removal. Step 18 states:

18. IF CNTMT Spray operating, THEN terminate CNTMT Spray as follows:

    A. Check CNTMT Spray termination criteria satisfied:

        - CNTMT pressure less than 22.5 psia.
        - CNTMT temperature less than 140°F.
        - ALL available CNTMT Cooling fans running in Emergency Mode.
        - TSC determines CNTMT Spray NOT required for CNTMT Iodine removal.
        - CNTMT Spray NOT required for decay heat removal following RAS actuation.

    B. Reset CSAS at PPS cabinets.

    C. Stop CNTMT Spray pumps.

    D. Close CNTMT Spray Header Isolation valves.

If RAS has actuated, CS pumps are the means of decay heat removal as RAS acts automatically to secure LPSI pumps and to align service water to the SDC heat exchanger. If RAS has not actuated, CS pumps are considered not needed for decay heat removal and may be secured assuming the remaining criteria are met. SDC entry criteria per OP-2202.003 Section 2 step 28 and Section 3 step 30 define SDC entry conditions per the following:

- RVLMS LVL 03 or higher elevation indicates WET.
- RCS MTS 30°F or greater.
- RCS pressure and temperature within SDC window, refer to Attachment 1, P-T Limits.
- Radiation Protection verifies radiation levels will permit access to SDC equipment.
- CNTMT Spray secured.
- LPSI pumps secured.

The SDC window per Standard Attachment 1 is defined by RCS temperature < 290°F and RCS pressure < 300 psia. SDC is initiated per OP-2202.003 Section 2 step 29 and Section 3 step 32 using the normal SDC operating procedure, OP-2104.004:

Initiate shutdown cooling as follows:

A. WHEN Low RWT Level/Low PZR Pressure Bypass Permissive lights ON, THEN perform the following:

1) Place Bypass switches in BYPASS.

2) Reset RAS at PPS cabinets.

B. Check SIAS reset

C. Verify LPSI Injection MOVs closed.

D. Place SDC system in service using 2104.004, Shutdown Cooling System.

E. Stop remaining RCPs.

F. IF RCP 2P32A or 2P32B stopped,
THEN verify associated PZR Spray valve in MANUAL and closed.

G. Refer to 2102.010, Plant Cooldown, for additional actions.

H. Consult TSC or operations management for further guidance.

Additionally, the EOPS direct that the Containment sump and ECCS pumps be monitored for blockage using Standard Attachment 43. If signs of blockage are noted, early HPSI and early Spray termination are initiated (i.e. one train of HPSI and Spray are secured).

COA A2 – Manually establish one train of containment sump recirculation prior to automatic actuation.

Response: Although it would be possible to switch one train of HPSI and CS to the sump early, the current design basis post-LOCA NPSH analysis has determined that the available margin is small. This margin is insufficient to provide for a timely and meaningful response. Furthermore, the hydraulic behavior of a single train aligned to the sump immediately upon switchover will not provide an indication of the sump performance with both trains several minutes later. In addition, there is an extensive operator burden involved during a design basis event. Manually aligning one ECCS train to sump recirculation requires several manual control component manipulations. This could be required early in a LOCA event while the operator is verifying proper ECCS component operations and responding to the event. This would introduce a greater opportunity for operator error and burden that could negatively affect accident mitigation. There is a burden on operators to make quick assessments of the break size and containment heat load needs before the RWT draindown is completed, a burden on the operators to conduct a successful manual transfer and shutdown of ECCS lineups, the potential existence of decreased submerged sump screen area, and the potential lack of NPSH margin due to a low volume of water in the containment. Therefore, Entergy has decided it is not in the best interest of safety to implement this COA at ANO-2.

Upon receipt of a RAS pre-trip annunciator (RWT level less than 40%), the EOPs direct monitoring for sump blockage per Standard Attachment 43 (OP-2202.003, Section 3, Step 20). This initiates sump blockage monitoring well before the RAS setpoint of 6% RWT level. Additionally, an EOP step independent of the RAS pre-trip annunciator further directs monitoring of containment sump blockage per Standard Attachment 43 (2202.003,

Section 3, Step 25). Standard Attachment 43 provides instructions for monitoring ECCS pump performance for containment sump blockage. HPSI pump and CS pump suction pressure, discharge pressure, flow, motor amperage, pump noise and emergency diesel generator amperage are all monitored for indications of sump blockage. LPSI pump parameters are not monitored as they automatically secure upon a RAS. If sump blockage is detected, contingency actions are taken per the EOPs to perform early CS and early HPSI termination.

COA A3 – Terminate one train of HPSI/high-head injection after recirculation alignment.

Response: Concerning early termination of one train of HPSI/high-head injection after recirculation alignment, CEN-152 bases for this step states: The intent of this step is to permit securing one HPSI pump following RAS if two HPSI trains are not needed for core heat removal. This action reduces the total ECCS flow through the containment sump screens in order to reduce debris buildup on the screens. It also establishes a protected train for use at a later time if needed. This instruction is applicable post-RAS only. It does not replace or alter the standard HPSI stop/throttle criteria which are available before and after RAS. [This is a plant specific instruction. Each plant must consider the advantages and disadvantages as they apply to their plant specific design and incorporate this action in their EOPs if it is determined to be risk beneficial with respect to containment sump blockage.]

As stated in the WCAP-16204, deliberate manual securing of one HPSI train is not considered a "failure." Thus, analysis is required to show acceptable consequences with a failure of the remaining running train after manually stopping one HPSI train. This would result in an interruption of core flow until the operator could start the standby HPSI pumps. This could result in a significant increase in the fuel peak cladding temperature and consequently a significant increase in radiological dose to the public. Entergy believes that this negative impact outweighs the potential benefit for sump NPSH. Therefore, because stopping one HPSI pump is not risk beneficial due to the risk of core damage upon a single failure loss of the one operating HPSI pump.

Furthermore, early termination of HPSI after recirculation alignment requires several manual control component manipulations. This would introduce a greater opportunity for operator error and burden that could negatively affect accident mitigation. ANO-2's position is to ensure these actions are taken when necessary to protect equipment (i.e., actual sump blockage indication) rather than preemptively based upon the possibility that sump blockage may occur.

In addition, EOPs direct use Standard Attachment 43 to monitor for sump blockage, loss of suction and cavitation on HPSI and CS pumps. Upon detection of indications of sump blockage per Standard Attachment 43, the EOPs direct early CS and early HPSI termination by verifying one train of HPSI and CS are secured.

COA A4 – Early termination of one LSPI/RHR pump prior to recirculation alignment.

Response: As stated in the WCAP-16204, deliberate manual securing of one LPSI/SDC train is not considered a "failure." Thus, analysis is required to show acceptable consequences with a failure of the remaining running train after manually stopping one LPSI/SDC train. This would result in an interruption of LPSI/SDC flow until the operator

could start the standby LPSI/SDC pumps. This could result in a significant increase in the fuel peak cladding temperature and consequently a significant increase in radiological dose to the public. Entergy believes that this negative impact outweighs the potential benefit for sump NPSH. Therefore, because stopping one HPSI/LPSI pump is not risk beneficial due to the risk of core damage upon a single failure loss of the one operating LPSI/SDC pump.

Furthermore, early termination of LPSI/SDC prior to recirculation alignment requires several manual control component manipulations. This would introduce a greater opportunity for operator error and burden that could negatively affect accident mitigation. ANO-2's position is to ensure these actions are taken when necessary to protect equipment (i.e., actual sump blockage indication) rather than preemptively based upon the possibility that sump blockage may occur.

COA A5 – Refill of RWST.

Response: The step to refill the RWT is in the currently approved ANO-2 EOP. This step is performed prior to RAS so that ample time is allowed to carry out action for RWT refill before it is need. OP-2202.003 Section 3, step 18 states:

IF possible, THEN initiate action to refill the RWT by ANY of the following:

- Normal make-up per OP-2104.003, Chemical Addition
- Make-up from Holdup tanks per 2104.006, Fuel Pool Systems
- Make-up from SFP per OP-2104.006, Fuel Pool Systems
- Instruct TSC to consider RWT, Refill strategy per SAMG.

OP-2104.003 contains the normal processes for make-up/filling of the RWT. The procedure provides instructions to calculate required boric acid and water volumes to ensure proper concentration as required for RWT operability. RWT refill, if possible, is procedurally directed to commence prior to sump transfer thus ensuring additional RWT inventory if needed. The normal fill water source for the RWT is from the reactor make-up water pumps (2P-109A/B) and boric acid pumps (2P-39A/B). The two parallel 2P-109 pumps are rated at approximately 200 gallons per minute (gpm) per pump. The two parallel boric acid pumps (2P-39A/B) are rated at approximately 140 gpm per pump. However, due to the system piping configurations, maximum flow from 2P-39A/B to the RWT is approximately 30 gpm with both pumps running.

OP-2104.006 Section 13 contains direction for an alternate flow path for borated water to the RWT through the spent fuel purification system. This method utilizes the 2P-66 pump and is capable of supplying approximately 150 gpm. The source of this water is the SFP inventory itself. Siphon breakers at elevation 401' will limit the initial amount of water available from the SFP to approximately 3000 gallons, based on approximate normal level of 401' 6".

OP-2104.006 Attachment O contains instructions for an alternate flow path for borated water to the RWT from the Holdup tanks (2T-12A/B/C/D). This method utilizes the Holdup tank recirculation pump (2P-48) which is rated at a flow of approximately 50 gpm. The 2T-12 tanks inventory is not controlled at a pre-established minimum therefore the available

volume of water from this source is not know. However, these tanks typically contain a substantial quantity of borated water suitable for RCS injection.

ANO-2 SAMG contains the following:

Additional borated water sources available for injection by either the HPSI pumps or the charging pumps include:

- any remaining BAMT inventory after RAS
- RWT inventory after RAS
- transfer of any excess SFP inventory to the RWT
- transfer of any hold-up tank (2T-12A/B/C/D) inventory to the RWT
- batch additions to the BAMTs

Additionally, the volume control tank can be manually unisolated and its remaining volume could be injected by the charging pumps. Unborated water may be added to the SFP from any excess CST inventory or by the service water system to then provide additional diluted but still borated make-up to the RWT. As a last resort, pure unborated make-up water can be provided directly to the suction of the charging pumps or to the RWT for injection by the HPSI pumps.

COA A6 – Inject more than one RWST volume from a refilled RWST or by bypassing the RWST.

Response: This is currently covered under the SAMGs.

COA A7 – Provide more aggressive cooldown and depressurization following a SBLOCA.

Response: Current EOPs expedite RCS cooldown by providing a floating step to initiate cooldown, which may be performed upon initial entry into the EOP. The maximum allowed cooldown rate is limited by technical specifications and is monitored using EOP (OP-2202.010) Standard Attachments 1 and 8.

The primary strategy of the SBLOCA EOP (2202.003, Section 2) is to minimize primary break flow while performing a controlled cooldown. Step 22 in Section 2 of 2202.003 directs that RCS pressure be maintained within 100 pounds per square inch atmospheric (psia) above minimum RCP NPSH requirements if RCPs are running. This results in maintaining RCS pressure low enough to minimize primary break flow, while allowing two RCPs to run, thereby aiding in core heat removal. If RCPs are not running, direction is given to maintain margin to saturation 30 to 45 degrees while in natural circulation. This requires RCS pressure to be lowered during the cooldown, thereby minimizing primary break flow. Step 22 states:

22. Minimize primary break flow as follows:

A. Check ANY RCP running.	A. IF ALL RCPs secured, THEN perform the following: 1) Maintain RCS MTS 30 to 45°F, refer to Attachment 1, P-T Limits 2) GO TO Step 22.C
B. Maintain RCS pressure within 100 psia above minimum RCP NPSH requirement, refer to Attachment 1, P-T Limits.	
C. Use ONE of the following to depressurize RCS: 1) Normal PZR spray using Attachment 27, PZR Spray Operation. 2) Aux spray using Attachment 27, PZR Spray Operation. 3) IF HPSI termination criteria met, THEN cycle Charging pumps or throttle HPSI flow to lower PZR pressure.	C. Cycle PZR High Point Vent valves as needed to depressurize RCS: • 2SV-4636-1 • 2SV-4636-2 • 2SV-4669-1 • 2SV-4670-2

COA A8 – Provide guidance on symptoms and identification of containment sump blockage.

Response: Upon receipt of a RAS pre-trip annunciator (RWT level less than 40%), the EOPs direct monitoring for sump blockage per Standard Attachment 43 (OP-2202.003, Section 3, Step 20). This initiates sump blockage monitoring well before the RAS setpoint of 6% RWT level. Additionally, an EOP step independent of the RAS pre-trip annunciator further directs monitoring of containment sump blockage per Standard Attachment 43 (OP-2202.003, Section 3, Step 25). An excerpt from the EOP follows:

20. IF RAS Pre-trip annunciator in alarm,
THEN perform the following:

    A. Notify Control Board Operators to monitor for CNTMT Sump blockage using Attachment 43, ECCS/CSS Pump Monitoring.

    B. Locally verify ESF pump room doors closed and dogged.

C. Locally verify the following valves closed:

- "A ESF PUMP ROOM DRAIN LINE ISOLATION" 2ABS-5
- "B ESF PUMP ROOM DRAIN LINE ISOLATION" 2ABS-6

25. Monitor Loss of ECCS/CSS pump suction as follows:

A. Check ECCS/CSS pump suction acceptable using Attachment 43, ECCS/CSS Pump Monitoring.

Standard Attachment 43 provides instructions for monitoring for containment sump blockage. HPSI pump and CS pump suction pressure, discharge pressure, flow, motor amperage, pump noise and emergency diesel generator amperage are all monitored for indications of sump blockage. LPSI pump parameters are not monitored as they automatically secure upon a RAS. If sump blockage is detected, contingency actions are taken per the EOPs to perform early CS and early HPSI termination (See COA A9 response). An excerpt from Standard Attachment 43 follows:

Monitor all available indications for signs of a loss of ECCS pump suction, i.e., CNTMT Sump blockage, as indicated by any of the following (listed in order of likely occurrence):
a) Unstable or lower than expected HPSI or CS flow
b) Unstable or lower than expected HPSI or CS pump discharge pressure
c) Lower than expected HPSI or CS pump suction pressure, low suction pressure alarm
d) Unstable or lower than expected HPSI or CS pump motor current
e) Raised HPSI or CS pump noise

If there are indications of a reduction in NPSH or pump performance, the operator reviews the parameter trends and attempts to diagnose what is happening (for example: an individual pump in distress, a valve or system component failure, or sump screen blockage). Accurate diagnosis of these occurrences under accident conditions is difficult and would require the operator to rely heavily on knowledge, experience, and training. None of the available indications would provide a 100% conclusive diagnosis.

1. Circle ECCS/CSS pump(s) in service.

HPSI 2P-89A HPSI 2P-89B HPSI 2P-89C CSS 2P-35A CSS 2P-35B

2. Monitor respective ECCS/CSS pump for signs of sump blockage from Control Room using available indications:

Amperage

- 2DG1 amperage A-2DG1
- 2DG2 amperage A-2DG2

Suction Pressure

- Suction pressure alarm 2K07-D7 "SDC SUCTION PRESS HI" and 2PI-5039A on 2C04 if enabled/aligned

Discharge Pressure

- 2PI-5108/P5108 HPSI HDR1 Pressure
- 2PI-5109/P5109 HPSI HDR2 Pressure
- 2PI-5622/P5622 CSS pump 2P-35A Discharge Pressure
- 2PI-5625/P5625 CSS pump 2P-35B Discharge Pressure

Flow

- 2FI-5101-1/F5101-1 HPSI HDR1 Flow
- 2FI-5102-2/F5102-2 HPSI HDR2 Flow

- 2FIS-5610/F5610 CSS pump 2P-35A Flow
- 2FIS-5616/F5616 CSS pump 2P-35B Flow
- CSS HDR 1 flow low alarm 2K06-E1 "SPRAY HDR FLOW LO"
- CSS HDR 2 flow low alarm 2K05-E1 "SPRAY HDR FLOW LO"

3. IF Rooms accessible (dose considerations) AND CNTMT less than 53 psia, THEN valve in LPSI Pump Suction Pressure transmitters (2PT-5039 and 2PT-5058) as follows:

   3.1 Verify 2PI-5039 Isol (2SI-5039A) open.

   3.2 Open 2PT-5039 Isol (2SI-5039).

   3.3 Verify 2PI-5058 Isol (2SI-5058B) open.

   3.4 Open 2PT-5058 Isol (2SI-5058).

   3.5 Verify suction pressure alarm enabled on 2PI-5039A.

4. IF Room accessible (dose considerations) AND manpower available, THEN monitor the following:

   - 2P-35A Suction Pressure – align 2P-35A Suction Pressure Gauge (2PI-5677)
   - 2P-35B Suction Pressure – align 2P-35B Suction Pressure Gauge (2PI-5687)
   - 2P-89A Suction Pressure – align 2P-89A Suction Pressure Gauge (2PI-5090)
   - 2P-89B Suction Pressure – align 2P-89B Suction Pressure Gauge (2PI-5100)
   - 2P-89C Suction Pressure – align 2P-89C Suction Pressure Gauge (2PI-5098)

5. IF manpower available, THEN monitor amperage at the respective pump breaker:

   - 2P-35A Local Ammeter at 2A-304
   - 2P-35B Local Ammeter at 2A-404
   - 2P-89A Local Ammeter at 2A-306
   - 2P-89B Local Ammeter at 2A-406
   - 2P-89C Local Ammeter at 2A-307/407

6. IF Room accessible (dose considerations), THEN monitor for cavitation noise at suction of respective pump(s).

7. IF CNTMT Sump Blockage observed,
   THEN notify Control Room Supervisor.

COA A9 – Develop contingency actions in response to containment sump blockage, loss of suction, and cavitation.

Response: EOPs direct use Standard Attachment 43 to monitor for sump blockage, loss of suction and cavitation on HPSI and CS pumps. Upon detection of indications of sump blockage per Standard Attachment 43, the EOPs direct early CS and early HPSI termination by verifying one train of HPSI and CS are secured. An example excerpt from the EOPs follows:

NOTE

Optimal Early Termination lineup configuration would include one CNTMT Spray pump and one HPSI pump with the same power supply, with a common sump suction line.

22. Verify Early HPSI Termination as follows:

    A. Check indication(s) of CNTMT Sump Blockage as per Attachment 43, ECCS/CSS Pump Monitoring.

    B. IF all available HPSI trains in service,
       THEN initiate Early HPSI Termination as follows:

       1) Verify ONE HPSI train secured by placing HPSI pump (2P89A/B/C) in PTL.

23. Verify Early CNTMT Spray Termination as follows:

    IF All of the following are TRUE

    - CNTMT Spray operating
    - Indication(s) of CNTMT Sump Blockage as per Attachment 43, ECCS/CSS Pump Monitoring

    THEN place EITHER CNTMT Spray pump (2P35A/B) in PTL.

COA A10 – Early termination of one train of HPSI/high-head injection prior to recirculation alignment.

Response: As stated in the WCAP-16204, deliberate manual securing of one HPSI train is not considered a "failure." Thus, analysis is required to show acceptable consequences with a failure of the remaining running train after manually stopping one HPSI/LPSI train. This would result in an interruption of core flow until the operator could start the standby HPSI pumps. This could result in a significant increase in the fuel peak cladding temperature and consequently a significant increase in radiological dose to the public. Entergy believes that this negative impact outweighs the potential benefit for sump NPSH. Therefore, because stopping one HPSI pump is not risk beneficial due to the risk of core damage upon a single failure loss of the one operating HPSI pump.

Furthermore, early termination of HPSI prior recirculation alignment requires several manual control component manipulations. This would introduce a greater opportunity for operator error and burden that could negatively affect accident mitigation. ANO-2's position is to ensure these actions are taken when necessary to protect equipment (i.e., actual sump blockage indication) rather than preemptively based upon the possibility that sump blockage may occur.